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### Editorial.....

It is heartening to note that our journal is able to sustain the enthusiasm and covering various facets of knowledge. It is our hope that IJMER would continue to live up to its fullest expectations savoring the thoughts of the intellectuals associated with its functioning .Our progress is steady and we are in a position now to receive evaluate and publish as many articles as we can. The response from the academicians and scholars is excellent and we are proud to acknowledge this stimulating aspect.

The writers with their rich research experience in the academic fields are contributing excellently and making IJMER march to progress as envisaged. The interdisciplinary topics bring in a spirit of immense participation enabling us to understand the relations in the growing competitive world. Our endeavour will be to keep IJMER as a perfect tool in making all its participants to work to unity with their thoughts and action.

The Editor thanks one and all for their input towards the growth of the **Knowledge Based Society**. All of us together are making continues efforts to make our predictions true in making IJMER, a Journal of Repute

**Dr.K.Victor Babu**  
**Editor-in-Chief**

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## TO COMPARE THE EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE (MET) AND MC KENZIE EXERCISE IN COMBINATION WITH TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) FOR TREATMENT OF MECHANICAL NECK PAIN

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### Abstract

Mechanical neck pain can be defined as generalized neck pain provoked by sustained neck postures and neck movement. Mechanical neck disorder is unrelated to a systemic problem, such as degenerative changes of cervical spine and whiplash injury of related soft tissues. It is a highly prevalent spinal disorder, with 45–54% of individuals affected during their life. Its a common problem in the working-age population (aged 20–60 years), particularly during computer work. It is characterized by symptoms of neck pain, such as headache, dizziness and limited range of motion. Many interventions are accepted as standard of care for mechanical neck pain,substantial evidence regarding the effectiveness of non operative interventions is still lacking.

**Objective** :- To compare the effectiveness between Muscle Energy Technique(MET) and Mc Kenzie Exercise in combination with TENS for treatment of mechanical neck pain.

**Methodology:** 30 subjects who fulfilled the inclusion criteria were randomly assigned to one of two groups after obtaining written informed consent.The subjects in Gr A was administered with Muscle Energy Technique in combination of TENS and in Gr B with Mc Kenzie exercise in combination of TENS respectively .Pain, functional disability and Cervical range of motion were the outcome measures which was assessed using VAS scale , NDI and CROM was assessed by goniometer for pre and post treatment.

**Result:-** The statistical paired t-test is used for comparing the pre intervention and post intervention scores of each variable for both the Groups. Statistical significance is set at  $P < 0.05$  .With group comparison it is found that all the values of VAS, NDI and CROM fulfills the  $P$  value  $\leq 0.05$ , which shows that there is significant improvement in both the groups.



**Conclusion:-** At the end of 3 weeks both the groups shows significant, however the effectiveness of MET was superior than Mc Kenzie in decreasing pain intensity, disability and increasing active cervical range of motion in mechanical neck pain.

**Key words :** Mechanical neck pain , Myofascial release technique, Mc Kenzie exercises, Transcutaneous electrical nerve stimulation.

## INTRODUCTION

Mechanical neck pain can be defined as generalized neck pain provoked by sustained neck postures and neck movement.<sup>(1)</sup> Mechanical neck disorder (MND) is unrelated to a systemic problem, such as degenerative changes of cervical spine and whiplash injury of related soft tissues. It is a highly prevalent spinal disorder, with 45–54% of individuals affected during their lives, and about 17–22% of recurrence in the neck pain population. It is a common problem in the working-age population (aged 20–60 years), particularly during computer work, characterized by symptoms of neck pain, headache, dizziness and limited range of motion (ROM). Several authors have proposed that these problems may result from lifestyle factors, habitual posture and muscle imbalance leading to pain provocation, reduced muscle strength and ROM.<sup>(2)</sup> Mechanical neck pain is not attributable to a specific disease or disorder and is labeled as ‘soft-tissue’ rheumatism or muscular or mechanical or postural neck pain. In the absence of traumatic injuries, the main cause of mechanical neck pain is poor posture, which in turn results in abnormal forces and strain on musculature that must balance and control the head as the persistent pain may be caused by inadequately addressed compensatory posture.<sup>(3)</sup> The aetiology of mechanical neck pain is poorly understood and mostly multifactorial, including poor posture, depression, anxiety, neck strain and occupational or sporting activities.<sup>(4)</sup>

Neck pain affects 30 % to 50 % of the general population experiencing chronic pain annually and 11% to 14 % of working population experience activity limitation.<sup>(1)</sup> Patients mostly present with neck pain have “non-specific (simple) neck pain,” where symptoms have a postural or mechanical basis.<sup>(5,4)</sup> Neck being the most common site of non-traumatic musculoskeletal pain. Prevalence is high in middle-aged people and has an increasing trend up to 50 years followed by a decline and it has found to be more in females.<sup>(5)</sup> In addition to the factors predisposing to pain in the general population, students subject themselves to hours of prolonged reading, writing and computer work which make them high-risk group for neck pain.<sup>(3)</sup> A study was done where the prevalence of self-reported weekly Neck And Shoulder Pain (NSP) in 15- to 18-year-old adolescents was 17% at baseline, and within seven years the prevalence of NSP had increased to 28%.<sup>(6)</sup>

Various studies revealed that specific treatment for non-specific neck pain ranges from cervical collar, cervical traction, moist heat, cervical mobilization,

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cervical manipulation, strengthening training routines, postural re-education, pharmacological treatment etc. Manual therapy for neck pain includes manipulation and mobilization. Various studies have shown that high velocity, low amplitude techniques may correct joint restriction, but not the restriction due to muscles.<sup>(7)</sup> Although many interventions are accepted as standard of care for mechanical neck pain, substantial evidence regarding the effectiveness of non operative interventions is lacking.<sup>(5)</sup> Neck pain is generally treated with spinal manipulative therapy and mobilization which have been shown to be viable and safe options in the short-term treatment of neck pain. In some case spinal manipulative care was declined by the patient which necessitated the need to employ other treatment methods. There is lack of evidence to allow conclusions to be drawn about the effectiveness of Muscle Energy Technique when compared with Mc Kenzie exercises for relieving mechanical neck pain so the purpose of this study is to compare the effectiveness of Muscle Energy Technique (MET) and Mc Kenzie Exercise in combination with Transcutaneous Electrical Nerve Stimulation for treatment of Mechanical Neck Pain. MET is a method of treatment that involves the voluntary contraction of a subject's muscle(s) in a precisely controlled direction, against a counterforce provided by the operator. It may be used to decrease pain, stretch tight muscles and fascia, reduce muscle tonus, improve local circulation, strengthen weak musculature and mobilise joint restrictions.<sup>(5)</sup> The McKenzie method was introduced in Sweden in 1985 and came to be frequently used in the 1990s as a treatment modality for patients with mechanical problems of the spine.<sup>(8)</sup> It makes use of similar presentations in pain response to spinal loading in neck movements and postures, and categorizes them into certain conditions. These are the postural, dysfunction and derangement syndromes. The McKenzie method utilizes a loading strategy that incorporates the centralizing phenomenon; this is defined as a rapid change in the location of pain from a distal or peripheral location to a more proximal or central position to the spine.<sup>(9)</sup> Transcutaneous Electrical Nerve Stimulation (TENS) is one of the commonest physical therapy modality used in the management of many musculoskeletal disorders. It is a method of electrical stimulation which primarily aims to provide a degree of symptomatic pain relief by exciting sensory nerves and thereby stimulating either the pain gate mechanism and/or the opioid system.<sup>(10)</sup>

## METHODOLOGY :

30 subjects within the age range of 20 -30 years consisting 67% female and 33% male participated in this comparative study design. All the subjects were patients at the Out patient Department of College of Physiotherapy and medical sciences and also at the Physical Medicine and Rehabilitation Department of Guwahati Medical College and Hospital. A convenience sample was used and all the subjects fulfilling inclusion and exclusion criteria were divided to two groups . One group receives Muscle energy technique with



Transcutaneous electrical nerve stimulation and the other group receives McKenzie method along with Transcutaneous electrical nerve stimulation applied at a frequency of 80 Hz, with -150 ms pulse duration and adjusted amplitude for 15 minutes<sup>(11)</sup> for a period of 3 weeks at a frequency of 4 days/ week .The pre and post intervention outcomes was measured using Visual analog scale, Goniometry and Neck disability index.

### **Intervention :**

Gr A - Muscle energy technique with Transcutaneous electrical nerve stimulation

Muscle energy technique using postisometric relaxation: -The subjects in this group received post-isometric relaxation (PIR) for trapezius and sternocleidomastoid muscle. In this procedure the physiotherapist and patient's force is matched. Initial effort involved approximately 20% of the patient's maximum strength. Duration of contraction was 7-10 seconds. 3-5 repetitions is given and neck is gently guided to new restriction barrier<sup>(7)</sup>.

I) For Trapezius :Assessment of the relative shortness of the right side upper trapezius :- One side is compared with the other, to ascertain the side most in need of Muscle Energy Technique attention.

Treatment:-The patient was in supine lying, arm on the side to be treated lying alongside the trunk, head/neck side bent away from the side being treated to just short of the restriction barrier, while the therapist would stabilize the shoulder with one hand and cups the ear/mastoid area of the same side of the head with the other: With the neck fully side bent and fully rotated contralaterally, the posterior fibres of upper trapezius are involved in the contraction . This will facilitate subsequent stretching of this aspect of the muscle.

With the neck fully side bent and half rotated, the middle fibres are involved in the contraction. With the neck fully side bent and slightly rotated towards the side being treated the anterior fibres of upper trapezius are being treated. The various contractions and subsequent stretches can be performed with therapist's arms crossed . The patient introduces a light resisted effort (20% of available strength) to take the stabilized shoulder towards the ear (a shrug movement) and the ear towards the shoulder. The double movement (or effort towards movement) is important in order to introduce a contraction of the muscle from both ends simultaneously. The degree of effort should be mild and no pain should be felt. The contraction is sustained for 10 seconds (or so) and, upon complete relaxation of effort, the therapist gently eases the head/neck into an increased degree of side bending and rotation, where it is stabilized, as the shoulder is stretched caudally. When stretching is introduced



the patient can usefully assist in this phase of the treatment by initiating, on instruction, the stretch of the muscle. This reduces the chances of a stretch reflex being initiated. Once the muscle is being stretched, the patient relaxes and the stretch is held for 10–30 seconds. <sup>(12)</sup>

ii) For Sternocleidomastoid: Functional Sternocleidomastoid (SCM) test:-The supine patient is asked to ‘very slowly raise your head and touch your chin to your chest’. The therapist stands to the side with head at the same level as the patient. At the beginning of the movement of the head, as the patient lifts this from the table, the practitioner would (if SCM were short) note that the chin was lifted first, allowing it to put forwards, rather than the forehead leading the arc-like progression of the movement. In marked shortness of SCM the chin pokes forward in a jerk as the head is lifted.

Treatment-The patient is supine with the head supported in a neutral position by one of the therapist’s hands. The shoulders rest on a cushion or folded towel, so that when the head is placed on the table it will be in slight extension. The patient’s contralateral hand rests on the upper aspect of the sternum to act as a cushion when pressure is applied during the stretch phase of the operation. The patient’s head is fully but comfortably rotated, contralaterally. The patient is asked to lift the fully rotated head a small degree towards the ceiling, and to hold the breath. When the head is raised there is no need for the therapist to apply resistance as gravity effectively provides this. After 7–10 seconds of isometric contraction (ideally with breath held), the patient is asked to slowly release the effort (and the breath) and to place the head (still in rotation) on the table, so that a small degree of extension occurs. The therapist hand covers the patient’s ‘cushion’ hand (which rests on the sternum) in order to apply oblique pressure/stretch to the sternum, to ease it away from the head and towards the feet. The hand not involved in stretching the sternum caudally should gently restrain the tendency the head will have to follow this stretch, but should not under any circumstances apply pressure to stretch the head/neck while it is in this vulnerable position of rotation and slight extension. The degree of extension of the neck should be slight, 10–15° at most. This stretch, which is applied as the patient exhales, is maintained for not less than 20 seconds to begin the release/stretch of hypertonic and fibrotic structures. <sup>(12)</sup>

Gr B:-Mc Kenzie exercise and Transcutaneous Electrical Nerve Stimulation:-

The McKenzie method, or mechanical diagnosis and therapy, is a system to classify/diagnose and to treat based on mechanical and symptomatic reactions on loading (repeated specific movements).Following the McKenzie protocol the type of exercises will be given. <sup>(13)</sup>



For postural syndrome:

To correct posture:-The patient was instructed to move into the extreme lordosis in the lumbar spine and extreme retraction in the cervical spine and then release the last ten percent of the movement.. It must be emphasised that in the correct sitting posture the lumbar lordosis should be retained to a similar degree as it should be retained to a similar degree as is present in the active alerted standing position. The spine should not be held in excessive extension end range. Maintaining a correct lumbar posture will more easily allow the patient to adopt a correct retracted cervical posture. Again, the retracted head posture should not be excessive and should allow the head to be held erect and high. The procedure is done 3 times daily for 5 to 15 times.<sup>(13)</sup>

For the cervical dysfunction syndrome:

The symptom of dysfunctions are most related to movement and becomes apparent when the patient is unable to accomplish end range of movement, particularly when attempting the extremes of flexion and extension.The following instructions must be given to the patient: -

Because posterior derangement is so common, patients with dysfunction in the cervical region must maintain correct posture at all times and will at the end of each session of exercise perform retraction and extension . If the exercises do not produce some minor pain, the movement has not been performed far enough into the end range. The type of discomfort aimed at is not unlike the pain felt when bending the finger backwards beyond the normal position. The pain should have subsided within ten to twenty minutes after completion of the exercises. When pain produced by the stretching procedures lasts continuously and is still evident the next day, that is, too much stretching has taken place; in this case the number of exercises in each sequence or the frequency of the sequences must be reduced. When stretching results in rapidly increasing and peripheralising pain, the procedure should be stopped immediately as derangement is likely to develop.<sup>(13)</sup>

To correct extension dysfunction:- To stretch the lower cervical spine in extension, the procedures of retraction (sitting or standing), retraction and extension (sitting or standing) and retraction and extension (lying supine or prone ) will be progressively indicated according to the effects obtained. The procedure is done for 5 to 15 times in each session.<sup>(13)</sup>

To correct flexion dysfunction:- Flexion is attained in sitting position without pressure in initial stage. Immediately after each session of five to fifteen movements of flexion the patient must retract and extend in order to reduce any tendency for posterior flow or displacement. Pain produced by stretching



of contracted structures involved in the loss of flexion should be felt at or near the centre or just to one side of the cervical spine about the C5-7 area. The last few degree of flexion is achieved by adding flexion with over pressure by therapist(myself) or by patient himself/herself for 5 to 15 times each session. <sup>(13)</sup>

To correct lateral flexion dysfunction :-Patient is asked to do lateral flexion for 5 to 15 times. To attain last few degree of flexion at the later stage lateral flexion is done adding over pressure by therapist or patient himself/herself. <sup>(13)</sup>

To correct rotation dysfunction :-Patient is asked to rotate in required direction. Exercise is performed 5 to 10 times. At the end to obtain few degree of rotation the patient is asked to perform rotation and adding over pressure by therapist or patient himself/herself. <sup>(13)</sup>

#### DATA ANALYSIS:-

The collected data was statistically analyzed using SPSS Software VERSION 20.0.

The statistical test used was mean, standard deviation and paired t-test for comparing the pre intervention and post intervention scores of each variable for the two groups separately.

Variance intervention was done to compare the effectiveness of Muscle Energy Technique and Mc Kenzie Exercise. Statistical significance was set at  $P < 0.05$ . Value of confidence interval was set A at 95%.

GENDER	GROUP A(MET)	GROUP B (MC KENZIE)	TOTAL	PERCENTAGE
FEMALE	10	10	20	67%
MALE	5	5	10	33%
TOTAL	15	15	30	100%

**Table 1:-** Shows genderwise distribution between Group A and Group B. After calculating the mean percentage it was found that more females have participated in the study which is 67% and male with 33%.Age wise distribution of subjects shows in Groupand Group2 where out of 15 subjects(100%) with mechanical neck pain in Group A( MET) ,60% were in the age group of 20-25 and 40% were in the age group of 26-30 and in GroupB ( Mc Kenzie) , 67% were in the age group of 20-25 and 33% were in the age group of 26-30.



OUTCOME MEASURES	N	MEAN	Std. Deviation
VAS	15	6.80	0.414
NDI	15	17.20	2.366
CROM (FLEX)	15	33.07	3.990
CROM (EXT)	15	32.66	5.300
CROM (ROT)RIGHT	15	51.20	7.408
CROM (ROT) LEFT	15	47.67	11.159
CROM (LATERAL FLEX) RIGHT	15	31.33	6.704
CROM ( LATERAL FLEX) LEFT	15	29.33	5.300

**Table 2:** Shows for group A (MET) Pre Test Mean and Std. Deviation Values of the outcome measures i.e Visual Analogue Scale, Neck Disability Index and all the Cervical Range of Motion.

OUTCOME MEASURES	N	MEAN	Std. Deviation	VARIANCE
VAS	15	2.26	.488	.238
NDI	15	3.73	1.335	1.781
CROM (FLEX)	15	46.333	2.968	8.809
CROM (EXT)	15	49.33	4.577	20.952
CROM (ROT) RIGHT	15	70.00	4.629	21.429
CROM (ROT) LEFT	15	67.33	6.229	38.809
CROM (LATERAL FLEX) RIGHT	15	52.00	5.606	31.428
CROM (LATERAL FLEX) LEFT	15	51.66	5.232	27.381

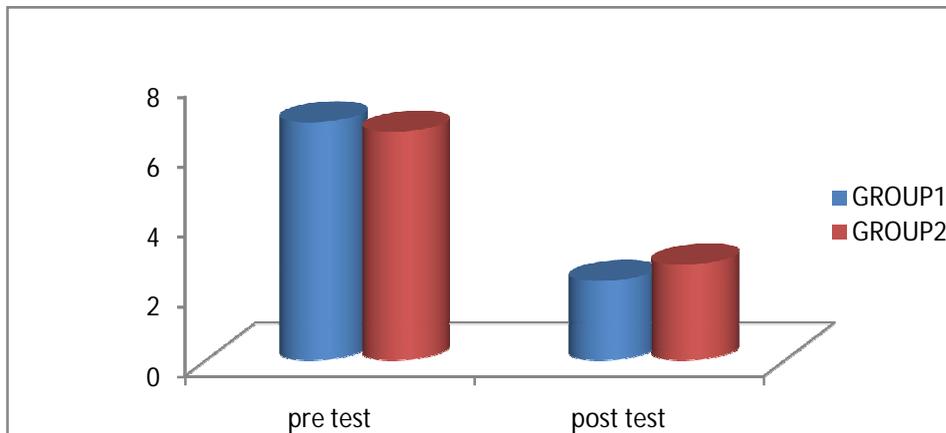
**Table 3 :** Shows for group A (MET) Post Test Mean, Std. Deviation and Variance values of the outcome measures i.e Visual Analogue Scale, Neck Disability Index and all the Cervical Range of Motion

OUTCOME MEASURES	N	MEAN	Std. Deviation
VAS	15	6.53	.743
NDI	15	17.00	2.204
CROM (FLEX)	15	31.73	6.341
CROM (EXT)	15	36.533	5.097
CROM (ROT) RIGHT	15	51.07	6.239
CROM( ROT) LEFT	15	52.60	6.978
CROM LATERAL (FLEX) RIGHT	15	32.60	4.485
CROM LATERAL (FLEX) LEFT	15	31.67	6.726

**Table 4 :** Shows for group B (Mc Kenzie) Pre Test Mean and Std. Deviation values of the outcome measures i.e Visual Analogue Scale, Neck Disability Index and all the Cervical Range of Motion.

OUTCOME MEASURES	N	MEAN	Std. Deviation	VARIANCE
VAS	15	2.73	.516	.267
NDI	15	4.80	1.897	3.600
CROM (FLEX)	15	41.66	5.563	30.952
CROM (EXT)	15	45.66	5.627	31.666
CROM (ROT) RIGHT	15	61.00	6.325	40.000
CROM (ROT) LEFT	15	61.46	7.189	51.695
CROM LATERAL (FLEX) RIGHT	15	47.266	7.215	52.066
CROM LATERAL (FLEX) LEFT	15	47.00	6.761	45.714

**Table 5:** Shows for Group B (Mc Kenzie) Post Test Mean, Std. Deviation and Variance values of the outcome measures i.e Visual Analogue Scale, Neck Disability Index and all the Cervical Range of Motion.



**Fig 8:-** Shows the difference in Pre and Post mean values of VAS between Group A and Group B

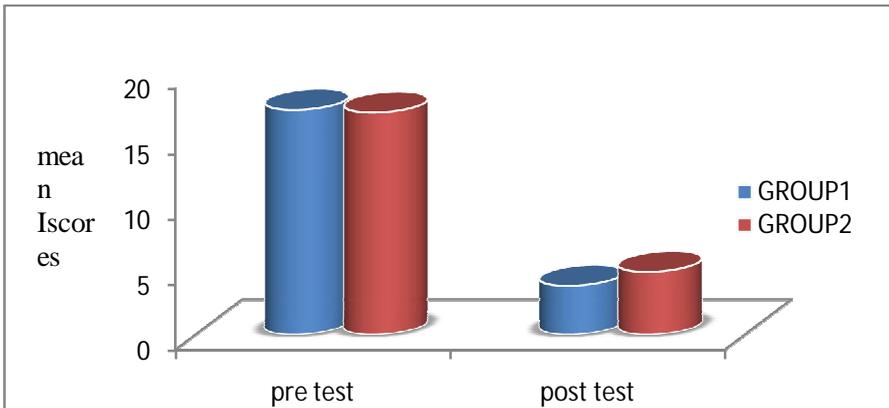


Fig 9:- Shows the difference in Pre and Post mean values of NDI between Group A and Group B

Table 6:- To compare the effectiveness between Group A (MUSCLE ENERGY TECHNIQUE) and Group B (Mc KENZIE)

GROUP1-GROUP2	95% CONFIDENCE INTERVAL OF THE DIFFERENCE		
	T	Df	P
VAS	2.43	14	0.029
NDI	3.10	14	0.007
CROM flexion	2.82	14	0.013
CROM extension	2.17	14	0.047
CROM rotation right	3.60	14	0.002
CROM rotation left	2.39	14	0.031
CROM lateral flexion right	2.77	14	0.150
CROM lateral flexion left	2.96	14	0.010

**Result:**

The study contains total number of 30 subjects where each group contains 15 subjects.

The statistical paired t-test is used for comparing the pre intervention and post intervention scores of each variable for Group A (MET) and Group B (Mc Kenzie). Statistical significance is set at  $P < 0.05$  where  $P$  value  $> 0.05$  is considered as non significant difference while  $P$  value  $\leq 0.05$  is considered to have represented a significant difference. Value of confidence interval was set



at 95%. Here after analyzing the t test between the two groups with the POST intervention are like:-

VAS t= 2.43 which is significant (p=0.029). NDI t= 3.10 which is significant (p=0.007).

CROM flexion t= 2.82 which is significant (p=0.013). CROM extension t= 2.17 which is significant (p=0.047). CROM rotation (right) t= 3.60 which is significant (p=0.002). CROM rotation (left) t= 2.39 which is significant (p=0.031). CROM lateral flexion (right) t= 2.77 which is significant (p=0.150). CROM lateral flexion (left) t= 2.96 which is significant (p=0.010).

Between group comparison it is found that all the values of VAS, NDI AND CROM [FLEXION, EXTENSION, ROTATION(R/L), LATERAL FLEXION(R/L)] fulfill the P value  $\leq 0.05$ , which shows there is a significant difference between the two groups therefore we reject the null hypothesis and accept the alternate hypothesis. Comparing the calculated Variance of both the Groups from Table 7 we found that MET Variance is less than McKenzie Variance thus it can be concluded that there was better improvement in MET group.

## DISCUSSION:-

The aim of the current study was to compare the effectiveness of Muscle Energy Technique (MET) and McKenzie Exercise in combination with Transcutaneous Electrical Nerve Stimulation (TENS) for the improvement in CROM, decreasing pain and reducing disability in both the groups for the treatment of mechanical neck pain. Mechanical neck pain is a highly prevalent spinal disorder, with 45–54% of individuals affected during their lives, and about 17–22% of recurrence in the neck pain population. It is a common problem in the working-age population (aged 20–60 years), particularly during computer work. It is characterized by symptoms of neck pain, such as headache, dizziness and limited range of motion; resulting from lifestyle factors, habitual posture and muscle imbalance. Improper head posture leads to pain provocation, reduced muscle strength and ROM.

Many wide variety of treatment protocols for mechanical neck pain are available however, the most effective management remains an area of debate. Neck pain is generally treated with spinal manipulative therapy. In some case spinal manipulative care was declined by the patient which necessitated the need to employ other treatment methods. There is lack of evidence to allow conclusions to be drawn about the effectiveness of Muscle Energy Technique when compared with McKenzie exercises for relieving mechanical neck pain so the purpose of this study was to compare the effectiveness of Muscle Energy Technique (MET) and McKenzie Exercise in combination with Transcutaneous Electrical Nerve Stimulation (TENS) for treatment of mechanical neck pain.

In this study 30 subjects were selected and randomly divided into 2 group having 15 in each group. Group A received MET in combination of TENS



and Group B received Mc Kenzie in combination of TENS. The patients Cervical Range of Motion was assessed by universal goniometer, pain by VAS and disability by NDI for both pre and post treatment. All the interventions was done 4 days for 3 weeks. After 3 week post-test assessment was done using the same parameters. Result indicate that there is a significant improvement in Cervical Range of Motion (CROM), decreasing pain and disability in patients with Mechanical neck pain at the end of 3 weeks in both the groups.

In this study subjects were found mostly between the age group of 20-30. This conclusion regarding the age is well supported by Nevein M M Gharib et al who said that neck pain was found to be a common complaint among undergraduate students, as evidenced by the high prevalence rate of 54% in our sample. This is concerning, given the relatively young age of this sample (mean age =  $20.49 \pm 2.14$  years), but supports findings in the literature suggesting that neck problems can occur at an early age (25-27) and often commence prior to graduation.<sup>(3,14)</sup> In this study the gender wise distribution in both the groups out of 30 subjects 20 were females and 10 were males. This comes in agreement with Habib *et al.*, who reported a higher prevalence among females than males for all ages for several types of musculoskeletal disorders. Neck pain in the general population affects females than males, with ranges of 12.5-22% in females and 9.5-16% in males<sup>(3,1)</sup>

The result of the study demonstrate that Group A receiving muscle energy technique in combination with TENS for 4 days a week for a period of 3 week which was found to be statistically significant and effective than the other group. The superior effect of Muscle Energy Technique than the other group is similar to the finding of other study. The fact can be the effects of Muscle Energy Technique in increasing the ROM post intervention was based on physiological mechanisms behind the changes in muscle extensibility. The combination of contractions and stretching (post isometric relaxation) used in MET would be more effective for producing greater viscoelastic change and passive extensibility than passive stretching alone (Mahajan et al.).<sup>(5,16)</sup>

Results of the present study for Muscle Energy Technique group for improvement in ROM were similar to previous studies conducted over neck area and other muscles/joint. Cassidy et al found immediate increase in ROM of neck in all three planes in patients with mechanical neck pain who were mobilized using Muscle Energy Technique.<sup>(17,5)</sup> Schenk et al found that the group treated with Muscle Energy Technique demonstrated increased range in each of the six directions of motion.<sup>(18,5)</sup> The results obtained for pain in the Muscle Energy Technique group were in consensus with the previous studies in which pain intensity reduced following Muscle Energy Technique over neck area, or other area of the body. Muscle Energy Technique for decrease in pain and disability is known for its hypoalgesic effect. Post isometric relaxation was claimed to be an effective method for acute tension in soft tissue problems that preclude immediate spinal adjustments, reduces muscle



spasm that is responsible for spinal fixation, reduces pain and lengthen the tightened neck muscles to normalize gross cervical range of motion (Digiovanna and Schiowitz, 1996).<sup>(19,16)</sup>

The Group B patients receive Mc Kenzie exercises with combination of Transcutaneous electrical nerve stimulation and the result there was improvement in the Cervical Range Of Motion, pain and disability and was considered statistically significant. Similar studies like Go`rel Kjellman et al said the main finding of their study is that there were no differences between groups at 12 months follow-up. However, in the short term, McKenzie treatment was more favourable than general exercise and the control group, with a more rapid improvement in pain intensity during the first 3 weeks.<sup>(8)</sup> Rathore.S in his study said; the McKenzie protocol, which has been commonly utilized in low back conditions, may also be employed in the treatment of mechanical neck pain. It makes use of similar presentations in pain response to spinal loading in neck movements and postures, and categorizes them into certain conditions. McKenzie, divides conditions into three syndromes based on symptoms and their response to loading. These are the postural, dysfunction and derangement syndromes.<sup>(9,13)</sup> In this study; we discuss the postural and dysfunction syndrome. The first is the postural syndrome that exhibits neck pain, without physical findings. Symptoms are similar to bending one's finger into a hyperextended position, for a prolonged period of time, and which cease upon its return to a neutral position. Rathore.S said Postural abnormalities have been implicated in the increased incidence of pain in otherwise healthy individuals.<sup>(9,20)</sup> Mc. Kenzie treatment consists of patient education on posture. A cervical lordosis is to be maintained with the head held over the shoulder region. This generally resolves symptoms and, as there are no functional limitations, no further care is required. The second condition is the dysfunction syndrome, whose hypothesized pathoanatomy is adaptively shortened tissue due to scarring or fibrosis of the ligamentous structures in the spine. This is secondary to trauma, poor posture or degenerative change. Overpressure or sustained loading may increase pain at the end range of motion. The patient exhibits intermittent pain and the symptoms resolve once the stress on the affected tissues is removed. Therefore, if range of motion were limited in extension, a loading strategy to provoke the dysfunction (viz., repeated extension to end range) would be prescribed. This is to restore motion to the restricted movement plane, and would generally involve a prolonged course of care of up to a few months.<sup>(13,21)</sup> Based on the results found by Kjellman, G. and Oberg, B., Peterson et al, and Paatelma et al, we determined that the McKenzie method is a successful treatment to decrease pain.<sup>(22)</sup>

Here both the groups received Transcutaneous Electrical Nerve Stimulation, as isolated Muscle Energy Technique and Mc kenzie exercise could not be approached directly on patients with subacute mechanical neck pain. Supporting studies were done like Mikhled M et al study demonstrated that TENS



treatment was effective in pain relief. It is a popular modality for treating musculoskeletal pain; exciting large-diameter afferent fibers.

According to the gate control theory, it may stimulate the large-diameter afferent fibers, which may reduce the transmission of pain signals through the small nociceptive afferent fibers, thereby inhibiting pain discrimination and perception.<sup>(23)</sup> Chiu et al. (2005), said there was a clinically relevant improvement in pain after a six-month follow-up, in the exercise and the Transcutaneous Electrical Nerve Stimulation groups (the control group received only infrared irradiation and advice on neck care).<sup>(24,11)</sup>

The combination of Transcutaneous Electrical Nerve Stimulation used in both the groups and its effect in reducing the pain might not be able to differentiate in the effect of Muscle Energy Technique or Mc Kenzie in reducing pain. Studies did previously have proved individual effects of Muscle Energy Technique and McKenzie exercises which have been well established. But the result of the present study shows when comparing both the treatments there is superiority of Muscle Energy Technique for improving the Cervical Range of Motion and decreasing the pain and disability in mechanical neck pain than the Mc Kenzie exercises

## CONCLUSION

Therefore after analyzing the data this study concluded that both the treatment techniques, Muscle Energy Technique (MET) and Mc Kenzie were effective in alleviating the mechanical neck pain in terms of decreasing pain intensity, disability and increasing active cervical range of motion as there was significant difference between the two groups, however MET was superior than Mc Kenzie in decreasing pain intensity, disability and increasing active cervical range of motion in mechanical neck pain.

Thus the therapist can use both the techniques for the treatment of mechanical neck pain as statistically significant improvement was seen (in terms of improvement in range of motion and reducing pain intensity) implying effectiveness of both the techniques. But Muscle Energy Technique being superior can be taken as the first choice of treatment.

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**SYNTHESIS OF NOVEL AZO-BASED LIGAND 1, 5-BIS  
(2-HYDROXY-4-(P-TOLYLDIAZENYL) PHENYL) PENT  
A-1, 4-DIEN-3-ONE (HTDPPD) AND ITS METAL (II) COMPLEXES FOR  
SELECTIVE SENSING OF Cu<sup>2+</sup> COMPLEX**

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## ABSTRACT

Due to the well-known variety of application like functional dyes and in industries, a new azo ligand is derived from 2-hydroxy-4-(p-tolyldiazenyl) benzaldehyde via diazotization reaction. The synthesized ligand and its metal complexes were characterized by FT-IR, UV-Vis and <sup>1</sup>H-NMR spectral techniques. The elemental analysis suggests that the stoichiometric ratio is 1:1 (metal: ligand). FT-IR and <sup>1</sup>H-NMR confirm the ligand and its corresponding metal complexes. HRMS data supports the formation of the compound and its coordination towards metal complexes. The free ligand and its metal complexes shows cation sensing and screened for *in vitro* antibacterial studies against four bacterial species. Metal complexes show noteworthy biological activity, Fluorescence than the Ligand.

**Keywords:** azo ligand, cation sensing.

## INTRODUCTION

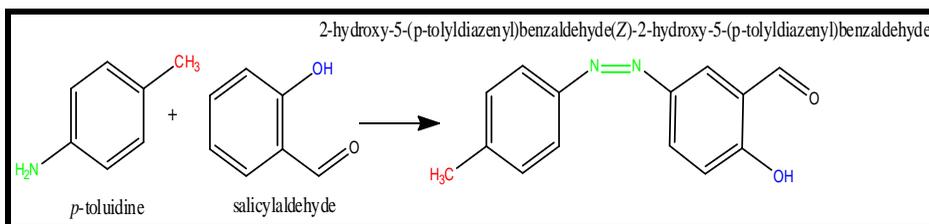
Azo compounds have advanced applications in organic synthesis and high technology areas such as laser, liquid crystalline displays and ink-jet printers [1-3]. Azo dyes are an important class of the organic photoactive materials, due to their excellent optical switching properties [4-8]. In addition, the azo dyes and their metal complexes are involved in many biological reactions such as inhibition of DNA, RNA, enzymes and biological activity against bacteria and fungi [9,10]. The coordination compounds of azo-azomethine ligands are also widely used in medicine, for corrosion prevention, metal recovery as well as to treat nuclear wastes [11]. Furthermore, since the azo compounds have a good thermal stability, the azo-azomethine compounds find important applications in the optical data storage as recording layer on digital versatile disk-recordable [12,13]. The Dye Sensitized Solar Cell (DSC) or the Grätzel cell, is a complex system wherein three different components, the semiconductor, the chromophore and the electrolyte are brought together to generate electric power from light without suffering from many permanent chemical transformations [14]. A monolayer of the chromophore, i.e. the sensitizer, is attached to the surface of the semiconductor.

## EXPERIMENTAL METHODS

### SYNTHESIS OF STARTING MATERIAL

#### Scheme 1: Synthesis of 2-hydroxy-5-(*p*-tolyl diazenyl) benzaldehyde (HTDBA)

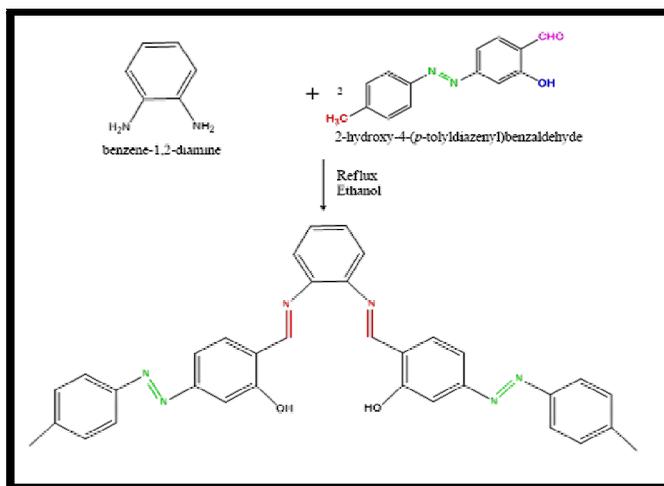
The *p*-toluidine (6.40g) was mixed with HCl (6ml) in distilled water (30ml) and NaNO<sub>2</sub> (2.8g) in water below 5°C. The diazotised *p*-toluidine was coupled with salicylaldehyde in the alkaline media. The pH during the coupling was kept fixed between 7-9. The diazo compounds were recrystallized several times from ethanol with addition of HCl to pH 3. All organic impurities were then extracted by washing with a small portion of diethyl ether. The precipitated compounds were dried under vacuum and recrystallized. (Scheme 1)



Scheme 1.Synthesis of HTDBA

### SYNTHESIS OF LIGAND

#### Scheme 2: Synthesis of 1, 5-bis (2-hydroxy-4-(*p*-tolyl diazenyl) phenyl) penta-1, 4-dien-3-one(HTDPPD)



Scheme 2.Synthesis of HTDPPD

A mixture of 2-hydroxy-4-(p-tolyldiazenyl) benzaldehyde (4.8 g/20mmol) and acetone (0.58 g/10mmol) in alkaline solution was stirred at room temperature for half an hour. Gradually red precipitate separates out, and then it was filtered and washed thoroughly with ethanol. The resulting product was recrystallized from ethanol. (Scheme 2)

## RESULT AND DISCUSSION

The ligand obtained was coloured, stable in air and non-hygroscopic in nature. They are freely soluble in organic solvents such as DMSO, DMF, Ethanol and Water. The physical property of the ligand HTDPPD and its metal(II) complexes are listed in Table 1

**Table 1. Elemental analysis data of the ligand**

Compounds	F.W. (g/mol)	Colour	Found Calculated (%)					$\Lambda_M$ ( $\Omega^{-1} \text{cm}^2 \text{mol}^{-1}$ )
			C	H	N	O	M	
<b>HTDPPD</b> $\text{C}_{33}\text{H}_{25}\text{N}_6\text{O}_2$	537.2	Red	73.38	4.69	15.63	5.95	-	-
			73.12	4.64	15.23	5.94	-	-
<b>[Cu(HTDPPD)Cl<sub>2</sub>]</b> $\text{C}_{33}\text{H}_{23}\text{CuN}_6\text{O}_2$	597.2	Dark brown	63.34	2.33	12.97	5.63	14.72	10.05
			63.33	2.38	12.99	5.89	14.65	
<b>[Co(HTDPPD)Cl<sub>2</sub>]</b> $\text{C}_{33}\text{H}_{23}\text{CoN}_6\text{O}_2$	593.2	Pale green	63.63	2.36	13.12	5.68	13.75	9.6
			62.99	2.39	13.32	5.64	13.61	
<b>[Ni(HTDPPD)Cl<sub>2</sub>]</b> $\text{C}_{33}\text{H}_{23}\text{NiN}_6\text{O}_2$	594.2	Dark green	62.98	2.36	13.11	5.63	13.79	11.9
			63.01	2.41	13.33	5.62	13.64	

## <sup>1</sup>H-NMR SPECTRAL STUDIES

The <sup>1</sup>H NMR spectrum of ligand is recorded in DMSO given in Fig.1. The peaks are assigned as follows: phenolic (-OH) group proton as singlet (13.1  $\delta$ ), aromatic protons as multiplet at (7.4-7.8  $\delta$ ), ethylene as doublet at (6.9  $\delta$ ) and methyl as a sharp singlet at (2.5  $\delta$ ).

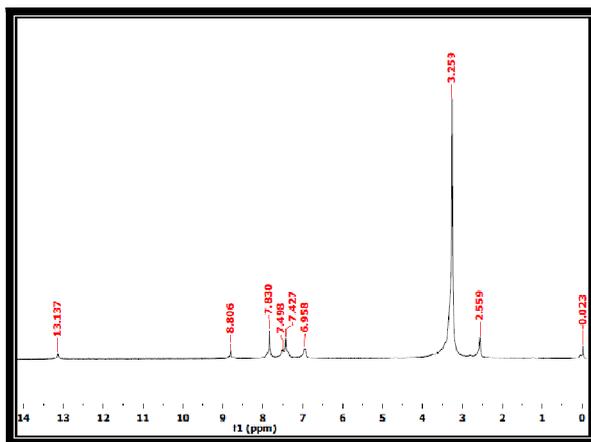


Fig.1. NMR Spectra of HTDPPD

## ELECTRONIC ABSORPTION SPECTRA

The electronic absorption spectra of Ligand, recorded in Ethanol at room temperature displays one of strong intensity located in the UV and the other, of weaker intensity, in the visible spectral region. The occurrence of such bands can be assigned to  $\pi-\pi^*$  and  $n-\pi^*$  electronic transitions of the azobenzene moiety. The sharp band located at 351 nm is due to the presence of  $\pi\rightarrow\pi^*$  transition of the of the transform of azobenzene [15]. A very weak  $n-\pi^*$  transition peak and also intramolecular charge transfer interaction is observed at 382nm. The intramolecular CT band can be assigned to the existence of tautomeric equilibrium originating from hydroxyl group in o-position of aromatic ring In most cases,  $trans\rightarrow cis$  isomerization is promoted by irradiation with wavelengths between 320–350 nm, while exposures to 380–410 nm favour the  $cis\rightarrow trans$  photoreversion [16,17]. The absorption peaks at 220 nm and 312 nm shows the presence of C=O and Ar-OH respectively [18].

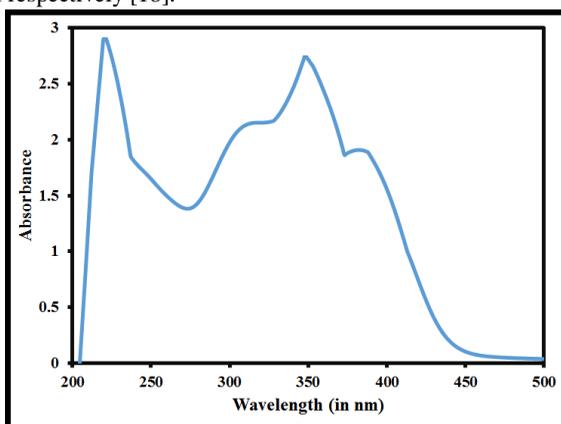


Fig.2. UV-Vis spectra of HTDPPD

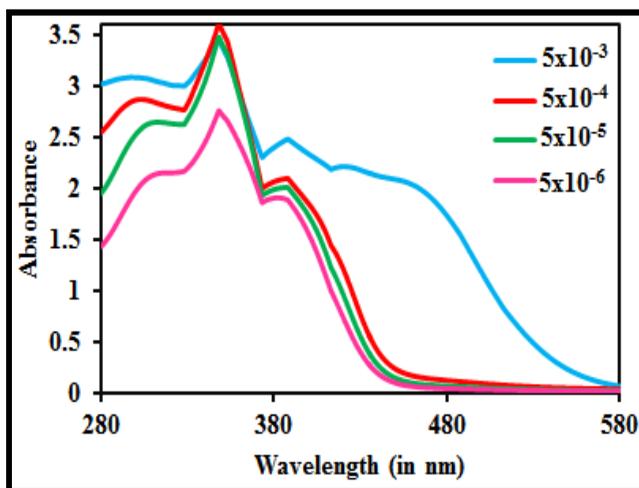


Fig.3. UV-Vis spectra of HTDPPD with different dilutions

#### SOLVENT EFFECT ON UV-VIS SPECTRA

The UV-vis absorption spectra were recorded using a variety of solvents such as DMF, DMSO, Ethyl Acetate, Ethanol, THF and Water. The concentration range is kept constant at  $10^{-5}$  M. It was found that the absorption band at 375–416 nm generally shows hypsochromic shift (negative solvatochromism) as the polarity of solvent was increased (Table 2), indicating the removal of double bond by saturation. The other bands at 425–500 nm shows bathochromic shift (positive solvatochromism) upon increasing solvent polarity. This positive solvatochromism exhibited by the dyes may be due to the effect of dipole moment changes of the excited state and/or due to increase in the conjugation [19]. The general increasing order of polarity of solvents is: THF < Ethyl acetate < DMF < DMSO < Ethanol < Water.

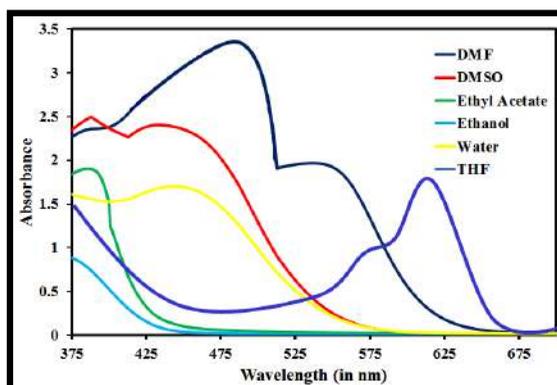


Fig.4. Absorption spectra of HTDPPD in different solvents.

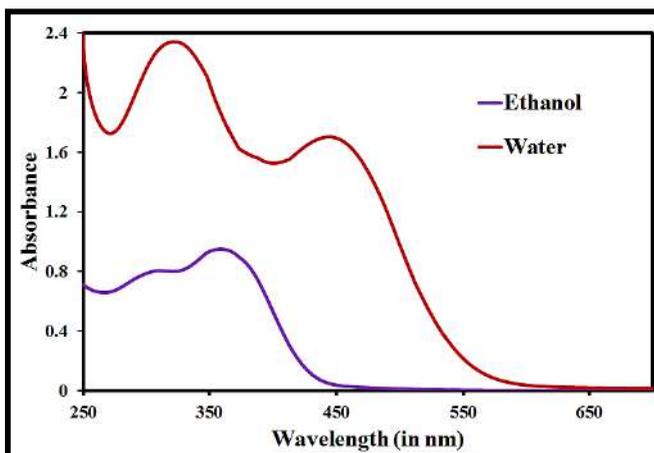


Fig.5. Absorption spectra of HTDPPD in Ethanol and Water

Table.2. Absorption spectral data of HTDPPD in various organic solvents;  $\lambda_{max}/nm$

LIGAND	DMF	DMSO	ETHYL ACETATE	ETHANOL	THF	WATER
HTDPPD	384	386	350	364	385	450
	489	438	386	304	422	334
	544				575	
					616	

### pH EFFECT ON UV/VIS SPECTRA

To gain further insights about the equilibrium between the tautomeric hydrazone-azo forms acid-alkali studies has been performed at different pH. Under acidic conditions (pH 1 to 6) the low energy bands with respect to the hydrazine-azo form diminished almost completely and a new high energy band appeared at 383 nm (Fig.6).

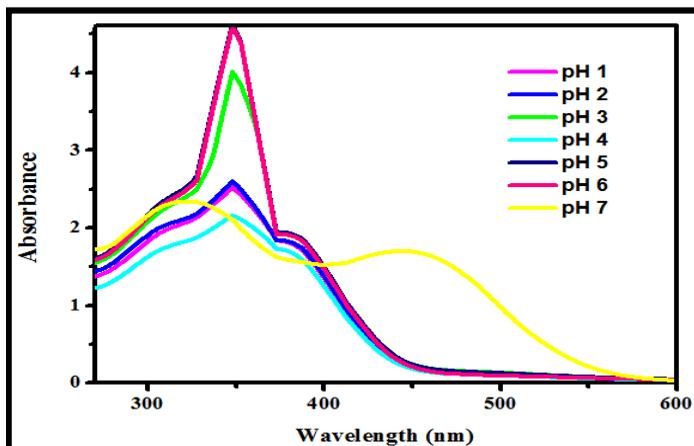


Fig.6. Absorption spectra of HTDPPD in different acidic pH

Upon changing the pH from 7 to 14 the absorbivity of the low energy bands decreased with the hypsochromic shift and high energy bands corresponding to the hydrazone-azo form dominate [20-22]. The new bands observed at 299 nm – 304 nm and 462 nm are assigned to  $n \rightarrow \pi^*$  and  $\pi \rightarrow \pi^*$  electronic transition of azo-aromatic chromophore of the aromatic ring and intra molecular charge transfer interaction (Fig.7) [23]. The disappearance of absorption band at 383 nm indicates the cis-trans isomerism.

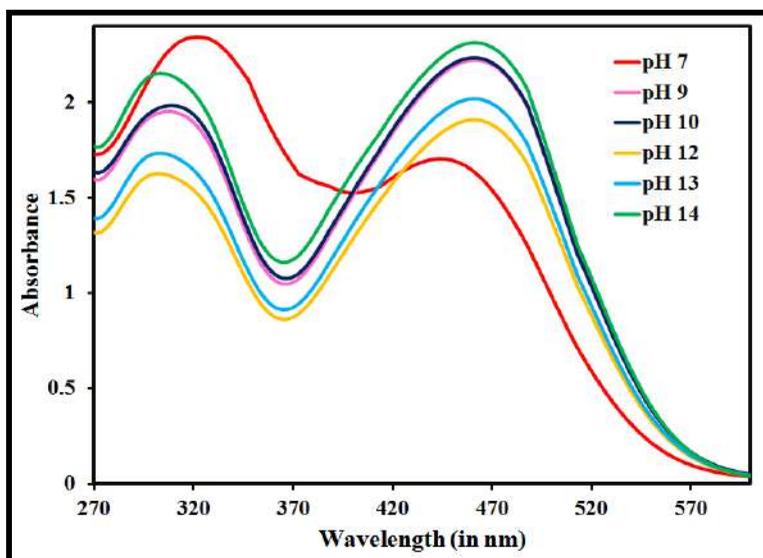


Fig.7. Absorption spectra of HTDPPD in different basic pH

## CATION SENSING STUDIES OF LIGAND

UV-Vis spectrum of Ligand is also studied in presence of other metals i.e.,  $\text{Na}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Cr}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Ni}^{2+}$ , and  $\text{Cd}^{2+}$  and a significant change was observed in case of  $\text{Cu}^{2+}$  (Fig. 8 and 9). The presence of absorption band at 279 nm is due to formation of Ligand- $\text{Cu}^{2+}$  complex whereas the absorption band at 237 nm indicates the presence of C=O group.

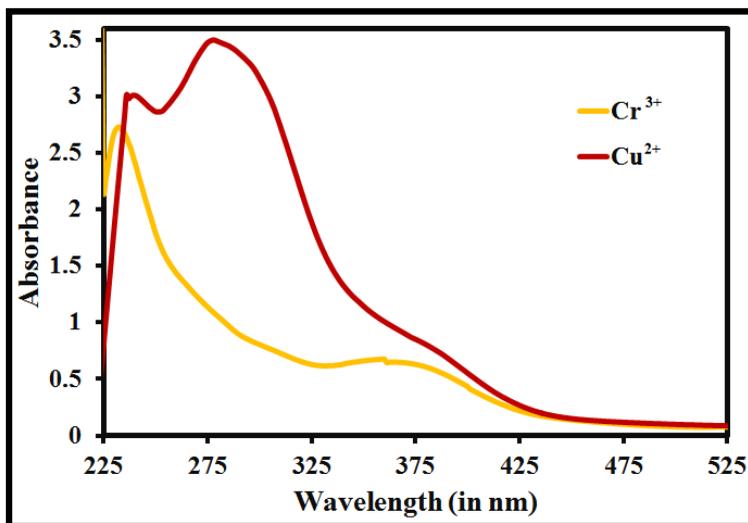


Fig.8. The absorption spectra of HTDPPD with Cr(III) and Cu(II).

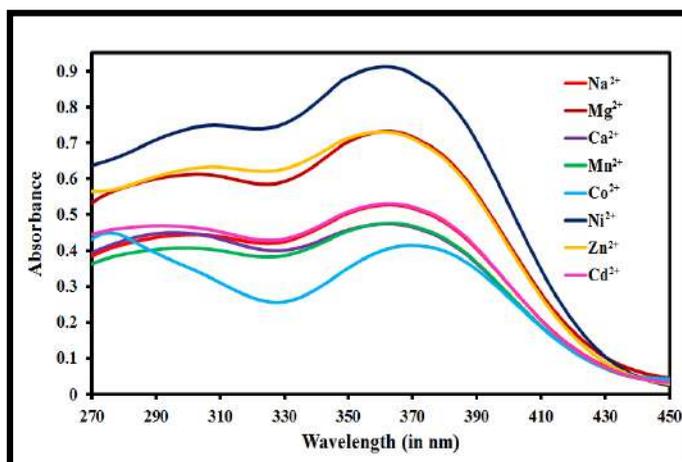


Fig.9. The absorption spectra of HTDPPD with different metals

Due to the complexation with  $\text{Cu}^{2+}$ , distinct colour change occurs from red to light blue. During coordination with  $\text{Cu}^{2+}$ , de-protonation of phenolic-OH of ligand affects the electronic properties of ligand which results in colour from red to light blue.



ig.10. Highest sensing of Cu(II) metal among all the metals with HTDPPD.

### INFRARED SPECTRAL STUDIES

IR spectral technique is the most suitable one to arrive information related to nature of bonding of the ligand to the metal ion. The IR spectra of both the free ligand and metal complexes were carried out in the range  $4000\text{--}400\text{ cm}^{-1}$ . The spectral data for ligand is presented in **Table 3**. The spectrum of the ligand shows a peak at  $3396\text{ cm}^{-1}$  which may be due to  $\nu(\text{NH})$  stretching vibration [24]. The aromatic ring shows  $\nu(\text{C-H})$  at  $2924\text{ cm}^{-1}$ ,  $\nu(\text{C=C})$  at  $1679\text{ cm}^{-1}$  and  $1444\text{ cm}^{-1}$ . The bands at  $1190$  and  $1147\text{ cm}^{-1}$  are assigned to  $\nu(\text{C-N})$  stretching [25] and a band at  $1120\text{ cm}^{-1}$  corresponds to alcoholic  $\nu(\text{C-O})$  [26] respectively. The ligand shows peak at  $840\text{--}810\text{ cm}^{-1}$  due to C-H bending in it. A band at  $3390\text{ cm}^{-1}$  and a weak band at  $1580\text{ cm}^{-1}$  shows the presence of phenolic  $\nu(\text{-OH})$  and  $\nu(\text{N=N})$ , respectively. The FT-IR spectra are depicted in **Fig. 11**.

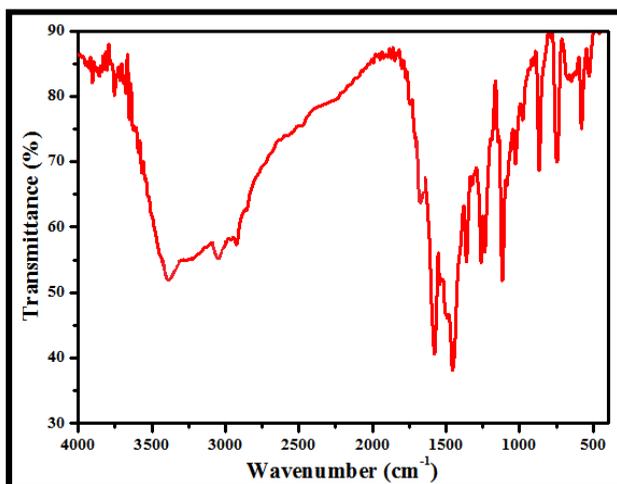


Fig.11. IR Spectra of HTDPPD

Table.3. IR spectral data of ligand (HTDPPD)

Compounds	$\nu(\text{C-H})$	$\nu(\text{C-C})$	$\nu(\text{C=O})$	$\nu(\text{C-N})$	$\nu(-\text{OH})$	$\nu(\text{N=N})$
LIGAND	838	1679	1120	1190	3390	1580

### ELECTROCHEMICAL BEHAVIOUR OF LIGAND

Cyclic voltammetry (CV) is popular for its comparative simplicity and its elevated information content. It is used most often as a diagnostic tool for elucidating the electron transfer process at the scan rate of  $100 \text{ mV s}^{-1}$  (-1.2 to 1.2 V). Using DMSO solution the oxidation and reduction behaviour of the ligand was performed at room temperature with tetrabutylammonium perchlorate (TBAP) as supporting electrolyte; glassy carbon as working electrode; Pt wire as auxiliary electrode; Ag/AgCl as reference electrode in order to monitor spectral and structural changes accompanying electron transfer. The ligand exhibited one-step reversible reduction peak at -0.75 V (cathodic side) and one oxidation peak at -0.60 V (anodic side) as shown in **Fig.12**. Also, an irreversible oxidation wave is observed at 0.90V [27]. The azo-dyes display oxidation at more positive potential as a consequence of the destabilizing effect of the electron-withdrawing group on the arylazo moiety. This process may also be associated with the reduction of the azo bonds [28].

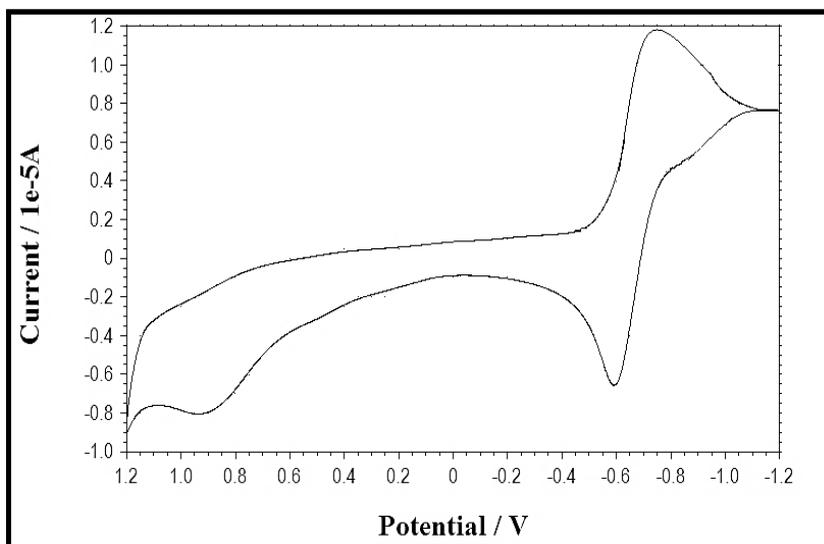
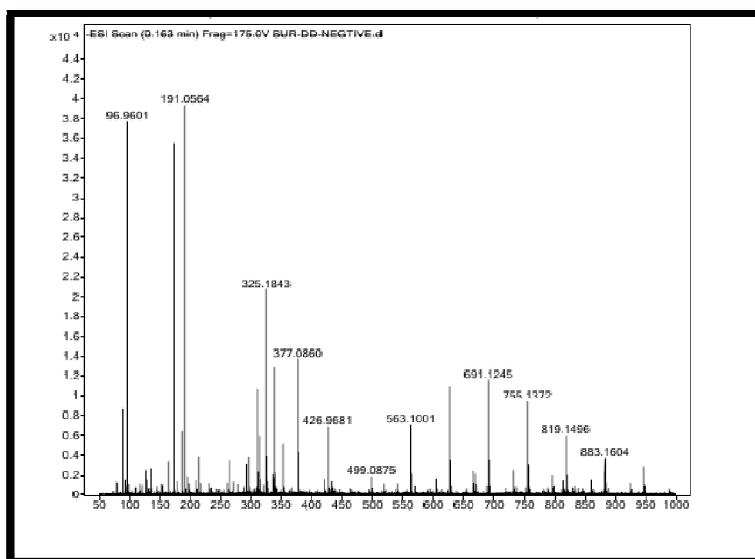


Fig.12. Cyclic voltammetry of HTDPPD

### MASS SPECTRAL STUDIES:

Mass spectrometry shows the spectra of the masses of the molecules comprising a sample of material. It is used for elucidating the chemical structures of molecules. The mass spectra of the **Cu(II)(HTDPPD)** shows a peak at  $m/z$  525 which is due to  $(M+Cl^- +H)$  confirmed the 1:1 stoichiometric composition of the metal(II) complexes of **[M(HTDPPD)Cl]** as shown in **Fig.13**. The peak at  $m/z$  191 is due to the fragmentation of ligand HTDPPD.



**Fig.13. Mass Spectrum of [Cu(HTDPPD)Cl<sub>2</sub>]**

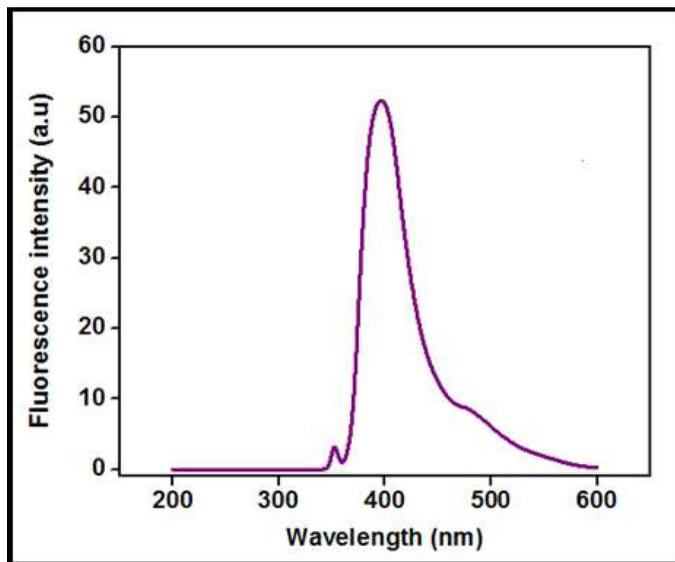
## FLUORESCENCE STUDIES

Fluorescence or photoluminescence property of ligand was studied at room temperature. From the observed fluorescence peak at 417nm which is related to the absorption band observed at 351 nm giving the Stoke shift of the order of 66 nm. The emission peak at 500nm obviously corresponding to absorption peak at 375nm leading to Stokes shift of the order of 125nm [29,30].The fluorescence intensity with high-quantum yield, and the excitation at 426–799 nm gives an emission at 442–804 nm, assigned to  $\pi-\pi^*$  intraligand fluorescence. The fluorescence quantum yield of the ligand was obtained using the following relation.

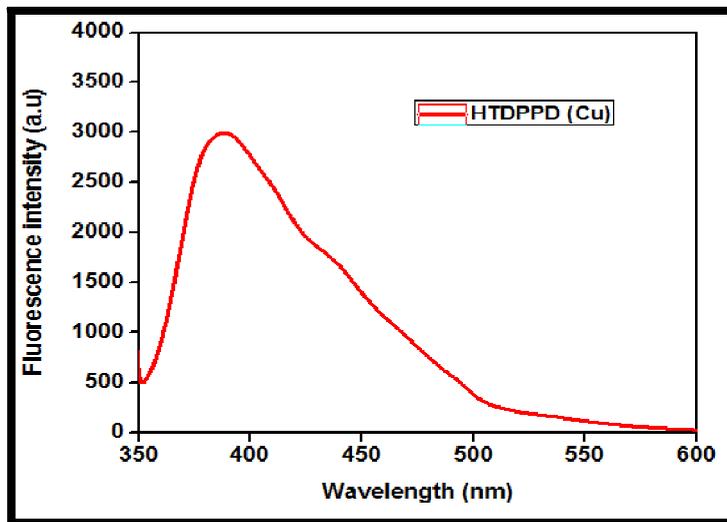
$$\Phi_S = A_S / A_R \times (AbS)_R / (AbS)_S \times \Phi_R$$

Where  $\Phi_S$ – fluorescence quantum yield of the sample,  $\Phi_R$ – fluorescence quantum yield of the reference,  $A_S$ – area under the fluorescence spectra of the sample,  $A_R$ – area under the fluorescence spectra of the reference,  $AbS$  – optical density of the sample.  $AbR$ – optical density of the reference solution at the wavelength of excitation. The

fluorescence spectrum of ligand is depicted in **Fig.14** and Copper complex of HTDPPD shown in **Fig.15**.



**Fig.14. Fluorescence Spectra of HTDPPD**



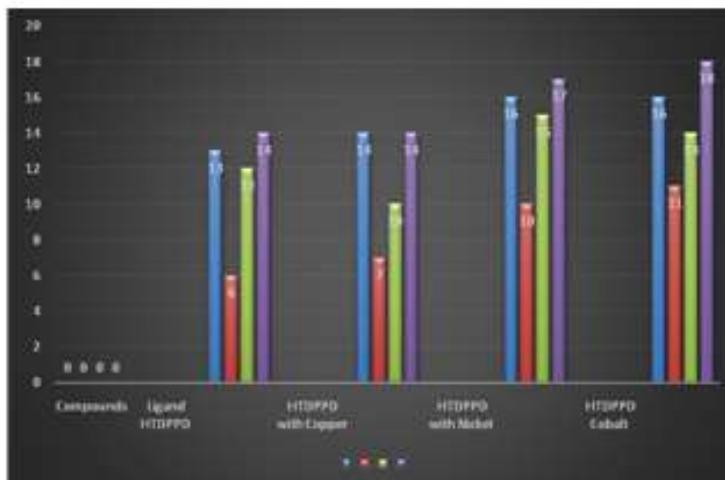
**Fig.15. Fluorescence Spectra of HTDPPD with Copper**

## BIOLOGICAL STUDIES

All the newly synthesized ligand HTDPPD and the metal (II) complexes were screened for their *in vitro* antimicrobial activity. The microorganisms employed for antibacterial studies were *S.Aureus*, *E.coli*, *P.Aeruginosa* and *B.Subtills*. Antimicrobial studies were assessed by well diffusion method. Amikacin was taken as the standard for antibacterial studies. The antimicrobial activity data clearly illustrates that the metal complexes have significant antibacterial activity against tested organism. All complexes display a high order of antibacterial activity than the ligand. From **Table 4**, it is concluded that the Co (II) complex showed higher activity towards all the bacterias. Other metal (II) complexes exhibit moderate antibacterial activity. From the data it is found that all the compounds have displayed maximum activity.[31]

**Table 4.**Antimicrobial activity data of the ligand (HTDPPD) and its M(II) complexes(Zone of inhibition in mm)

Compounds	<i>S.Aureus</i>	<i>E. coli</i>	<i>P.Aeruginosa</i>	<i>B.Subtills</i>
Ligand HTDPPD	13	6	12	14
HTDPPD with Copper	14	07	10	14
HTDPPD with Nickel	16	10	15	17
HTDPPD Cobalt	16	11	14	18



**Fig. 16.** Antimicrobial activity of ligand and its complexes against a)

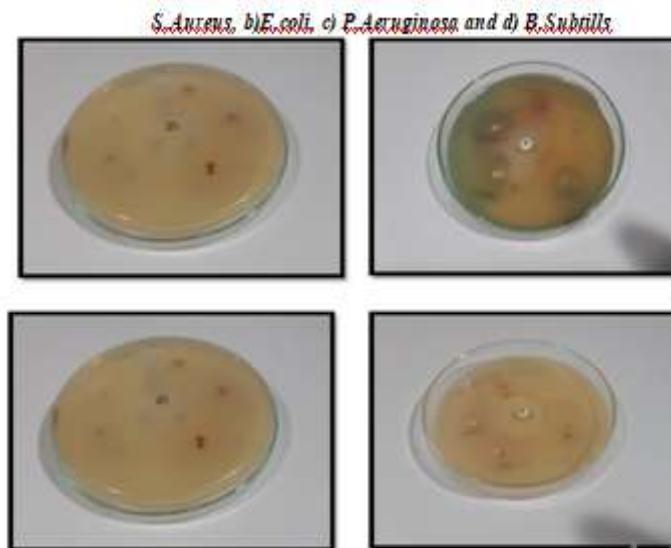


Fig.17. Inhibition Zones formed against a) *S. Aureus*, b) *E. coli*, c) *P. Aeruginosa* and d) *B. Subtilis*.

### PROPOSED STRUCTURE OF METAL (II) COMPLEXE OF HTDPPD

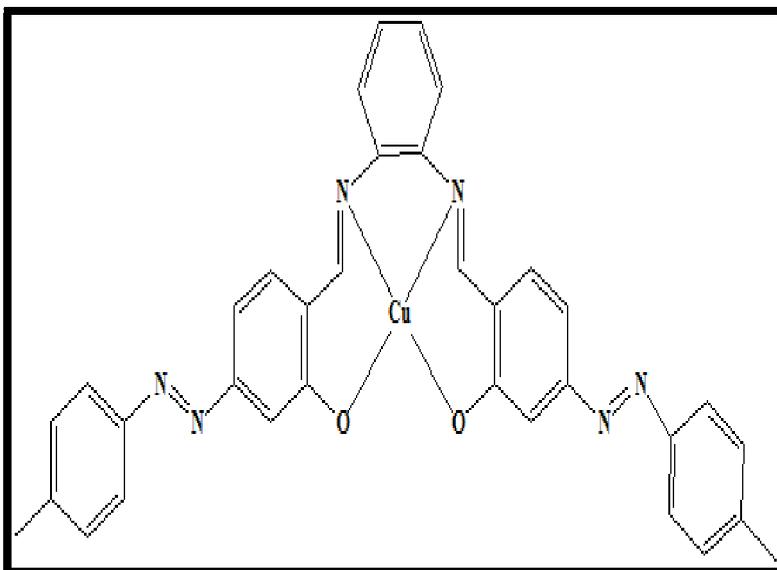


Fig.18. Proposed Structure of Metal(II) Complex of HTDPPD



## CONCLUSION

A novel multidentate ligand 1, 5-bis (2-hydroxy-4-(p-tolyldiazenyl) phenyl) penta-1, 4-dien-3-one was synthesized and its metal(II) complexes have been synthesized and characterized. The UV data of all the cations and at different pH values indicates its good sensing properties. From the mass spectral and analytical data, the proposed structure of the metal(II) complex is square planar geometry. IR confirms the presence of azo group in the ligand. NMR confirms the structure of the ligand by appeared corresponding peaks for various protons. Ligand shows highest cation sensing with  $\text{Cu}^{2+}$  cation than the others which can produce sensor applications in pharmaceutical industries. Redox behaviour of the copper(II) complex was assigned as irreversible from their cyclic voltammetry data. Novel copper compound can exhibit as potential photoactive materials, as indicated from their characteristic fluorescence properties. The antimicrobial studies illustrate that the Copper(II) complex has significant antimicrobial activity against tested organism. Based on these results, it could be proposed that this novel azo based ligand can be better moiety for sensor and pharmaceutical applications.

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## LEGAL IMPLICATIONS OF WRITING OFF LOANS

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### Introduction

Recently on 28<sup>th</sup> April 2020<sup>1</sup>, Indian banks wrote-off a huge amount of over Rs. 68,000 crores loans which was due by the top 50 willful defaulters in the states. The top parties included Choksi's scam-hit company, Gitanjali Gems Limited, which owed Rs.5,492 crore and other companies like Nakshatra Brands Private Limited, REI Agro Ltd and Winsome Diamonds & Jewellery, etc. The present article will explain the various intricacies of writing-off loans and different conditions in which a loan can be written off of any individual.

Writing-off Loan<sup>2</sup> is a tool which comes into role when a defaulter doesn't repay the loans for three consecutive quarters leaving the amount to become a Non-Performing Asset (NPA) or a bad loan. It is used by banks to clean up their balance sheets and keep a record of the unrecovered debt given by them to the entities. For e.g. If any person has taken a loan from the bank and fails to return it within the stipulated time then the bank will try to recover the amount with the help of various legal means or by contacting his family members, if in case even after this step bank fails to recover the amount, the bank may write-off the loan. This means that writing off doesn't take back the right of the bank to recover the loan given, it simply helps the bank to keep a track on the amount on the balance sheet.

The most common query among the people is that whether writing-off loan is the same as waiving of loan? The answer is No.

- Waiving-off loan refers to releasing the defaulter from the liability to pay the debt and permanent cancellation of the recovery of dues. For e.g. The loan is waived off in certain circumstances such as during the case of natural calamity, the farmers are exempted or waived off on their dues by the government as a relief for them, whereas in the case of writing off the recovery made after is counted in the profits for the bank in the year of recovery.
- Another difference between the two is that the decision of waiving off loan is taken by the government while that of writing-off loan is taken by the banks.

### What happens once the amount is written off by bank?

When a bank writes-off the loan the debt will not be counted as a part of its net non-performing asset and gross income. As explained earlier writing-off loan will not

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<sup>1</sup><https://www.news18.com/news/business/banks-technically-write-off-over-rs-68000-cr-loans-choksi-among-50-top-wilful-defaulters-rti-2595437.html>

<sup>2</sup><https://www.indiatoday.in/india/story/what-is-loan-write-off-and-how-it-helps-banks-1353388-2018-10-01>

amount to the waiver of loan leaving on the bank to recover the debt repayment and may recover it once the bad-loan reaches its resolution and the write-back recovered counts in the profit of the bank and counts in the credibility of the bank. This leads to the cleaning of balance sheets of the bank i.e. to replace the bad assets with good ones.<sup>3</sup> Moreover, when the banks need to take a haircut on a bad loan resolution, the need occurs to recapitalize the banks due to which burden shifts to the taxpayer to compensate it.<sup>4</sup> This process must be transparent and can't be compromised as its essential for the public discourse and guard against the misrepresentation of funds.<sup>5</sup>

#### **Perks enjoyed by banks after writing off a loan**

- Once the bank removes the non-performing asset it enjoys a tax deduction from the total loan amount that was given.
- Despite writing off the loan the bank has the option to pursue the loan and can subsequently generate the revenue from the amount.
- The option of selling the defaulted loan always rests with the bank to the third-party agencies to recover the amount from the defaulters.

Even if the loan is written off, the bank can't just let the money go. It tries several different ways to get compensated and recover its amount. Below mentioned are the few ways through which banks recover the debt -<sup>6</sup>

- Securitization –

In this the bank has the discretion to sell the assets of the defaulters to an asset reconstruction company to recover the amount but in the process only a part of the loan can be recovered in the majority of cases whereas the remaining default amount has to be paid from its own capital or the profit.

- Provisioning – The banks use the recovered profit to compensate the written-off assets.
- Capital- In this, the contributions are made by the shareholders in against the loss incurred by writing off the loan.
- Debt Write-off –
  - This relieves the bank from as it can now reclaim the blocked funds for continuing the business. The stakeholder which enjoys the most profit is the bank as the reserve money which was kept blocked replenishes and increases the money lending capacity of the bank.
  - Once the bank acquires its full money lending capacity it can lend more money, participate in bigger financial transactions which would eventually benefit the running economy of the state.
  - Later as per the will, bank may also take legal steps to put the defaulter under the pressure to recover the amount or to curtail his financial activities.

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<sup>3</sup><https://www.indianeconomy.net/splclassroom/what-is-loan-or-debt-writeoff-whether-it-means-no-need-for-repayment/>

<sup>4</sup><https://www.accountingtools.com/articles/2017/5/11/bad-debt-expense>

<sup>5</sup><https://economictimes.indiatimes.com/blogs/et-editorials/an-act-of-prudence-not-loan-forgiveness/>

<sup>6</sup><https://lms.indianeconomy.net/news/what-is-debt-write-off-what-are-its-implications/>

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The supreme authority to look after the write-offs and keep checks is Reserve Bank of India (RBI) and it releases several circulars and guidelines through which whole process is governed.<sup>7</sup>

Statistical analysis of past write-off of loans

In the past, there have been several instances where leading banks of the states have written off the loan worth whooping amounts, some of the latest incidents along with the figures are mentioned below –

- The largest bank of the country State Bank of India (SBI) wrote off loans close to Rs. 14,000 Cr. in agriculture sector from the last five years in December 2019 due to the rise in non-performing assets where it rose from 8.89 percent to 13.49 percent in the time span of 5 years.<sup>8</sup>
- The below mentioned table deals with all the famous banks that dealt with big write-offs in FY19.<sup>9</sup>

Bank Name	FY 19 (In Cr.)	FY 18 (In Cr.)
State Bank of India	58,905	40,196
Oriental Bank of Commerce	2,864	3,857
Bank of Baroda	13,102	4,948
Canara Bank	14,267	8,310
UCO Bank	9,744	2,734
Union Bank of India	7,771	3,477
Central Bank of India	10,375	3,003
Bank of Maharashtra	5,127	2,460
Syndicate Bank	6,774	2,313
Cooperation Bank	5,929	8,228
Allahabad Bank	4,283	2,936

The below statistics show the increase in writing off loan by the banks. (In Cr.)<sup>10</sup>

- 2008-09 – 2,165 Cr.
- 2009-10 – 15,068 Cr.
- 2010-11 -20,299 Cr.
- 2011-12 – 18,248 Cr.
- 2012-13 – 31,549 Cr.
- 2013-14 – 25,424 Cr.

<sup>7</sup>[https://www.rbi.org.in/scripts/BS\\_ViewMasCirculardetails.aspx%3Fid%3D449](https://www.rbi.org.in/scripts/BS_ViewMasCirculardetails.aspx%3Fid%3D449)

<sup>8</sup><https://www.businesstoday.in/current/economy-politics/sbi-writes-off-agriculture-loans-worth-rs-14000-crore-in-5-years-npas-jump-to-1349/story/391379.html>

<sup>9</sup><https://www.bloombergquint.com/economy-finance/public-sector-banks-write-off-a-fourth-of-their-bad-loans-in-fy19>

<sup>10</sup><https://thewire.in/banking/indian-banks-wrote-off-rs-1-44-lakh-crore-in-loans-in-2017-2018>



- 2014-15 – 52,947 Cr.
- 2015-16 – 71, 253 Cr.
- 2016-17 – 89,048 Cr.
- 2018-19 – 1,44,093 Cr.
- Total - 480,093 Cr.

## Conclusion

Although it is argued that write-off doesn't amount to waiver; however, historically banks have not been able to recover much from written-off accounts.

Post the admission of the application for insolvency by the Adjudicating Authority, IPR is appointed who takes over the management from the CD and makes best efforts to ensure that a successful resolution of the CD is obtained and maximum recovery can be made by creditors. It should however be noted that the will of the legislature as indicated by the Bankruptcy law Reform Committee was that the primary purpose of IBC is not debt recovery but debtor resolution. The category of debt would be significant to ascertain the participation of the creditor in the Committee of Creditors (which takes all future decisions pertaining to debt recovery and resolution of the debtor). For e.g. if the creditor has given any operational debt then, the operational creditor cannot become a part of the COC. In case of homebuyers; however, it has been stated that despite their debt being operational they can be part of the COC.

The Economic Survey for 2018-19 pointed out recovery from other sources (like SARFEASI, DRT, LokAdalat) was 23% while the same was 43% under the IBC between 2017-19. The overall recovery in resolved cases is nearly ₹74,497 crore for the financial creditors, which is 194% of the liquidation value.<sup>11</sup> Resultantly, less loans are being written off as bad debts and there is reduction in the NPA count of banks.

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<sup>11</sup><https://www.thehindu.com/business/budget/recovery-under-ibc-higher-at-43/article28287222.ece>



## THE UTILIZATION OF AN AUXILIARY INFORMATION IN THE ESTIMATION PROCEDURE OF POPULATION VARIANCE

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### Abstract

This article addresses the problem of estimating the population variance in simple random sampling using the information of an auxiliary variable. We derive the expressions for bias and mean squared error of the proposed estimator. The efficiency of the proposed estimator is compared with some commonly known estimators and found to be better than conventional estimators. The verification of the proposed work is done by empirical calculation which is performed on some natural population.

**Keywords :** Ratio type estimator, bias, mean squared error, percent relative efficiency.

### 1. Introduction

In sample surveys, auxiliary information always plays a vital role in better estimation of the parameter under investigation. This information can be used to improve the precision of the estimators. The suitable utilization of this auxiliary information can reduce the MSE of the sample mean, thus resulting in more efficient estimators. This paper, is an attempt to extend the powerful Searls approach to the traditional estimators using auxiliary information regarding to variables in simple random sampling. Many authors like, Singh et al. (1973), Das and Tripathi (1978), Sisodia and Dwivedi (1981), Isaki (1983), Bahl and Tuteja (1991), Prasad and Singh (1992), Swain (1994), Garcia and Cebrian (1996), Upadhaya and Singh (2001), Kalidar and Cingi (2006a, 2006b); Gupta and Shabbir (2006, 2007), Yadav and Kadilar (2013, 2014) had proposed an improved ratio estimators using Searls type estimators. Recently, Kumari and Thakur (2018,2019, 2020) have made the use of logarithmic relationship between the auxiliary variable and study variable as logarithm function which is very common in various branches of science as well as non-science disciplines. In this paper, some improved logarithmic estimators are proposed for improving the efficiency of the Kumari and Thakur (2020) estimators as these classes of estimators are expected to improve the mean squared error. The proposed estimators would work considerably well in case when the study variable is logarithmically related to the auxiliary variable.

Consider a finite population  $U = U_1, U_2, \dots, U_N$  of size  $N$  from which a sample of size  $n$  is drawn according to simple random sampling without replacement (SRSWOR). Let  $y_i$  and  $x_i$  denotes the values of the study and auxiliary variables for the  $i$ th unit ( $i = 1, 2, \dots, N$ ), of the population. Further,  $\bar{y}$  and  $\bar{x}$  be the sample means and  $s_y^2 = \frac{\sum_{i=1}^n (y_i - \bar{y})^2}{(n-1)}$  and  $s_x^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{(n-1)}$  be the sample variance of the study variable and auxiliary variable respectively.



**2 Estimators available in literature**

**2.1 Conventional variance estimator**

$$t_0 = s_y^2$$

The bias and variance of  $t_0$  to the first order of approximation, are given as

$$B(t_0) = 0$$

$$V(t_0) = S_y^4 I b_{2y}^*$$

**2.2 Isaki ratio estimator**

$$t_1 = s_y^2 \left[ \frac{s_x^2}{s_x^*} \right]$$

The bias and MSE of  $t_1$  to the first order of approximation, are given as

$$B(t_1) = S_y^2 I [ b_{2x}^* - I_{22yx}^* ]$$

$$V(t_1) = S_y^4 I [ b_{2y}^* + b_{2x}^* - 2I_{22yx}^* ]$$

**2.3 Conventional product estimator**

$$t_2 = s_y^2 \left[ \frac{s_x^2}{S_x^2} \right]$$

The bias and MSE of  $t_2$  to the first order of approximation, are given as

$$B(t_2) = S_y^2 I b_{22}^*$$

$$V(t_2) = S_y^4 I [ b_{2y}^* + b_{2x}^* + 2I_{22yx}^* ]$$

**2.4 Isaki regression estimator**

Isaki (1983) suggested the following regression estimator for population variance

$$t_3 = s_y^2 + b (S_x^2 - s_x^2)$$

where b is a sample regression coefficient whose population regression coefficient is  $\beta$ .

The bias and MSE of  $t_3$  to the first order of approximation, are given as

$$B(t_3) = 0$$

$$V(t_3) = S_y^4 I \left[ b_{2y}^* - \frac{t_{2yx}^*}{b_{2x}^*} \right]$$

**2.5 Singh et al. estimator**

singh et al. (1973) considered the following estimator,

$$t_4 = \alpha_4 s_y^2$$

where  $\alpha_4$  is a Searl (1964) constant. The optimum value of Searls constant is  $\alpha_4 = n/(n + b_{2y}^*)$  for which the mean squared error is minimum.

$$MSE(t_4)_{opt} = S_y^4 I \left[ \frac{n b_{2y}^*}{n + b_{2y}^*} \right]$$

**2.6 Das and Tripathi estimator**

$$t_5 = s_y^2 \left[ \frac{S_x^2}{S_x^2 + \alpha_5 (s_x^2 - S_x^2)} \right]$$

where  $\alpha_5$  is a constant. The bias and MSE of  $t_5$  to the first degree of approximation is given as

$$B(t_5) = S_y^2 I \left[ \alpha_5 b_{2y}^* - \alpha_5 I_{22yx}^* \right]$$

$$V(t_5) = S_y^4 I \left[ b_{2y}^* + \alpha_5 b_{2x}^* - 2\alpha_5 I_{22yx}^* \right]$$

The MSE of  $t_5$  is optimum for  $\alpha_5 = \frac{I_{22yx}^*}{b_{2x}^*}$  and is given by

$$MSE(t_5)_{opt} = S_y^4 I \left[ b_{2y}^* - \frac{I_{22yx}^{*2}}{b_{2x}^*} \right]$$

**2.7 Prasad and Singh estimator**

Prasad and Singh (1992) introduced the following estimator

$$t_6 = \alpha_6 s_y^2 \left[ \frac{S_x^2}{S_x^2} \right]$$

where  $\alpha_6$  is a constant. The bias and MSE of  $t_6$  to the first degree of approximation is given as

$$B(t_6) = S_y^2 I \left[ \alpha_6 (n + b_{2x}^* - I_{22yx}^*) - n \right]$$

$$V(t_6) = S_y^4 I \left[ \alpha_6^2 (n + b_{2y}^* + 3b_{2x}^* - 4I_{22yx}^*) - 2\alpha_6 (n + b_{2x}^* - I_{22yx}^*) - n \right]$$

The MSE of  $t_6$  is optimum for  $\alpha_6 = \frac{(n + b_{2x}^* - I_{22yx}^*)}{(n + b_{2y}^* + 3b_{2x}^* - 4I_{22yx}^*)}$

and is given by

$$MSE(t_6)_{opt} = S_y^4 I \left[ n - \frac{(n + b_{2x}^* - I_{22yx}^*)^2}{(n + b_{2y}^* + 3b_{2x}^* - 4I_{22yx}^*)} \right]$$

**2.8 Garcia and Cebrian estimator**

Garcia and Cebrian (1996) introduced the following estimator

$$t_7 = s_y^2 \left[ \frac{S_x^2}{S_x^2} \right]^{\alpha_7}$$

where  $\alpha_7$  is a constant. The bias and MSE of  $t_6$  to the first degree of approximation is given as

$$B(t_7) = S_y^2 I \left[ \alpha_7 \frac{(\alpha_7 + 1)}{2} b_{2x}^* - \alpha_7 I_{22yx}^* \right]$$

$$V(t_7) = S_y^4 I \left[ b_{2y}^* + \alpha_7^2 b_{2x}^* - 2\alpha_7 I_{22yx}^* \right]$$

The MSE of  $t_7$  is optimum for  $\alpha_7 = \frac{I_{22yx}^*}{b_{2x}^*}$  and is given by

$$MSE(t_7)_{opt} = S_y^4 I \left[ b_{2y}^* - \frac{I_{22yx}^{*2}}{b_{2x}^*} \right]$$

**2.9 Upadhaya and Singh estimator**

Upadhaya and Singh (2001) suggested following estimator

$$t_8 = s_y^2 + \alpha_8 (S_x^2 - s_x^2)$$

where  $\alpha_8$  is a constant. The MSE of  $t_8$  is optimum for  $\alpha_8 = \frac{s_y^2 I_{22yx}^*}{s_x^2 b_{2x}^*}$  and is given by

$$MSE(t_8)_{opt} = S_y^4 I \left[ b_{2y}^* - \frac{I_{22yx}^*}{b_{2x}^*} \right]$$

### 2.10 Shabbir and Gupta (2006) estimator

Sabbir and Gupta (2006) proposed the following estimator

$$t_9 = \lambda t_m$$

where  $\lambda$  is a Searls (1964) constant whose value is to be determined later. Here  $t_m$  is a combination of Singh et al. (1973), Prasad and Singh (1992) and is defined as

$$t_m = K_1 s_y^2 + K_2 s_y^2 \left( \frac{S_x^2}{s_x^2} \right)$$

where  $K_1$  and  $K_2$  are the weights such that  $K_1 + K_2 = 1$

. The optimum MSE of  $t_9$  is given by

$$MSE(t_9)_{opt} = S_y^4 I \left[ n - \frac{\left( n + I_{22yx}^* - \frac{I_{22yx}^*}{b_{2x}^*} \right)^2}{\left( n + b_{2y}^* + 2 I_{22yx}^* - 3 \frac{I_{22yx}^*}{b_{2x}^*} \right)} \right]$$

### 2.11 Shabbir and Gupta (2007) estimator

$$t_{10} = K_1 s_y^2 + K_2 (S_x^2 - s_x^2) \exp \left( \frac{S_x^2 - s_x^2}{S_x^2 + s_x^2} \right)$$

where  $K_1$  and  $K_2$  are suitably chosen constants.

**Situation 1.**  $k_1 + K_2 = 1$  The bias and MSE of  $t_{10}$  the first degree of approximation are given as

The optimum MSE of  $t_{10}$  is given by

$$MSE(t_{10})_{opt} = S_y^4 I \left[ A_1 - \frac{(A_1 + A_3)^2}{(A_1 + A_2 + 2A_3)} \right]$$

**Situation 2.** Unconstrained choice of  $K_1$  and  $K_2$  The bias and MSE of  $t_{10}$  the first degree of approximation are given as

$$MSE(t_{10}^*)_{opt} = S_y^4 I \left[ \frac{Var(\hat{S}_{reg})}{1 + \frac{Var(\hat{S}_{reg})}{S_y^4}} \right]$$

### 2.12 Kadilar and Cingi estimator

Kadilar and Cingi (2006) suggested the following ratio type estimator

$$t_{11} = w_1 s_y^2 + K_2 \left( s_y^2 \frac{S_x^2}{s_x^2} \right) v$$

where  $w_1$  and  $w_2$  are the weights such that  $w_1 + w_2 = 1$

The optimum MSE of  $t_{11}$  is given by

$$MSE(t_{11})_{opt} = S_y^4 I \left[ n - \frac{\left( n + I_{22yx}^* - \frac{I_{22yx}^{*2}}{b_{2x}^*} \right)^2}{\left( n + b_{2y}^* + 2 I_{22yx}^* - 3 \frac{I_{22yx}^{*2}}{b_{2x}^*} \right)} \right]$$

**2.13 Yadav and Kalidar (2013) estimator**

Yadav and Kalidar (2013) introduced the following estimator

$$t_{12} = s_y^2 + \exp \left( 1 - \frac{\alpha_{12} s_x^2}{S_x^2 + (\alpha_{12} - 1) s_x^2} \right)$$

Where  $\alpha_{12}$  is a constant. The optimum MSE of  $t_{12}$  is given by

$$MSE(t_{12})_{opt} = S_y^4 I \left[ b_{2y}^* - \frac{I_{22yx}^{*2}}{b_{2x}^*} \right]$$

**2.14 Yadav and Kadilar (2014) estimator**

Yadav and Kadilar (2014) introduced the following ratio-product-ratio estimator

$$t_{\alpha, \beta, 12} = s_y^2 \alpha \left( \frac{(1-\beta) s_x^2 + \beta S_x^2}{\beta s_x^2 + (1-\beta) S_x^2} \right) + s_y^2 (1 - \alpha) \left( \frac{(1-\beta) S_x^2 + \beta s_x^2}{\beta S_x^2 + (1-\beta) s_x^2} \right)$$

Where  $\alpha$  and  $\beta$  is a constant. The optimum MSE of  $t_{\alpha, \beta, 12}$  is given by

$$MSE(t_{12})_{opt} = S_y^4 I b_{2y}^*$$

**3. The proposed estimators**

We propose the following new classes of log-type estimators for the population variance  $S_y^2$  as :

$$T_1^* = w_1 s_y^2 \left[ 1 + \log \left( \frac{S_x^2}{s_x^2} \right) \right]^{a_1}$$

where  $a$  is the characterizing scalar.

$$s_x^{*2} = a s_x^2 + b, S_x^{*2} = a S_x^2 + b$$

such that  $a (\neq 0)$ ,  $b$  are either real numbers or functions of the known parameters of the auxiliary variables  $x$  such as the standard deviations  $S_x$ , coefficient of variation  $C_x$ , coefficient of kurtosis  $b_{1x}$ , coefficient of skewness  $b_{1x}$  and correlation coefficient  $\rho$  of the population. If  $a_i = 0$ , then the proposed estimator becomes the usual per unit variance estimator  $S_y^2$ .

**4. Bias and MSE of proposed estimators**

In order to obtain the bias and mean square error (MSE), let us consider

$$E(\epsilon_0) = E(\epsilon_1) = 0, E(\epsilon_0)^2 = I b_{2y}^*, E(\epsilon_1)^2 = I b_{2x}^*, E(\epsilon_0 \epsilon_1) = I I_{22yx}^* \text{ where } b_{2x}^* = b_{2x} -$$

$$1, b_{2y}^* = b_{2y} - 1 \text{ and } I_{22yx}^* = I_{22yx} - 1, I = \frac{1}{n},$$

**Theorem 1.** The bias and mean squared error of the proposed estimators are given as

$$Bias(T_1^*) = S_y^2 \left[ w_1 \left( 1 - a_1 I I_{22yx}^* + a_1 I b_{2x}^* + \frac{a_1^2}{2} I b_{2x}^* \right) - 1 \right]$$

$$MSE(T_1^*) = S_y^4 w_1^2 \left[ 1 + I(b_{2y}^* + 2a_1^2 b_{2x}^* - 2a_1 b_{2x}^*) \right] - 2 S_y^4 w_1 \left[ 1 + I(a_1 b_{2x}^* - a_1 I_{22yx}^* + \frac{a_1^2}{2} b_{2x}^*) \right] + 1$$

**Proof:** Consider the estimator

$$T_1^* = w_1 S_y^2 \left[ 1 + \log \left( \frac{S_y^2}{s_y^2} \right) \right]^{a_1} \tag{1}$$

$$= w_1 S_y^2 (1 + \epsilon_0) [1 + \log(1 + \epsilon_1)]^{a_1}$$

$$\text{where } s_y^2 = S_y^2 (1 + \epsilon_0), s_x^2 = S_x^2 (1 + \epsilon_1)$$

$$T_1^* = w_1 S_y^2 (1 + \epsilon_0) \left[ 1 - a_1 \left( \epsilon_1 - \frac{\epsilon_1^2}{2} \right) + \frac{a_1 (a_1 + 1)}{2} \left( \epsilon_1 - \frac{\epsilon_1^2}{2} \right)^2 \right]$$

$$T_1^* - S_y^2 = (w_1 - 1) S_y^2 + w_1 S_y^2 \left[ \epsilon_0 - a_1 \left( \epsilon_1 - \frac{\epsilon_1^2}{2} \right) + \frac{a_1 (a_1 + 1)}{2} \epsilon_1^2 - a_1 \epsilon_0 \epsilon_1 \right] \tag{2}$$

Taking expectation on both the sides of (2), we get the desired expression for bias

$$Bias(T_1^*) = S_y^2 \left[ w_1 \left( 1 - a_1 I I_{22yx}^* + a_1 I b_{2x}^* + \frac{a_1^2}{2} I b_{2x}^* \right) - 1 \right]$$

Squaring on both the sides of (2), we get the desired expression for MSE

$$MSE(T_1^*) = S_y^4 w_1^2 \left[ 1 + I(b_{2y}^* + 2a_1^2 b_{2x}^* - 2a_1 b_{2x}^*) \right] - 2 S_y^4 w_1 \left[ 1 + I(a_1 b_{2x}^* - a_1 I_{22yx}^* + \frac{a_1^2}{2} b_{2x}^*) \right] + 1$$

**Corollary 1.** The optimum value of  $a_1$  and  $w_1$  are as follows

$$a_{1 \text{ opt}} = \frac{I_{22yx}^*}{b_{2x}^*}$$

$$w_{1 \text{ opt}} = \frac{B}{A}$$

$$\text{Where } A = \left[ 1 + I(b_{2y}^* + 2a_1^2 b_{2x}^* - 2a_1 b_{2x}^*) \right]$$

$$B = \left[ 1 + I \left( a_1 b_{2x}^* - a_1 I_{22yx}^* + \frac{a_1^2}{2} b_{2x}^* \right) \right]$$

The minimum mean squared error is given by

$$MSE(T_1^*)_{opt} = S_y^4 \left( 1 - \frac{B^2}{A} \right)$$

### 6. Comparison of estimators

In this section, we compare the proposed classes of estimators with some important estimators.

The comparison will be in terms of their MSEs up to the order of  $n^{-1}$ . Let us define

$$C_1 = b_{2y}^* + b_{2x}^* - 2I_{22}^*, C_2 = b_{2y}^* + b_{2x}^* - 2I_{22}^*, D = b_{2y}^* b_{2x}^* - I_{22}^*, E = \frac{nb_{2y}^*}{n+b_{2y}^*}$$

$$F = \left[ n - \frac{(n+b_{2x}^* - I_{22}^*)^2}{n+b_{2y}^*+3b_{2x}^*-4I_{22}^*} \right], G = \left[ n - \frac{\left( \frac{n+I_{22}^* - I_{22}^{*2}}{b_{2x}^*} \right)^2}{n+b_{2y}^*+2I_{22}^*-3\frac{I_{22}^{*2}}{b_{2x}^*}} \right], H = \left[ A_1 - \frac{(A_1+A_2)^2}{A_1+A_2+2A_3} \right]$$

$$MSE(t_0) > MSE(T_1^*)_{opt} \quad \text{if } b_{2y}^* + \frac{B^2}{A} - n > 0$$

$$MSE(t_1) > MSE(T_1^*)_{opt} \quad \text{if } C_1 + \frac{B^2}{A} - n > 0$$

$$MSE(t_2) > MSE(T_1^*)_{opt} \quad \text{if } C_2 + \frac{B^2}{A} - n > 0$$

$$MSE(t_3) > MSE(T_1^*)_{opt} \quad \text{if } D - \left( n - \frac{B^2}{A} \right) b_{2x}^* > 0$$

$$MSE(t_4) > MSE(T_1^*)_{opt} \quad \text{if } E - \frac{B^2}{A} - n > 0$$

$$MSE(t_5) > MSE(T_1^*)_{opt} \quad \text{if } D - \left( n - \frac{B^2}{A} \right) b_{2x}^* > 0$$

$$MSE(t_6) > MSE(T_1^*)_{opt} \quad \text{if } F + \frac{B^2}{A} - n > 0$$

$$MSE(t_7) > MSE(T_1^*)_{opt} \quad \text{if } D - \left( n - \frac{B^2}{A} \right) b_{2x}^* > 0$$

$$MSE(t_8) > MSE(T_1^*)_{opt} \quad \text{if } D - \left( n - \frac{B^2}{A} \right) b_{2x}^* > 0$$

$$MSE(t_9) > MSE(T_1^*)_{opt} \quad \text{if } G + \frac{B^2}{A} - n > 0$$

$$MSE(t_{10}) > MSE(T_1^*)_{opt} \quad \text{if } H + \frac{B^2}{A} - n > 0$$

$$MSE(t_{11}) > MSE(T_1^*)_{opt} \quad \text{if } G + \frac{B^2}{A} - n > 0$$

$$MSE(t_{12}) > MSE(T_1^*)_{opt} \quad \text{if } D - \left( n - \frac{B^2}{A} \right) b_{2x}^* > 0$$

### 7. Empirical study

To compare the efficiency of the suggested class of estimator numerically, we considered nine natural data sets. The description of the population is given below.

**Population 1.** (Cochran (1977), Pg. no. 107)

y : number of persons per block

x : number of rooms per block

$S_y^2 = 214.69, S_x^2 = 56.76, b_{2y}^* = 1.2387, b_{2x}^* = 1.3523, I_{22}^* = 0.5432, C_x = 0.1450, \bar{X} = 58.8, \rho = 0.6515, n = 10.$

**Population 2.** (Cochran (1977), Pg. no. 203)

y : actual weight of peaches on each tree

x : eye estimate of weight of peaches on each tree.



$S_y^2=99.81, S_x^2=85.09, b_{2y}^*=0.9249, b_{2x}^*=1.2932, I_{22}^*=1.1149, C_x=0.1621, \bar{X}=56.9, \rho=0.9937,$   
 $n=10.$

**Population 3.** (Sukhatme P. V. (1970), Pg. no. 185)

y : wheat acreage in 1937

x : wheat acreage in 1936

$S_y^2=26456.99, S_x^2=22355.76, b_{2y}^*=2.1842, b_{2x}^*=1.2030, I_{22}^*=1.5597, C_x=0.5625, \bar{X}=265.8, \rho=0.977, n=10.$

**Population 4.** (Singh D and Chaudhary F. S., Pg. no. 107).

y : number of boats landing at a particular centre

x : catch of fish in quintals.

$S_y^2=201324.4, S_x^2=396.8889, b_{2y}^*=0.9462, b_{2x}^*=0.6078, I_{22}^*=0.6333, C_x=0.7288, \bar{X}=27.3333,$   
 $\rho=0.9308, n=4.$

**Population 5.** (Singh D and Chaudhary F. S., Pg. no. 141).

y : number of bearing lime trees

x : area under lime (in acres)

$S_y^2=6564586.45, S_x^2=1092.1024, b_{2y}^*=12.2574, b_{2x}^*=4.5788, I_{22}^*=6.7126, C_x=1.4273, \bar{X}=22.6209,$   
 $\rho=0.9021, n=9.$

**Population 6.** (Choudhary F. S. and Singh D., Pg. no. 176).

y : number of cows in milk enumerated

x : number of cows in milk in the previous year.

$S_y^2=332721.2079, S_x^2=281472.7868, b_{2y}^*=6.2079, b_{2x}^*=5.0043, I_{22}^*=4.9528, C_x=0.8276, \bar{X}=641.05,$   
 $\rho=0.8933, n=8.$

**Population 7.** (Singh S., Pg. no. 324-325).

y : approximate duration of sleep (in minutes)

x : age in years of the persons.

$S_y^2=3582.579, S_x^2=85.2367, b_{2y}^*=1.6678, b_{2x}^*=1.2389, I_{22}^*=0.9961, C_x=0.1349, \bar{X}=67.2667, \rho=-0.8552,$   
 $n=9.$

**Population 8.** (Singh S., Pg. no. 1114).

y : approximate duration of sleep (in minutes)

x : age in years of the persons.

$S_y^2=0.0073, S_x^2=0.0063, b_{2y}^*=2.6323, b_{2x}^*=2.4016, I_{22}^*=1.8351, C_x=1.2352, \bar{X}=0.1831, \rho=0.7789,$   
 $n=11.$

By using the above data set, the percent relative efficiency of the different estimator are given in Table 2.



Table 2: PRE of the estimators with respect to t0

Table with 9 columns (Est., Pop 1, Pop 2, Pop 3, Pop 4, Pop 5, Pop 6, Pop 7, Pop 8) and 17 rows (t0, t1, t2, t3, t4, t5, t6, t7, t8, t9, t10, t10+, t11, t12, t\_alpha\_beta\_12, Tc). Values represent relative efficiency for different estimators across population sets.

In the above table, the relative efficiency of the proposed estimator is much better as compared to other estimators for all the data sets given here.

8. Conclusion

In this paper, we propose a generalized log-type ratio estimator which is used for estimating the population variance. The expressions for bias and mean squared error are obtained and compared with some commonly known estimators. We found that the proposed estimator is more precise than such estimators both theoretically and numerically.

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## IMPACT OF NON-PERFORMING ASSETS ON PROFITABILITY PERFORMANCE OF SELECTED PUBLIC SECTOR BANKS AND PRIVATE SECTOR BANKS IN INDIA: A COMPARATIVE STUDY

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### Abstract:

The paper attempts to analyse profitability performance of selected public and private sector banks in India. It determines the impact of the banks' internal factors on profitability (i.e. net profit). The study identifies the main internal factors affecting the profitability. There is a negative effect of net NPAs on profitability of public sector banks. The analysis indicates that there is a significant impact of net NPAs on profitability of public sector banks. On the other hand, there is a positive impact of net NPAs on profitability of private sector banks and the impact is insignificant.

**Key words:** NET NPAS, Net Profits, Internal Factors, Correlation and Regression Analysis.

### 1. Introduction:

Strong banking system of a country works as the main driver of the economy and plays an important role in the economic development of the country. But now-a-days the banking sector's health and profitability performance have shown diminishing trend due to increasing trend of non-performing assets (NPAs) of the banks. As per the norms (RBI) banks assets are classified into two categories which are performing and non-performing assets. In the context of banking sector, assets may be divided into two groups, viz. (i) performing assets and (ii) non-performing assets. Performing assets are those assets which generate interest income regularly and customers of the banks paid their instalment amount in respect of principal and interest within the due date. Non-performing assets are those assets that are doubtful in order to get return of principal and/ or interest due on maturity. Non-performing assets are divided into four categories, viz. (i) standard assets, (ii) substandard assets, (iii) doubtful assets and (iv) loss assets. Different types of NPAs have been contributing huge losses to banks. At present public sector banks are facing more problems than private sector banks for the management of NPAs. A mounting level of NPAs in the banking sector can severely affect banks' profitability and performance. If NPAs are not properly managed, it can cause financial and economic degradation which, in turn, give adverse signals on investment climate. Therefore, it is highly relevant to assess the profitability and performance of the selected banks.

### 2. Literature review:

**Kiran Chopra (1987)** has analysed the emerging trends in profits and profitability of some selected public sector banks. The author opined that there is a need



to introduce management essentials for the better managements of profits and productivity of public sector banks. The study has also recommended for proper management of both costs and earnings.

**Alper and Anbar (2011)** have examined the bank specific and macro-economic determinants of the banks' profitability over the time period 2002-2010. The banks' profitability was measured by return on assets (ROA) and return on equity (ROE) on 'Bank Specific and Macro-economic Determinants of Commercial Bank Profitability: Empirical evidence from Turkey'.

**Adam (2014)** investigated the 'Financial performance of Erbil Bank for Investment and Finance, Kurdistan Region of Iraq' for the period 2009-13. He concluded that the overall financial performance of Erbil Bank is improving the liquidity ratio, assets quality or credit performance and profitability ratios (ROA, ROE and NIM). This study suggests and recommends the development and enhancement of some bank operations which will enhance the bank's profitability and improve the financial performance.

**Sharifi, O. and Akter, J. (2016)** have examine the trends, status and impact of NPAs on profitability of Public Sector Banks during the period of 2009-2015 and found that the impact of NPAs negatively on financial performance of Public Sector Banks.

The literature review gives an account on profitability, financial performance, determinants of the banks' profitability and many other relevant areas. However, no studies appear to be comprehensive and compact one. Therefore, there is a wider scope of further study that may be done for examining profitability performance of selected banks.

**3. Objectives of the Study:** The main objectives of this paper are as follows:

- To assess the relationship between Net NPAs and Net Profits of selected banks in India

- To examine the impact of Net NPAs on the Net Profits of selected banks in India

**4. Methodology:**

**Sample designed:** The Public and Private Sectors Banks were selected based on purposive sample method among the banks listed with the /on national stock exchange, top (3) three Public and Private Sector Banks in India were taken for the study on the basis of market capitalization.

**Data Collection:** This study is based on secondary data which have been collected from the RBI reports, database of statistical table of RBI for the year of 2018.

**Study period:** The present study has been covered a period of 9 financial years from 2009-10 to 2017-18.

**Tools used:** The data has been analysed by using ratios, mean, Standard Deviation (SD), coefficient of variation (CV), correlation and multiple regressions with the help of MS Excel and SPSS 21.

**Proxy of Profitability:** Profits is identified as good indicators of profitability of banks.

Table 1: Showing the Total Assets for Selected Public and Private Sector Banks in India as on 31.03.2018

Public Sectors Banks	Assets (Rs. in crore)	Private Sector Banks	Assets (Rs. in crore)
State Bank Of India	3454752	HDFC Bank Ltd.	1063934
Punjab National Bank	765830	ICICI Bank Limited	8791898
Bank Of Baroda	720000	Axis Bank Limited	691330

### 5. Analysis of the data:

Mean and standard deviation has been calculated to know the average performance and coefficient of variation has been calculated to show the stability in the performance of banks. The correlation analysis has been used to find the relationship between NPAs and profitability (i.e., Net profits) of the selected banks.

Table 2:

Net NPAs and Net Profits of the Selected Public Sector Banks in India (Amount in Crores)

Years	State Bank of India		Punjab National Bank		Bank of Baroda	
	Net NPAs	Net Profit	Net NPAs	Net Profit	Net NPAs	Net Profit
2010	10870	9166	982	3905	602	3058
2011	12347	8265	2039	4433	791	4242
2012	15819	11707	4454	4884	1544	5007
2013	21956	14105	7237	4748	4192	4481
2014	31096	10891	9917	3343	6035	4541
2015	27591	13102	15397	3062	8069	3398
2016	55807	9951	35423	-3974	19406	-5396
2017	58277	10484	32702	1325	18080	1383
2018	110855	-6547	48684	-12283	23483	-2432
Mean	38291	9014	17426	1049	9134	2031
SD	32278	6115	17227	5705	8850	3614
CV(%)	84.30	67.85	98.86	543.75	96.90	177.88
Correlations	-0.804** (0.009)		-0.904** (0.001)		-0.849** (0.004)	

\*\* Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows the correlation between net NPA and net profit of selected public sector banks in India. The correlation for SBI (-0.804), PNB (-0.904) and BOB (-0.849) depict that net profit and net NPAs negatively correlated. This shows that when net NPAs is an increasing level but there will be a downfall in the net profits of the banks.

Table 3: Net NPAs and Net Profits of the Selected Private Sector Bank in India  
(Amount in crores)

Years	HDFC Bank		ICICI Bank		Axis Bank	
	Net NPAs	Net Profit	Net NPAs	Net Profit	Net NPAs	Net Profit
2010	392	2949	3841	4025	419	2515
2011	296	3926	2407	5151	410	3388
2012	352	5167	1861	6465	473	4242
2013	469	6726	2231	8325	704	5179
2014	820	8478	3298	9810	1025	6218
2015	896	10216	6256	11175	1317	7358
2016	1320	12296	12963	9726	2522	8224
2017	1844	14550	25217	9801	8627	3679
2018	2601	17487	27824	6777	16592	276
Mean	999	9088	9544	7918	3565	4564
SD	790	4970	10230	2434	5540	2479
CV(%)	79.03	54.68	107.19	30.74	155.38	54.32
Correlations	0.963 <sup>**</sup> (0.000)		0.213 <sup>(0.582)</sup>		-0.594 <sup>(0.092)</sup>	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that the correlation of selected private banks in India. The correlation for HDFC (0.963), ICICI (0.213) and Axis Bank (-0.594) but the correlation for Axis Bank negatively correlated, whereas HDFC, ICICI banks positively correlated between Net profits and net NPAs .This shows that when net profit is an increasing level but there will be decreasing in net NPAs.

Table 4: Net NPAs and Net Profits of the Public and Private Sector Bank in India  
(Amount in crores)

Years	Selected Public Sector Banks		Selected Private Sector Banks	
	Net NPAs	Net Profit	Net NPAs	Net Profit
2010	12454	16130	4652	9488
2011	15176	16940	3114	12466
2012	21817	21598	2686	15875
2013	33385	23333	3404	20231
2014	47048	18775	5143	24507
2015	51057	19562	8469	28749
2016	110636	581	16806	30246
2017	109060	13192	35687	28030
2018	183022	-21262	47016	24540
Mean	64850	12094	14108	21570
SD	57638	14156	16292	7492
CV(%)	88.88	117.05	115.48	34.73
Correlations	-0.897 <sup>**</sup> (0.001)		0.499 (0.171)	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows that the correlation of public and private banks in India. The correlation for public sector banks (-0.897) and private sector banks (0.499) depict that net profit and net NPAs negatively and positive correlated respectively.

#### 6. Impact of net NPAs on the Net profits of the Selected Public and Private Sector banks:

1<sup>st</sup> Hypotheses:  $H_0$ : There is no significant impact of NPAs on Net Profits of Selected Public Sectors Banks.

Table 5: Regression analysis of Selected Public Sector Banks and Model Summary and ANOVA Output

Model Summary <sup>b</sup>	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
Model	0.897 <sup>a</sup>	0.805	0.777	6680.69	28.921	.001 <sup>b</sup>

a. Predictors: (Constant); Net NPAS b. Dependent Variable: Net Profits (Loss)

Regression analysis of selected public sector banks shows that, net profit and net NPAs are positively correlated as revealed by Table 5. The degree of the relationship is strong which 0.897 is.  $R^2$  value (0.805) states that net NPAs has 80.50% impact on Net profits of the banks. The p value of F-test is 0.001, which is less than the significant level of 0.05%. Hence, the null hypothesis is rejected and it can be concluded that there is a significant impact of net NPAs on net profits of selected public sector banks in India. Since Durbin-Watson statistics is 1.848 which is less than 2, there is no autocorrelation.

2<sup>nd</sup> Hypotheses:  $H_0$ : There is no significant impact of NPAs on Net Profits of Selected Private Sectors Banks.

Table 6: Regression analysis of Selected Private Sector Banks and Model Summary and ANOVA Output

Model Summary <sup>b</sup>	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
Model	0.499 <sup>a</sup>	0.249	0.142	6940.27	2.323	.171 <sup>b</sup>

a. Predictors: (Constant); Net NPAS b. Dependent Variable: Net Profits (Loss)

Regression analysis of selected private sector banks revealed that, net profit and net NPAs are positively correlated by Table 6. The degree of relationship moderate which is at 0.499,  $R^2$  value (0.249) states that net NPAs has 24.90% impact on Net profits of the banks. The p value of F-test is 0.171, which is less than the insignificant level of 0.05%. Therefore, the null hypothesis is accepted and it can be concluded that there is a no significant impact of net NPAs on profitability (i.e, Net profits) of selected private Sector banks in India. Durbin-Watson statistics is 0.440 which is less than 2, there is no autocorrelation.

#### 7. Finding:

Hence, correlation analysis of Net Profit and Net NPAs reveals that all the selected public sector banks are negatively correlated and all the selected private sector banks are positively correlated except for Axis Banks.



Regression analysis results shows that there is a significant impact of NPAs on Net profits of Selected Public Sector banks in India and there is a no significant impact of NPAs on Net profits of selected private Sector banks in India during the study periods.

### 8. Conclusion:

The result indicates that profitability of Selected Public Sector banks overall can be improved by increasing the quality of their assets portfolio. Therefore, banks may control the NPAs by checking the authentication of the loan holders so that profitability position is not hampered. Management of NPAs is to be made more effective applying my view of keeping the level of NPAs under control and improving profitability of the selected banks. Hence, it can be concluded that Selected Public Sector banks in India is a significant impact of NPAs on Net profits than selected private Sector banks in India.

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## ON GENERALIZED WEAKLY CLOSED SETS IN TOPOLOGICAL SPACES

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### Abstract:

In this paper, we introduce a new type of closed sets called generalized weakly closed sets (briefly gw-closed set) and generalized weakly open sets in topological spaces and study some of their properties.

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**Key words:** g-closed, gw-closed, gw-open

### Introduction

Andrijevic[1] introduced a new class of generalized open sets in a topological space. Levine[6] introduced the concept of generalized closed sets in topological space and a class of topological spaces called  $T_{1/2}$ -spaces. Many authors [2, 4, 6, 9, 10] have contributed their results in topological spaces by using various types of sets. The aim of this paper is to introduce the concepts of generalized weakly closed sets (briefly gw-closed set) and generalized weakly open sets (briefly gw-open set) in topological spaces.

### Preliminaries

Throughout this section, let  $X$  and  $Y$  are topological spaces on which no separation axioms assumed unless otherwise explicitly stated. Let  $A \subseteq X$ , the closure of  $A$  and the interior of  $A$  will be denoted by  $Cl(A)$  and  $Int(A)$  respectively, the union of all  $w$ -open sets  $X$  contained in  $A$  is called  $w$ -interior of  $A$  and it is denoted by  $wInt(A)$ , the intersection of all  $w$ -closed sets of  $X$  containing  $A$  is called  $w$ -closure of  $A$  and it is denoted by  $wCl(A)$ .

**Definition 1.1 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be semi-open[7] if  $A \subseteq Cl(IntA)$ .

**Definition 1.2 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be pre-open[11] if  $A \subseteq Int(Cl(A))$ .

**Definition 1.3 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be  $\alpha$ -open[8] if  $A \subseteq Int(Cl(Int(A)))$ .

**Definition 1.4 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be a generalized semi-preclosed set (briefly gsp-closed)[4] if  $sCl(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is open.

**Definition 1.5 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be a generalized semiclosed set (briefly gs-closed)[2] if  $sCl(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is open.

**Definition 1.6 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be a weakly closed set (briefly  $w$ -closed)[6] if  $Cl(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is semi-open in  $X$ .

**Definition 1.7 :** A subset  $A$  of a topological space  $(X, \tau)$  is said to be a generalized closed set (briefly  $g$ -closed) [6] if  $Cl(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is open in  $X$ .

## II. Generalized weakly closed sets

In this section, we introduce the new class of sets generalized weakly closed sets in topological spaces. Several characterizations of generalized weakly closed sets are given.

**Definition 2.1:** A subset  $A$  of a topological space  $(X, \tau)$  is called generalized weakly closed set (briefly  $gw$ -closed set) if  $wCl(A) \subseteq U$  whenever  $A \subseteq U$  and  $U$  is  $g$ -open in  $X$ . The complement of a generalized  $w$ -closed set is called generalized weakly open (briefly  $gw$ -open). The collection of all  $gw$ -closed (resp.  $gw$ -open) subsets of  $X$  is denoted by  $gwCl(X)$  (resp.  $gwO(X)$ ).

**Remark 2.2 :**

Every  $w$ -closed set is  $gw$ -closed, but the converse is not true.

**Example 2.3 :**

Let  $X = \{a, b, c\}$  and let  $\tau = \{X, \emptyset, \{a\}, \{a, b\}\}$ , then the family of all  $w$ -closed set of  $X$  is  $wCl(X) = \{X, \emptyset, \{c\}, \{b, c\}\}$ , but the family of all  $gw$ -closed set of  $X$  is  $gwCl(X) = \{X, \emptyset, \{c\}, \{b, c\}, \{a, c\}\}$ . Here the set  $\{a, c\}$  is  $gw$ -closed but not  $w$ -closed in  $X$ .

**Theorem 2.4 :**

Let  $A$  be a  $gw$ -closed subset of  $(X, \tau)$ . Then  $wCl(A) - A$  does not contain any non-empty closed sets.

**Proof:**

Let  $F \subseteq Cl(X)$  such that  $F \subseteq wCl(A) - A$ . Since  $X - F$  is open,  $A \subseteq X - F$  and  $A$  is  $gw$ -closed, it follows that  $wCl(A) \subseteq X - F$  and thus  $F \subseteq X - wCl(A)$ . This implies that  $F \subseteq (X - wCl(A)) \cap (wCl(A) - A) = \emptyset$  and hence  $F = \emptyset$ .

**Corollary 2.5:**

Let  $A$  be a  $gw$ -closed set. Then  $A$  is  $w$ -closed if and only if  $wCl(A) - A$  is closed.

**Proof:**

Let  $A$  be a  $gw$ -closed set. If  $A$  is  $w$ -closed, then we have  $wCl(A) - A = \emptyset$  which is closed set. Conversely, let  $wCl(A) - A$  be closed. Then, by Theorem 2.4,  $wCl(A) - A$  does not contain any non-empty closed subset and since  $wCl(A) - A$  is closed subset of itself, then  $wCl(A) - A = \emptyset$ . This implies that  $A = wCl(A)$  and so  $A$  is  $w$ -closed set.

**Definition 2.6 :** Let  $A$  be a subset of a space  $X$ . A point  $x \in X$  is said to be a  $w$ -limit point of  $A$  if for each  $w$ -open set  $U$  containing  $x$ , we have  $U \cap (A - \{x\}) \neq \emptyset$ . The set of all  $w$ -limit points of  $A$  is called the  $w$ -derived set of  $A$  and is denoted by  $Dw(A)$ .

Since every open set is  $w$ -open, we have  $Dw(A) \subseteq D(A)$  for any subset  $A \subseteq X$ , where  $D(A)$  is the derived set of  $A$ . Moreover, since every closed set is  $w$ -closed, we have  $A \subseteq wCl(A) \subseteq Cl(A)$ .

The proof of the following result is straightforward and thus omitted.

**Lemma 2.7 :**

If  $D(A) = Dw(A)$ , then we have  $Cl(A) = wCl(A)$ .

**Corollary 2.8 :**

If  $D(A) \subseteq Dw(A)$  for every subset  $A$  of  $X$ . Then for any subsets  $F$  and  $B$  of  $X$ , we have  $wCl(F \cup B) = wCl(F) \cup wCl(B)$ .

**Corollary 2.9 :**

If  $A$  and  $B$  are gw-closed sets such that  $D(A) \subseteq Dw(A)$  and  $D(B) \subseteq Dw(B)$ . Then  $A \cup B$  is gw-closed.

**Proof:**

Let  $U$  be an open set such that  $A \cup B \subseteq U$ . Then since  $A$  and  $B$  be gw-closed sets, we have  $wCl(A) \subseteq U$  and  $wCl(B) \subseteq U$ . Since  $D(A) \subseteq Dw(A)$ , thus  $D(A) = Dw(A)$  and by lemma 2.7,  $Cl(A) = wCl(A)$ . Similarly,  $Cl(B) = wCl(B)$ . Thus  $wCl(A \cup B) \subseteq Cl(A \cup B) = Cl(A) \cup Cl(B) = wCl(A) \cup wCl(B) \subseteq U$ , which implies that  $A \cup B$  is gw-closed. Let  $B \subseteq A \subseteq X$ . Then we say that  $B$  is gw-closed relative to  $A$  if  $wCl_A(B) \subseteq U$  where  $B \subseteq U$  and  $U$  is open in  $A$ .

**Theorem 2.10 :**

Let  $B \subseteq A \subseteq X$  where  $A$  is gw-closed and open set. Then  $B$  is gw-closed relative to  $A$  if and only if  $B$  is gw-closed in  $X$ .

**Proof:**

Let us assume that  $B \subseteq A$  and  $A$  is both gw-closed and open set, then  $wCl(A) \subseteq A$  and thus  $wCl(B) \subseteq wCl(A) \subseteq A$ . It is obvious that  $A \cap wCl(B) = wCl_A(B)$ , we have  $wCl(B) = wCl_A(B) \subseteq A$ . If  $B$  is gw-closed relative to  $A$  and  $U$  is open subset of  $X$  such that  $B \subseteq U$ , then  $B = B \cap A \subseteq U \cap A$  where  $U \cap A$  open in  $A$ . Hence as  $B$  is gw-closed in  $X$  and  $U$  is an open subset of  $A$ ,  $wCl(B) = wCl_A(B) \subseteq U \cap A \subseteq U$ . Therefore  $B$  is gw-closed in  $X$ .

Converse part : If  $B$  is gw-closed in  $X$  and  $U$  is an open subset of  $A$  such that  $B \subseteq U$ , then  $U = V \cap A$  for some open subset  $V$  of  $X$ . As  $B \subseteq U$ , then  $B = B \cap U = B \cap (V \cap A) = (B \cap V) \cap A$  for some open subset  $V$  of  $X$ . As  $B \subseteq U$  and  $B$  is gw-closed in  $X$ ,  $wCl(B) \subseteq V$ . Thus  $wCl_A(B) = wCl(B) \cap A \subseteq V \cap A = U$ . Therefore  $B$  is gw-closed relative to  $A$ .

**Corollary 2.11 :**

Let  $A$  be open and gw-closed set. Then  $A \cap F$  is gw-closed whenever  $F \in wCl(X)$ .

**Proof :**

Since  $A$  is gw-closed and open, then  $wCl(A) \subseteq A$  and thus  $A$  is w-closed. Hence  $A \cap F$  is w-closed in  $X$  which implies that  $A \cap F$  is gw-closed in  $X$ .

**Theorem 2.12 :**

If  $A$  is a gw-closed set and  $B$  is any set such that  $A \subseteq B \subseteq wCl(A)$ , then  $B$  is a gw-closed set.

**Proof:**

Let  $B \subseteq U$  where  $U$  is open set. Since  $A$  is gw-closed and  $A \subseteq U$ , then  $wCl(A) \subseteq U$  and also  $wCl(A) = wCl(B)$ . Therefore  $wCl(B) \subseteq U$  and hence  $B$  is a gw-closed set.

**Theorem 2.13 :**

A subset  $A \subseteq X$  is gw-open if and only if  $F \subseteq wInt(A)$  whenever  $F$  is closed set and  $F \subseteq A$ .

**Proof:**

Let  $A$  be gw-open set and suppose  $F \subseteq A$  where  $F$  is closed. Then  $X-A$  is a gw-closed set contained in the open set  $X-F$ . Hence  $wCl(X - A) \subseteq X - F$  and  $X - wInt(A) \subseteq X - F$ . Thus  $F \subseteq wInt(A)$ . Converse part : If  $F$  is a closed set with  $F \subseteq wInt(A)$  and  $F \subseteq A$ , then  $X - wInt(A) \subseteq X - F$ . Thus  $wCl(X - A) \subseteq X - F$ . Hence  $X-A$  is a gw-closed set and  $A$  is a gw-open set.

**Proposition 2.14** :[5]

Let  $A$  be a subset of a topological space  $(X, \tau)$ . If  $A \in SO(X)$ , then  $pCl(A)=Cl(A)$ .

**Proof** : straightforward

**Remark 2.15** :

If  $(X, \tau)$  is extremally disconnected then the closure of every open subset of  $X$  is open.

**Theorem 2.16** :[3]

For a space  $X$ , the following statements are equivalent:

1.  $(X, \tau)$  is extremally disconnected;
2.  $sCl(A \cup B) = sCl(A) \cup sCl(B)$  for all  $A, B \subseteq X$ ;
3. The union of two semi-closed subsets of  $X$  is semi-closed;
4. The union of two sg-closed subsets of  $X$  is sg-closed;
5. Every semi-preclosed subset of  $X$  is preclosed;
6. Every sg-closed subset of  $X$  is preclosed;
7. Every semi-closed subset of  $X$  is preclosed;
8. Every semi-closed subset of  $X$  is  $\alpha$ -closed;

**Theorem 2.17** :

A space  $X$  is extremally disconnected if and only if every gw-closed subset of  $X$  is gw-closed.

**Proof:**

Suppose that  $X$  is extremally disconnected. Let  $A$  be gw-closed and let  $U$  be an open set containing  $A$ . Then  $wCl(A) = A \cup [Int(Cl(A)) \cap Cl(Int(A))] \subseteq U$ , i.e.,  $[Int(Cl(A)) \cap Cl(Int(A))] \subseteq U$ . Since  $Int(Cl(A))$  is closed, we have  $Cl(Int(A)) \subseteq Cl[Int(Cl(A)) \cap Cl(Int(A))] \subseteq [Cl(Int(Cl(A))) \cap Cl(Int(A))] \subseteq U$ . It follows that  $pCl(A) = AUCl(Int(A)) \subseteq U$ . Hence  $A$  is gw-closed.

Converse part : Let every gw-closed subset of  $X$  be gw-closed. Let  $A \subseteq X$  be regular open. Then  $wCl(A) = A \cup [Int(Cl(A)) \cap Cl(Int(A))] = A \cup [Cl(Int(A))] \subseteq A$ . Then  $A$  is gw-closed and so gw-closed. Since every regular open is semi open set by Proposition 2.14 and  $A$  is gw-closed we have  $Cl(A) = pCl(A) \subseteq A$ . Therefore  $A$  is closed and  $X$  is extremally disconnected.

**Conclusion**

The notions and results of gw-closed set, gw-open set can be extended further in fuzzy topology, soft topology, nano topology and bitopological spaces.

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## LET MIND MASTER- REVIVE VEDIC MATHEMATICS

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### **Abstract**

Learners of all ages are phobic towards mathematics and it receives least score in the rating scale of their favored subjects. Mathematics, a perfect science finds prime place in all life applications and researchers of all domains never fail to apply the techniques of it, but still learners consider mathematics as threatening. Digital learning systems make learning joyful and not the learners of mathematics as the skill of speedy computation is not accelerated to the desired level of competing competitive examinations. The learners become mastery over digital applications but not quick in mental calculations as the digital gadgets have stolen the opportunities of their mind to calculate. Academicians are responsible to foster learner's interest towards mathematics and make them compatible with mathematical computations, a pre requisite of learning. In the outcome based system of education, the curriculum must consist of courses to boost the joyful learning of mathematics in all levels of education and introduction of Vedic Mathematics will certainly satisfy it. This research work strongly projects the outcomes of curriculum inclusive of Vedic Mathematics from an outlook of mathematics teaching community.

**Keywords:** Vedic Mathematics, Sutras, Curriculum, Joyful Learning, Computational Skills

### **1. Introduction**

The history of mathematics has concrete evidences of contributions of Indians towards theoretical conceptualization and development of mathematical concepts. Aryabhata, Brahmagupta, Bhaskara II, and Varāhamihira played vital role in study of various domains of mathematics. The ancient and medieval mathematical works had shades of Vedas, the books of knowledge written in Sanskrit. In particular, Atharva Veda consists of sixteen sutras which encompass all of mathematics [1]. The word sutra refers to short rule and it is recounted effortlessly. A structure of mathematics with sutras is Vedic mathematics. Jagadguru Swami ShriBharathi Krishna TrithajiMaharaja [4] wrote a book titled Vedic mathematics, a rediscovery of techniques of solving complex problems. Stephani Fogel [8] in the research on origins and modern applications of Vedic Mathematics stated the non - compliance of the researchers with the sutras and its coexistence in Vedic period. The myth and controversies still remain unsolved with deficit supply of appropriate proofs. [2,3]The spending of time on digging its past can be vested on appreciating the miracles of using sutras and sub sutras.

The personal grudge against Trithaji Maharaja resulted in fragile imprints of Vedic mathematics in the early educational system alsoVasanthaKandasamy [6] in her



book on Vedic mathematics stated that the sutras are outcomes of one's thoughts and it is not Vedic in origin, but still some of the Hinduva based educational institutions claim Vedic mathematics to be Vedic and this prelude religious based controversies in educational systems and prevent the spread of Vedic mathematics. On other hand the stepping of

Macaulayan educational system [8] in India has triggered reign of western practices in education for the past decades. The holistic indigenous system of Indian education has lost its identity and recovery of it is essential. The phrase 'Revival of Vedic Mathematics' may puzzle educational fraternity amidst bloom and blast of data analytics. The arguments and controversies will certainly take upper hand but the only substantiation, this article keeps forward is 'let mind master, not machine'. As a teacher of mathematics, I feel from my experience, Gen Z student community have fragile computational skills, logical thinking and this obstruct them from comprehending higher concepts. Learning mathematics must be made joyful by the teacher, but many times teachers are prime reason for learners to dislike mathematics. The process of teaching mathematics comprises of complete transformation of teacher's comprehension to learner, which make mathematics distinct. The present curriculum of schools and colleges consists of advanced courses intended to enhance the standards of learners without proper building of essential skills. The subject 'Mathematics' is characterized as the most difficult and this atmosphere shall get changed by inclusion of courses facilitating joyful and active teaching cum learning of mathematics.

What makes a school student feel mathematics tough? Is it numbers? , Symbols? oron the other hand Formulae? Which plays a major role?oron the other hand composite role?Only the perception is playing dominant job ever since. Learners should feel mathematics easier and the teachers should make so. This fundamental internalization will mitigate the detestation and anxiety of mathematics. How shall we make it happen? One possible way is to introduce new courses focusing only on promoting learner's interest and rudimentary computational skill development as learning outcomes. The courses must present mathematical concepts in a different manner which will certainly kindle learner's interest and it motivates them to learn further. Learners must acquire confidence in them and get stirred in enriching their computational skills. The next question in queue, what kind of courses can be introduced to fulfill the above stated aspects? Presently the educational programmes in the name of advanced and novel courses, introduce various software applications, programming languages and techniques to teach the same mathematical concepts. Does it make the learning easier? Sometimes it makes teaching also complicated. Instead of marching forward with upgraded versions of digital learning portals, let us take some time to rewind the indigenous methods of learning mathematics to ease knowledge acquisition

Covid-19 has shaken this world and has paved way for paradigm shift towards contemporary trends in all systems inclusive of education. The outbreak of online interfaces, channels to share expertise is getting viral in all social networks. This pandemic disaster gave me an opportunity to engage in a webinar on Vedic Mathematics, by which I became aware of sixteen sutras and its application in solving



complex problems in no time. The efficiency of these sutras is mind blowing and this has to be disseminated to teaching and student community. Teaching of these sixteen sutras will make differences in learner's perception and approach towards mathematical problems. The subsequent query, what will be the consequential impact of introducing Vedic mathematics on learners and how to make so? This research article briefly presents the answers for the above stated questions from the outlook of teaching community.

The remaining of the article is structured as follows: section 2 elucidates the positive effects of introducing Vedic Mathematics in curriculum; section 3 justifies the theoretical perspectives discussed in section 2 with numerical results; section 4 comprises discussions of results and last section concludes the work.

## **2. Benefits of Curriculum inclusive of Vedic Mathematics**

Vedic mathematics is a complementary to regular math taught in schools, but the inclusion of it as a course in the curriculum will positively bring a lot of changes in the teaching and learning process. Insertion of Vedic mathematics in present curriculum will bring wide range of transformation in the realm of teaching and learning process. The subsequent impacts of practicing Vedic mathematics are presented as follows

### **2.1 Activation of Cognitive Domain**

Cognitive is one of the three domains of learning and it is the point of action generation. The process of thinking decides the destiny of action and the effectiveness of the actions depends on the sharpness of mind. Learners on getting familiarized with sutras and its application feel great changes in their way of logical thinking, reasoning, mental dexterity, that are reflected in their academic performance. The visualization and concentration of the learners are enhanced and it sharpens the mind. The activation of cognitive domain paves way for robust thinking and it takes to higher altitudes. Robust thinking makes the learners creative and it is expected from them to make different tasks. The learners must also learn to think out of box in the process of finding solutions to the problems, an essential component in qualifying competitive examinations.

### **2.2 Zestful Learning**

Learning is a process that lasts till our last breathe and it continues even after our existence as a form of experience or model to others; it is never ending process. Learning becomes complete only if it gives us the joy of doing so and it is also subjected to learning of mathematics. Vedic mathematics makes learning of mathematics dynamic and joyful. The sutras ease the computational process and kindle interest in learners. If learning becomes delighted then learners are attracted towards the subject. Joyful learning facilitates learners to acquire knowledge of all concepts ranging from simple to complex. The joyful process of learning burdens the process of teaching and inters personal relationship between teachers and learners get strengthened. One of the challenges of educational institutions is to make learning joyful, especially learning of mathematics as they are highly aware of the hardships in implementation. But inclusion of Vedic mathematics in the curriculum will certainly make learning of mathematics joyful and it will assist in tackling the obstacles of practicing zestful process of learning.



### **2.3 Love towards Mathematics**

In general the learners have aversion towards mathematics in the early years of schooling or in the subsequent years due to several reasons. The nature of the subject, the approach of teacher, learning environment, teaching methods, complicated problems, composition of several formulae and derivations, perception of the subject all together develops a sense of fear or aversion towards mathematics and it is transferred to one generation to another. As mathematical concepts and principles form the basis for all other sciences, the learners must acquire profound knowledge of mathematical application. The learner's repulsion from mathematics must be turned off and they must be made to fall in love with mathematics and it is possible only by inclusion of Vedic mathematics in curriculum. Vedic mathematics will make the learners feel that mathematics is simple and easy; it is a skill which can be developed and enriched by repeated practice.

### **2.4 Makes Learning Different**

Vedic Mathematics makes the system of learning distinct; the solutions running to several pages are confined to lines of one or two. Rapidity and accuracy are the features of Vedic mathematics. For instance the multiplication of five digit numbers is time consuming and learners feel it is highly tedious, but imagine if the result is obtained in a fraction of a second like a magic the learners get amused, this is the power of the sutras, also the calculation of higher order derivatives in differential calculus, multiplication of polynomials of higher order, solving of equations and many other complex problems can be solved in no time. The conventional time consuming solving techniques will be replaced by instant methods of computation and this makes learning of mathematics different to the learners. On the other hand the teachers will also get adapt to new methods of teaching mathematics. The inclusion of mathematics in curriculum will provide opportunities to both teachers and learners a different environment

### **2.5 Man independent of reckoner**

Man make machine to lessen his tasks but man gets replaced by machine many a times. The human mind is highly creative and wonderful as machines are its brainchild. But the pathetic situation is man fails to master the machines and gets mastered by machines. The human mind is more powerful and exhibits high speed of accuracy in calculation, but still man depends on calculator for simple calculations. This kind of behaviour is present amidst the learners and they rely on calculator for very simple calculations. This makes their mind idle and passive. The learners' mind has to be activated and they have to be made independent of calculator. If a machine can do wonders why can't the man who created it. The learning of Vedic mathematics provides learners quick computational tips to act smarter without assistance of any calculating device. The rate of learner's dependence on devices for calculation must be mitigated by inclusion of Vedic mathematics in the curriculum.

### **3. Methodology**

This research work intends to present the changes in learners on including Vedic mathematics in curriculum and interest of teaching fraternity towards the same. A sample of 100 respondents consisting of school teachers and college professors working in both private and government institutions were chosen and data was collected through questionnaire. Fig 3.1 presents respondent's support towards inclusion of Vedic

mathematics in curriculum. Nearly 92.3% of teaching community voted in favour of it. Fig 3.2 represents respondent's outlook of impact of Vedic mathematics on

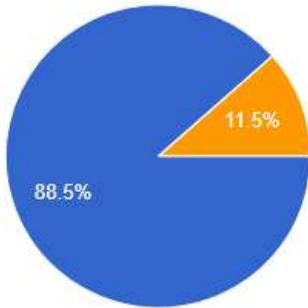


Fig 3.1

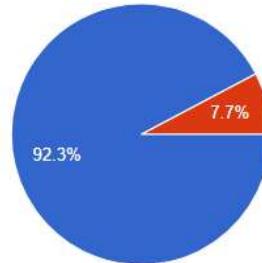


Fig 3.2

The above collected data was also analyzed by fuzzy tools. The technique of fuzzy matrix is used to determine the core factor that supports inclusion of Vedic mathematics in curriculum from teacher's view point. Based on expert's opinion and literature review, the benefits of Vedic mathematics are presented as factors

- X1 Contribution to holistic development of human mind
- X2 Enhancement of interest towards learning mathematics
- X3 Development of multidimensional thinking
- X4 Acquisition of techniques to outmaneuver competitive examinations
- X5 Enrichment of learner's spiritual domain of personality

The Raw Time Dependent Matrix is constructed from the data collected by taking the years of experience of respondents along the rows and factors along the columns.[7]

Experience in Years	X1	X2	X3	X4	X5
0-5	10	11	9	10	5
6-10	32	37	35	34	26
11-15	26	27	30	28	16
16-20	11	10	10	9	4
21-25	10	10	11	11	3

The Average Time Dependent Data Matrix (ATDDM) obtained from RTDM by dividing each entry by the time period

Experience in Years	X1	X2	X3	X4	X5
0-5	2	2.2	1.8	2	1
6-10	6.4	7.4	7	6.8	5.2
11-15	5.2	5.4	6	5.6	3.2

16-20	2.2	2	2	1.8	0.8
21-25	2	2	2.2	2.2	0.6

The Average and Standard Deviation of the above ATDDM

<b>Mean</b>	3.56	3.8	3.8	3.68	2.16
<b>SD</b>	1.869	2.22	2.23	2.09	1.79

After the computations of refined time dependent matrix for various values of  $\alpha$ , the Fuzzy Combined Effective Time Dependent matrix representing the factors strongly emphasizing the effects of including Vedic mathematics in curriculum from teacher's outlook is presented in Fig 3.3. Also the ranking of the factors based on the score values is represented in Fig 3.4

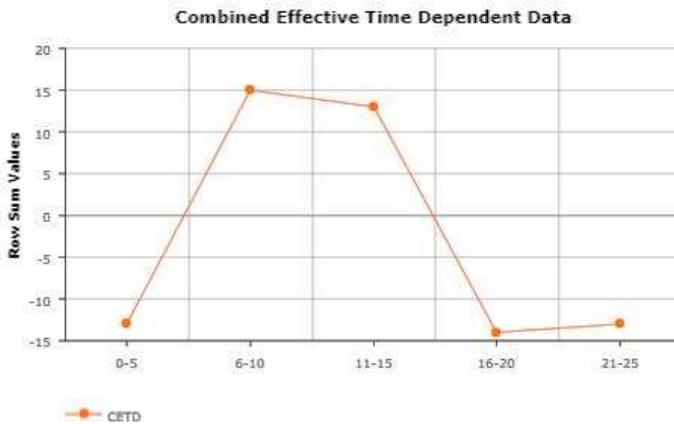


Fig.3.3

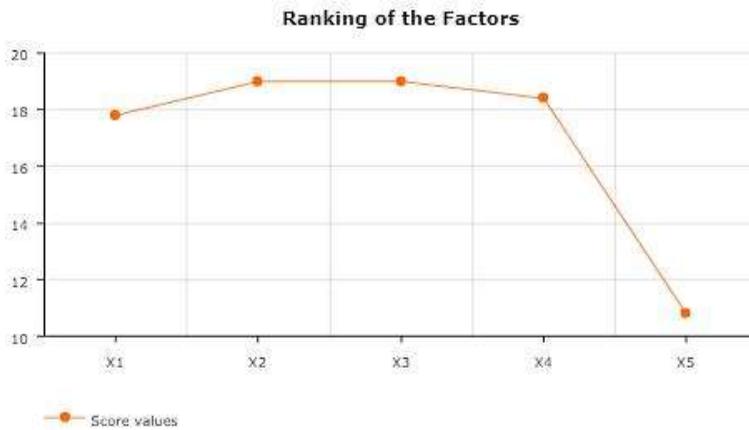


Fig 3.4



#### 4. Discussion

Fig 3.4 vividly presents the core factors that contribute towards inclusion of Vedic mathematics in present curriculum. The factors X2 and X3 score maximum values in teacher's viewpoint followed by X4, X1 and X5. The results show the teacher's willingness and belief on transformational impacts of Vedic mathematics on learners. Also the young professors are highly interested to teach Vedic Mathematics to the student community which will bring a paradigm shift in teaching and learning process of mathematics.

#### Conclusion

This research work is a step towards the study of the positive impacts on learners of introducing Vedic mathematics in the present curriculum from teacher's outlook. The preliminary survey conducted shows the interest and belief of the teaching community on the transformational impacts of including Vedic Mathematics on learners. This work also investigates the viable group of teachers highly in favour of teaching Vedic mathematics and presents the core factors supporting inclusion of Vedic mathematics in curriculum. This paper comprises of theoretical arguments in favour of Vedic mathematics and justification of the same with numerical data. The teaching community strongly believe inclusion of Vedic mathematics in curriculum will create learners of different kind.

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# I r ijEijk dk nk'kud fpLru

MMWnønk l kdr

vfrfFk fo}ku&n'ku fohkx

vo/ksk irki fl g fo'ofok|ky;} jhok %e:izh

i kphu dky l s gh Hkjr; \_\_f'k; ka us /ke/ ds eW; rRota dk l k{kRcdkj fd; k FkKj mlgkaus ea-ka dk f}0; Kku i ktr FkA bl dh dkj.k mucs i jorh dky ds ykta us u rls ea-ka dls l h[k l drs Fla vlg u gh og /ke/ ds eW; rRota dk l k{kRcdkj gh dj l drs FkA bl ds mi jkUr Hh xq &f'k'; ijEijk dk fuogu djrs gq|v/; ; u&v/; kiu dk nls pyrk jgk fdlrq \_\_f'k; h&efu; ka ds nlt js oxka us vtpk; ka l s l p d j ea-ka ds eW; ka dls l a fBr d jus dk iz kl fd; ka tc rd eut; dh 'kDr v/; ; u l s l ekr gkus yxh rc \_\_f'k; ka dks Kku ds rRo dls Hko"; grr fpLrk l r kus yxhA ml le; rd onka dk l xg ek= FkA bu l arfr; ka dh f'k{k 0; oLFk dls {h.k nq|kdj on dh vud 'k{k|kvla dk fuekz k djuk i k j Etk fd; ka blgha Jfr ijEijk/va ds ek; e l s vtpk; ka l s xg.k fd; k x; k j Kku vlxspydj yqku dyk ea ijf.kr gsrk gA bl idkj l s l r ijEijk dk fodkl gsrk gA

I r dh ok.kh ea ufrd f'k{k ds vk; kela dk fpLru l ekfr gA ml h l s l ekt dk l Ei w k fodkl fd; k tk l drk gD; k d l nkpj i w k l d k d j ds }k j k vtpk j .k dh 'kD rk i j cy fn; k x; k gA ; gh vtpk j dh 'kD rk ekuo ds 0; ogkj ea ijf.kr gsrk gA bl l s f'k{k.k l l a f k u k a ea Hh ufrd f'k{k dls i k r l gu feysk vlg ekuo ds d k d {kerk dk fodkl gsrkA bl l s subz ih-eh m l s ; & i w k t h o u dh vlg v l x s c - a h A bl r j g d s c n y o l s l e k t v l g j k ' V a d k f o d k l l E h k o g A ; g k j r d v k / k u d f ' k { k k i z k y h e a u f r d f ' k { k d s u g k s d h c g r c m h d e h d k v k h k l e k u o d l s g l s x ; k g A f Q j H h u f r d e W ; k a d s f ' k { k l s o ; f D r o f r g A b l g h a u f r d e W ; k a d h f ' k { k d s } k j k f o | k f w z d s o ; f D r o d k f o d k l l E h k o g A ; g k j r d u f r d f ' k { k k l l d k j j v n ' k j i j k i d k j e k r k & f i r i k x # l o ; k o } v k r n i j f o u ; i w d l 0 ; o g k j d j u k 0 ; f D r l h [ k r k F k k f d l r q v k t , d s o k r o j . k d s f y , o f r g l s x ; k g A b l o f r g l s d s d j k . k e k u o l e k t e a v L o L F ; o k r o j . k i s h k g l s x ; k g A v k t d k M M V j j o d h y l b l t h f u ; j v k r n e a m l i d k j d s d k y 0 ; o g k j u g h a g A ; s l H h / k u g h / k u d s i h N s n k M + j g s g A / k u d s v H k o e a 0 ; f D r d l s t h o u d s y k s i M + j g s g A / k u d s v H k o e a l y k d s y k s i M + j g s g A / k u d s v H k o e a > k i M & i e h H h u g h a j g u s f n ; k t k j g k g A b l i d k j d h f o l a f r ; k a u s e k u o d l s v l / k k c u k f n ; k g A v k ; s f n u g l s o k y h ? R v u k e a v k f k d r a h l f t l d s p y r s i f r & i R u h e a > x M k r y k d j H k k b s & H k k b z e a Q w r u k o H k j k t h o u g l s x ; k g A b l r u k o d k f u n k u o l r n r % l n k p j v l g l n k p j d s } k j k 0 ; f D r l e k h t h o u 0 ; r h r d j l d r k g A l e k h t h o u e a l R ; v f g d k j l n k p j t s s R ; k a e a f o l e k u g A ; g k j r d 0 ; f D r e a v e h j d l s n q | k d j v e h j h e a t h u s d l i u s r u k o d s l n x h e a t h o u d l s H k j f n ; k g A b l i d k j d h f o l a f r ; k a d h e y t M + v k / k u d r d u l f d v l g v k / k u d f ' k { k i z k y h f t e n k j g A

I r gesk l T tu l f'k{k vtpkjh vlg 0; kogkj dky gsrk gA vfrfFk ds vkus ds mi jkUr os mucs Lokxr ds fy, mPp vki u ea cBkrs gA Bgus dh mlke 0; oLFk djrs gA bl ds mi jkUr e/k ok.kh l s i j k e ' k z d j r s g A b l i d k j l s l r d s v k n ' k z d h d Y i u k H k j r h ; n k ' k u d f p L r u i j E i j k e a d h x b z g A

## r. W u H h e # n d a o k d - p p r i w z l q r k A I r l e s t u x g s q u k e P N | r s d n k p u A A ' 1

r: k dk vki u j H h e j ty ds l k f k & l k f k ok.kh ea feBkl l k / k q t u l a d s ? k j i j p l j i d k j d h o l r q / k a d h d H h H h d e h u g h a g s r h g A

; Fk' kDr fpdL'kUr ; Fk' kDr d p z A  
u fdipnoel; Ursujk% i f. Mrcd ; %A A 2

bl l d k j e a o g h a c d j e k u g s t k s ; Fk' kDr dk ; z d j u s d h l e f i z j [ k r k g A f Q j H h 0 ; f D r ; f n i w k ' k D r v l g f u ' p ; d s l k f k d k ; z d j r k g A o g h a l Q y r k d l s i k t r d j r k g A , d s 0 ; f D r n i l j a d l s N k k / k l e > d j j m u c l s n r d k j r k u g h a o g h a 0 ; f D r K k u h d g k t r k g A b l i d k j l s 0 ; f D r l Q y r k d h l h - h i j i g p t r k g A f d l h H h f u / k u 0 ; f D r d k v i e k u u g h a d j r k A p k g s o g e v e s y s d i M a i g u s g q D ; k a u g l \ 0 ; f D r l s } s k a d j u k ; k t k f r d s v k / k j i j v i d k j d j u k j , d i d k j l s d y a d v l g v f h k ' k i g A f Q j H h ; f n } s k a d j u s d s m i j k U r m u 0 ; f D r ; k a d k v i e k u d j r k g A m l s v i j k / k e k u k x ; k g s t c f d 0 ; f D r d l s n i l j a d s i j k i d k j d j u s d h i w k l k e f i z k D r i k t r g A

bl h l U n H z e a e g l r e k f o n j d g r s g a f d l n k p j ' k h y d s c y i j p y u s o k y k 0 ; f D r v f / k d e g l u g s r k g A m l h i d k j l s t h o u e a l R ; v f g d k j l e k v l g R ; k x d s c y i j l n k p j d k v u d j . k f d ; k t k l d r k g A ; f n g e o r e k u l U n H z d h d r d j a r l s o l r n r % l e k t e a v k ; s f n u g l s j g h f g d k j e k u o r k d l s l e a k j d j u s o k y h g A m l h i d k j l s e g l r e k f o n j v f g d k e k x j ' k h y l n k p j d l s v f / k d c y i n k u d j r s g D ; k i d e u t j ; v f g d d j g u s d s m i j k U r g h l E i w k l t x r - e a l e k & ' k k U r i k t r d j r k g A

vfga tk l e H o g k A A 3



I r d k t h o u i w i z i l s v f g d d g l r k g s D ; k i c d v f g d k d s } k j k g h l q k v i g ' k k f u r d i s i k t r f d ; k t k l d r k g a v f g d k d s c y i j p y u s d s m i j k u r g h f o ' o e a ' k k f u r f e y l f k f i r g l s l d r h g a f g d k g k u s d s d k j . k l a k ' z v i g v ' k i a r d k o k r o j . k m r i l u g l r k g a , d h f l f k f r e a 0 ; f d r & 0 ; f d r d s c h p h k ; d h f l f k f r c u t k r h g a f o j h h b l d s c k n u h r ' k l = y k e d d y ; k . k d k j h g a m l h i z k j l r d h o k . k h y k e d f g r m i d k j i n k u d j u s o k y h g a b l l s u h r ' k l = l n k p j e k x i z g k u s d s d k j . k l e k t d h f l f k f r d i s l n < < c u k , j [ k u s e a v g e h k e d k g r h g a b l i z k j l s / k e j v f i z d k e v i g e k f k d k e n y u h r ' k l = e a o f . k r g a

v | k n o k m f n u m % l w l ; f u j s g l % f i r r k e j o | k r a

r e k s e = l s o : . k s e k e g u r l e f n r % f l w % i f f l o h m r | k s a <sup>4</sup>

l w e . m y e a f o ' o d s v l / k d j d s f u o j . k d s f y , d k ; z e k = e a c k / k i g p k u s d s m i j k u r v l / k d j d s f o u k ' k d s f u f e l k g h n o r k f u o k d j r s g a t g k f e = ] o : . k j v n f r ] f l w / h i i f o h d s l k f k & l k f k v d k ' k d h v f / k ' b k = h n o h v i g n o r k f u o k d j r s g a b l l d k j d k v l / k d j g v t k r g s D ; k i c d m u d s } k j k g h l e i w i z d k ; z i s = e a i z k ' k o s y t k r k g a m l h i z k j l s l r d h e f g e k g s f d f o ' o d s , d l e k u h k o l s n s k u s d s d k j . k l n k p j d h f ' k k l s f o h k r k e u o j g k g a

v u l ; p r k % l r r a ; k s e k a l e j f r f u r ; ' k a r l ; k g a l y / h k i k f i z f u r ; ; q l ; ; k s x u ' a a <sup>5</sup>

h k x o k u j h n ' . k d g r s g s f d t i s e j k / ; k u d j r k g a o g h a b z o j d k u k e h k t r k g a m l l r d i s e j k n ' i z u l g t h k o l s i k r g l r k g a b l i z k j l s r i s v f u r ; l d k j d s 0 ; k o g k f j d t h o u e a h k x o r - h k d r e k g e k ; k e a d ; k a o l s g q \ l a r k a d h f d l h i z k j d h t k r u g h a g r h g a l p p s e u l s b z o j d h h k f d r e a l r d s f p l u r d k 0 ; f d r h k j k d k d j r k g a m u d s ' k j . k e a g k u s l s p i s k i h d k d l u k u n w t k r k g a

b l h d k j . k l r o k . k h e a d g k x ; k g s f d b [ k n d i s r i s i k u h h h u l h c u g h a g l r k j n i j k a d i s n i k c [ ' k u s p y s g a v i u k e r i s f l f k j u g h n i j k d i s v i k / h i z t c k k j g s g a b <sup>6</sup> i q ; k n ; s u c g t u e l e f t i u s ] l r i x e l s ; f n h k o r - n i f r u l s t u l ; a

v k l u g r n i r e k g e g u l / k d j k i s u ' ; b i r n k a n ; e s r e g k u - f o o d ' a a <sup>7</sup>

v f / k d t l e k a d s m i j k u r i k t r g k u s o k y s i q ; d k m n ; v f / k & 0 ; k f / k j l a d v ] ' k i c d s i k i & r k i l s i f j i w i z t j k e r ; q ; q r v l [ k d j l d k j e a i q ; d k ; z d j u s o k y s g h l r l a d s i k t r g l r s g a m l l s v k k u n r e k g d s v l / k d j e a o l t k u s l s m l d k t h o u u " v g l s t r k g a b l l s g h l r e l e k d s } k j k m r i l u g k u s o k y s t h o u p p z i q ; d h v i g p y h t k r h g a n i j x l o e f k b r ; k t ; ' a a <sup>8</sup>

b l l s o r z e k u d h f l f k f r n [ k u s e a c g r g h h k ; k c g y x r h t k j g h g s f t l e a e u t ; d i s y x r k g s f d ; f n b l i z k j d k v i f j f r 0 ; f d r v r k g a m l s f d l i z k j d s b g j u s d k i z l / k f d ; k t k , \ ; g k j r d v k t l r d s h k k e a v k u s o k y s p l e c p p k a d s v i g j . k d u k z v k f n d h l e l ; k v i a d s d k j . k l a r d s l o : i d i s i g p k u s d h f o d b l e l ; k m r i l u g l s p i h g s \ b l r j g l s e k u o e a v ' k i a r h k j e k g s y c u k g a r k g a m l d s t h o u e a , d h h k f u r ; k j f o l e k u g l s p i h g s f d o g m l l s c k j f u d y u k c g r g h d f b u y x r k g a

l r g e s k k n i a f r o k y s 0 ; f d r d i s r ; k x d j u s d h c k r d j r s g a t i s l k / q d k l o k x i g u u s d s m i j k u r ? m e r s f o j r s j g r s g a b l i z k j d s l k / k o s k / k j h d i v h 0 ; f d r d i s l k / m e k u u s l s d ; k m i d k j g l s k a , d s y l s k a l s e k u o f p u k d i s ' k o j [ k u k v k o ' ; d g s d ; k i c d i v h l a r d i s r ; k x d j u s d h v i o ' ; d r k g a b l l s t i s h k d n ' k f d r l a r e a g a o g h h u " v g l s t k r h g a m l d s m i j k u r m l d k t h u o 0 ; f i z g k u s y x r k g a

p h k j r h ; k a d h n ' i z u f o k ; d / k j . k k d s f c y d y u i s r y s < a l s c r k u s o k y k ' k n ' v l ; k r e f o l k ' ; g g s t i s c m k g h v f k i w i z g a v / ; k r e ' k n ' v f / k ' r f k v i r e b u n i s ' k n a l s c u k g a v f / k i r ; ; d k v f i z v k / h j r , d k g l r k g a n ' i z u v i r e f o k ; d f o l k u g l s j v i r e k f / k ' b r f o l k g a , d k v / ; k r e f o l k ' k n l s c k s / k r g l r k g a b <sup>9</sup>

b l l e c l / k e a , d m n k j . k d s r i s i j l e > k t k l d r k g s f d e g l r e k f o n j d s j k t i v d k d k b z y k p u g h f k l f d u r q n l h i e g k u s d h m i s k d b z c k j > s y u h i m a f o n j g e s k y k e d f g r v i g / k e l d s v u p l y c r s d j r s j g a / k r j k ' v o f o n j d h c r i a d i s c g r v p n h r j g l s e k u s f i j f o j h h i e e k g v i g ' k d i u d h v u s r d r k i w i z d w u h r e a o l r s t k j g s f k a f o n j t s k e g k k u h / k e l v i g v / k e l d i s i f j h k r ' k r d j u s o k y k i k . m o k a v i g d i s o k a d s d y e a , d k d k b z u g h f k a o g t k u r s f i j f d / k e l g h e k u o d k l c l s c m k i q ' k f i z g a b l f y , m l g k u s t h o u h j / k e l i k y u d k d k ; z f d ; k a



I UnHkZ %&

- 1- MW Hhejkt 'keZ ^kL=h'] I hNr I kgr; esu&d&f'kM , oajkVh; &pruH jkVh; I hNr I kgr; dln] t; ij] I dJ.k 2008] i"B 16
- 2- MW Hhejkt 'keZ ^kL=h'] I hNr I kgr; esu&d&f'kM , oajkVh; &pruH jkVh; I hNr I kgr; dln] t; ij] I dJ.k 2008] i"B 16
- 3- ogH i"B 15
- 4- ; tφh : nh 4@16
- 5- xhrk 8@14
- 6- fo; ksh gfj] I rok.kh] i"B 139
- 7- i | igk.k mUkj 194@74
- 8- dY; k.k] i"B 140
- 9- 'kL=h nfoM] ukjk; .k] Hkjr; n'kZ dh eyxkeh I eL; k; i fo'ofok [ky;] i d'ku I kxj] i Fk I dJ.k 2009] i"B 17





I ek/Mu %

I jdkj }kjk l pkyr vudka; kstukvla dk fu"i knu fd; k tk jgk gA bl i zdkj dh ; kstukvla dk ykHk efgykvla dks fey jgk gA fdUrq vHh Hkh dN v/kjh gA tks fuf'pr : i l s efgykvla ds vkfFkZd l 'kDr dj .k dh fn'kk ea egRo i wkZ dk; Z gksxA

ftl i zdkj l s ykMyh y{eh ; kstukj tuuh l g{kk ; kstukj Å"kk fdj .k ; kstukj vkfn ; kstuk, a l jdkj }kjk l pkyr gA bl ds l kF&l kFk i pk; rka ea Hkh efgykvla dks fodkl r djus gsrq vkj {k .k i klr gA ; gk rd jk'Vh; efgyk vk; kx dh LFki uk vkfn l s efgykvla dks vkfFkZd : i l setarh inku djus ea dkjxj dne dgk tk l drk gA fOj Hkh efgyk l 'kDr dj .k ds dN dk; Øe vkfFkZd flFkr dks iHkfor djrs gA vkt Hkh lekt vkfFkZd : i l s bruk fi NMk gA fdl h Hkh u; s dkj [kku] fl ykb] cqkb] d<kb] NkV&NkV/s y?kq m | kxka ds fy, l jdkj ij fuHk] jguk i Mrk gSfd dc dtZ fey xka fOj i zu vkrk gSfd dtZ yus ds Hkh vudka eki n .M+ gA oLr% dtZ ml efgyk dks gh fey i krk gA tks okLro ea l {ke gA ; gk rd dtZ ea Mks jgus oks ykx fl Qkjl ds ne ij nh jh&rhl jh ckj Hkh dtZ ys yrs gA fdUrq tks vl gk; vSj xjh gA ml s dtZ feyuk cgr gh dFbu dne mBkuk gsrk gA

; fn dtZ fey Hkh rks ml ea u tkus fdrus fgl s gks tkrsgA fd og fdl h dk; Z dh l #vkr djus l s igys gh 50 i fr'kr i s k [kr e gks tkrk gA bl dk l cl s cMk dkj .k nyky vSj /kh [kjh vkfn us bu efgykvla dks muds vf/kdkj ka l so i pr dj fn; k gA

efgyk l 'kDr dj .k ds fy; s foHkku ; kstukvla dk fO; kko; u d bnz vSj jkT; l jdkj ka ds ek/; e l s gsrk gA bl ea yxHkx ifro"z yk [kka dkj kM+ : i s dk ctV LohN r gsrk gA fdUrq okLro ea ; g vkfFkZd : i l s fu/kkZjr y{; ka rd igpus ea fdruh l Qy gsrh gA og rks i R; cd 0; fDr tkurk gA , d h flFkr ea ml i s k dk bruk vfu; a .k gks tkrk gSfd ey ; kstuk Lor% v/kjh jg tkrh gS tcd foHkku ; kstukvla dk i Hko 'kgjh vSj xkeh .k efgykvla ds foHkku oxka dks vkfFkZd l gk; rk inku djus ds fy, gA

efgyk l 'kDr dj .k ds vkfFkZd i Hko %

- vkfFkZd ; kstukvla ds l pkyu l s tMk g bZ i R; cd i fO; kvla dh l eL; k, a i zdk'k ea vkt; sch vSj bl s nj djus ds fy, i zkk l dks l eL; k l s voxr dj k; k tk; xka
- efgykvla dh vffkZd flFkr dk efgyk l 'kDr dj .k dh ; kstukvla dk ij i Mks oks i Hkoka ds 0; ogkfj d n"V dks k] ftl l s fodkl ds ekxz dks l k/kd cuk; k tk l d] ck/kd ughA
- xkeh .k , oa 'kgjh efgykvla dks bu ; kstukvla dk ykHk inku dj] mudh vkfFkZd flFkr dks l qe cuk; k tk l drk gA
- Lo; d oh efgyk l xBuka dks vkfFkZd enn nus l s l ekt ea , d vPNs okrkj .k dk fueZk gsrk gA bl l s }Skt bZ; kZ vkfn l s Np/dkj feysxA
- efgykvla ds vkfFkZd l 'kDr dj .k l s muds thou Lrj ij l qk] gksxA mlga thou fuoZu gsrq l e i pr l qo/kk, i vkt kuh l s fey l ds xhA
- efgyk l 'kDr dj .k ds vk/kkj ij muds 'kS[kd Lrj dks vSj vf/kd etar cuk; k tk l drk gA
- foHkku ; kstukvla ds }kjk fdruh efgykvla dks jkstxkj ds vol j mi yC/k gsrk gA blga ; kstukvla l s tu&tlx: drk dks Hkh QSyk; k tk l drk gA
- efgyk l 'kDr dj .k ds }kjk bu ; kstukvla ds i Hkko fu"i knu ea tu&l gHkfxrk ds }kjk blga l ekt dh eC; /kjk ea yk; k tk l drk gA



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## A STUDY OF MOBILE BANKING IN INDIA

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### *Abstract*

Innovation assumes a significant job in banking area. Banking is one of the biggest money related establishments continually investigates the chance of innovation empowered administrations to give better client experience and accommodation. Cell phone is a typical innovation gadget that turned out to be a piece of each person in the data time. Internet Banking is a rising exchange channel for giving financial administrations. The Banking business has changed from the customary model of lining the clients to the advanced innovation based method of exchanges that are accessible at some random purpose of time on quickly and anyplace, gave the individual has arrange access to profit the administrations from the particular banks. With the selection of Mobile Banking method of administrations, the financial part is having a huge development over the globe including India. Directly the Internet innovation has carried the third transformation to this world.

India is the second largest telecom market in the world, which is having high potential for expanding banking services using mobile. However, Mobile Banking has not become the choice of millions of people. The main objective of this study is to identify the mindset and analyse the security issues in Mobile Banking among the banking customers in India.

**Key words:** ITC, LTE,KYC,ATM,IOT

### **Introduction**

Mobile Banking (m-banking) has risen as a well known method of banking in many created and creating nations. In India, there are roughly 13 million Mobile Banking clients and this figure is relied upon to develop quickly with Mobile exchanges surpassing charge card exchanges before the decade's over. By certain measures, there are more cell phones in India than there are financial balances. The blend of two factors—an enormous unbanked populace and the universality of phones—is an impetus for high Mobile Banking appropriation. The Mobile Banking is characterized as "the arrangement of banking administrations to clients on their cell phones" explicitly the activity of bank current and store or investment accounts. Portable Banking is a use of Mobile figuring which furnishes clients with the help should have been ready to bank anyplace, whenever utilizing a portable handheld gadget and a portable assistance, for example, Short



Message Service (SMS). Portable Banking office evacuates the existence confinements from banking exercises, for example, financial records adjusts or moving cash starting with one record then onto the next and efficient when we go to bank and doing some financial exercises. Web Banking helps the client's whenever access to their banks. Client's could look at their record subtleties, get their bank proclamations, perform exchanges like moving cash to different records and take care of their tabs sitting in the solace of their homes and workplaces. Be that as it may, the greatest constraint of Internet banking is the prerequisite of a Personal Computer with an Internet association, however unquestionably a major obstruction on the off chance that we consider the vast majority of the creating nations of Asia like India. Mobile Banking tends to this basic confinement of Internet Banking, as it diminishes the client necessity to only a cell phone. Mobile utilization has seen an unstable development in a large portion of the Asian economies like India. The fundamental reason for Mobile Banking scores over Internet Banking is that it empowers 'Anyplace Anytime Banking is Available'. Clients needn't bother with access to a work station to get to their ledgers.

#### **ORIGINATION OF M- BANKING IN INDIA**

One of the most leading sectors in the world in the adoption of mobile technology is the banking industry including India. India was depicted to be the fastest growing mobile communications nation in Asia. Presently, banking industry of India has engaged the use of Information and Communication Technology (ICT) as a platform for effective and efficient .

means of conducting financial transactions. But, banking sector of India found technology-oriented financial services in the year of 1987 through the Automated Teller Machines (ATMs). It was installed by HSBC bank, after 20 years completion of the execution process of cash dispensers for the first appearance in the world made by Barclays bank in UK, 1967. To strengthen the banking sector, financial reforms were initiated as a part of the economic reform started in India since 1991 onwards. Reforms were introduced in two phases, based on the report of Narsimahan committee in the year of 1991 and 1997. The second committee report, suggested whatever programme required by the banking sector reforms and make it in the India's banking system to become internationally competitive. This suggestion also helped to making fast development of technological-oriented financial services provided by the bankers to their customers in the past two decades. In recent days, finance-related services that are offered by employing mobile telecommunication technologies are generally referred to as M- Banking technology-enabled financial information or services (Tiwari. R, et.al). So, the first M- Banking and payment initiatives were announced during 1999. The first bank to provide Mobile Banking facilities in India was ICICI bank in the year 1999, followed by HDFC bank and IDBI bank. Self-service Technological advances have reshaped the size and nature of the financial industry, allowing it to extend beyond the traditional to modern concept of saving and borrowing through extension of the technological progression in the banking sector. The terms M- Banking, m-finance, m-transfers and m-payments refer to the inter-services between customers and bankers. Now, M-Banking development is a next generation of electronic banking which delivers financial services when the customers use their handheld devices to access their accounts and pay their bills from a bank which operates



their account without having to physically visit their bank. In recent days, Mobile Banking is performed between bankers and its customers in the form of Short Message Service (SMS) or the Mobile Internet for the purpose of attaining higher levels of customer satisfaction and increased loyalty by providing 24X7 facilities and bankers will benefit further from reduced administrative expenses, lesser number of branches and lower handling charges with better service to the customers than branch banking. However, around the globe various IT initiatives developed by the bankers and use the mobile phone to provide financial services without access to traditional banks. Innovations in mobile technology the banks are conduct fast paced demands among the

various group of peoples or customers in the 21st Century through the high-quality of response and M-Banking which is an integral part of m-commerce has become very popular among mobile users ever since its existence in 2007. The success of M- Banking services depends upon the mobile network operator, M-Banking technology vendor, bank and the customer. Further, M- Banking has great deal of capabilities to offer value-added service, transformation of information and decision making services to the organization. M- Banking is a type of m-commerce service since it allows consumers to perform the following technology-enabled financial information availed from the banks through the mobile device. Therefore, the Government of India and the Reserve Bank of India (RBI) encourage banks to provide banking facilities to those peoples through M- Banking technology. In the year 2008, the RBI issued M- Banking guidelines to the banks. This disqualifies mobile network operators from offering their own service.

#### DEVELOPMENTS IN MOBILE TECHNOLOGY

Motorola was the first company introduced mobile phone in the year 1973, which is very costly and also more weight (in Kgs) when compared with present mobile sets which are cheap and small in size.

**1st Generation (1G):** The first analog Mobile system widely deployed in North America was the Advanced Mobile Phone System (AMPS). It was commercially introduced in the Americas in 1978, Israel in 1986, Australia in 1987 and India in the year 1995.

**2nd Generation (2G):** Second generation mobile communication replaced the analog signal with digital signal.

There are two major technical developments occurred that is GSM and CDMA technologies<sup>3</sup>. The NTT DoCoMo in Japan introduced internet service on mobile phones in the year 1999.

**3rd Generation (3G):** The mobile phone became essential communication system for millions of users worldwide. The 3G technology developed with the concept of packet switching instead of circuit switching for data transmission.

**4th Generation (4G):** The fourth generation technology introduced in the year 2009 with the technology advancement like WiMAX & Long Term Evolution (LTE) technologies.

**5th Generation (5G):** The 5G network is yet to be released but is widely anticipated by the mobile industry. Many experts claim that the network will change not just how we use our mobiles, but how we connect our devices to the internet.



Mobile network operators claim that 5G will be available by 2020 but nothing is certain just yet. For more information on 5G and the IoT, check out our video interview of Dr Hamid Falaki, Technical Architect at Digital Catapult on how 5G will enhance the IoT (Internet of Things)

### Review of Literature

**Sharma and Singh (2009)<sup>1</sup>** found that the Mobile Banking clients in India were increasingly worried about security issues like budgetary fakes, account abuse and ease of use issue, trouble in recollecting the various codes for various kinds of exchange, application programming establishment and refreshing because of absence of normalization.

**Uppal R.K( 2010)<sup>2</sup>** made a study on M-Banking advantages to clients and financiers and furthermore clarifies M-Banking is the best option for banks and clients. For banks it helps in expanding benefit thought process, other hand for client M-Banking is time and cash sparing administrations. M banking help bank to decrease cost as well as help it to hold its significant clients, this office empowers the clients to bank," anyplace whenever banking.It reasons that the private banks are on the top in giving the M-Banking administrations to their clients and have high benefit.

**Sudhakara A.M, Moorthy Suryanarayan M.R ( 2011)<sup>3</sup>** made a study on the status of Mobile Banking in India and different nations with accentuation on information security and gauges and its suggestion on banking segment. Henceforth the Public segment likewise embraced this new advancement for expanding their benefit and contact client better. And furthermore help client and bank too for decreasing cost and improve effectiveness. Paper recommend that banks ought to guarantee security of information and information assurance by embracing most recent innovation and gauges ought to be encircled to draw in its whole bank client to do Mobile Banking which guarantees progression in business and which thusly brings about benefits. By embracing right Mobile Banking guidelines and Mobile security norms the banks can arrive at entire populace which in financial development of the nation.

**Singh Preeti, Bamoriya Sharma Prerna (2011)<sup>4</sup>** made a study on issue and challenges in M-Banking in India structure client's viewpoint. The examination distinguished certain issues to banks, portable handsets and telecom administrators' viz Mobile handset operability, security/protection, normalization of administrations, customisation, downloading and introducing application programming and telecom administrations quality. Study shows' Mobile Banking handset operability is a significant issue in Mobile Banking, because of accessibility of different handset models in the market.' Privacy and security are another basic issue for clients. Targets of this investigation are study the chose issues in Mobile Banking from clients' viewpoints and investigate the apparent utility of Mobile Banking in contrast with retail banking and web based banking among the Mobile Banking clients and non clients.

**Gamoorthy Avinaya, Sha and Sankar .C, Sangeeta.M,( 2012)<sup>5</sup>** made a study to focus on Mobile innovation, slants, its models significance and administrations, issue in security and recommends conceivable arrangement. The administrations offered by Mobile Banking included getting account data, moving assets, sending check book demand, overseeing stores, checking exchanges and so on. M – banking



is helpful for the two suppliers and clients. encourage Mobile Banking future directions into IB adoption and usage research in developing countries.

**Ratten Vanessa (2012)<sup>6</sup>** made a study on the job of business and E-fund in estimating an individual's point of view to receive M-Banking and furthermore decide mindfulness and information on client's about M-Banking and promoting. The primary discoveries of the examination paper are that individuals' innovative tendency and learning inclination will decide how they react to promoting and information about Mobile Banking. The functional ramifications are that money related organizations engaged with e-account can center their showcasing endeavors at expanding individuals' presentation to Mobile Banking.)

**Technical Committee Report, RBI (2014)<sup>7</sup>** made a study that the Mobile Banking transaction is economical compared to the traditional banking channels and hence there is need for banks to encourage the Mobile Banking channel in a big way keeping in mind the long term economic gains. Bank-specific applications and individual platforms have a major role in building brand loyalty, an alternate uniform/common platform, interoperability and similar seamless transactional experience to the users/customers of all banks would encourage Mobile Banking.

**Ms. Jasdeep Kaur(2017)<sup>8</sup>** In this paper, an attempt has been made to give an overview of e-banking, how it has evolved over a period of time in India. The paper also throws a light on growth of different e-banking products in last five years which are significantly being used in Indian banking industry.

**Abhinav Gupta and Dr.Rizwana Atiq(2019)<sup>9</sup>** This study plays an important role in identifying the key factors and issues that help in the adoption of Mobile Banking. This research paper defines many issues and challenges which are facing in use of Mobile Banking.

#### **Research Gap**

The review of literature points out that the studies are based on Financial Frauds of Mobile Banking ,Security issues, Mobile Banking Transactions and how Mobile Banking is useful to Banks and customers hence, the study is undertaken to analyze the progress of Indian Banking industry.

#### **Objectives of the Study**

1. To understand the basic concept of Mobile Banking in India.
2. To Study the developments in Mobile Technology.
3. To Study the Challenges comes in front of users while adopting Mobile Banking.
4. To analyze the positive and negative factors of Mobile Banking.
5. To Study the various purpose of using Mobile Banking.



### Sources of Data

The study is based on both primary data and secondary data. The primary data by administering a structured questionnaire to 350 respondents and Secondary data include Research Publications, RBI Reports and Websites.

### CHALLENGES WITH ADOPTION OF MOBILE BANKING

**1. Economic Challenges:** The rural population in India is spread across 600,000 villages, each with a low transaction value. Profitability can simplest be accomplished by big volumes, requiring enormous initiative from monetary establishments. Unlike the very successful M-PESA of South Africa, whose version has been very a success because of the shortage of alternative payments in South Africa, India does own some infrastructure within the sorts of postal bills, affordable delivery and neighbourhood governments. Therefore, any cell banking need to be less expensive sufficient to be attractive for the cease-patron over present techniques.

**2. Regulatory Challenges:** Although the RBI is supportive towards Mobile Banking in India, there are numerous regulations which are being placed into location:

**i. Restricted to Financial Institutions:** The guidelines country that best current financial establishments and banks are allowed to offer Mobile Banking. Although the tips cover Microfinance Institutions (MFIs), sizable existing huge fixed expenses. For a completely inexpensive solution, it would had been greater effective to allow non-profit groups or evangelical corporations to construct their very own MFI without being encumbered through big current infrastructure.

**ii. Rupee Transactions:** All transactions must be carried out simplest in India's national forex, the rupee. While this may now not be a risk inside the starting, this could pose a constraint for interoperability between Indian cell bills and the world. Also, it excludes carriers from the rewarding remittance marketplace in India and boundaries regions from which mobile operators may be worthwhile.

**iii. Existing Account Holders:** The suggestions also country that best the ones having a valid bank account could be allowed Mobile Banking. This limits the whole capability of cell banking to extend micro-credit score and produce banking to the large variety of unbanked clients in India.

**3. Demographic Challenges:** India has 18 authentic languages which can be spoken throughout the u . S . A .. The nation governments also are dictated to correspond in their regional language for professional functions. Additionally, two-thirds of the population in India is illiterate, creating difficulties in deployment of Mobile Banking solutions. For a pan-Indian cell banking answer, this can be cumbersome to triumph over.

### POSITIVE IMPACT OF MOBILE BANKING



➤ **Cost Reduction**

The biggest advantage of Mobile Banking gives to banks is that it notably cuts down the expenses of imparting service to the clients. For carrier providers, Mobile Banking offers the next ideal manner to achieve increase. Countries like India in which cell penetration is nearing saturation, Mobile Banking is assisting provider companies boom revenues from the now static subscriber base. Service companies are an increasing number of the use of the complexity of their supported Mobile Banking offerings to attract new customers and maintain antique ones.

➤ **To Control Fraud**

A very powerful manner of improving customer support might be to inform customers better. Credit card fraud is one such place. A financial institution may want to, via the use of Mobile technology, tell owners each time purchases above a sure cost were made on their card. This way the proprietor is constantly informed while their card is used, and what kind of money became taken for each transaction.

➤ **Reminder Facility**

Similarly, the financial institution could remind customers of brilliant loan reimbursement dates, dates for the payment of month-to-month installments or really tell them that a bill has been offered and is up for charge. The clients can then take a look at their balance at the phone and authorize the required amounts for payment. The clients can also request for extra data. They can routinely view deposits and withdrawals as they arise and also pre- agenda payments to be made or cheques to be issued. Similarly, one may also request for services like prevent cheque or problem of a cheque e-book over one's cell telephone.

➤ **Easy to avail Mobile Services**

A mobile is almost continually with the customer. As such it is able to be used over a huge geographical place. The customer does now not need to visit the bank ATM or a branch to avail of the bank's offerings. Research indicates that the quantity of footfalls at a financial institution's branch has fallen down significantly after the installation of ATMs. As such with Mobile services, a bank will need to rent even less employees as human beings will not want to go to financial institution branches apart from sure activities. With Indian telecom operators operating on imparting offerings like money transaction over a mobile, it could quickly be viable for a financial institution to provide telephone primarily based credit systems. This will make credit score cards redundant and additionally aid in checking credit score card fraud apart from offering more desirable customer convenience. The use of mobile technology is thus a win-win proposition for each the banks and the financial institution's customers

➤ **Security features**

Customer will receive the signals only inside the mobile number, which he has registered with financial institution. Moreover the touchy data such as account range is not despatched as a whole. But best the last six digits and account kind may be sent to the purchaser. The patron can obtain his account balance and transactions only when the request is received from the Mobile cellphone quantity registered with us and



duly authenticated by way of the four digit Code Number, so one can be supplied whilst PULL Alert offerings are added. The mobile phone wide variety and the Code wide variety from which the service is accessed will serve as a User ID and password for authentication. The Code number has therefore to be kept exclusive.

#### **NEGATIVE IMPACT OF MOBILE BANKING**

##### **➤ Security**

Security professionals typically agree that cell banking is safer than computer banking due to the fact very few viruses and Trojans exist for phones. That does not suggest Mobile Banking is proof against protection threats, but Mobile customers are specifically susceptible to a phishing-like rip-off called "smishing." It occurs whilst a Mobile Banking person gets a faux textual content message soliciting for financial institution account info from a hacker posing as a monetary organization. Many human beings have fallen for this trick and had money stolen through this rip-off. Online banking is typically completed through an encrypted connection so that hackers can't examine transmitted facts, but consider the consequences if your mobile tool is stolen. While all banking programs require you to go into a password or PIN, many people configure their Mobile gadgets to save passwords, or use insecure passwords and PINs which can be easy to bet.

##### **➤ Compatibility**

Mobile Banking is not available on each device. Some banks do no longer offer Mobile Banking at all. Others require you to use a custom cell banking utility only available on the most popular smart telephones, together with the Apple iPhone and RIM Blackberry. Third-party Mobile Banking software program isn't always continually supported. If you do not own a smart telephone, the sorts of cell banking you may do are usually constrained. Checking bank account balances via textual content message isn't a problem, however extra advanced functions such as account transfers are generally no longer available to customers of "dumb phones."

##### **➤ Cost**

Network carrier prices quickly add up. The cost of cell banking might not appear enormous if you have already got a compatible tool, however you still want to pay statistics and textual content messaging expenses. Some economic establishments charge an extra fee for Mobile Banking service, and you could need to pay a price for software program. These more charges quick upload up, mainly in case you get right of entry to Mobile Banking often

#### **Mobile Banking Growth 2009 to 2019**

Mobile Banking in India is in a budding stage, it was started in the year 2009 with 43.7 Millions Mobile Banking users in India with the high penetration of mobile phones acting as a growth driver. India's existing

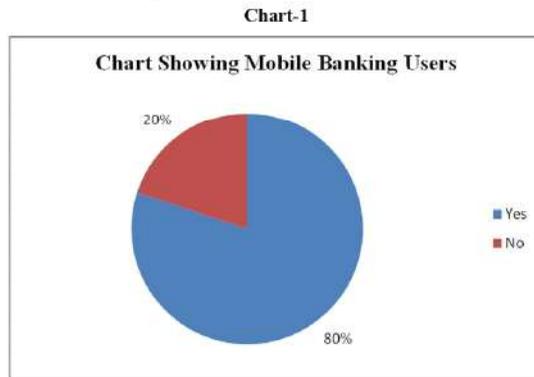
mobile phone user base consists of 813.2 million users, ICICI bank maintains its position as country biggest private lender on mobile screen as well with 17.75 million users. HDFC accounts for second most subscribers with 9.1 million subscribers followed by State Bank of India with 6.13 million subscribers.

### ANALYSIS AND INTERPRETATION OF DATA

For analysis and interpretation of data primary data is used in the form of questionnaire to 350 respondents.

#### 1. No. of Mobile Banking users

The number of Mobile Banking users are shown in Chart -1

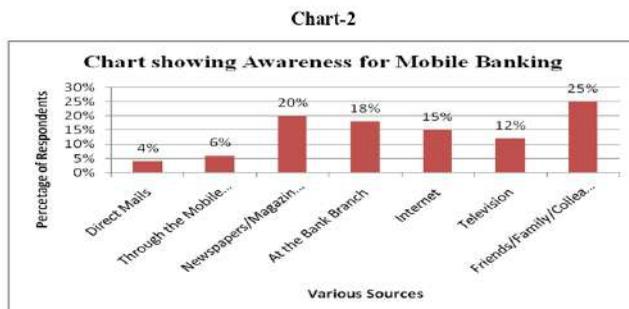


Source:Compiled from questionnaire

The above chart shows that in today's time out of 350 respondents 80 % use Mobile Banking and 20% are the non user's of Mobile Banking.

#### 2. Sources of Awareness of Mobile Banking

Source of Awareness of Mobile Banking are shown in Chart-2



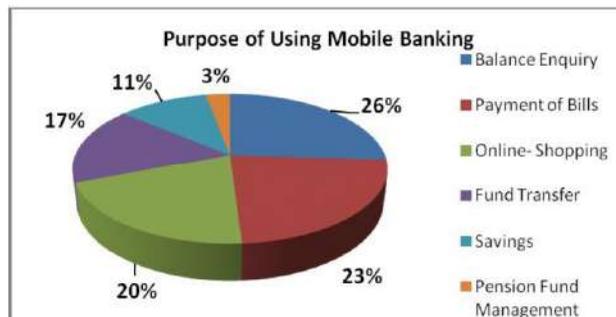
Source:Compiled from questionnaire

The Biggest source of awareness for Mobile Banking is Family / Friends/ Colleagues who are the users of Mobile Banking with 25%. Newspapers/ Magazines/ Other Printed Ads shows 20%.Internet, Television and the Bank Branch is 15%, 12% and 18%. Direct-mails 4% and Through the mobile service providers6% making the less contribution in it.

### 3. Purpose of using Mobile Banking

The main purpose of Mobile Banking are shown in Chart-3

Chart-3



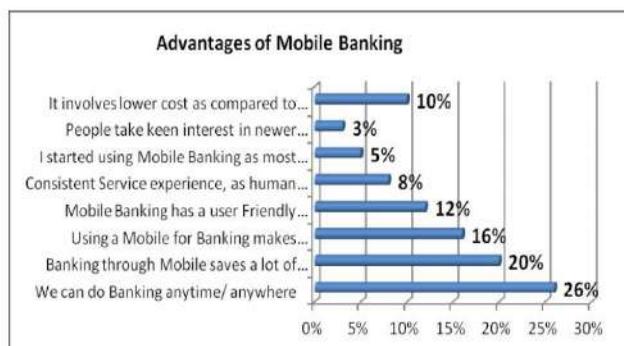
Source:Compiled from questionnaire

From the above chart it is clear that 26% Respondents use Mobile Banking for knowing Balance Enquiry, 23% for Payments of Bills, 20% for Online- Shopping, 17% for Fund Transfer, 11% and 3% for Savings and Pension Fund Management.

### 4. Advantages of Mobile Banking

The various advantages of Mobile Banking are shown in chart-4

Chart-4



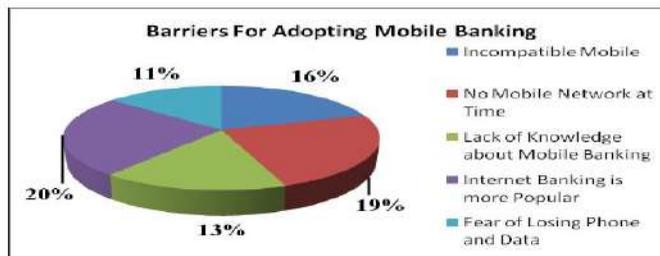
Source:Compiled from questionnaire

The above graph shows that easy access at anytime anywhere is the biggest reason for adopting Mobile Banking out of 350 respondents 26% adopts M- Banking due to this reason only. 20% adopt it because it saves time. 16% using it because Mobile for banking makes banking hassle free and effortless, 12% thinks that Mobile Banking has a user Friendly Interface. 10% says it involves lower cost as compared to the traditional or older modes of Banking. 8% thinks that it is gives a Consistent Service experience, as human intervention is less 5% people started using Mobile Banking as most of my Family and Colleagues were also using it is and 3% people take keen interest in newer technologies is.

#### 5. Barriers for adopting Mobile Banking

The various barriers for adopting Mobile Banking are shown in Chart-5

Chart-5



Source:Compiled from questionnaire

From the above chart it is clear that Out of 350 respondents 20% people avoid Mobile Banking because Internet Banking is more popular. 19% says No Mobile Network at Time is another major cause. 16% says that they are carrying Incompatible Mobile. 13% have Lack of Knowledge about Mobile Banking. 11% feels the Fear of Losing Phone and Data.

#### Findings of the Study

1. Banks should create awareness about the Mobile Banking services through Advertisements, Pamphlets, Demo Fares, Campaigning etc. so that the customer feel informed and it may create interest among them.
2. Trust is also an important point of concern. Trust between the customers and the service provider is very important, without security and privacy users will not use mobile for financial transactions.
3. Perceived ease of use and perceived usefulness are found to be important factors to influence the consumer intention to adopt Mobile Banking. Hence, the main attention of management should be focused on the development of usefulness of system, trust building and cost reduction.



4. Perceived cost is also an important factor; therefore, this study suggests that the creative promotional and pricing strategies, including cost reduction should be implemented to attract more price-conscious customers.

5. It is also found that customers will adopt Mobile Banking if they find it easy to use and understand

#### **Conclusion**

It is well recognized that mobile phones have immense potential of conducting financial transactions thus leading the financial growth with lot of convenience and much reduced cost. For inclusive growth, the benefits of Mobile Banking should reach to the common man at the remotest locations in the country. For this all stakeholders like Regulators, Govt., telecom service providers and mobile device manufactures along with bankers need to make efforts so that penetration of Mobile Banking reaches from high-end to low-end users and from metros to the middle towns and rural areas. Inclusion of non-banking population in financial main stream will benefit all. There is also need to generate awareness about the Mobile Banking so that more and more people use it for their benefit. Research so far has outlined a diversity of thinking and innovation that exists in the m- payments arena.

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तसव्युफ़: प्रारंभिक विकास का एक संक्षिप्त अवलोकन

मोहम्मद रिज़वान अंसारी

शोधार्थी, विभाग इस्लामिक स्टडीज़

अलीगढ़ मुस्लिम विश्वविद्यालय, अलीगढ़

उत्तर-प्रदेश

सार

तसव्युफ़ इस्लाम धर्म की सबसे महत्वपूर्ण अवधारणाओं में से एक है और आज भी मुस्लिम जीवन विद्यमान है। यह धार्मिक जीवन की वह प्रणाली है जिसमें अंतरात्मा से संबंधित क्रिया-कलापों पर ज़ोर दिया गया है। तसव्युफ़ का इतिहास इस्लामिक अरबी सभ्यता का विस्तार करता है, जो अहल-ए-सुफ़ा (वह लोग जो पैगंबर हज़रत मुहम्मद सलल्लाहो अलैह वसल्लम के समय में मस्जिद-ए-नबवी के चबूतरे पर बैठा करते थे) के साथ आरम्भ होता है। मुस्लिम इतिहास में जब से इसकी प्रतीति हुई तभी से विभिन्न विद्वानों ने विस्तृत रूप में इसकी चर्चा की। यद्यपि, चारों खलीफ़ाओं के काल के पश्चात मुस्लिम समुदाय में बड़ा परिवर्तन हुआ, जिसके परिणामस्वरूप मुस्लिमों के बीच राजनीतिक उथल-पुथल और गृहयुद्ध आरंभ हो गए, जिसने विभिन्न राजनीतिक और धार्मिक समूहों को जन्म दिया। धर्मनिष्ठ मुस्लिमों के एक समूह ने इस इस राजनीतिक विवाद से ख़ुद को अलग कर, पूजा एवं अन्य धार्मिक कर्तव्यों के लिए अपना समय समर्पित करते हुये एकांत-वास में रहने का निर्णय लिया। इन आध्यात्मिक मुस्लिमों के सभी उद्देश्य एवं विचार सूफ़ी संतों के समरूप थे, इसके अलावा कुछ नहीं, चाहे उन्हें उस नाम (सूफ़ी) से बुलाया जाता था या नहीं। इसलिए, इस शोध-पत्र का उद्देश्य इस्लामिक युग के आरंभिक चरण में तसव्युफ़ की उत्पत्ति और महत्व का संक्षिप्त विवरण प्रस्तुत करना साथ ही इस्लाम के कुछ प्रसिद्ध सूफ़ी संतों की शिक्षाओं को उजागर करना है, जिन्होंने मुस्लिम समाज पर बहुत प्रभाव डाला है। किस प्रकार से उनकी आध्यात्मिक शिक्षाओं ने लोगों की जीवनशैली को फिर से आकार दिया है।

कीवर्ड: तसव्युफ़, अंतरात्मा, अहल-ए-सुफ़ा, सूफ़ी-संत, प्रभाव।

परिचय

सूफ़ी शब्द की व्युत्पत्ति, चाहे वह अहल-ए-सुफ़ा, सफ़ा, या सफ़ से हुई हो, लेकिन इसका एक निष्कर्ष निकलता है कि इसका मूल इस्लाम में पाया जाता है। एक सूफ़ी का तात्पर्य किसी ऐसे व्यक्ति से है जो कुरान और हदीस के अनुसार अपना जीवन व्यतीत करता है। हालाँकि, सांसारिक अस्वीकृति तसव्युफ़ की विशेषता नहीं है क्योंकि यह अविश्वासी संतों से उत्पन्न हुई है और इसे स्व-निर्मित दर्शन के रूप में भी जाना जाता है। तसव्युफ़ मुस्लिमों के जीवन में बहुत महत्वपूर्ण भूमिका निभाता है। वास्तव में, शरीयत के प्राथमिक स्रोतों के कार्यान्वयन के माध्यम से इसका अभ्यास वास्तविक और प्रामाणिक प्रकार का आध्यात्मवाद है। इस अभ्यास से शरीर और आत्मा



की आंतरिक शुद्धि होती है। आध्यात्मिक शुद्धि मनुष्य को अच्छे और बुरे कार्यों में अंतर करने में सक्षम बनाती है, और इसलिए, मनुष्य अल्लाह के ध्यान में सत्य मार्ग की खोज में लग जाता है। यह एक स्पष्ट संकेत प्रदान करता है कि आध्यात्मिक गुणों को रखने या प्राप्त करने से मनुष्य के चरित्र और दृष्टिकोण को ढालने में मदद मिलती है। यह विशेषता, निस्संदेह, अच्छाई के प्रचार और बुरे कार्यों को रोकने की कुरान के संदेश को पूरा करने की प्रक्रिया में खुद को संलग्न करने का मार्ग प्रशस्त करती है। जब वह इस दिव्य निर्देश के महत्व को समझ जाता है, तो अल्लाह का भय स्वतः उसके अन्तर्मन में उतर जाता है, इस प्रकार वह दूषित क्रिया-कलापों से दूर हो जाता है।

सूफी शब्द की उत्पत्ति को लेकर विद्वानों में अलग-अलग मतभेद हैं। प्राच्यविदों का मानना है कि सूफी शब्द की उत्पत्ति सूफ शब्द से हुई है जिसका अर्थ- ऊन होता है। उनके अनुसार, सूफी संत ऊनी वस्त्र पहनते थे जिसके कारण सूफी शब्द का प्रयोग उनके लिए किया जाता था। दूसरी ओर, कुछ मुस्लिम विद्वानों का मत है कि सूफी शब्द असहाब-ए-सुफा (जो मस्जिद-ए-नबवी में समय बिताते थे और एक विशेष अवधि के लिए आध्यात्मिक गतिविधियों में संलग्न थे, हर समय नहीं) से अस्तित्व में आया। कुछ अन्य मुस्लिम विद्वानों का मानना है कि सूफी शब्द सफ से उभरा है जिसका अर्थ है प्रथम श्रेणी। यहाँ, उन्होंने उल्लेख किया कि सूफी संत प्रथम श्रेणी के मुस्लिम थे। विद्वानों के एक अन्य समूह का कहना है कि इसकी उत्पत्ति सफा शब्द से हुई है जिसका अर्थ है पवित्रता। उन्होंने इस बात पर जोर दिया कि सूफी संतों का मुख्य उद्देश्य दिल और दिमाग की शुद्धि एवं अल्लाह और उसके पैगंबर मुहम्मद (सलल्लाहो अलैह वसल्लम) से मोहब्बत करना है।

### तसव्वुफ का प्रारंभिक विकास

वास्तव में कुरान और हदीस में सूफी शब्द का सीधा उल्लेख नहीं है। हालांकि, गौण रूप से तसव्वुफ दोनों में पाया जाता है। दूसरे शब्दों में, अल्लाह ने मुस्लिमों से आंतरिक बीमारियों और बुराईयों से खुद को शुद्ध करने का आग्रह किया, जो तसव्वुफ का मुख्य उद्देश्य है। लेकिन, यह ध्यान में रखा जाना चाहिए कि तसव्वुफ शब्द मूल रूप से दुनिया में इस्लाम की स्थापना के लगभग दो शताब्दी पश्चात अस्तित्व में आया।

जब हम तसव्वुफ के इतिहास को देखते हैं, तो पाते हैं कि यह आठवीं शताब्दी में अस्तित्व में आया था। जिस समय लोग बड़े पैमाने पर राजनीतिक और भौतिक चीजों में लगे हुए थे। उस समय, मुस्लिम सूफी संतों ने, राजनीतिक क्षेत्र में निवास न करके, आध्यात्मिक जागृति लाने और मानवीय मूल्यों को फैलाने का प्रयास किया। जब भौतिकवाद ने अनेक मुस्लिमों के दिलों को संक्रमित किया, तो सूफी संतों ने संदेश दिया कि-

*go back to your Allah, purify yourself, go back to the reality of Islam*

अर्थात्- अपने रब की तरफ वापस जाओ, अपने आपको पवित्र करो और इस्लाम की सच्चाई की तरफ पलट जाओ

(Development of Mystic Thought and Indian Sufis, by Dr. Abroo Aman Andrabi, Assistant Professor Department of Islamic Studies Jamia Hamdard, New Delhi)।



उन्होंने लोगों को भौतिकवाद से प्रभावित नहीं होने की चेतावनी दी और कहा कि उन्हें इस्लामी शिक्षाओं के सही क्रियान्वयन पर लौटना चाहिए जो उन्हें अल्लाह के करीब लाने का एकमात्र उपाय है। यही कारण है कि मुस्लिम समुदाय को अपंग करने वाली पश्चिमी संस्कृति को मिटाने के लिए तसव्वुफ की स्थापना की गई थी।

सूफी संत ऐसी आध्यात्मिकता का अभ्यास करते हैं जो कुरान और हदीस का विरोध नहीं करती है। हालांकि, कभी-कभी वे कुरान और अहादीस के कुछ संदेशों को अलग तरीकों से समझाते हैं। सूफी संतों द्वारा तसव्वुफ के उद्देश्य से संबंधित संदेशों की गहनता से चर्चा की जाती है और कभी-कभी वे कुछ ऐसे अर्थ जोड़ते हैं जिनसे अन्य विद्वान सहमत नहीं होते हैं। लेकिन सभी सूफी संत इस बात को स्वीकार करते हैं कि प्रामाणिकता के दो स्रोत कुरान और हदीस ही हैं। तसव्वुफ आध्यात्मिक विषय पर विशेष ध्यान देता है। ऐसा इसलिए है क्योंकि सूफी संतों का मानना है कि जब कोई मुस्लिम भलाई में विश्वास रखता है, तो वह एक अच्छे आध्यात्मिक जीवन के विकास की ओर जाता है। उनका जीवन इस्लामी नियमों के अनुसार व्यतीत होता है।

तसव्वुफ के 8 वीं और 9 वीं शताब्दी में विकसित प्रमुख केंद्र इस प्रकार हैं :

1. बसरा, कूफा और बगदाद (इराक)।
2. फारस के खोरासन जिले में बल्ख शहर।
3. मिस्र।

विकास के अपने शुरुआती दौर में, तसव्वुफ प्रभावी रूप से इस्लाम के आंतरिक विषय पर ही केन्द्रित था। एक दृष्टिकोण के अनुसार, वे यह मानते हैं कि यह सीधे कुरान से है। दूसरों का मानना है कि तसव्वुफ पैगंबर मुहम्मद (स.अ.व.) के रास्ते की सख्त नकल है, जिसके माध्यम से हृदय का दैवीय संबंध अटूट हो जाता है। विभिन्न चरणों के माध्यम से मनुष्य तसव्वुफ के द्वारा अल्लाह से निकटता स्थापित करता है। वे इस प्रकार हैं :

1. पश्चाताप की अवस्था।
2. संयम की अवस्था।
3. धैर्य की अवस्था।
4. अल्लाह पर भरोसा।

ये अवस्थाएँ तसव्वुफ के नैतिक और आध्यात्मिक विषयों का निर्माण करती हैं। प्रत्येक चरण में सम्पूर्ण प्रतिबद्धता सूफियों की आध्यात्मिक प्रगति के लिए महत्वपूर्ण है। व्यक्तिगत आत्मा को अरबी में नफ्स कहा जाता है। आरंभ में आत्मा इच्छाओं के अधीन होती है जिसे तसव्वुफ के माध्यम से संतोषी आत्मा और बाद में शांत आत्मा में अनुशासित किया जाता है। आत्मा की इन विशेषताओं को कुरान में विस्तार से वर्णित किया गया है और जिसको सूफी विद्वानों ने व्याख्यायित किया है।

तसव्वुफ की प्राथमिक शिक्षा एकेश्वरवाद (तौहीद) पर आधारित है। सूफी संतों का मानना है कि अल्लाह की प्रारंभिक रचना मानव बुद्धि थी, जो मनुष्य को ज्ञान प्राप्त करने और सही-गलत,



अच्छाई-बुराई में अंतर स्पष्ट करने में सहायक है। तसव्वुफ में यह ज्ञान उच्च स्तरीय होता है, जो मन के बजाय हृदय से उठता है। यह सहज ज्ञान है जो एक आध्यात्मिक व्यक्ति को एक दार्शनिक से अलग करता है। यह सूफी संतों को आध्यात्मिक ज्ञान और दर्शन का अनुभव करने में सक्षम बनाता है।

### प्रारंभिक सूफी संत

प्रारंभिक सूफी संत वास्तविक अर्थों में अध्यात्मवादी थे और गरीबी उनका आदर्श थी। उनका मानना था कि भौतिक संपत्ति और चिंताएं धार्मिक जीवन से विचलित करती हैं। वे आश्चर्य थे कि वांछित एकाग्रता केवल तभी संभव है जब किसी को सांसारिक वस्तुओं का मोह अथवा लोभ न हो। कुछ ने इस कदम को आगे बढ़ाया, त्याग को न केवल भौतिकवादी लालच की इच्छा के रूप में, बल्कि खुद की इच्छा के लिए। इसके बाद ही कोई व्यक्ति ईश्वरीय सुख अर्जित करने के लिए स्वयं को समर्पित कर सकता है। उन्होंने कहा कि जब पृथ्वी पर इस जीवन में भौतिक समर्पण की उपलब्धि के लिए कुल समर्पण और भक्ति की आवश्यकता है, तो अगले, अनन्त जीवन में, इसके समान या इससे भी अधिक भक्ति और समर्पण के बिना सफलता संभव नहीं है।

इब्ने खलदून ने प्रारंभिक सूफी संतों के जीवन के तरीके को संक्षेप में प्रस्तुत किया है : *सूफी संतों के तरीके को शुरुआती मुसलमानों ने सत्य और मोक्ष के मार्ग के रूप में माना था।* उन्होंने उत्साहपूर्वक पवित्रता को संरक्षित किया, अल्लाह के लिए भौतिकवादी आकर्षण की सभी वस्तुओं को छोड़ दिया, सुख, धन और शक्ति को त्याग दिया, समाज को छोड़ दिया और अल्लाह की सेवा के लिए आध्यात्मिक जीवन का नेतृत्व किया। ये तसव्वुफ के आवश्यक विचार थे जो शुरुआती समय के मुस्लिमों के बीच फैले थे। इस प्रकार, हम पाते हैं कि तसव्वुफ का पहला चरण अध्यात्मवाद की खोज था, जो अल्लाह के इस्लामी अवधारणा के कुछ प्रारंभिक विश्वासियों के व्यक्तिगत विचार-विमर्श का परिणाम था।

कई परंपराएं हैं, जो यह बताती हैं कि पैगंबर और उनके साथी (सहाबी) किस तरह अल्लाह के डर से रहते थे। पहले चरण के सबसे प्रसिद्ध सूफी हसन अल-बसरी (642-728/20-106) ने एक बार अपने शिष्यों से कहा था-

*I have seen people among the Prophet's companions to whom the world meant less than the dust under their feet* अर्थात्- मैंने पैगंबर के साथियों के बीच लोगों को देखा है जिनके लिए दुनिया

उनके पैरों के नीचे की धूल से कम थी

उन्होंने अपने जीवनकाल के दौरान पैगंबर के कई वरिष्ठ साथियों से मुलाकात की। उनके अनुसार वे ऊंट के बालों से बने सरल, घरेलू परिधान पहनते थे एवं धार्मिक जीवन में लीन थे और सांसारिक मोह माया से मुक्त जीवन व्यतीत करते थे।

### हसन अल-बसरी

हसन अल-बसरी (642-728 ई. / 20-106 हिजरी) प्रारंभिक आध्यात्मिक विकास के सबसे प्रसिद्ध व्यक्तित्वों में से एक थे, जिसने दुनियादारी से अलग अल्लाह की धर्मनिष्ठता और भय पर जोर दिया। उनका जन्म मदीना में हुआ था और बाद में बसरा में रहने लगे। उम्र के अनुसार वह



अली बिन अबी तालिब (देहांत 661 ई. / 39 हिजरी) के शिष्य होने के लिए बहुत छोटे थे, फिर भी सूफी सिलसिले पैगंबर मुहम्मद (स.अ.व.) और अली के माध्यम से उनके वंश का पता लगाते हैं। कुछ सूफी परंपराएं दिखाती हैं कि कुछ अवर्णनीय आध्यात्मिक अनुभव के कारण हसन, अली के शिष्य बन गए।

### मलिक इब्ने दीनार

मलिक इब्ने दीनार अल-सामी (130 हिजरी / 748 ई.) सिजिस्तान (काबुल) के एक फ़ारसी गुलाम के बेटे थे और हसन अल-बसरी के शिष्य बन गये। उनका रूपांतरण एक शाम से शुरू होता है, जब वह दोस्तों की पार्टी के साथ आनंद ले रहे थे। जब उनके सभी साथी सो रहे थे तो एक तमूरा (एक प्रकार का वाद्य यंत्र) से आवाज आई, जिसे वह बजा रहे थे - *ओ मलिक! पश्चाताप क्यों नहीं करते?* मलिक ने अपने बुरे तरीकों को छोड़ दिया और हसन अल बसरा के पास गये और दृढ़ता से पश्चाताप किया।

इसके बाद वह इतने उच्च स्तर तक पहुँच गये कि एक बार जब वह एक जहाज में थे और उन्हें गहने चुरने का संदेह हुआ, इससे पहले कि वह अपनी आँखें आसमान की ओर उठाते उससे पहले ही समुद्र की सभी मछलियाँ सतह पर आ गयीं और प्रत्येक मछली एक-एक गहना अपने मुँह में ले गयी। मलिक ने एक गहना ले लिया, और उस आदमी को पहचान लिया जिसका गहना गायब था और उसको वह गहना दे दिया। उसके पश्चात उन्होंने समुद्र पर पैर रखा और तब तक चलते रहे जब तक वह तट पर नहीं पहुँच गये। उन्होंने कहा- जो काम करना मुझे सबसे अच्छा लगता है, वह है ईमानदारी, क्योंकि एक क्रिया केवल अपनी ईमानदारी के आधार पर कर्म बन जाती है। एक क्रिया का संबंध आत्मा से शरीर की भावना के समान है, जैसा कि आत्मा के बिना शरीर एक बेजान चीज है, ऐसे ही ईमानदारी के बिना एक क्रिया पूरी तरह से असत्य है। मलिक बिन दीनार, राजा चेरामन पेरुमान (ताजुद्दीन) के जाने के बाद भारतीय उपमहाद्वीप में इस्लाम का प्रचार करने के लिए भारत आने वाले पहले ज्ञात मुस्लिमों में से एक थे।

### राबिया बसरी

राबिया बसरी (713-801 ई. / 91-179 हिजरी), हसन बसरी के समकालीन थी। दोनों एक-दूसरे को अच्छी तरह से जानते थे। वह बसरा में पैदा हुई और अपना पूरा जीवन वहीं बिताया। वह एक गरीब परिवार से थी और अकाल के दौरान उन्हें गुलामी में बेच दिया गया था। वह जब चाहे अल्लाह की इबादत करती थी। अंत में, उनके मालिक, उसके स्वभाव और सहनशीलता से प्रभावित होकर उन्हें आज़ाद करने का फैसला किया। तब से, उन्होंने अपना सारा समय अल्लाह की इबादत याद में समर्पित कर दिया।

उन्होंने कहा कि अल्लाह को याद किया जाना चाहिए और मन में बिना किसी स्वार्थ के इबादत करनी चाहिए। उन्होंने उन लोगों की आलोचना की जो अल्लाह की अपने मतलब के लिए करते थे। वह कहती हैं कि -



*'I want to light a fire in Paradise and pour water in Hell so that people no longer worship Allah for hope of Paradise or for fear of Hell.' She prayed: 'O my Lord, if I worship You from fear of Hell, burn me in Hell, and if I worship You out of hope of Paradise, exclude me from it, but if I worship You for Your own sake, then do not withhold from me Your eternal beauty'*

अर्थात्- मैं स्वर्ग में आग लगाना चाहती हूँ और नर्क में पानी डालना चाहती हूँ ताकि लोग अब जन्नत की उम्मीद के लिए या जहन्नूम के डर से अल्लाह की इबादत न करें। आगे उन्होंने दुआ की: मेरे अल्लाह, अगर मैं नर्क के डर से तेरी इबादत करूँ, तो मुझे नर्क में जालना, और अगर मैं जन्नत की आशा में तेरी इबादत करूँ, तो मुझे इससे बाहर कर देना, लेकिन अगर मैं तेरी इबादत तेरे लिए ही कर रहा हूँ, तो मेरे ऊपर अपनी रहमत हमेशा बनाए रखना

### इब्राहिम बिन अदहम

इब्राहिम बिन अदहम (782 ई. / 160 हिजरी) का जन्म बल्ख के एक राजसी परिवार में हुआ था। एक बार जब वह एक शिकार पर गए थे और एक मृग का पीछा किया जिसकी वजह से वह अपना रास्ता भूल गए।

जंगल में रहने के दौरान, उन्होंने एक अजीब आवाज़ सी रोटी हुई आवाज़ सुनी, जागो! क्या आप इसके लिए बनाए गए थे? इस शब्दों का उन पर यह असर पड़ा। अंत में, उन्होंने निष्कर्ष निकाला कि अब तक उनके जीवन जीने का तरीका अल्लाह की इच्छानुसार नहीं था और इसलिए, अपने तरीके को बदलने का फैसला किया। पूरी रात अल्लाह को याद करते हुये, उन्होंने पश्चाताप किया और अल्लाह से लापरवाह जीवन जीने के लिए माफी मांगी। अगली सुबह वह एक रूपांतरित आदमी थे। उन्होंने अपनी सारी संपत्ति छोड़ दी और अब्दुल वाहिद बिन जायद के शिष्य बन गए, जो हसन बसरी के शिष्य थे।

### प्रारम्भिक सूफी संतों की प्रथा

हसन बसरी, राबिया बसरी और इब्राहिम बिन अदहम के समय तक तपस्या एक आंदोलन की प्रमुख विशेषता बन गई थी, जिसे बाद में तसव्वुफ़ के रूप में जाना जाने लगा। सूफी संत भौतिक जीवन को त्याग कर अपना समस्त समय अल्लाह की इबादत करने में लगा रहे थे। वे आश्चर्य थे कि इस आध्यात्मिक मार्ग पर ध्यान केंद्रित करने के लिए सांस्कारिक जीवन का त्याग आवश्यक था। वे अपनी आवश्यकताओं का परित्याग कर अधिक से अधिक समय अल्लाह की इबादत करने में व्यतीत करते थे। वे अल्लाह का ईमानदारी से स्मरण कर अपना दिन व्यतीत करते थे। इस प्रक्रिया में, वे कुरान और हदीस द्वारा दिखाए गए अल्लाह के मार्ग से विचलित हो गए थे।

शुरुआती सूफी संतों का मानना था कि भौतिकवादी संपत्ति जितनी कम होगी, उतना ही वे खुद को अल्लाह की इबादत के लिए निस्वार्थ भाव से समर्पित कर पाएंगे। इस प्रकार, कम माल होने को स्वर्ग में प्रवेश प्राप्त करने के लिए पुष्टि के रूप में लिया गया था। यही कारण है कि सूफी संतों ने



उच्च संबंध में गरीबी को रखा। तब यह स्थिति उत्पन्न हुई की जो निर्धन हैं वही इबादत करने के योग्य है बल्कि ऐसा माना गया की मनुष्य को समस्त सांस्कारिक इच्छाओं से मुक्त होना चाहिए। इस प्रकार लक्ष्य को प्राप्त करने के लिए हृदय और हाथ दोनों भौतिक इच्छाओं से मुक्त हों। इच्छाओं की इस अनुपस्थिति ने सभी वस्तुओं को परिमित करने से समस्त मुक्ति प्रदान की, सूफी दृष्टिकोण में इसे ही 'वास्तविक गरीबी' माना गया है।

इस धारणा को बाद के सूफी संत, निजामुद्दीन औलिया (मृत्यु 1325 ई. / 803 हिजरी) ने इन शब्दों में व्यक्त किया-

*Rejection of the world does not mean that one should strip oneself of one's clothes and sit idle.*

*Rejection of the world means that one may put on clothes and take food. But one should not set one's heart on anything. This and this alone is rejection of the world*

अर्थात्- दुनिया की अस्वीकृति का मतलब यह नहीं है कि कपड़े उतारना और बेकार बैठना चाहिए। संसार की अस्वीकृति का अर्थ है कि व्यक्ति कपड़े पहन सकता है, भोजन ग्रहण कर सकता है।

लेकिन किसी भी चीज से दिल नहीं लगाना चाहिए। बस यही दुनिया की अस्वीकृति है इस प्रकार प्रारम्भिक दौर के सभी सूफी संत अपने क्रिया कलापों से ही मुसलमान दृष्टिगोचर होते थे। उन्होंने इबादत के सभी अनिवार्य रूपों का अवलोकन किया था। जहाँ तक उनके विश्वासों और प्रथाओं का संबंध था, कुछ ने उन्हें परंपरावादी मुसलमान करार दिया। लेकिन वास्तव में उन्होंने कुरान और हदीस की शिक्षाओं पर जोर दिया। धीरे-धीरे, इबादत के अनिवार्य रूपों (फर्ज) की तुलना में आवश्यकता से अधिक रूपों की इबादत (नवाफिल) उनके लिए अधिक महत्वपूर्ण हो गई।

### निष्कर्ष

तसव्युफ स्वयं को सत्य की आध्यात्मिक खोज के रूप में देखता है और इसके सभी व्यावहारिक आयाम इस कथन को पूर्ण रूप से पालन करते हैं। यह एक कठिन मार्ग की यात्रा है जिस पर हर कोई आसानी से नहीं चल सकता है क्योंकि यह त्याग मांगता है। ध्यान के रूप में (अल्लाह की याद) और मुराकबा, (मानव और उसके निर्माण का रहस्य), इस पथ पर अत्यंत महत्वपूर्ण और सहायक हैं। लेकिन, आखिरकार, यह अल्लाह ही है जो इनायत करता है कि वह खुद यात्री का अनावरण करता है और कोई आध्यात्मिक अभ्यास भी उसकी करुणा की बराबरी करने की कोशिश नहीं कर सकता है। एक सूफी ने एक सपना देखा जिसमें उन्होंने देखा कि वह अपनी मृत्यु के बाद जुनैद बगदादी (अपने जमाने के मशहूर सूफी रहे) को देखा और उनसे पूछा कि अल्लाह ने उनके साथ कैसा व्यवहार किया। तो उन्होंने कहा-

*He forgave me out of His mercy and not due to my spiritual practices, except for the two-rakat namaz that I offered at midnight to My Lord, none served any good purpose for me here.* अर्थात्-

उसने मुझे अपनी रहमत से माफ कर दिया, मेरे आध्यात्मिक अभ्यास के कारण नहीं, बल्कि उस दो रकत नमाज़ के कारण जो मैंने रात को अपने रब को प्रस्तुत की।



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## RELIGIOUS TRENDS IN MIGRATION AND REMITTANCES IN KERALA

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### Abstract

In Kerala, like any state in India, religion plays an important role in molding the socio economic structure. This study is an attempt to look into the role of religion in migration and remittance. The study examines about the total number of emigrants from Kerala and their remittance from three major religions – Hindu, Christian and Muslim. The data source for the study is from Kerala Migration Survey. Simple statistical tools like averages, percentages and graphs were used to analyse the data. According to the census reports 2011 the religious composition of population in Kerala shows 55 percent Hindus followed by Muslims and Christians with 27 and 18 percent respectively. But the study finds religious composition of emigrants in Kerala shows a different picture compared to the religious composition of population. The religious composition of emigrants in Kerala is as follows, Muslims with 41.7 percent, followed by Hindus and Christians with 34.7 and 23.6 percent respectively. The study finds that in the case of remittance also Muslim community holds a higher share.

**Key words:** Migration, Religion, Emigrants, Remittance

### Introduction

Religion has played an important role in the formation of Kerala society. Almost all families in Kerala are affected by Gulf migration in one way or other. Large scale migration started from Kerala only after 1970s. The rise in oil price resulted a sudden flow of funds to the oil exporting countries which paved the way for huge investments in these countries. Thus they required unskilled and semiskilled labours for their constructional activities. Kerala abundant with this type of labours and comparatively near to Middle East utilized this opportunity leading to large out flow of labours towards the Gulf countries.

Kerala Migration Survey (KMS) is the first migration study started in 1998 which covers the entire state. It is now a periodic ongoing study about migration known as Migration Monitoring Study, Kerala. It is conducted by Centre for Development Studies, Thiruvananthapuram, sponsored by Government of Kerala and World Bank. KMS has now a 20 years history in migration data collection. It not only collects data but it analysis, interpret and give valuable future policy suggestions to the authorities regarding migration and migrants.

The impact of migration on various dimensions of socio, economic, demographic and religious areas are analyzed in the various surveys of KMS. This study is an enquiry



into the religious variation in international migration from Kerala. It will be interesting to study about the religious trend and pattern of migration for the past 20 years.

### **Review Literature**

K.C.Zachariah (2016) had a study about the socio-demographic profile of religious communities in Kerala. The study gives information about demographic characteristics, education, employment, migration and remittance of various religious denominations in Kerala. One of the major findings of the study is the prediction about the long term population trends of the three religions in Kerala. Hindus who were two thirds of state population in the beginning of the last century shrunk to 50 percentage of state population. At the same time Muslims who were lesser than Christians during the last century become more than double of Christian population and has exceed one third of state population. According to the author three R's – Religion, Region and Remittance are the reasons for the variation in the socio economic changes in Kerala.

J. Vineesh Prakash (2017) examined about the trends and patterns of international migration in Kerala and assessed its impact on the state. The study preceded by using secondary data from NSDP of Kerala state and the remittance data from Kerala Migration Survey. ARDL bound testing methodology was used to test the long run association between economic growth and remittance. The estimated coefficient of remittance has a positive and significant impact on economic growth. Thus the study suggests the existence of long-run relationship between remittance and economic growth of Kerala. The study found that as the major portion of remittances were used for building houses and household requirements. Thus the construction sector, trade, banking, insurance, transport etc. started growing. Thus he concludes that migration and flow of remittance have played an important role in economic development of the state. He also pointed out that traditionally emigrants from Kerala were unskilled and semi-skilled but now the trend is changing towards skilled labour migration. This is the reason why the remittance share is not falling as the emigration rate falls.

K.C. Zachariah and Irudaya Rajan (2010) have examined the dimension of emigration and remittance in the context of sudden increase in oil price. The study found that number of emigrants and also remittance increased in Kerala. During 2008 period 40 percent of total emigrants were Muslims. Even during this period of global financial crisis, in Kerala there occurred 19 percent of increase in emigrants and 135 percent increase in remittance. In the share of remittances 34.7 percent is from Muslim community. And it is found that Malappuram district contributes largest share compared to other districts in Kerala.

K.C. Zachariah and Irudaya Rajan (2007) Muslims form only 25 percentage in the state population but received about 50 percent of remittance during 2006-2007. The study examined about the differentials in the employment rate in different religious groups. The male unemployment rate is highest among Muslims and lowest among Hindus.

### **Significance and importance of the study**

International migration from Kerala is one of the most studied aspect, but still the dynamics and complex relationship between migration and religion has not explored much. Migration has contributed very much to the poverty alleviation in Kerala than any other factor, including agrarian reforms, trade union activities and social welfare



activities (Zachariah and IrudayaRajan,2010).Migration is the most dynamic factor in Kerala, which reduced unemployment and raised the standard of living of people considerably(Khadria,2010). KMS found that extend of emigration and District Domestic Product is negatively correlated. The studies empirically found that district with low income have highest emigrants, example Malappuram district. It is hoped thatthe analysis would help in the formulation of migration policies. This also help in the solution of problems caused by emigration and thus increase futuremigration and economic development in the state.

**Objectives of the study**

The objectives of the study are

- 1. To find the extentof emigrants from different religions in Kerala.
- 2. To examine the remittance flow from various religions.

**Data source and methodology**

The study mainly based on the Secondary data from Kerala Migration Survey. The first survey was conducted about 20 years back, in 1998. The subsequent surveys were conducted in 2003, 2007, 2008, 2011, 2013, 2016 and the current one completed in 2018. In the earlier series of analysis10000 households were selected from 200 panchayat and municipal wards, later it was increased to 15000 households and 250 panchayat and municipal wards.Simple statistical techniques like averages, percentages; graphical presentation along with trend analysis is used in the study to make interpretations.

**Trends in migration among various Religions**

Extent of migration from 1999 to 2018 is examined below. Migration pattern in Kerala is highly influenced by religion. The distribution of total population according to religionin Kerala is different from the distribution of emigrants by religion.

Table:1 **Total Number of emigrants by Religion 1999 -2018**

Religion	1999	2004	2008	2013	2018
Hindus	407483	573458	806917	861235	737011
Christians	280307	460814	497407	571799	500236
Muslims	674164	804206	889088	967342	884640
Total	1361955	1838478	2193412	2400375	2121887

Source: Kerala Migration Survey, 2018.

The religious composition of emigrants from 1999 to 2018 is shown in the Table:1. Till 2013 the numbers of emigrants in all religious denominations were increasing. But in 2018 data shows a fall in the number of emigrants in all religious groups. A steep short with 124224 numbers of emigrants are among Hindus. There are 71563 short of emigrants in Christians and 82702 short in Muslims.

Table:2 **Emigrants by Religion for periods 2013 and 2018**

Religion	Percent		Per100 Household		With 1 migrant Household	
	2013	2018	2013	2018	2013	2018
Hindus	35.9	34.7	18.1	14.9	12.8	11.4

<b>Christian</b>	23.8	23.6	34.9	27.6	19.6	16.9
<b>Muslim</b>	40.3	41.7	54.2	42.6	36.5	33.5
<b>Total</b>	<b>100</b>	<b>100</b>	<b>29.3</b>	<b>24.0</b>	<b>19.2</b>	<b>17.7</b>

Source: Kerala Migration Survey, 2018

Total percentage share of emigrants, emigrants per 100 households and households with at least one emigrant is shown in Table:2 Majority of emigrants from Kerala in 2018 were Muslims, about 41.7 percent (about 40.3 percent in 2013). Whereas their share in total population is only 26 percent. Hindu emigrants were only 34.7 in 2018 (34.9 percent in 2013) but their share in total population is about 55 percent. In 2018 Hindus lag considerably behind the other communities in case of emigrants per 100 households. While there are 42.6 among Muslims and 27.6 among Christians, in Hindus it is only 14.9. Same is in the case of households with at least one migrant.

Below in Figure: 1 shows the religious composition of migrants in total population of Kerala (2011 census) and religious composition of emigrants (KMS 2018).

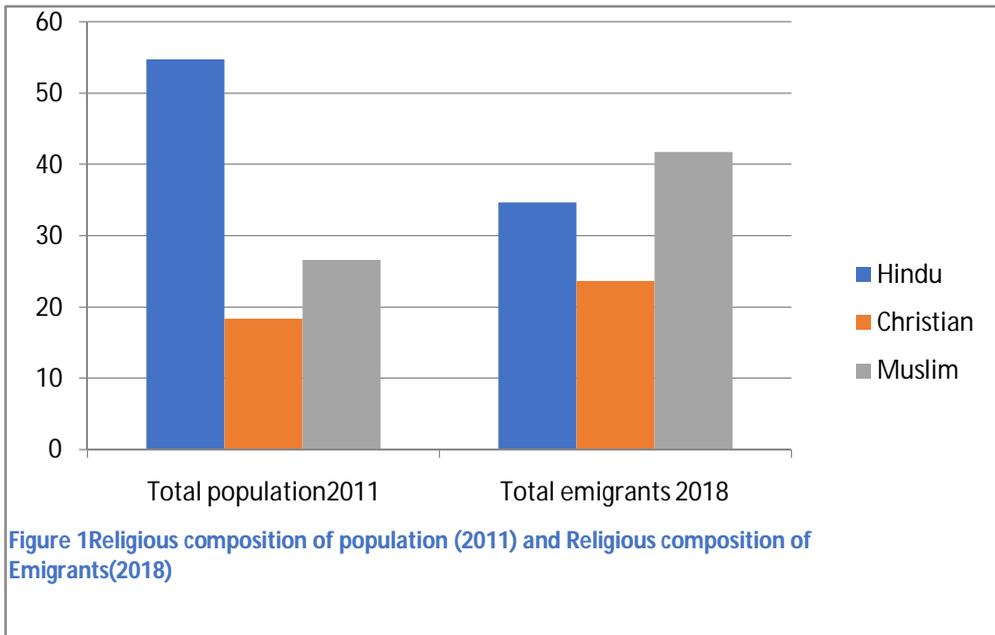


Figure 1 Religious composition of population (2011) and Religious composition of Emigrants (2018)

### Trends in remittances among various religions

The remittance flow from different religions is examined below (Table:3). The remittances show a disproportionate share among various religions. The data shows Muslims receive a larger amount of remittance in 1998 to 2013.

Table:3 Remittances to Kerala by Religion 1998 - 2013

Religion	1998	2003	2008	2013
Hindus	3921	5475	16493	28137
Christians	3193	4679	8508	17238
Muslims	6538	8311	18995	25767
<b>Total</b>	<b>13652</b>	<b>18465</b>	<b>43288</b>	<b>71142</b>

Source: Kerala Migration Study, 2013.

The composition of remittance by religion in 2013 and 2018 is shown in below table.

Table:4 Household Remittances by Religion, 2013-2018

Religion	2013	2018	Percent Increase
Hindu	8745	11431	30.7
Christian	5806	6252	7.7
Muslim	9823	13034	32.7
<b>Total</b>	<b>24374</b>	<b>30717</b>	<b>26.0</b>

Source: Kerala Migration survey, 2018

During 2013 and 2018 household remittances have a considerable increase among all religions. Largest increase was seen in Muslims with 33 percent and among Hindus it was 31 percent. For Christians it was only 7.7 percent.

Table:5 Percentage Share of Remittance by Religion, 2013 and 2018

The percentage share of remittance for 2013 and 2018 is shown below.

Religion	2013	2018
Hindus	35.9	37.2
Christians	23.8	20.4
Muslims	40.3	42.4
<b>Total</b>	<b>100</b>	<b>100</b>

Source: Kerala Migration Survey, 2018

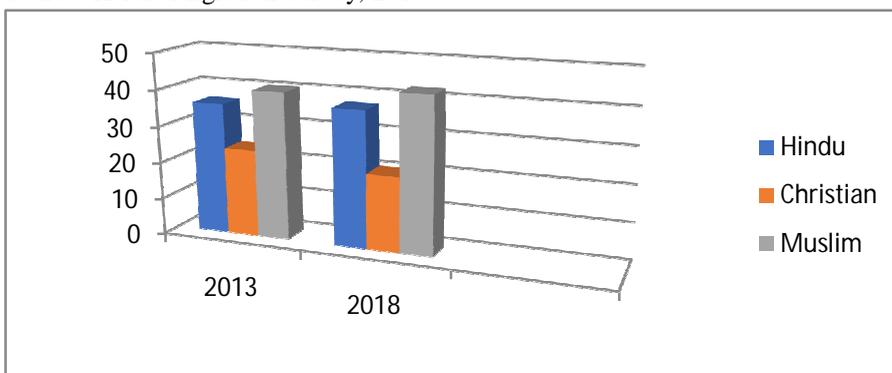


Figure 2 Remittances share among various religion in 2013 and 2018



In 2018 largest amount of remittances was received by Muslim community that is 42.4 percent, Hindus with 37.2 percent and Christians with 20.4 percent. This is shown in Figure:2

### Findings and conclusion

Hindus represents 54.73 percentage of total population in Kerala but there are only 34.7 percent in emigrant population. Thus we can say Hindus are under-represented as emigrants compared to other religions. While Christians and Muslims are over-represented. Among emigrants, 41.7percent were Muslims and 23.6 percent were Christians according to KMS 2018. While according to the religious composition of population in Kerala, Muslims are only 26.56 percent and the Christians are only 18.38 percent of the population.

It is interesting to know that there is 278488 decrease in the total count of emigrants in 2018 compared to 2013. But in the case of remittances it is wonder to notice that there is a 26 percent increase in 2018 compared to 2013. Thus we can understand that the emigrants are earning higher wages. Out of Rs.30717 crore total household remittance, Rs.13034 crore was received by Muslim community. This is about 42.4 percent of the total remittance. But Muslim households are only 21.8 percent of total households in Kerala. Thus we can conclude that compared to other religions in Kerala Muslims receive a much higher share of remittances.

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## A STUDY OF SUFISM AND SHARI'AH AND ITS VALUES IN ISLAM

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### ABSTRACT

This study analyzes the contested relationship between Sufism and the Shari'ah. Some Sufis describe Sufism or *tasawwuf* as the inner reality of the *Shari'ah* while others see it as the inward dimension of Islam. Sufism has its roots in the Qur'an and Sunnah, and the life of the earliest Muslims. In developing all these aspects, Sufism took elements from the prophetic Islam, from the Quran and the Sunnah. To set Sufism in proper perspective, a few words must be said about the Prophetic piety. This may also help to understand the spiritual dimension of Islam, and remove the misleading notion that Islam is essentially a law and that is was *tasawwuf* emerging after the fall of some centuries that gave it a spiritual dimension. The religious reformer, Shaykh Ahmad Sirhindi uses the Shari'ah in the two senses. First, the usual sense of the rule and regulation of the Qur'an and Sunnah concerning worship rites, morals, society, economy and government, along with the elaboration and application of these rules by scholars which agree with the Qur'an and the Sunnah. In other words the Shari'ah means everything which Allah has prescribed (*shara'a*) directly or through the Prophet (pbuh), and is identical with the Prophetic religion. Sirhindi writes, 'all the goods of this world and the next, leaving nothing out for which one should have to go beyond the Shari'ah. These descriptions are good as far as the underline the basic orientation of Sufism, and highlight the close relationship that exists between Sufism and the Shari'ah. This study is purely based on original sources such as the Qur'an ahadith and secondary sources as available.

**Keywords:** Sufism, Shariah, Islam, Qur'an, Hadith, Muslims.

Scholars in modern times have viewed differently the relation of Sufism with Prophetic Islam. Some thinks that Sufism is an exotic growth and traces its various elements to one external source or the other.

### What is Sufism?

What is the strength of the Sufi seeker in his search for the truth of life? It is that of love, of Harmony, of fullness. It brings Allah down from His heaven into the very centre of person's life. As Emerson said when speaking about the poems of Hafiz: "Love is a leveler and Allah becomes a groom and heaven a closet."

And if there is any offense it is "to limit the Holy One of Israel," an offense for which not only the Israelites were visited with retribution, as we read in Psalm 78, but it is a sin for which all those who slight down the circle of the being and becoming of Allah



have been punished all through human history. Why? For, there is in man the spirit of non-conformity which in its positive aspects means the yearning for agreement with the All. It lies undeveloped for a long time because it is drugged with dogmas and doctrines, and with other similar opiates of explicit visions and versions of truth. But there comes a moment when it is roused; when its titanic energy is released; when man challenges the whole world and invites on his head the annoyance of Allah and men, when he says in the words of Rabindranath Tagore:

“I am only waiting for love to give myself up at last into his hands. That is why it is so late and I have been guilty of such omissions.

“They come with their laws and their codes to bind me fast; but I evade them ever, for I am only waiting for love to give myself up at last into his hands.

“The market day is over and work is all done for the busy. Those who come to call me in vain have gone back in anger. I am only waiting for love to give myself up at last into his hands.”

Now, it is this spirit of non-conformity or of love which is the pith and core of the Sufi's faith, of Sufism, (which term is used only for convenience's sake, as Sufism is not an 'ism' at all). It has not then progeny of Islam or the original gift of Persia to the world. It has co-existed with man. Adam, when he lived in the Garden of Eden, was an obedient servant of the Deity, but he became a Sufi only when he tasted of the Tree of Knowledge of Good and wickedness and was exile from Paradise. Sufism is, in the words of Inayat Khan, “the love of wisdom and the wisdom of love.” Has not this spirit been at work down the corridor of centuries? The *Rishi* who sang in the *Upanishads* “this world is permeated by God,” the Buddha who said, “The droplet slips into the shining sea,” the Christ who declared his oneness with the Father, the Prophet who bore witness to God, as alone being worship, and the Founder of Sikhism who proclaim from house tops the similar Truth, all these men of Allah were Sufis in the real sense of the term. For, according to the Sufi, “The face of the Beautiful shines all over.

Wherever there have been Muslims, there have been Sufis. If there was no phenomenon called 'Sufism' at the time of the Prophet, neither was there anything called 'fiqh' or 'kalam' in the later senses of these terms. All these are names that came to be applied to various scope of Islam after the tradition became diversify and elaborate. In looking for a Quranic name for the occurrence that later generations came to call Sufism, some authors settled on the term *Ihsan*, 'doing what is beautiful,' a divine and human quality about which the Quran says a good deal, mention in particular that God loves those who have it. In the famous Hadith of Gabriel, the Prophet describes *Ihsan* as the innermost dimension of Islam, after *Islam* ('submission' or correct activity) and *Iman* ("faith" or correct understanding)."

The term 'Sufism' in Islam, is usually derived from the Persian (*sawwof*), Greek *Sophos*, meaning 'wise' or from *soof*, meaning “wool,” The cite being to the woolen garment which the first Sufis wore. Personally, however, I am inclined to attach more significance to the fable which means “bench,” placed outer surface the mosque at Mecca were called Sufis. For, may it not be that the people who sit on the bench outer surface the mosque sat there not with a view to asking for alms at the hands of the charitably inclined, but in silent complaint against the sin of limiting the Limitless, God, within the four walls of a house of clay? Were it not so, the abstain of the song of the

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Sufis till this day would not have been, to quote a pair from Sachal, a modern of Shah Latiff. “We have seen the *Kaaba* in the heart, of what benefit, then, is it to go to Mecca?”

Nor would have Bayazid of Bastami said. “There is none other than Allah within my cloak, “ or Mansur the Prince of Sufis given to the Sufis their present battle cry. “I am God.” Or as Abu Ali of Sindh said, “I went from God to God, waiting they cried from me in me, “O Thou I. ‘Verily, I am God, there is no God except me, glory to me. How great is my magnificence!”

In fact, true Sufis perform compulsory prayers and other duties (*Fard*) which the Shariah has placed on them, and watch the Sunnah of the Prophet (*Sallallah u AlaihiwaSallam*) which he has recommended. They never think that they can any time give out with the Shariah. Those who violate the Shariah and commit sins are rather impostor, who uses Sufism to justify their evil deeds. There is general agreement among Sufis that the only way to know what things are lawful or unlawful, and what acts are right or wrong is the Quran, the Sunnah of the Prophet (*Sallallah u AlaihiWaSallam*), the Ijtihad of capable jurists (*Mujtahideen*), and their harmony (*Ijma*). These are also the means for knowing the degrees of compulsion n, whether a thing is obligatory (*Fard/Wajib*) or prohibited (Haram), praiseworthy (*Mandub*), undesirable (*Makruh*), or permissible (*Mubah*). The inspiration (*Ilham*) or the Kashf of the Sufi has no rule in this regard, neither in determining the legality or otherwise of things, nor in fitting the degree of their compulsion. Shaykh Ahmad Sirhindi, the great seventeenth century Indian Sufi and religious reformer, states the general view in the clearest terms: It is commonly agreed that in formative the rules (*Ahkam*) of the Shariah, what counts is the Quran, the Sunnah of the Prophet, the Qiyas of a capable jurist (*Mujtahid*) and the consensus of the Ummah. No other principle separately from these four is to be taken into thought to determine the legality of rules. Inspiration (*Ilham*) does not determine whether something is correct or incorrect, and the Kashf of a Sufi does not establish the degree of a rule, whether it is compulsory or desirable. The saints (*Auliya*) have to follow, like annormal Muslim, the opinions of the Mujtahids. Their revelations (*Kushuf*) and inspirations (*Ilhamat*) do not raise their status and relieve them from following the judgments of the jurists (*Fuquaha*). They have to follow the judgments of the jurists (*Mujtahideen*) in matter of Ijtihad.

### **Definition of Shariah**

Shariah is the sum total of rules and regulations that we required to follow. This includes apparent and hidden both. In earlier times this way was called Fiqh. Imamul-Aazam Abu hanifa defines Fiqh thus: Marafatun-Nafse ma lahawa ma alaiha (recognizing the good and bad things of self). Later on Fiqh was the apparent deeds of Shariah and the hidden deeds called Tasawwuf. The procedures of these hidden deeds are called Tasawuf. The procedures of these hidden deeds is called Tariqah, then by the correction of these deeds on the heart is created light and cleanliness specially between Allah and His servants and is called “*Haqiqah*”. This knowledge is called “*Marefah*” and the person is called “*Arif*” or researcher. These are all parts of Shariah is concerned with apparent rules only is not said by any learned scholar.

### **The nature of Shariah and its need**



The verses of the Holy Quran presence of Shariah and Allah's order to the Holy Prophet (pbuh) to walk on this path proves that for humanity, this is the best code of the life and all the other ways of life devised by ignorant people are selfish and rejected by Allah.

**There are five parts of Shariah:**

- (1) Beliefs, to accept from heart and tongue that whatever Allah and the Holy Prophet (pbuh) have informed is true to be found in book of belief.
- (2) Worships like Prayers, fasting, Zakah, Hajj and the like.
- (3) Dealings and Transactions, rules of marriage, divorce buying and selling, service agriculture.

This does not mean that Shariah teaches how to do business of but that do not transgress, do not go wrong, what is permissible and what is not permissible.

- (4) Way of life: standing, sitting, meeting, being a guest, how to go somewhere, what are its rules, how to treat wives, children, relatives, strangers, servants etc.

- (5) Tasawwuf or self-Reform: People think by mistake that for Tasawwuf you have to leave children, wife, and worldly way of life. This is entirely wrong. This is what ignorant Sufis say, the combination of these five is Shariah and religion. If something is missing that much religion is missing.

It will be apparent that the word of Allah and its rules are just and Shariah must be obeyed. Also, in our case any quality is strong it overwhelms us; therefore, for being just we must obey Shariah. Justice is what Shariah orders, for instance sympathy is a good thing but so much reduction as to object to Allah is wrong. For example, a baby is sick; cries have sympathy and pray for him but do not object to Allah as to why He does not accept the prayer? Why does He not cure him? This is because of wisdom that parents do not give medicine and Allah does not like it. Give medicine and then pray.

Shariah has educated us in a way where all good and evil are considered. All we have to do is to learn the Shariah and not to follow any other nation. The Holy Prophet (pbuh) has taught us where there is no harm and all pleasure. If a Muslim follows Shariah he will be pleased external pleasure and intrinsic pleasure both.

**VALUES OF THE SHARIAH AND SUFISM**

Besides belief, virtues and rules, there is a fourth aspect of the Shariah: its vision of the good life. What is the good life which the Shariah envisages? What are its constituents? How do the goods of the body stand with the goods of the spirit? How far does the good of society constitute the good of the individual, and how does the good life compare with the good of the next life? Similarly, what are the principles that determine the degree of obligation, define what is obligatory, what is highly commended, and what is less commended, and what is left to our discretion? In short what is the overall ideal of the Shariah, what are its values and priorities?

To raise some specific questions: What is the ultimate goal of man: knowledge of Allah (*marifah*), union with Him (*jam*) or fulfillment of His will (*ubudiyah*)? Have the other components of the good life a value in themselves? How are they related to the ultimate good? Another question about the relation between this life and the next: In order to make the life-hereafter good, should one concentrate on some aspects of life neglecting the others, or should one work for the fulfillment of the whole life life in the way the Shariah wants? How does the Shariah value exclusive devotion to Allah, *dhikra*



and meditation in comparison to a life in which these things are reduced and combined with an active involvement in the overall happiness of the human being?

The Quran refers along with beliefs, virtues and rules, to these matters also; tells what the ideal life is; what its constituents are; how they compare with each other; and who the embodiments of that good life are the Sunnah of the Prophet (pbuh) further elaborates Islamic values and priorities. But Islamic thought has done little to carry the task further. *Fiqh* has more concerned with particular aspects of life, with various forms of worship, with social, political, economic activities separately, and has defined what is right or wrong, obligatory or commended in each and every field. There are various schools of *fiqh*; and each there are hundreds of books that discuss rules down to the minutest details; there are also many books that deal with the principles of these schools. But there are not half a dozen works which address some of the questions we have raised.

**Conclusion:** From above discussion it is concluded that Sufism and Shariah is very vast topic. So I have discussed so many important things. So far as the words of some Sufis negating human will or its effectiveness, as has been referred to above, are concerned, one should note that if they do not agree with the Shariah, they are null and void; they have no validity or authority. It is the words of the doctors ('ulama') of the *Ahl'l-Sunnah* which have authority. Only those words of the Sufis are acceptable which agree with the views of the 'ulama' and those which disagree have to be rejected. The truth is that the Sufis whose experiences are correct hardly do not diverge from the Shariah in whatever they feel, say or do, nor do they have ideas and revelations that differ from the Shariah. In this paper I have to discuss the values of Sufism and Shariah,

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## FAME OF THE NARAYANA SHARMA IN PRESERVING MODERN SOCIAL ENVIRONMENT

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In this solar system, only the earth has a complete and ideal environment to sustain life. on the earth, every living thing has a specific environment or habitat where they spend their life cycles and collect the useful elements for sustenance. Appropriate knowledge of nature is called contemporary environmental thought. But the term, 'nature' does not only mean natural elements but also artificial and beautiful state of society created by man who has collected elements from nature. So, both natural elements and man-made creations are called environment. There are differences of opinions among environmentalists regarding the definition of environment, but in general, we can say that the surroundings or conditions in which a person, animal, or plant lives or operates is called environment. The Concise Oxford Dictionary defines, "Environment is everything that is around. It can be living or non-living things ". It can also be said that the environment is a natural, economic, political and cultural scenario or condition by which people are affected anywhere and at any time.

### **Division of Environment :**

There are two types of environment, natural and social.

### **Natural Environment :**

This type of environment is man-made and is divide into two kinds – 1) organic and 2) inorganic. The environment created by organic matter like plants, animals etc. is called organic environment and the environment created by inorganic material like soil, minerals etc. is called inorganic environment.

### **Social Environment :**

The social environment, social context, socio-cultural context or milieu, refers to the immediate physical and social setting in which people live or in which something happens or develops related to human activities. It includes the human culture, behaviour, individual education, the individual or group of people living and institutions with which they interact.

The key elements of this environment are culture, family and society. These are human beings as well as other creatures. But what is culture? Whether there is a relationship between culture and the environment is a matter of paradox.

There are many views on culture which are as follows –



A) **Culture** is the characteristics and knowledge of a particular group of people, encompassing language, religion, cuisine, social habits, music and arts as gleaned by Kim Ann Zimmermann.

B) "**Culture** encompasses religion, food, what we wear, how we wear it, our language, marriage, music, what we believe is right or wrong, how we sit at the table, how we greet visitors, how we behave with loved ones, and a million other things," Cristina De Rossi.

C) "**Culture** . . . is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society."- said by Edward Burnett Tylor and others.

Although there is no apparent connection between culture and environment, there is no existence of environment without culture, and the culture is impossible without environment. So the bonding between the two is eternal and in a broad sense, culture is a combination of all human qualities.

### **Divisions of Environment According to Thought.**

According to environmentalists, there are three levels of the environment - environment-centric, nature-centric and socio-economic-centric. Some of them have explained the environment from the point of pollution, some from ecological perspective, while others from angle of wildlife conservation, or in respect to human development. But the environment is indivisible and indestructible and the common goal of these environmentalists is the development of life.

#### **Environment-Centric Thought :**

According to this thought , the environment, nature and man are identical. Therefore, human being should learn from nature without conflicting with it and should develop nature and himself through education. This perception of thought has been shared by Rachel Carson, Masanobu Fukuoka , James Lovelock and other notable environmentalists.

#### **Nature-Centric Thought :**

According to these ideology, nature is a force by which everything is controlled. That is, the help of nature is needed to make human endeavour successful. Notable environmentalists in this regard are Elen Sample, Proponent of the conservation movement, Henry David Thoreau and others.

#### **Socio-Economic-Centric Thought :**

According to these ideologies , economic development and social development is essential for the improvement of the environment. Notables in this regard are –Evan Ilchio, Rudal Bahro etc.

So there is no doubt that environmental protection is necessary for the survival of animals, other living things and mankind.



### Work of the Narayana Sharma

People have been fascinated by stories since time immemorial because of the beauty of imagination more than reality. Ancient literature written in different languages has been enriched with stories where the intimacy of domestic animals with humans are seen. There are three main reasons for writing such stories, such as spending leisure time, entertaining and teaching ethics. Sanskrit literature has entertaining materials not only for boys but also for the elderly. For this reason, Sanskrit literature is universal, full of joy and full of eternal beauty. Under the patronage of King Dhabalchandra, Narayan Sharma wrote a book of short stories named “**Hitopadesha**’. According to him, childhood is the best time for education. So he says –

“यन्नवे भाजने लग्नः संस्कारो नान्यथा भवेत् ।

कथाच्छलेन बालानां नीतिस्तदिह कथ्यते ” ॥ इति –(हितोपदेश-मित्रलाभ-८)

This book consists of four chapters, entitled as Mitralabha, Suhridbheda, Bigraha and Sandhi for teaching the foolish sons of king Sudarshan of Pataliputra. There are well thought out solutions to the problems in people's lives. Not only solution , but the praise of knowledge, the praise of scripture, the impermanence of youth, futility of wealth, etc., the condemnation, the instruction on the elements of worldly happiness, the praise of religion, the supremacy of fortune, the necessity of initiative, advantages and disadvantages of associating with the righteous and the wicked along with other aspects of human nature are incorporated. The great indication of various eternal truths are instructed here. So this book is not just a textbook, it is a constitution that protects the environment through beneficial advice. According to this constitution, the honest character of the people is formed and the socio-economic environment is also protected by the people with honesty

### Socio-Economic Environment in Hitopadesha

#### Men`s and Women's character to pollute the social environment :

Both men and women have a role to play in the well-being of a family. If the family is stable, the society will also be stable. If a man or a woman loses their character, there will be chaos in the family and in the society. But, advice is provided in this text to warn the socialists against the utter social instability occurs when women rather than men loose the character or fall from chastity . Here are some examples .

In the fifth part of the Mitralabha in Hotopadesha , the author narrate, In the city of Kaushambi, a young lady named Lilavati ,wife of an old merchant named Chandan Das, fell in love with the son of another merchant. Although Lilavati's husband did not lack of wealth and had all kinds of material pleasure and peace, but why his wife was attracted to other man, in this regard to warn the society about the reason Narayana said about women`s character –

**First** of all, the wife becomes adulteress due to independence, living in the father's house after marriage, arbitrariness in front of many in social events, living abroad, old



age of the husband, frequent intercourse with bitch women, loss of own's profession or violence. So he says –

“स्वातन्त्रं पितृमन्दिरे निवसतिर्यात्रोत्सवे  
सङ्गति गोष्ठीपुरुषसन्निधावनिअयमो वासो विदेशे तथा ॥  
संसर्गः सह पुंश्चलीभिरसकृद्वृत्तैर्निजायाः क्षतिः

पत्युर्वाद्भक्यमीषितं प्रवसनं नाशस्य हेतुः स्त्रियाः ॥ –(हितोपदेश-मित्रलाभ-११४)

**Secondly**, a woman has to be an adulteress due to drinking, bad company, estrangement of husband, travelling in vain, living in another's house etc. So he says –

“पानं दुर्जनसंसर्गः पत्या च विरहोऽटनम् ।

स्वप्नश्चान्यगृहे वासो नारीणां दूषणानि षट् ॥ –(हितोपदेश-मित्रलाभ-११५)

**Thirdly**, the desire for crime is arised in the mind of a lustful woman. In this regard, Narayana says –

“सुरूपं पुरुषं दृष्ट्वा भ्रातरं यदि वा सुतम् ।

योनिः क्लिद्यति नारीणामामपात्रमिवम्भ सा –(हितोपदेश-मित्रलाभ-११६)

That is to say, a woman's vagina gets wet like a raw clay pot whenever she sees any handsome man, no matter who the brother or son is.

**Fourthly**, the author thinks of women as cows. Just as cows are attracted to new grasses in the forest, so women are attracted to new males. In this context he says –

“न स्त्रीणामप्रियं कश्चित् प्रियो वापि न विद्यते ।

गावस्तृणमिवारण्ये प्रार्थयन्ति नवं नवम् ।’ –(हितोपदेश-मित्रलाभ-११९)

**Fifthly**, the author's statement about women's satisfaction is that they are satisfied only with sexual intercourse and not for any other reason. They never take a break from orgasm. They have no shame, no fear, no humility, no affection in this matter. Also in this matter they never consider space, time or person. So writer says –

“स्थानं नास्ति क्षणं नास्ति नास्ति प्रार्थयिता नरः ।

तेन नारदः नारीणां सतीत्वमुपजायते ॥ –(हितोपदेश-मित्रलाभ-११७)

“न लज्जा न विनीतत्वं न दाक्षिण्यं न भीरुता ।

प्रार्थनाभाव एवेति सतीत्वे कारणं स्त्रियाः ॥ –(हितोपदेश-मित्रलाभ-१२१)

**Sixthly**, in the story, the sharpness by which the housewife, in spite of the arrival of her husband at the time of the company of the merchant's son, helped him to keep the concubine by showing outward affection towards her husband, is comparable to the intellect of the deba-guru or demon-guru. So writer says –

“उशना वेद यच्छास्त्रं यच्च वेद बृहस्पतिः ।

स्वभावेनैव तच्छस्त्रं स्त्रीवृद्धौ सुप्रतिष्ठितम् ॥ –(हितोपदेश-मित्रलाभ-१२३)



For this reason, from birth to death, a woman must be Subordinated to any one male like as father, husband and son . So the author's instruction –

“पिता रक्षति कौमारे भर्ता रक्षति यौवने ।

पुत्राश्च स्थविरे भावे न स्त्री स्वातन्त्र्यमर्हसि ॥ –(हितोपदेश-मित्रलाभ-१२२)

The author warns the society not only about women but also about the character of men. In the seventh story of the Mitralabha section, the lust for the wife of a merchant named Labanyavati and of a prince named Tungabal ,in the city of Birpur is described and in that context the author's advices –

“सन्मार्गे तावदास्ते प्रभवति पुरुषस्तावदेवेन्द्रियाणां

लज्जां तावद्विधत्ते विनयमपि समालम्बते तावदेव ।

भूचाप्यकृष्टमुक्ताश्रवणपथगता नीलपक्षमाण एते

यावल्लीलावतीनां न हृदि धृतिमुषो दृष्टिवाणाः पतन्ति ॥”( हितोपदेशः –मित्रलाभः -१९५)

In the eighth story of the Suhridveda part, during the conversation between Damnak and Pingal, Damnak warns about male immorality in this manner –

“न सोऽस्ति पुरुषो लोके यो न कामयते श्रियम् ।

परस्य युवतीं रम्यां सादरं नेक्षतेऽत्र कः ?”( हितोपदेशः –मित्रलाभः -१२९)

In the sixth story of Suhridveda, there is a story about the wife of a cowherd from a city called Dwaravati. She was extremely slanderous as she had sex with the village chief and his son. One day when Dwaravati met the son of the village chief, then the chief came and she also met with him. At that time when the husband of that woman came, she maintained the peace of the family by taking shelter of lies by his own intellect. In this context, the author says, women's happiness is only in sex. So he instructed –

नाग्निस्तृप्यति काष्ठानां नापगानां महोदधिः

नान्तकः सर्वभूतानां न पुंसां वामलोचना ॥ ( सुहृद्भेदः -११३ )

गुणाश्रयं कीर्तियुतं च कान्तं पतिं रतिज्ञं सधणं युवानाम्

विहाय शीघ्रं वनिता व्रजन्ति नरं परं शीलगुणादिहीनम् ॥ ( सुहृद्भेदः -११५ )

न तादृशीं प्रतिमुपैति नारी विचित्रशय्यां शयितापि कामम् ।

यथा हि दुर्वादिविकीर्णभूमौ प्रयाति सौख्यं परकान्तसङ्गात् ॥ ( सुहृद्भेदः -११६ )

So the author's warning is –

“न दानेन न मानेन नार्जवेन न सेवया ।

न शस्त्रेण न शास्त्रेण सर्वथा विषमाः स्त्रियः ॥’इति . ( सुहृद्भेदः -११४ )

Thus, in order to protect the society from the adultery of women and to remedy the pollution of the environment, many stories have been presented by the author in chapter four of this book. The main purpose of these stories is that although women are the protectors of society, they are also the destroyers. Therefore, acquiring knowledge from



these stories and better understanding of the mind and character female, will lead to social and environmental protection.

### **The relevance of the Hitopadesha to the female character in modern times.**

A lot of things are happening in modern India due to lack of awareness towards such female characters. Here are just a few examples of what happened in West Bengal in 2017, which will prove the effectiveness of the warning about the female character given in this book.

- 1) After 5 years of love, Anupam Singh of Hridaypur village in Barasat of North 24 Parganas got married to a woman named Manua. A year later Manua fell in love with one of his neighbours named Ajit Roy. In Anupam's absence, the two would always meet. One day, having a new love, her husband was killed by heartless Manua with the help of her boyfriend on 03/05/2017. ( **The Anandabazar Patrika 4/5/2017 , Page -1** ). This killing is not normal but very brutal. So it is proved that Narayan's thought about female character is applicable even in modern times.
- 2) On 7/10/2017, a man named Chanchal Ghosh was killed by his wife Riya in Kankasa of Burdwan district. They also had a 4-years-old daughter. Despite having a daughter, the lustful woman was attracted to a man named Jhantu Mandal and killed her husband. Narayan said that caution should be exercised from such women. ( **The Anandabazar Patrika 8/10/2017 , Page -6** ).
- 3) On 2/10/2017, a man named Madan Paik was killed by his wife's boyfriend in Nayagram under the district of Jhargram, West Bengal . His wife was Chandana. It was reported that a local youth fell in love with this woman. So even though this incident is new but there is a warning in this text. ( **The Anandabazar Patrika 3/10/2017 , Page -11** ).
- 4) On 17/09/2017, a 54-years-old man was killed in Howrah district by his wife Sharmistha. They had been married for 20 years and had a son. Yet this lustful woman fell in love with her son's tutor and lost her husband's life. This incident was extremely tragic. ( **The Anandabazar Patrika 18/09/2017 , Page -1** ).

From these incidents it is evident that if those men had treated their wives in such a manner as instructed in the Hitopadesha, their fate would not have been so tragic.

### **Illiteracy or poor education is the cause of environmental pollution.**

Considering illiteracy as the cause of environmental pollution, the author of the Hitopadesha has composed many verses praising Vidya in the preface of his book. Some of them are discussed here. The author says –

सर्बद्रव्येषु बिद्यैब द्रव्यमाहु रणुत्तमम्।

आहार्यत्वादनर्घत्वादक्षयत्वाच्च सर्बदा ॥( प्रस्ताबना -४ )



In this verse the superiority of knowledge has been declared. Again, the common truth that an ordinary person is able to cross the ocean of misfortune only through knowledge has been stated by the author in this way –

संयोजयति बिद्यैब नीचगापि नरं सरित् ।

समुद्रमिब दुर्धर्षं नृपं भाग्यमतः परम् ॥ ( प्रस्ताबना -५ )

The author thinks that, un-educated sons are adorned like egret in a team of goose. Even if a person is born into an honest family due to lack of knowledge, he is not considered as a civilized person in the society. There are many such advices in this text. All that advice proves that illiteracy is the cause of environmental pollution. Because, wisdom does not come from illiteracy, without wisdom people cannot understand what is right and what is wrong, if they do not understand right and wrong, they create anarchy in the society and that anarchy brings environmental pollution, this eternal truth has been established in the Hitopodesha.

#### **Environmental pollution for illiteracy or ill-education in modern times :**

Now, with the help of the United Nations, universal education is prevalent in India. The main purpose of this project is identical with the Hitopodesha. However, society is being polluted by this teaching because it is not taught according to the Mahabharata. The Hitopodesha not only teaches on the subjective education, but it also gives importance on the moral education of students. He thought that, just as the stains painted on the new pot are as clear as the character-building reforms in the hearts of the students, they are forever clear. But at present English Language is the predominant language in all-India examinations. So most parents try to teach their son or daughter in English medium from an early age for their future financial security, not for character building . Not only in English medium, but also in Bengali language, there is no suitable subject for character building for childhood education. This education is only in Sanskrit and nowhere else. But in this country especially in West Bengal Sanskrit is neglected. Thus, in the absence of this teaching of the Hitopodesha, fraternal quarrels for money, material unrest between father and son, immoral conflict between husband and wife, etc. are seen as environmental pollution.

#### **Environmental pollution due to greed in Hitopadesha.**

- a) Greed is the destroyer - this eternal truth is mentioned in the Hitopadesha .There was an old tiger with a gold bracelet was sitting on the shore of the lake, because he was too old to hunt. So he was sitting in this position to explore food. At that time he saw a greedy Brahmin and wanted to give him the gold bracelet. The Brahmin knew that tigers eat people, but that Brahmin eventually became the food of the tiger in his greed for gold bracelets. So the author warns

“नदीनां शस्त्रपाणीनां नखिनां शृङ्गिनां तथा ।

विश्वासो नैव कर्तव्यः स्त्रीषु राजकुलेषु च ॥” (हितोपदेशः –मित्रलाभः -१९)



This means that rivers, women, scriptures, clawed animals, horned animals and no people of the dynasty are to be believed and relied upon.

b) In the Mitralava part of the Hitopadesha, it is seen that a hunter spread a grain of rice in the forest and spread a net over it.

The birds were caught in the net when they saw the grains of rice and sat down to eat the rice due to greed. This is an example of destruction due to greed. For this reason, the author says to curb the greed of socialists -

**लोभात् क्रोधः प्रभवति ,लोभात् कामः प्रजायते ।**

**लोभान्मोलुप्तश्च नाशश्च ,लोभः पापस्य कारणम् ॥( मित्रलभः -२७) .**

It is said in the Hitopadesha that greed causes the delusion of the wise –

**असम्भवं हेममृगस्य जन्म ,तथापि रामो लुलुभे मृगाय ।**

**प्रायः समापन्नबिपत्तिकाले ,धियोऽपि पुंसां मलिना भवन्ति ॥( मित्रलाभः -२८ )**

So greed destroys oneself, society and the environment, this is the statement of the author.

#### **Environmental pollution due to greed in modern times.**

There are many instances of destruction due to greed in modern India. Some of them are being mentioned by me here. Sarada, Alchemist, Rose Valley ,Verona, Janapriya etc. Many companies were in India. Poor people put money in these companies in the hope of getting much more money in shorter term, less than usual due to greed. But due to extreme greed ,the owners of these companies, embezzled all that money from the poor and caused pollution.

#### **Unknown habitats cause environmental pollution :**

The third story in the Mitralabhat of the Hitopadesha tells the story of a vulture . There an innocent vulture was killed by an unknown breed of cats. So there the author says –

**अज्ञातकुलशीलस्य बासो देयो न कस्यचित् ।**

**मार्जारस्य हि दोषेण हतो गृध्रो जरद्गबः ॥( मित्रलाभः -५६ )**

#### **The result of letting the unknown clan to stay in modern times :**

At present there is a place called Khagragarh in the Burdwan district of West Bengal. There was a bomb blast on 2/10/2014. (The Anandabazar Patrika on 3/10/2014) .A few days before that explosion, a resident of Bangladesh named Kausar came with his local friends. There they want to stay in the house of a person named Rezaul Sheikh. The landlord allowed them to stay for more money without seeing any identity card. Two years later, there was a big explosion due to the production of explosives, which killed the owner of the house along with the young and old. This catastrophe is due to not knowing the advice given in the Hitopadesha not to give place to anyone without knowing one's identity. So there is a need for this text in modern times.



### **Disunity is the cause of environmental pollution:**

The author of the Hitopadesha narrates the story of the doves in the part of Mitralabh as a perfect example of this subject. There the pigeons were tempted to sit on the rice particles scattered by the hunter and were trapped. Then they thought and worked collectively and flew away together with the net and saved themselves from the gulf of death. So to warn the socialists, the author says –

“अल्पानामपि वस्तूनां संहति कार्यसाधिका।  
तृणैर्गुणत्वमापन्नैर्वध्यन्ते मत्तदन्तिनः ॥” (हितोपदेशः –मित्रलाभः -३५)

### **The result of unity in modern times :**

At present, following the advice given in the Hitopadesha, self-help groups (S.H.G) has been established by the Government of India, with 10 poor women in each group. These women have jointly invested in small-scale cottage industries with bank loans. So, each of these women has achieved family improvements by staying organized. It is noteworthy that the families of all these women are very poor. It was never possible for one of them to set up such an industry, but because of the unity, they are all now prosperous.

### **Dependence is the cause of environmental pollution :**

It is man's duty to earn money for his livelihood, but the author of the Hitopadesha has thought about how that money will come. According to him, there are two ways to earn money. Firstly submissively and secondly independently. The author has accepted the second. In this regard, he said –

“शीतवातातपक्लेशान् सहन्ते यान् पराश्रिताः ।  
तदंशेनापि मेधावी तपस्तप्त्वा सुखी भवेत् ॥” (हितोपदेशः –सुहृद्भेदः -२१)

This means that the wise man is happy to work a part of the hardship that the dependent people could not and suffer from the cold, wind and sun. Here he makes it clear that intelligent people can easily earn more money than their subordinates. The author compares the dead with the subsistence -

“ एतावज्जन्मसाफल्यं यदनायात्तवृत्तिता ।  
ये पराधीनतां यातास्ते वै जीवन्ति के मृताः ॥” (हितोपदेशः –सुहृद्भेदः -२२)

The writer says, submissive earners are like prostitutes. Just as a prostitute decorates herself in various ways and entertains others, so do submissive people. So the author says –



“अवुधैरर्थलाभाय पण्यस्त्रीभिरिव स्वयम् ।

आत्मा संस्कृत्य संस्कृत्य परोपकरणीकृतः”॥ ( हितोपदेशः –सुहृद्भेदः -२४)

The author thinks that, in this way the notion of the money earner under the latter category gradually becomes narrow and thus, he continues to pollute his own environment. So the author says that it is not desirable to have a servant like a dog, it is desirable to earn oneself like the best elephant-

‘सेव्यसेवकयोरन्तरं पश्य

लाङ्गुलचालनमधश्चरणावपातं

भूमौ निपत्य वदनोदरदर्शनं च

श्वा पिण्डस्य कुरुते गजपुङ्गवस्तु

धीरं विलोकयति चाटुशतैश्च भुङ्क्ते”॥( हितोपदेशः –सुहृद्भेदः -४२)

So to the writer those who make money under others like servants are extremely disgusting and animalistic. They gradually become useless and turn into social garbage.

#### **Environmental pollution by dependency in modern times :**

The author's excellence in self-reliance has been proven as relevant even in modern times. At present, the government has taken various projects that make the youth repulsive to work or to get employment without thinking about their self-reliance. Through those projects, the independent skill and will of work of the youth is being eradicated. They are slowly losing their jobs as they earn money without work. As a result, their physical and mental weakness is increasing and they are turning into terrorists.

Subsidy is given in many of those projects but most of the people are getting only subsidy from the banks without doing anything. As a result, on the one hand, they have no need to earn their own living and the other hand ,the government's project is not being implemented. So the government should have given some conditional guidelines for these projects so that only those who take this money for themselves with the objectives performed or achieved will get this money and no one else. Then, on the one hand, as unemployment would be reduced, on the other hand, the money given by the government would be used properly. Again there are some of these projects that are paid for only with some money but there is no guideline as who will use that money. As a result, many people are using that money for dishonest purposes. So there is no doubt that the environment is being polluted by making people unproductive and unworthy for employment through such grants. So the author's instruction is that people should be helped to earn independently, not to survive as dependent. This will bring social stability.

Observing those projects, we can say that the government has not taken up them to make the citizens self-reliant, but to cripple them from work culture and industrious



with some financial benefits. Due to this, unemployment is increasing day by day in India. At present, people have no worries about earning money on their own, as the government has various schemes by which they could earn money and get food. So the environment can be protected and unemployment can be eradicated if the government takes the initiative to make the youth really self-reliant as per the advice of the author of Hitopadesha.

#### **Conclusion :**

People are social beings. Without society we had not existed, do not exist and will not exist. So we should always try to protect the society. But if this situation continues in our society, then the damage will be more than the benefit. So we have to try to improve the society as a whole. This effort is described in the Hitopadesha by Narayan Sharma. The Hitopadesha is a book which contains instructions on the code of conduct and duties of everyone from the common man to the statesman. So, if we work with this book, there is no doubt that India will get the best seat in the world assembly again in a safe environment just as she will improve herself and her society.

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**MARDER TYPE BULK VISCOUS STRING COSMOLOGICAL UNIVERSE IN  $f(R, T)$   
GRAVITY WITH TIME VARYING DECELERATION PARAMETER**

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**ABSTRACT:**

We propose a specially homogeneous and anisotropic Marder Space-time with bulk viscous string bulk viscosity in the framework of  $f(R, T)$  gravity by considering two cases (i) the special form and (ii) linearly varying deceleration parameter. To obtain a deterministic solution of the field equation we have been used some physical plausible condition. In this theory, cosmological model is presented in both cases. Also some important features of the models, thus obtained, have been discussed.

**Keywords:**String Matter, Bulk Viscous, Marder Universe, Deceleration Parameter,  $f(R, T)$  gravity

**INTRODUCTION:**

Recent data obtained from the observational cosmology [1-6] on the late-time acceleration of the universe and the existence of dark matter have posed a fundamental theoretical challenge to gravitational theories. Scientist continue to work to identify the causes of acceleration of the universe [7]. On the way of explaining the observations is by assuming that at large scales the Einstein gravity model of general relativity breaks down, and a more general action describes the gravitational field. In this context, it is very essential to investigate alternative gravitation theories in order to find accelerating expansion of the universe. In recent years, Harko et al. suggested a new generalized theory known as  $f(R, T)$  theory [8]. According to this theory, gravitational Lagrangian involves an arbitrary function of the scalar curvature ( $R$ ) and trace energy momentum tensor ( $T$ ). Several researchers have investigated  $f(R, T)$  theory in different contexts. Shamir et al. [9] have obtained exact solutions of Bianchi types I and V cosmological models in  $f(R, T)$  gravity and Chaubey and Shukla [10] have studied a new class of cosmological models in  $f(R, T)$  gravity. This theory has recently been studied by many other scientists [11-19]. The LRS Bianchi type II universe model was also studied in  $f(R, T)$  gravity for bulk viscosity and string [20]. Aygun [21] have studied marder type universe with bulk viscous string cosmology in  $f(R, T)$  gravity.

Pawar and Solanke [22] have investigated Marder's two fluid dark energy cosmological models in Saez-Ballester theory. A string cloud model with bulk viscosity was also researched in Brans-Dicke cosmology [23]. Samanta et al. investigated BVS models in higher dimensions for the Saez Ballester theory [24]. Pradhan obtained magnetized BVS solutions with the cosmological term [25]. Sahoo and Mishra [26] studied Kaluza-Klein dark energy model in form of wet dark fluid in this theory. Reddy et al. [27] presented Kantowski-Sachs bulk viscous string model in  $(R, T)$  theory. Recently, Naidu et al. [28], Kiran and Reddy [29], and Reddy et al. [30] discussed the Bianchi type-V, Bianchi type-III, Kaluza-Klein space time with cosmic strings, and bulk viscosity in  $f(R, T)$  gravity, respectively. Ahmed et al.[31] have studied Bianchi type V cosmological model in  $f(R, T)$  gravity.

In this work we investigate the role of variable deceleration parameter in Marder space time model with bulk viscous string cosmology in  $f(R, T)$  theory with varying deceleration parameter. The present paper is organized as follows. In section 2, A brief Review of  $f(R, T)$  gravity is described. Section 3 deals with modified gravitational field equations for  $f(R, T) = R + 2f(T)$  model. Cosmological solutions of the field equations using linearly varying deceleration parameter  $q$  proposed by Akarsu and Dereli [32] presented in section 4 and also discuss some physical properties, energy conditions and state finder diagnostic of the constructed model in three different physical viable cosmologies. In section 5 conclusions of the present work are presented.

## 2. MODIFIED $f(R, T)$ THEORY:

The field equations of  $f(R, T)$  gravity obtained from the action

$$S = \frac{1}{16\pi G} \int [f(R, T) + L_m] \sqrt{-g} d^4x, \quad (1)$$

Here  $T$  is the stress energy tensor of the matter,  $T_{\alpha\beta}$ , and  $g$  is the determinant of metric tensor  $g_{\alpha\beta}$  while  $f(R, T)$  is the function of the Ricci scalar,  $R$ .  $L_m$  indicates the Lagrangian [8]. The matter's energy momentum tensor is given by [8]:

$$T_{\alpha\beta} = \frac{2}{\sqrt{-g}} \frac{\delta(\sqrt{-g} L_m)}{\delta g^{\alpha\beta}}, \quad (2)$$

Where  $L_m$  is the Lagrangian density and depends only on the metric tensor, and the relation is given by [8]:

$$T_{\alpha\beta} = g_{\alpha\beta} L_m - \frac{2\partial L_m}{\partial g^{\alpha\beta}}, \quad (3)$$

By varying the action of  $f(R, T)$  given in equation (1), we get:

$$(g_{\alpha\beta}\nabla^\alpha\nabla_\alpha - \nabla_\alpha\nabla_\beta)f_R(R, T) + f_R(R, T)R_{\alpha\beta} - \frac{1}{2}f(R, T)g_{\alpha\beta} = -f_T(R, T)(T_{\alpha\beta} + \Theta_{\alpha\beta}) + 8\pi T_{\alpha\beta}$$

(4)

Here  $f_T(R, T)$  indicates the derivative with respect to T and  $f_R(R, T)$  indicates the derivative with respect to R [8].  $\nabla_\alpha$  is the covariant derivative [8]. We show  $\Theta_{\alpha\beta}$  in equation (4) as follows [8]:

$$\Theta_{\alpha\beta} = -2T_{\alpha\beta} + g_{\alpha\beta}L_m - 2g^{ik} \frac{\partial^2 L_m}{\partial g^{\alpha\beta} \partial g^{ik}}$$

(5)

If we contract Equation (4), the contraction is obtained between R and T as follows;

$$f_R(R, T)(3\nabla^\alpha\nabla_\alpha + R) - 2f(R, T) = -f_T(R, T)(T + \Theta) + 8\pi T$$

(6)

Here  $\Theta = g^{\alpha\beta}\Theta_{\alpha\beta}$  [ , ]. Using equations (4) and (6), we obtained the following equation [8]:

$$f_R(R, T)\left(R_{\alpha\beta} - \frac{1}{3}g_{\alpha\beta}R\right) + \frac{1}{6}f(R, T)g_{\alpha\beta} = (8\pi - f_T(R, T))\left(T_{\alpha\beta} - \frac{1}{3}Tg_{\alpha\beta}\right) - f_T(R, T)\left(\Theta_{\alpha\beta} - \frac{1}{3}\Theta g_{\alpha\beta}\right) + \nabla_\alpha\nabla_\beta f_R(R, T). \quad (7)$$

And we write the perfect fluid matter distribution as follows:

$$T_{\alpha\beta} = (\rho + p)u_\alpha u_\beta - pg_{\alpha\beta},$$

(8)

Here p is the cosmic pressure,  $\rho$  is the cosmic density,  $u_\alpha, u_\beta$  are four velocities,

and  $u_\alpha u^\alpha = 1$  [8]. From equation (5), we obtain [8]:

$$\Theta_{\alpha\beta} = -(2T_{\alpha\beta} + pg_{\alpha\beta})$$

(9)

According to Harko et al. [8], three models of  $f(R, T)$  theory are:

$$f(R, T) = \begin{cases} R + 2f(T) \\ f_1(R) + f_2(T) \\ f_1(R) + f_2(R)f_3(T) \end{cases}$$

(10)

In this paper we will research the bulk Viscous string cosmological model with Marder type universe in two different  $f(R, T)$  models. The Marder space time is given by [33-34]:

$$ds^2 = A^2(dt^2 - dx^2) - B^2dy^2 - C^2dz^2$$

(11)

And the energy momentum tensor of the bulk viscous string model is given by [27]:

$$T_{\alpha\beta} = (\rho + \bar{p})u_\alpha u_\beta - \bar{p}g_{\alpha\beta} - \lambda x_\alpha x_\beta,$$

(12)

Where  $\bar{p} = p - 3\xi H = \varepsilon\rho$

(13)

And  $\varepsilon = \varepsilon_0 - \beta$  ( $0 \leq \varepsilon \leq 1$ )

(14)

$$p = \varepsilon_0\rho$$

(15)

Here  $\varepsilon_0$  &  $\beta$  are constants,  $\rho$  is energy density,  $\lambda$  is the string tension density, H is the Hubble parameter, and  $\xi$  is the coefficient of bulk viscosity [27].  $u_\alpha$  is the four velocity vector and  $x_\alpha$  is the direction of the string, which satisfies the following [27]:

$$x_\alpha u^\alpha = 0, \quad u_\alpha u^\alpha = -x_\alpha x^\alpha = 1$$

(16)

We first define the expressions for the average scale factor and volume scale factor. Define the generalized Hubble's parameter H in analogy with a flat FRW model.

The average scale factor ( $a$ ) and spatial volume ( $V$ ) are defined as

$$V = a^3 = A^2BC$$

(17)

We define the generalized Hubble's parameter H as

$$H = \frac{1}{3} \frac{\dot{V}}{V} = \frac{\dot{a}}{a} = \frac{1}{3} \left( 2 \frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C} \right)$$

(18)

Overhead dot denotes differentiation with respect to cosmic time t.

### 3. MODIFIED GRAVITATIONAL FIELD EQUATIONS FOR $f(R, T) = R + 2f(T)$ MODEL:

For the  $f(R, T)$  modified gravitation theory, the gravitational field equations are given by [8]:

$$G_{\alpha\beta} = g_{\alpha\beta} [f(T) + 2pf'(T)] + [2f'(T) + 8\pi]T_{\alpha\beta} \tag{19}$$

Where the prime indicates differentiation w.r.t. the argument [8]. If we take  $f(T) = \mu T$ , where  $\mu$  is a constant, in equation (19), we get [8]:

$$G_{\alpha\beta} = g_{\alpha\beta} [\mu\rho - p\mu] + [2\mu + 8\pi]T_{\alpha\beta} \tag{20}$$

and field equations are given by:

$$\frac{1}{A^2} \left[ \frac{\ddot{C}}{C} + \frac{\ddot{B}}{B} + \frac{\dot{B}\dot{C}}{BC} - \frac{\dot{A}\dot{B}}{AB} - \frac{\dot{A}\dot{C}}{AC} \right] = -8\pi\lambda - 3\mu\lambda + 3\mu\bar{p} - \mu\rho + 8\pi\bar{p}$$

$$(21) \quad \frac{1}{A^2} \left[ \frac{\ddot{C}}{C} + \frac{\ddot{A}}{A} - \left( \frac{\dot{A}}{A} \right)^2 \right] = 3\mu\bar{p} - \mu\lambda - \mu\rho + 8\pi\bar{p} \tag{22}$$

$$\frac{1}{A^2} \left[ \frac{\ddot{B}}{B} + \frac{\ddot{A}}{A} - \left( \frac{\dot{A}}{A} \right)^2 \right] = 3\mu\bar{p} - \mu\lambda - \mu\rho + 8\pi\bar{p}$$

$$(23) \quad \frac{1}{A^2} \left[ \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{A}\dot{C}}{AC} \right] = -8\pi\rho - 3\mu\rho + \mu\bar{p} - \mu\lambda \tag{24}$$

Let us introduce the dynamical scalars such as expansion parameter ( $\theta$ ), shear scalar ( $\sigma^2$ ) and the mean anisotropy parameter ( $A$ ) as usual.

$$\theta = u_{;\alpha}^{\alpha} = 3H = 2\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C} \tag{25}$$

$$\sigma^2 = \frac{1}{2} \left[ \sum_{i=1}^3 H_i^2 - \frac{1}{3}\theta^2 \right] \tag{26}$$

$$A = \frac{1}{3} \sum_{i=1}^3 \left( \frac{\Delta H_i}{H} \right)^2 \quad (27)$$

Where  $\Delta H_i = H_i - H$ ,  $i = 1, 2, 3$ .

Recently, a special law was proposed for the deceleration parameter which is linear in time with a negative slope. This law covers the law of Berman (where the deceleration parameter is constant) used for obtaining exact cosmological models, in the context of dark energy, to account for the current acceleration of the universe. According to this law, only the spatially closed and flat universes with cosmological fluid exhibiting quintom-like behaviour are allowed and the universe ends with a big rip. This new law gives the opportunity to generalize many of these dark energy models having better consistency with the cosmological observations. The linearly varying deceleration parameter ( $q$ ) is defined as

$$\begin{aligned} q &= -\frac{a\ddot{a}}{\dot{a}^2} = \frac{d}{dt} \left( \frac{1}{H} \right) - 1 = -\frac{\dot{H}}{H^2} - 1 \\ &= -kt + n - 1 \end{aligned} \quad (28)$$

Where  $k$  and  $n$  are positive constants. We see that the deceleration parameter ( $q$ ) is a linear in time with negative slope. The sign of  $q$  indicates whether the model inflates or not. The positive sign of  $q$  corresponds to standard deceleration model whereas the negative sign indicates accelerated expansion.

Solving equation (26) for the scale factor, we obtain the law of variation of average scale factor  $a$  as

$$a = (nlt + c_1)^{\frac{1}{n}}, \quad k = 0, \quad n > 0 \quad (29)$$

$$a = c_2 e^{lt}, \quad k = 0, \quad n = 0 \quad (30)$$

$$a = c_3 e^{n \frac{2}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)}, \quad k > 0, \quad n > 1 \quad (31)$$

Where  $c_1$ ,  $c_2$ ,  $c_3$  are constants of integration.

Equation (27) implies that the condition for the expanding universe is  $n = q + kt + 1 > 0$ .

#### 4. COSMOLOGICAL SOLUTIONS:

The field equations (21) to (24) is a system of four independent equations in six unknowns i.e.  $\bar{p}$ ,  $\rho$ ,  $\lambda$ ,  $A$ ,  $B$ ,  $C$ . Since the field equations are highly non-linear for the complete determinacy, we need extra conditions among the variables. Therefore in order to obtain an explicit solution of the system we require two more suitable assumptions relating these two unknowns.

Let us first assume the condition that the expansion scalar in the model is proportional to the shear scalar which leads to

$$A = (BC)^m \quad (32)$$

$$\text{Where } m = \frac{3k_1 + 1}{2 - 3k_1}.$$

Here we discuss three different physically viable cosmologies  $k = 0$ ,  $n > 0$ ;  $k = 0$ ,  $n = 0$  and  $k > 0$ ,  $n > 1$  respectively, which have physical interests to describe the decelerating and accelerating phases of the universe.

*Case I.* When  $k = 0$ ,  $n > 0$  and  $\frac{B}{C} = V^b$ , where  $b$  is any constant, then from equations (17), (29) and (32), we have found

$$A = (nlt + c_1)^{\frac{X_1}{n}} \quad (33)$$

$$B = (nlt + c_1)^{\frac{X_2}{n}} \quad (34)$$

$$C = (nlt + c_1)^{\frac{X_3}{n}} \quad (35)$$

$$\text{Where } X_1 = \frac{3m}{2m+1}, X_2 = \frac{3+2bm+b}{2(2m+1)}, X_3 = \frac{3-2bm-b}{2(2m+1)}$$

From (23) & (24) with the help of (33)-(35), we obtained the rest energy density as

$$\rho = \frac{l^2 \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) - n(X_1 + X_2) \right]}{(2\mu + 8\pi)(\varepsilon + 1)(nlt + c_1)^{\frac{2X_1}{n} + 2}} \quad (36)$$

From (23) & (24), with the help of (36), we obtained the total pressure as

$$-\bar{p} = \frac{(\varepsilon_0 - \beta)l^2 \left[ X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3) - n(X_1 + X_2) \right]}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)(nlt + c_1)^{\frac{2X_1}{n} + 2}} \quad (37)$$

$$p = \frac{9(\varepsilon_0 - \beta)\xi l}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)(nlt + c_1)} + \frac{(\varepsilon_0 - \beta)l^2 \left[ X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3) - n(X_1 + X_2) \right]}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)(nlt + c_1)^{\frac{2X_1}{n} + 2}} \quad (38)$$

From (21) & (22) with the help of (33)-(35), we obtained the rest energy density as

$$\lambda = \frac{l^2 \left[ X_1X_2 - X_2X_3 + X_1X_3 - X_2^2 - n(X_2 - X_1) \right]}{(-2\mu - 8\pi)(\varepsilon_0 - \beta + 1)(nlt + c_1)^{\frac{2X_1}{n} + 2}} \quad (39)$$

$$\xi = \frac{\beta l \left[ X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3) - n(X_1 + X_2) \right]}{9(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)(nlt + c_1)^{\frac{2X_1}{n} + 2}} \quad (40)$$

#### 4.1.1 Some physical properties of the model :

Some physical properties of the model are given below, which are crucial in the discussion of cosmology:

(i) The spatial volume  $V = (nlt + c_1)^{\frac{3}{n}}$

(ii) The scalar of expansion  $\theta = \frac{9l}{(nlt + c_1)}$

(iii) The mean Hubble parameter  $H = \frac{3l}{(nlt + c_1)}$

(iv) The shear scalar  $\sigma^2 = \frac{l^2 \left[ X_1^2 + X_2^2 + X_3^2 - 27 \right]}{2(nlt + c_1)^2}$

In this model we observe that the spatial volume ( $V$ ) is zero at  $t = t_0 = -\left(\frac{c_1}{nl}\right)$ . The

energy density ( $\rho$ ) and total pressure ( $\bar{p}$ ) tend to infinity at  $t \rightarrow t_0$ . Cosmological

parameter  $\theta$  Shear  $(\sigma^2)$  and Hubble parameter  $(H)$  tend to infinity at  $t \rightarrow t_0$  and expand with cosmic time  $t$ . For  $t = 0$  all physical and kinematical parameters are constant. When  $t \rightarrow \infty$ , the scalar expansion  $\theta$ , shear scalar  $(\sigma^2)$  and Hubble parameter  $(H)$  goes to zero in Marder type model. Hence we observe that universe

starts evolving with cosmic time (t). We observe that  $\lim_{t \rightarrow \infty} \frac{\sigma^2}{\theta} = 0$ , so model approach

isotropy for large cosmic time t.

From equation (38), we observe that pressure varies with time. When pressure and energy density are decreasing function of time. In this study we obtain nonzero string tension density for a homogeneous and anisotropic Marder type universe.

Sahni et al [35] proposed a cosmological diagnostic pair [r, s] called statefinder.

$$r = \frac{n(1-n)(1-2n)}{27} \tag{41}$$

$$s = \frac{n(1-n)(1-2n) - 27}{81 \left( n - kt - \frac{3}{2} \right)} \tag{42}$$

The cosmological diagnostic pair [r, s] tends to be constant for large cosmic time. Therefore, on the basis of the above discussion and analysis, our model and their corresponding solutions are physically acceptable.

**Case II.** When  $k = 0$ ,  $n = 0$  and  $\frac{B}{C} = V^b$ , where b is any constant, then from equations (17), (30) and (32), we get

$$A = c_2^{X_1} e^{X_1 t} \tag{43}$$

$$B = c_2^{X_2} e^{X_2 t} \tag{44}$$

$$C = c_2^{X_3} e^{X_3 t} \tag{45}$$

From (23) & (24), with the help of (43)-(45), we obtained the rest energy density as

$$\rho = \frac{l^2 \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) \right]}{(2\mu + 8\pi)(\epsilon_0 - \beta + 1) c_2^{2X_1} e^{2X_1 t}} \tag{46}$$

From (23) & (24), with the help of (46), we obtained the total pressure as

$$p = \frac{(\varepsilon_0 - \beta)l^2 [X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3)]}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)c_2^{2X_1}e^{2X_1lt}} \quad (47)$$

$$p = \frac{9(\varepsilon_0 - \beta)\xi l}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)} + \frac{(\varepsilon_0 - \beta)l^2 [X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3)]}{(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)c_2^{2X_1}e^{2X_1lt}} \quad (48)$$

$$\xi = \frac{\beta l [X_2^2 - (X_1X_2 + X_2X_3 + X_1X_3)]}{9(2\mu + 8\pi)(\varepsilon_0 - \beta + 1)c_2^{2X_1}e^{2X_1lt}} \quad (49)$$

From (21)& (22) with the help of (43)-(45), we obtained the rest energy density as

$$\lambda = \frac{l^2 [X_2^2 + X_2X_3 - X_1X_2 - X_1X_3]}{(-2\mu - 8\pi)(\varepsilon_0 - \beta + 1)c_2^{2X_1}e^{2X_1lt}} \quad (50)$$

#### 4.1.2 Some physical properties of the model :

Some physical properties of the model are given below, which are crucial in the discussion of cosmology:

- (i) The spatial volume  $V = c_2^3 e^{3lt}$
- (ii) The scalar of expansion  $\theta = 9l$
- (iii) The mean Hubble parameter  $H = 3l$
- (iv) The shear scalar  $\sigma^2 = \frac{l^2 [X_1^2 + X_2^2 + X_3^2 - 27]}{2}$

In this model, we observed that at the initial epoch the values of the energy density ( $\rho$ ) proper pressure ( $p$ ), total pressure ( $\bar{p}$ ) and coefficient of bulk viscosity ( $\xi$ ) are very high and these values gradually decrease with the evolution of cosmic time  $t$ . Spatial volume  $V \rightarrow \infty$  as  $t \rightarrow \infty$ . Here we observe that  $\frac{\sigma}{\theta} = \text{const} \tan t$ , model does not approach isotropy at any time  $t$ . In this case we obtain nonzero string tension density for any finite time  $t$  and string tension density does not survive for  $t \rightarrow \infty$ .

$$r = \frac{1}{27} \quad (51)$$

$$s = \frac{-26}{81 \left( n - kt - \frac{3}{2} \right)} \quad (52)$$

*Case III.* When  $k > 0$ ,  $n > 1$  and  $\frac{B}{C} = V^b$ , where  $b$  is any constant, then from equations (17), (31) and (32), we get

$$A = c_3^{X_1} e^{\frac{2X_1}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)} \quad (53)$$

$$B = c_3^{X_2} e^{\frac{2X_2}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)} \quad (54)$$

$$C = c_3^{X_3} e^{\frac{2X_3}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)} \quad (55)$$

From (23)& (24) with the help of (53)-(55), we obtained the rest energy density as

$$\rho = \frac{4 \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) + (X_1 + X_2)(kt - n) \right]}{(2\mu + 8\pi)(\epsilon_0 - \beta + 1)t^2(2n - kt)^2 c_3^{2X_1} e^{\frac{4X_1}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)}} \quad (56)$$

From (23)& (24) with the help of (56), we obtained the total pressure as

$$p = \frac{4(\epsilon_0 - \beta) \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) + (X_1 + X_2)(kt - n) \right]}{(2\mu + 8\pi)(\epsilon_0 - \beta + 1)t^2(2n - kt)^2 c_3^{2X_1} e^{\frac{4X_1}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)}} \quad (57)$$

$$p = \frac{6(\epsilon_0 - \beta)\xi}{(2\mu + 8\pi)(\epsilon_0 - \beta + 1)t(2n - kt)} + \frac{4(\epsilon_0 - \beta) \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) + (X_1 + X_2)(kt - n) \right]}{(2\mu + 8\pi)(\epsilon_0 - \beta + 1)t^2(2n - kt)^2 c_3^{2X_1} e^{\frac{4X_1}{n} \tanh^{-1} \left( \frac{kt}{n} - 1 \right)}} \quad (58)$$

$$\xi = \frac{\beta 2n \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) + (X_1 + X_2)(kt - n) \right]}{3(2\mu + 8\pi)(\epsilon_0 - \beta + 1)t(2n - kt)c_3^{2X_1} e^{\frac{4X_1}{n} \tanh^{-1}\left(\frac{kt-1}{n}\right)}} \quad (59)$$

From (21)& (22), with the help of (53)-(55), we obtained the rest energy density as

$$\lambda = \frac{4 \left[ X_2^2 - (X_1 X_2 + X_2 X_3 + X_1 X_3) + (X_1 + X_2)(kt - n) \right]}{(-2\mu - 8\pi)(\epsilon_0 - \beta + 1)t^2(2n - kt)^2 c_3^{2X_1} e^{\frac{4X_1}{n} \tanh^{-1}\left(\frac{kt-1}{n}\right)}} \quad (60)$$

#### 4.1.3 Some physical properties of the model :

Some physical properties of the model are given below, which are crucial in the discussion of cosmology:

(i) The spatial volume  $V = c_3^3 e^{\frac{6}{n} \tanh^{-1}\left(\frac{kt-1}{n}\right)}$

(ii) The scalar of expansion  $\theta = \frac{6}{nt(2n - kt)}$

(iii) The mean Hubble parameter  $H = \frac{2}{t(2n - kt)}$

(iv) The shear scalar  $\sigma^2 = \frac{2 \left[ X_1^2 + X_2^2 + X_3^2 - 3 \right]}{t^2(2n - kt)^2}$

In this model , we observe that for large cosmic time (t), the spatial volume, expansion scalar, shear scalar and Hubble parameter tend to zero. The total energy density, proper pressure, total pressure gradually decrease with evolution of time.

We observe that  $\lim_{t \rightarrow \infty} \frac{\sigma^2}{\theta} = 0$  , so model

approach isotropy for large cosmic time t. The condition of Homogeneity and isotropization, formulated by Collins and Hawking [36].

#### 5. CONCLUSION:

In this work, we have considered a general class of cosmological model in the presence of bulk viscous string cosmological models with variable deceleration parameter in  $f(R, T)$  theory of gravity where, gravitational Lagrangian involves an arbitrary function of the scalar curvature ( $R$ ) and trace energy momentum tensor ( $T$ ) .



For different values of  $k$  and  $n$ , we can generate a class of models of the universe in Marder type space time with time dependent deceleration parameter in modified

$f(R, T)$  gravity.

In this paper, the gravitational field equation has been established by taking  $f(R, T) = R + 2f(T)$ .

We find the exact solutions of Marder space time in  $f(R, T)$  gravity theory by considering the special choice of scale factor. Which yields a time dependent deceleration parameter (28). Which represents a model of the universe which evolves from decelerating phase to accelerating phase. This scenario is consistent with the recent observations [1, 2]. The cosmological parameters have been discussed in each case.

We have also discussed the well known physical properties of our constructed model in three different viable cosmologies. It is observed that our model represents an expanding, shearing and non-rotating and accelerated universe. It is also observed that our derived models are isotropic at present epoch which is in good agreement with the current observations.

We have also found that our constructed model for three different cases are physically acceptable.

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## A NEW CLASS OF UNIVALENT FUNCTIONS ASSOCIATED WITH A CERTAIN FRACTIONAL CALCULUS OPERATOR

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### ABSTRACT

In this paper we have introduced a subclass  $P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  of univalent and analytic functions with positive coefficients by making use of a certain fractional calculus operator and studied some properties as coefficients estimate, distortion bounds, closure theorems radius of starlikeness and radius of convexity.

**Key words:** Univalent functions, Analytic function, Convolution, Starlike functions, positive coefficients.

**AMS Subject Classification[2010]:** 30C45

### 1. INTRODUCTION

Denote the class of functions  $f(z)$  of the form

$$(1.1) \quad f(z) = z + \sum_{n=2}^{\infty} a_n z^n,$$

by  $A$ , which are analytic and univalent in the unit disk  $\Delta = \{z \in \mathbb{C} : 0 < |z| < 1\}$ .

Define the Hadamard (or convolution) product of the function  $f(z)$  given by (1.1) and  $F(z) \in A$  given by

$$(1.2) \quad F(z) = z + \sum_{n=2}^{\infty} b_n z^n,$$

as

$$(1.3) \quad (f * F)(z) = (F * f)(z) = z + \sum_{n=2}^{\infty} a_n b_n z^n,$$

Let  $P$  be a subclass of  $A$  which consists of functions of the form

$$(1.4) \quad f(z) = z + \sum_{n=2}^{\infty} a_n z^n, \quad (a_n \geq 0)$$

Let  $\psi(a_1, a_2; z)$  be the incomplete beta function defined by

$$\psi(a_1, a_2; z) = z + \sum_{n=2}^{\infty} \frac{(a_1)_n}{(a_2)_n} z^n, \quad a_2 > 0$$

Where Pochhammer symbol  $(\beta)_n$  is defined as

$$(\beta)_n = \begin{cases} \beta(\beta+1)(\beta+2)\dots(\beta+n-1), & n = 1, 2, \dots \\ 1, & n = 0 \end{cases}$$

Further Carlson-Shaffer operator [2]  $L(a, c)$  is defined as  $L(a, c) = \psi(a, c; z) * f(z)$  for  $f \in A$

For real number  $\mu$  ( $-\infty < \mu < 1$ ) and  $\gamma$  ( $-\infty < \gamma < 1$ ) and a positive real number  $\eta$ , Murugusundramoorthy etc. [3] have defined an operator  $U_{0,z}^{\mu,\gamma,\eta} : A \rightarrow A$  by

$$(1.5) \quad U_{0,z}^{\mu,\gamma,\eta} f(z) = z + \sum_{n=2}^{\infty} \frac{(2-\gamma+\eta)_{n-1} (2)_{n-1}}{(2-\gamma)_{n-1} (2-\mu+\eta)_{n-1}} a_n z^n,$$

which may be written for  $f(z) \neq 0$  as

$$U_{0,z}^{\mu,\gamma,\eta} f(z) = \begin{cases} \frac{\Gamma(2-\gamma)\Gamma(2-\mu+\gamma)}{\Gamma(2-\gamma+\eta)} z^\gamma J_{0,z}^{\mu,\gamma,\eta} f(z), 0 \leq \mu < 1 \\ \frac{\Gamma(2-\gamma)\Gamma(2-\mu+\gamma)}{\Gamma(2-\gamma+\eta)} z^\gamma I_{0,z}^{-\mu,\gamma,\eta} f(z), -\infty \leq \mu < \infty \end{cases}$$

Here  $J_{0,z}^{\mu,\gamma,\eta}$  and  $I_{0,z}^{-\mu,\gamma,\eta}$  are fractional differential and fractional integral operators [6] respectively.

Also

$$\begin{aligned} U_z^\mu f(z) &= \Gamma(2-\mu) z^\mu D_z^\mu f(z), -\infty < \mu < 1. \\ &= \Omega_z^\mu f(z) \end{aligned}$$

where  $D_z^\mu$  and  $\Omega_z^\mu$  are due to Owa [4].

Further at  $\gamma = 0, n = \lambda - 1, \mu = \lambda$  where  $\lambda > -1, U_{0,z}^{\mu,\gamma,\eta} f(z)$  reduces to  $D^\lambda f(z)$

. Here  $D^\lambda$  is the Ruscheweyh derivative [5] of order  $\lambda$  which is defined as

$$D^\lambda f(z) = z + \sum_{n=2}^{\infty} \frac{(\lambda+1)(\lambda+2)\dots(\lambda+n-1)}{(n-1)!} a_n z^n, \quad \lambda > -1, z \in \Delta.$$

**Definition 1.1:** A function  $f(z)$  of the form (1.4) is said to be in the class  $P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  if the following inequality holds

$$(1.6) \quad \left| \frac{\frac{z(U_{0,z}^{\mu,\gamma,\eta} f(z))''}{(U_{0,z}^{\mu,\gamma,\eta} f(z))'} + \alpha}{\alpha \frac{z(U_{0,z}^{\mu,\gamma,\eta} f(z))''}{(U_{0,z}^{\mu,\gamma,\eta} f(z))'} + (1+\delta)} \right| < \beta, \text{ for } z \in \Delta, 0 < \alpha < \frac{1}{2}, \frac{1}{2} \leq \beta < 1, 0 \leq \delta \leq \frac{1}{2}.$$

The class  $P_{0,z}^{\lambda,0,\lambda-1}(1-\alpha, \beta, 1-\delta)$  reduces to  $N(\alpha, \beta, \delta, \lambda)$  which was studied by Atshan etc. [1].

In this paper, coefficient inequalities, distortion theorem as well as closure theorem for the class  $P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  are obtained. Also radii of starlike and convexity are also obtained for the functions of this class.

### 2. COEFFICIENTS ESTIMATES

**Theorem 2.1:** A necessary and sufficient for  $f(z)$  of the form (1.1) to be in the class  $c$  is that

$$(2.1) \quad \sum_{n=2}^{\infty} n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)a_n \leq \{\beta(1+\delta) - \alpha\}.$$

$$(2.2) \quad \text{where } \varphi(n) = \frac{(2-\gamma+\eta)_{n-1}(2)_{n-1}}{(2-\gamma)_{n-1}(2-\mu+\eta)_{n-1}}$$

$$\text{and } -\infty < \mu < 1, -\infty < \gamma < 1, \eta \in R, 0 < \alpha < \frac{1}{2}, \frac{1}{2} \leq \beta < 1, 0 \leq \delta \leq \frac{1}{2}.$$

The result (2.1) is sharp for the function

$$(2.3) \quad f(z) = z + \frac{\{\beta(1+\delta) - \alpha\}}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)} z^n, n \geq 2.$$

**Proof:** Assume that the inequality (2.1) holds true and let  $|z|=1$ , then we have

$$\begin{aligned} & \left| z(U_{0,z}^{\mu,\gamma,\eta} f(z))^{n+\alpha}(U_{0,z}^{\mu,\gamma,\eta} f(z))' - \beta \left| \alpha z(U_{0,z}^{\mu,\gamma,\eta} f(z))^{n+(1+\delta)}(U_{0,z}^{\mu,\gamma,\eta} f(z))' \right| \right| \\ &= \left| \alpha + \sum_{n=2}^{\infty} n(n-1+\alpha)\varphi(n)a_n z^{n-1} \right| - \beta \left| (1+\delta) + \sum_{n=2}^{\infty} n\{(n-1)\alpha + 1+\delta\}\varphi(n)a_n z^{n-1} \right| \end{aligned}$$

$$\leq \sum_{n=2}^{\infty} n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)a_n - \{\beta(1+\delta) - \alpha\} \leq 0 \text{ by}$$

hypothesis.

Hence by maximum modulus principle,  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$ .

For converse part, suppose that  $f$  defined by (1.4) is in the class  $P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$ .

Hence

$$\left| \frac{z(U_{0,z}^{\mu,\gamma,\eta} f(z))'' + \alpha(U_{0,z}^{\mu,\gamma,\eta} f(z))'}{\alpha z(U_{0,z}^{\mu,\gamma,\eta} f(z))'' + (1+\delta)(U_{0,z}^{\mu,\gamma,\eta} f(z))'} \right| = \left| \frac{\alpha + \sum_{n=2}^{\infty} n(n-1+\alpha)\varphi(n)a_n z^{n-1}}{(1+\delta) + \sum_{n=2}^{\infty} n\{(n-1)\alpha + 1 + \delta\}\varphi(n)a_n z^{n-1}} \right| < \beta.$$

Since  $\operatorname{Re}(z) \leq |z|$  for all  $z$ , we have

$$\operatorname{Re} \left\{ \frac{\alpha + \sum_{n=2}^{\infty} n(n-1+\alpha)\varphi(n)a_n z^{n-1}}{(1+\delta) + \sum_{n=2}^{\infty} n\{(n-1)\alpha + 1 + \delta\}\varphi(n)a_n z^{n-1}} \right\} < \beta.$$

Let  $z \rightarrow 1^-$  through real axis, we obtain the inequality (2.1). Finally, the function

$$f(z) = z + \frac{\{\beta(1+\delta) - \alpha\}}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)} z^n, n \geq 2.$$

follows the sharpness.

**Theorem 2.2:** If  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$ , then

$$(2.4) \quad a_n \leq \frac{\{\beta(1+\delta) - \alpha\}}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)}, n \geq 2.$$

### 3.GROWTH AND DISTORTION THEOREMS

**Theorem 3.1:** Let  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  Then for  $|z| = r$  where  $z \in \Delta$

$$(3.1) \quad r - \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r^2 \leq |f(z)| \leq r + \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r^2$$

$$(3.2) \quad \text{where } \varphi(2) = \frac{2(2-\gamma+\eta)}{(2-\gamma)(2-\mu+\eta)}$$

and equality holds true for the function

$$(3.3) \quad f(z) = z + r + \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} z^2$$

**Proof:** In view of inequality (2.1), it follows that

$$\sum_{n=2}^{\infty} n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)a_n \leq \{\beta(1+\delta) - \alpha\}$$

or

$$2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2) \sum_{n=2}^{\infty} a_n \leq \{\beta(1+\delta) - \alpha\}$$

or

$$(3.4) \sum_{n=2}^{\infty} a_n \leq \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)}$$

Thus for  $|z| = r < 1 \in \Delta$

$$|f(z)| \leq |z| + \sum_{n=2}^{\infty} |a_n| |z|^n \leq r + r^2 \sum_{n=2}^{\infty} a_n$$

or

$$(3.5) |f(z)| \leq r + \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r^2$$

and

$$|f(z)| \geq |z| - \sum_{n=2}^{\infty} |a_n| |z|^n \geq r - r^2 \sum_{n=2}^{\infty} a_n$$

or

$$(3.6) |f(z)| \leq r - \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r^2$$

On using (3.5) and (3.6), (3.1) follows.

**Theorem 3.1:** Let  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  Then for  $|z| = r$  where  $z \in \Delta$

$$(3.7) \quad 1 - \frac{\{\beta(1+\delta) - \alpha\}}{[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r \leq |f'(z)| \\ \leq 1 + \frac{\{\beta(1+\delta) - \alpha\}}{[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)} r$$

and equality holds true for the function given by (3.3).

**Proof:** Using inequality (2.1), it follows that

$$\sum_{n=2}^{\infty} a_n \leq \frac{\{\beta(1+\delta) - \alpha\}}{2[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(2)}$$

Thus for  $|z| = r < 1 \in \Delta$

$$|f'(z)| \leq 1 + \sum_{n=2}^{\infty} n |a_n| |z|^{n-1} \leq 1 + 2r \sum_{n=2}^{\infty} a_n$$

or

$$(3.8) \quad |f'(z)| \leq 1 + \frac{\{\beta(1+\delta) - \alpha\}}{[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(2)} r$$

and

$$|f'(z)| \geq 1 - \sum_{n=2}^{\infty} n|a_n||z|^{n-1} \geq 1 - 2r \sum_{n=2}^{\infty} a_n$$

or

$$(3.9) \quad |f'(z)| \geq 1 - \frac{\{\beta(1+\delta) - \alpha\}}{[(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(2)} r$$

On using (3.8) and (3.9), (3.7) follows.

#### 4.CLOSURE THEOREM

**Theorem 4.1:** Let

(4.1)

$$f_1(z) = z \text{ and } f_n(z) = z + \frac{\{\beta(1+\delta) - \alpha\}}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(n)} z^n, n \geq 2$$

then  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  if and only if it can be expressed in the form

$$(4.2) \quad f(z) = \sum_{n=1}^{\infty} \lambda_n f_n(z) \text{ where } \lambda_n \geq 0 \text{ and } \sum_{n=1}^{\infty} \lambda_n = 1.$$

**Proof:** Let  $f(z)$  can be expressed in the form (4.2), then

$$f(z) = \sum_{n=1}^{\infty} \lambda_n f_n(z) = z + \sum_{n=2}^{\infty} \frac{\{\beta(1+\delta) - \alpha\} \lambda_n}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(n)} z^n$$

Then

$$\sum_{n=2}^{\infty} n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(n) \times \frac{\{\beta(1+\delta) - \alpha\} \lambda_n}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(n)}$$

$$= \{\beta(1+\delta) - \alpha\} \sum_{n=2}^{\infty} \lambda_n = \{\beta(1+\delta) - \alpha\} (1 - \lambda_1) \leq \{\beta(1+\delta) - \alpha\}.$$

Hence  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$  by using Theorem (2.1)

Conversely let  $f(z) \in P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$ . From Theorem (2.1) we have

$$a_n \leq \frac{\{\beta(1+\delta) - \alpha\}}{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\rho(n)}, n \geq 2.$$

Setting

$$\lambda_n = \frac{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)}{\{\beta(1+\delta) - \alpha\}}$$

and  $\lambda_1 + \sum_{n=2}^{\infty} \lambda_n = 1.$

It follows that  $f(z) = \sum_{n=1}^{\infty} \lambda_n f_n(z).$

### 5. RADII OF STARLIKENESS AND CONVEXITY

**Theorem 5.1:** Let the function  $f(z)$  given by (1.4) be in the class  $P_{0,z}^{\mu,\gamma,\eta}(\alpha, \beta, \delta)$ , then

(i)  $f(z)$  is starlike in the disk  $|z| < r_1$  of order  $\phi$  ( $0 < \phi < 1$ ), where

$$(5.1) \quad r_1 = n \geq 2 \left\{ \frac{(1-\phi)n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)}{(n-\phi)\{\beta(1+\delta) - \alpha\}} \right\}^{\frac{1}{n-1}}$$

(ii)  $f(z)$  is convex in the disk  $|z| < r_2$  of order  $\phi$  ( $0 < \phi < 1$ ), where

$$(5.2) \quad r_2 = n \geq 2 \left\{ \frac{(1-\phi)[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)}{(n-\phi)\{\beta(1+\delta) - \alpha\}} \right\}^{\frac{1}{n-1}}$$

**Proof:**(i) It is enough to highlight that

$$\left| \frac{zf'(z)}{f(z)} - 1 \right| \leq \frac{\sum_{n=2}^{\infty} (n-1)a_n z^{n-1}}{1 + \sum_{n=2}^{\infty} a_n z^{n-1}} \leq 1 - \phi.$$

or  $\frac{\sum_{n=2}^{\infty} (n-1)a_n |z|^{n-1}}{1 - \sum_{n=2}^{\infty} a_n |z|^{n-1}} \leq 1 - \phi$

The last inequality holds true if

$$\sum_{t=p+1}^{\infty} \frac{(n-\phi)}{(1-\phi)} a_n |z|^{n-1} \leq 1.$$

In view of (2.1), the last inequality is true if

$$\frac{(n-\phi)}{(1-\phi)} |z|^{n-1} \leq \left\{ \frac{n[(n-1)(1-\alpha\beta) + \alpha - \beta(1+\delta)]\varphi(n)}{\{\beta(1+\delta) - \alpha\}} \right\}$$

which when solved for  $|z|$  yields (5.1).



(ii) Using the fact that  $f(z)$  is convex if and only if  $zf'(z)$  is starlike, result (5.2) follows.

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## CONTENT BASED AUDIO RETRIEVAL USING SPECTRAL ANALYSIS

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### Abstract

Data retrieval is the most popular field of research today. Data is being created on a high pace and in varied formats. As other multimedia data, unprocessed audio recordings are analyzed and characterised based on abrupt changes of features. Then, audio segments are classified and indexed. Whenever we wish to fetch the audio samples from the collection, we may put a set of features or a query audio clip into the computer. The search engine will then find similar matched audio clip in response to the query.

This paper illustrates a simple algorithm for audio retrieval using Content Based Audio Retrieval (CBAR) Technique. The analysis is based on Pitch and Formants the basic audio features.

**Keywords:** Content based audio retrieval, Data retrieval, Formant analysis, pitch.

### Introduction

A lot of work is constantly being in process for Content Based Retrieval for images. But during past few years there is a rapid growth of multimedia data and there is a great need to develop methods for generation, storage, transmission and retrieval of the same. Out of these operations the timely and efficient retrieval of data is very crucial (Y. Rui, T.S. Huang, and S.-F. Chang, 1999).

In general the Retrieval methods are classified into following categories:

**i) Text Based Retrieval:** The retrieval that is based on Text analysis involves adding data related to data such as caption, keywords or other explanatory terms so that fetching of the content can be performed over the annotation words, mainly performed by Google, Yahoo etc. This resembles the traditional algorithms of text and keyword based search (K. Chang and A. Hsu, 1992).

**ii) Content-Based Retrieval:** The method of fetching data from a database on the basis of inherent features (such as color, texture and shape for images and videos and pitch, contour, crossing rate for audios) automatically extracted from the data themselves. This is now one of the most popular methods used in data retrieval. And came out to be much efficient than the traditional text based retrieval.

The traditional text or key based procedure exhibits a lot of drawbacks while performing the annotation. Few of the drawbacks are mentioned here:

- (1) It is difficult to demonstrate a lot of things such as feelings or situations.
  - (2) Digital data is increasing at a large pace, annotation can become a never end.
  - (3) There are different ways of explaining the same thing
  - (4) There may be issues related to of spelling, grammar and abbreviations.
- Therefore, to remove the drawbacks of traditional system the Content-Based Retrieval Systems (CBRS) were introduced .

Lot of systems based on Content similar retrieval has been developed for retrieval of images and videos. CBAR systems are devised in recent year based on the mechanism of image and video retrieval. For such systems, compact and more comprehensive music representation along with more efficient indexing structures and retrieval strategies would be main consideration (Flickner, M., Sawhney, H. and et al, 1995).

The audio clips both speech or music only is treated as a signal waveform. The algorithms uses zero crossing rate, Envelope (Centroid, Kurtosis, Spread, Skewness, Flatness, Roll-off, Entropy, and Irregularity), spectrums and Filter banks which include pitch and clarity.

Figure 1 shows the processes that are involved in the Audio Retrieval methodology:

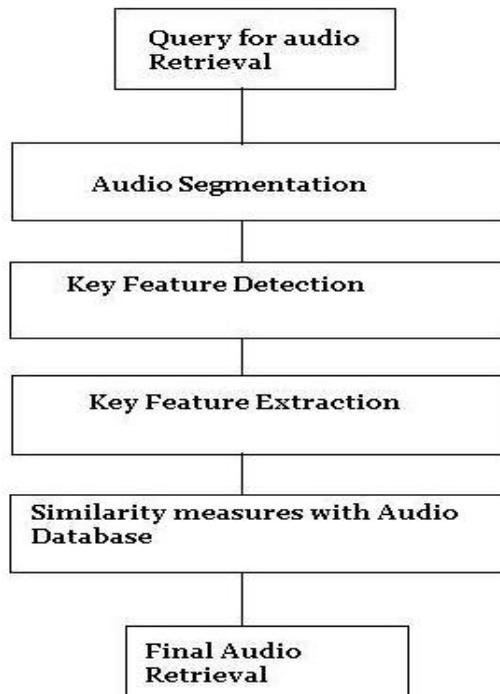


Fig 1 Basic Audio Retrieval Process



## Methodology

The following paper illustrates a simple algorithm to retrieve audios from audio data base. The two basic audio features used are Pitch and Formants Analysis to gather features about audios to develop a simple Content Based Retrieval (J. Foote et al, 1997).

### A) Pitch and Formants Analysis for Musical Instruments Audio Retrieval

The algorithm used here is designed to find a group of audio that most likely matches with the query clip based on the average pitch of the clips as well as the location of the formants in the frequency domain representation.

The Audio Retrieval section of this project can be divided into different steps:

- i. Browse the query audio clip.
- ii. Plot the waveforms of the clip in Time and Frequency domain.
- iii. Plot the Pitch and Formants of the query clip.
- iv. Compare the waveforms and other features with other clips in the database.
- v. Retrieve the closest clips.

#### a) Pitch analysis

The Pitch of the audio or sound we mean the level of highness or lowness a sound (E. Wold, T. Blum, D. Keslar, and J. Wheaton, 1996). For the project Pitch analysis was carried out and related parameters were found so that fetching process can take place. The average pitch value of the total data set is computed. The plot of the pitch contour with time is plotted to visualize the variation in pitch. This output is used for instrument recognition and retrieval purposes.

#### b) Formant analysis

Along with the pitch analysis Formant Analysis is also carried out. Formant is the name given to the different power spectral of audio files (S. Z. Li, 2000). The five peaks values of the power spectral density are calculated and the first three are depicted in the formant plot. The vector position of the peaks in the power spectral density is found out and can be used to fetch audio file (S. Pfei\_er, S. Fischer, and W. E\_elsberg, 1996) .

## Results and Discussion

### a) Data set:

For the experimental verification of the proposed system a total of 52 audio clips of different musical instruments are grouped into 8 groups. The audio clips that are used to illustrate the retrieval process have .wav extension. They are almost similar to AIF files, most commonly used in Windows operating systems. These files are based on Resource Interchange File format (D. Roy and C. Malamud, 1997). Benefit of using .wav is that they are lossless and uncompressed but there is no restriction on the file type, .mp3, mp4 etc also work well with the algorithm.



**b) Numerical Results**

Query Clips	Average Pitch
1.wav	185.2245
2.wav	210.0407
3.wav	71.6915
4.wav	173.6220
5.wav	0 0
6.wav	68.6916
7.wav	260.9467
8.wav	176.2532

**TABLE I : AVERAGE PITCH OF QUERY CLIPS**

Query clips	Pitch correlation
1.wav	0
8.wav	8.9713
4.wav	11.6025
2.wav	24.8161
7.wav	75.7222
3.wav	113.5330
6.wav	116.5329
5.wav	185.2245

**TABLE III : Pitch correlation of 1.av with other clips**

The above two tables shows the experimental data for the identification of the audio clips. The simple calculation of the reference clip pitch values is jotted down in the table.

The second table shows the pitch correlation of the query clip with the all other reference clip so that the difference between the values can be calculated. Correlation is used to estimate the association between the pitch of the sound clips.

### Screen Shots

The given project is implemented in form of GUI (Graphical User Interface). The following screen shots display the different modules that are implemented in the project for audio retrieval. The project is developed in MATLAB. Any high level language can be used for the implementation point of view.

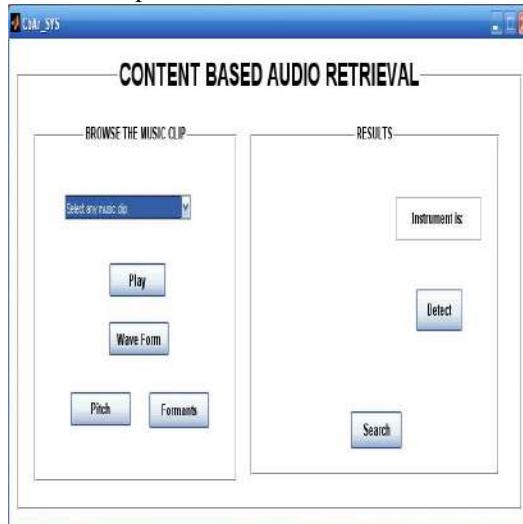


Fig 2 Front page of Audio retrieval system

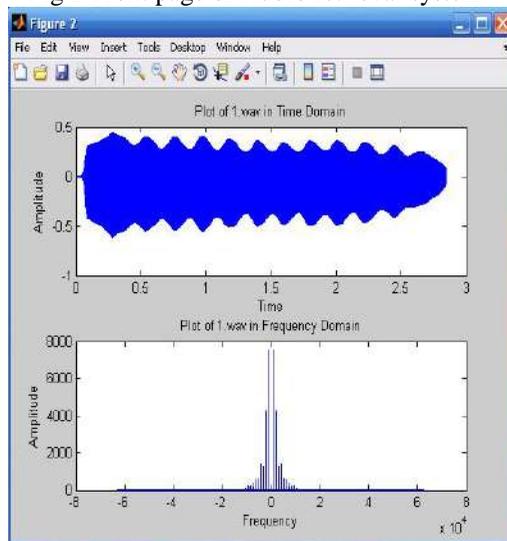


Fig 3 Plots of selected clip in time and frequency domain

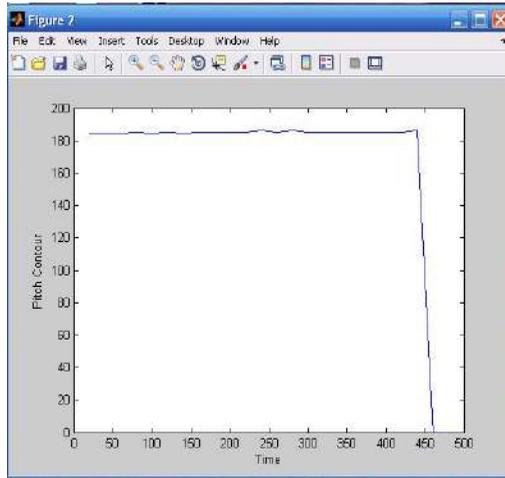


Fig 4 Pitch contour of the audio clip

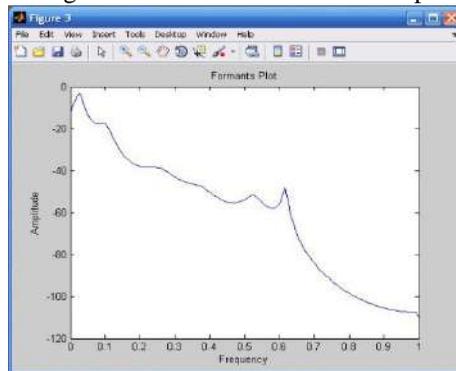


Fig 5 Formants Plot of the audio clip

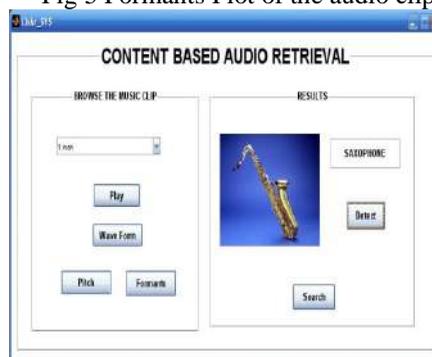


Fig 6 Detection of Instrument



Fig 7 Instrument Detection



Fig 8 Searched results

## CONCLUSION

Data retrieval is an important research area. A lot of innovations are been made in this area. This paper presents a new method aiming to reduce the retrieval time and better results of a content based retrieval system. Audio retrieval module makes use of pitch and power spectrum as features used to extract similar sounding audios and instrument recognition. Apart from this the Audio Retrieval module of the project just deals with single musical instrument clip, it can be further extended to speech, sound and sound mixtures, A different threshold value can be considered so as to include different sounds and cover a large range of pitch and other parameters.



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## A STUDY ON THE ROLE OF TEXTILES DURING COVID -19

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### ABSTRACT

The basic needs of a human being are food clothes and shelter. A global pandemic infected the human race with a virus called corona covid-19. There is an influence on culture of the essential needs of human beings. Clothing plays a key role in the community, where it is primarily used as a protection. A study is carried out on Textiles having a greater effect on us during this pandemic. The Masks, Personal Protective Equipment and gloves that are also used by a common man are the developments of a textile product. The study on Textiles made of synthetic fabrics having a significant role. Woven, knitted and unwoven technology benefits people in various ways. The role of textiles and textile development in India has a greater impact during this break.

**Keywords:** PPE, protective textiles, medical textiles, polyester, Gloves, Nonwoven, Masks, Knitted, Woven

### Introduction

The Protection of human life from environmental conditions and now such virus that affects the body and life has always been a key requirement of textile products. There are innovations of textiles in the form of antiviral textile finishes and fibers. Medical textiles are the boon to the textile industry as they provide protection to the human so they can also be considered Protective textiles. With the help of coating, finishing and micro encapsulation the textiles provides safety to the mankind. The properties of the natural fibers and the manmade fibers differs .Each fibers has its own properties .Compared to manmade fibers the natural fibers have a good absorbency, cohesiveness, handle properties. The natural fibers have an inbuilt moisture regain ability .The synthetic fibers as though they are made of chemicals the major of these properties are low. Synthetic fibers have good strength, toughness, toughness, heat resistance, mildew, ability to stay in a pressed state.

Synthetic fibers are made of polymers that are by-products of petroleum or natural gas. Despite of these properties, protective textiles and Health care and hygiene products in medical textiles are made of synthetic fibers. Fabrics manufactured from Cotton are used in Surgical clothing gowns, Bedding, Sheets, Pillow cover, Uniforms, Surgical hosiery. The Viscose is used in manufacturing of Caps, Masks, Wipes. Polyester a main part in today's scenario is used in Gowns, Masks, Surgical cover drapes, Blankets, Cover stock Poly amide in surgical hosiery .The Polypropylene in Protective clothing which is at the most important for the real heroes working over with covid-19 to save our world Polyethylene in Surgical covers, Drapes,



Glass fibers in the form of Caps and mask and Elastomeric for Surgical hosiery. Furthermore, fabric-forming structures play a significant role in medical and protective textiles. Knitting fabrics are used in the form of masks, bandages and socks. Woven fabrics are used in sheets, blankets and gowns. Nonwovens play a major role in medical textiles in the forms of specific needs.

Non woven are formed by the formation of web, entanglement and binding or fusing of fibers .These can be manufactured as per the required as woven and knitted .The use of these fabrics and fabric manufacturing technology paved a great way for various industries in the world. It is known that the use of technical textiles is in ones day to day life.

The main objectives of this study are

- Review of the textile products used during covid 19
- Examination of the fibers and Finishes used in those products
- Assessment of the properties of these items
- Indian textile industries engaged in development
- Indian Culture accordance with today's Pandemic

### **Textile products as Protective and medical Textiles**

During this outbreak of the Corona Covid 19, there was a massive demand for masks used to cover the ears. The 3 ply nonwoven face masks were used mainly for prevention purposes. Due to the high demand of the masks, Knitted fabrics and woven fabrics are made into masks and meant to use regularly as reusable. Gloves are primarily used by doctors, nurses and civil servants who are not protected outside. They are susceptible to different individuals and conditions that can directly affect them. Personal protective equipment is the main and important textile commodity to be developed for the protection of human beings. They are used by hospitals and all other staff in close communication with patients. They are completely wrapped in clothing that prevents the virus from reaching the body's surface. Head and face covers, shoes, bed covers, napkins, handkerchiefs, sheets, towels are some other textiles used as protective textiles in the form of masks. Some fasteners, such as buttons, elastics, etc., are also used along with these materials. Many of the other items used along with these are wipes, towels, wraps, etc. Some of these cloth products ensure human health and therefore avoid the virus from invading the body.

### **Fibers in the Products of Protective Textiles**

Fibers are the essential raw materials of a textile product. There are hundreds of fibers ranging from natural to man-made fibers and synthetic fiber developments called regenerated fibers. Each of these fibers has certain properties that satisfy the required needs and specifications. Many natural fibers, such as cotton, hemp, linen, bamboo and silk, have absorbency and cohesion properties. Many of the regenerated and man-made fiber polyester, polyamide, glass, nylon, has the strength and strength



that is most necessary at the moment. Many other fabrics have antibacterial and fungal properties that may be suitable for certain products.

The main aim of any Protective textile product is the protection of mankind and resistance to any viral infections which is approximately 80–200 nm in diameter. The knitted fabrics can be used when the loop length is reduced to the maximum and has the high tightness factor. The woven fabrics cover factor should be at the almost finest stage so that the micro particles cannot penetrate through them. The non woven fabrics are best suited for the protective textiles as they are bounded together or fused so that the porosity of the fabrics is low. The regenerated fibers which are made up of wood pulp also have some antibacterial and antimicrobial properties. These can also be used as masks, wipes etc. Finishes can also be given to any fabric that may help to prevent the penetration of microorganism. There are many finishes natural and chemical and some water resistant that can be incorporated into the textiles. The Textiles can be finished with Curcumin (Turmeric), Indica (Neem), Ocimum(Tulsi),Oregano(mint), sage, Lemon, Echinacea and many more metals such as silver copper etc can be given to have an antiviral effect on garments .

### **Properties of Textile Products**

The PPE Personal Protective Equipment which is mainly used as Medical textiles consists of a Face mask, Hand gloves, Face covers, Boot Cover and a Protective Suit. These are particularly made of 100% Polyester, Nonwoven Fabric of 90GSM. They are given specifications according to the World Health Organization. The test title include Resistance to blood penetration , Resistance to Blood penetration with Virus, Other physical properties of Tearing Strength, Tensile Strength, Puncture Resistance, Abrasion Resistance, Bias Weight and Seam strength. Three (3) ply, fluid-resistant masks are > 99 percent Bacterial Filtration Efficiency (BFE) at 5 micron capacity; > 95 percent Bacteria Filtration Efficiency (BFE) at 3 micron capacity. Reduces access to blood and body fluids. Minimizes contamination of patients with exhaled microorganisms. This product is intended for use in infection prevention procedures. It is made of Spun bound polypropylene for inner and outer facing of mask. The N 95 respirator mask consists of four layers of material: the outer layer of spun-bond polypropylene, the second layer of cellulose / polyester, the third layer of melted polypropylene filter material and the inner (fourth) layer of spun-bonded polypropylene. The second layer masks are inbound with copper and zinc which forms an ionic bond with negatively charged side groups of virus. Similarly these materials are used to produce all the other protective textiles.

### **Indian textile industries engaged in development**

Indian Ministry of Textile paved a perfect way to help the good man during this pandemic. Many fabric and apparel industries have come up with new innovations in the development of the PPE suit, gloves and mask. The Ministry of Textiles has introduced the Unique Certification Code for the Manufacturing Industry to improve



production. The PPE should be developed as per the WHO specification and Requirements. These tests will be conducted by SITRA and DRDE and the approval will be given with the code and specific number. Around 2.06 lakhs PPE suits were manufactured each day within two months from the Corona Outbreak in India. Some of the Industries manufacturing PPE suits are Alok Industries, JCT Phagwara, Gokaldas Exports, Aditya Birla, shiva tex fabs etc. Nearly a hundred factories are open in Tirupur, with special permission to cover this vital life-saving face in the midst of a country-wide lockdown to tackle the spread of corona virus. The factory of Melange Polymers Pvt Ltd, which has been in business for quite some time, produces 50,000 masks every day, using 2,000 machines and about 200 employees. Likewise small scale industries and domestic markets are on to the stage today in manufacturing masks and other necessities. Government has taken certain initiatives in providing the needs to the hospitals and people.

### **Indian Cultural Practices**

In India, there are many traditions and practices that have been practiced since ancient times. In the present scenario, they are considered to be less significant. Some of the cultures and traditions are placed on us by saying that they have some religious significance, even though they are scientifically established. The new generation of our Indian Society follows other cultures without knowing our values. The Traditional Garments of India are mainly fully covered for men and women. They wear garments such as dhotis, Shirts, Salwars, Kurtis etc. Whatever they wear they have separate piece of cloth or shawls on their head. Men in almost every part of India wear a head dress or a cap. Women prefer Saris, lehngas, Cholis, salwar and Kameez all with a long shawl flowing from their head. These may be a part of Tradition but today in this pandemic it is very essential to cover the full body. The most important tradition in India is wearing Ornaments and Accessories made of Gold, Silver and Bronze. Many of these metals are used by men, women and children as necklaces, anklets, bracelets, hip belts, nose rings, earrings, finger rings, toe rings, etc. These metals tend to have antiviral properties. In today's Pandemic WHO advises not to touch the eyes, nose or mouth with hands not cleaned. If these ornaments are worn, metals may prevent the virus from entering the body. There are many herbs and Medicinal Plants in ancient India as per ayurveda which may provide solution to CoV. Some of the examples are Turmeric and Santalum album that are used regularly by men and women in India.

### **CONCLUSION**

The Textile Industry incorporated with the medial textiles has contributed some of its advancement for the benefit of the world during this period. The PPE, Masks and Gloves are very much important for the prevention and safety measure of a human life. Indian Industry effortlessly is working towards the manufacturing of these aids for the hospitals and Civil Servants. In this Study it is analyzed that the role of Textiles during this Covid 19 era has aimed at the protection and safe guard the human lives. Some of the Traditions of Indian cultures are back from the ancient period such as washing hands



and feet before entering house, A practice a saying Namasthe, use of Turmeric, neem leaves etc.The Traditional values from our ancestors provide much beneficial to the mankind when comes to existence.

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## BITCOIN PRICE PREDICTION USING MACHINE LEARNING

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Under The Guidance

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### Abstract

-In this paper, we tried to estimate the price of bitcoin keeping in mind the various parameters that affect the price of bitcoin. In our work, we indicated understanding and recognizing the daily changes in the bitcoin market, while getting information about the most appropriate features around the price of bitcoin. We predict the daily price of bitcoin change with the highest possible accuracy. The market capitalization of publicly-traded cryptocurrencies is currently above \$ 230 billion. Bitcoin is one of the most valuable cryptocurrencies and serves primarily as a digital store of value, and its price prediction has not been well studied. These characteristics are outlined in the following subsection; The underlying details of bitcoin as they are described in depth in the cited papers.

**Keywords-** Bitcoin, Cryptocurrency, Reference Layer, Timestamp, Blockchain.

### 1.INTRODUCTION

#### A. Bitcoin:

Bitcoin uses peer-to-peer technology to work with no central authority or banks. Bitcoin is open-source technology; Its design is for the public and, no one owns or controls Bitcoin, and everyone can participate. The digital currency was used as open-source software in 2009 by pseudonymous producer Satoshi Nakamoto. It is called cryptocurrency, because it uses cryptography to control the creation and transfer of money. Users send payments by broadcasting digitally signed messages over the network. The participants are known as miners and have a timestamp transaction in a shared public database called blockchain, for which they are rewarded with transaction fees and newly minted bitcoins. Traditionally "bitcoin" refers to capitalized technology and networks while "bitcoin" refers to the lowercase currency itself. Can be bitcoin obtained by mining or in exchange for products, services, or other currencies like dollars, Rupee, etc.

#### B. Prediction :

The value of bitcoin varies like any other stock. Several algorithms are used on stock market data for price forecasting. However, the parameters affecting bitcoin are different. Therefore foretelling the value of bitcoin is necessary so that the right investment decisions can be made. The price of bitcoin does not depend on business events or intervening government officials, unlike the stock market. Thus, to estimate

the value we feel it is necessary to leverage the machine learning [6] [7] technique to estimate the price of bitcoin.

## II.LITERATURESURVEY

### —Using the Ensemble of Bitcoin Price Prediction Neural Network [5].

Here he explored the relationship between features of bitcoin and the next day price of bitcoin using an artificial neural network ensemble approach using a genetic algorithm-based selective neural network ensemble, he has constructed neural networks with multi-layered perceptrons. In order to better understand the practicality and its effectiveness in a real-world application, a set of about 200 features of a cryptocurrency over a period of 2 years using the unit to estimate the next day's direction of bitcoin price Was. Over a period of 50 days, a trading strategy based on ensemble was compared against a dayprepret day trend following testing trading strategy via back-testing. The former trading strategy generated around 85% return, the apparent trading trend followed by the average trading strategy, which produced around 38% return, and a trading strategy that followed the best MLP (multilayer perceptron) model in singles that About 53 occurred. In% return.



**Fig.I Bitcoin Price History**

## III.DATASETS

The primary dataset includes the price of bitcoin between October 10, 2015, and March 01, 2019 at an interval of approximately one hour.

**TABLE I -SAMPLE DATASET**

Date	Open	High	Low	Close	Volume
2018-10-25 23:00:00	6405.08	6408.66	6405.08	6408.66	0.04456267
2018-10-25 22:00:00	6397.5	6408.66	6394.84	6405.08	23.39852208
2018-10-25 21:00:00	6396.56	6402.63	6393.99	6397.5	35.4535606

The above dataset is downloaded from <https://www.cryptodatadownload.com>

#### IV. METHODS

Several models were evaluated on the task of estimating the directionality of bitcoin price changes. Classification models such as logistic regression (LR), support vector machines (SVM). Other models were based on regression algorithms, such as autoregressive integrated moving average (ARIMA). Models based on a recurrent neural network (RNN) were implemented and tested.

All of the models were assessed on how well they performed on the task, and these results are analyzed. The impetus for trying such a large number of models was to analyze how the assumptions underlying each of the respective models could affect the model's performance. The methods underlying these models and their assumptions are briefly summarized below.

##### A. Logistic Regression

It is a statistical method to examine a dataset in which there are one or more individualistic variables that determine an outcome. The outcome is measured with a divided variable ( only two possible outcomes). It is used to predict a binary outcome (1 / 0, Yes / No, True / False) given a set of independent variables. It is a predictive regression model in which the dependent variable is categorical. It uses Maximum Likelihood Estimation to formulate the probabilities in which Logistic Regression will take on a particular class.

$$h_{\theta}(x) = g(\theta^T x) = \frac{1}{1 + e^{-\theta^T x}}$$

where  $x$  is the input and  $\theta$  the parameter that must be learned.

### *B. Support Vector Machine*

Like logistic regression, the support vector machine algorithm yields a binary classification model while making very few assumptions about the dataset. The classifier is obtained by optimizing:

$$\min_{\gamma, w, b} \frac{1}{2} \|w\|^2$$
$$\text{s.t. } y^{(i)}(w^T x^{(i)} + b) \geq 1, \quad i = 1, \dots, m$$

where  $x$  is the input and  $w, b$  are parameters that must be learned. Predictions are made by analyzing the value of  $wax + b$ .

### **C. Auto-Regressive Integrated Moving Average (ARIMA)**

ARIMA is a model used for time series analysis and forecasting. The model is used on time series data which will be transformed into a stationary time series; the predictions are a linear regression upon features including time differences and moving averages. The implementation used is from the Stats models package (Seabold and Perktold, 2010). In ARIMA, the data is the difference that is, the price features are transformed into the difference between prices.

- ❖  $p$ : number of autoregressive terms.
- ❖  $d$ : number of nonseasonal differences needed for stationary
- ❖  $q$ : number of lagged forecast errors in the prediction equation

$$\left(1 - \sum_{k=1}^p \alpha_k L^k\right) (1 - L)^d X_t = \left(1 - \sum_{k=1}^q \beta_k L^k\right) \epsilon_t$$

Let  $L$  be the lag operator, in the above equation and  $p, d, q$  are hyper-parameters over which we optimized. At each time  $t$ , we train a model using price history to predict the price in time and use the sign of a change in price as a predictor.

### **D. Recurrent Neural Networks (RNN)**

The RNN (Recurrent Neural Network) was first developed by the scientist Elman. The RNN is structured similarly to MLP (multi-layer perceptron), with the exception that signals can flow both forward and backward in an iterative manner. To facilitate both backward and forward flow, an additional layer is called

the reference layer. In addition to the input between layers, the output of each layer is fed to the reference layer which is fed to the next layer. Next input In this context, the state is overwritten at each timestep. This provides the advantage of allowing the network to be specifically weighted to events that occur in an array with MLP rather than to the same weight of all inputs.

We used Long short-term memory(LSTM)cells. We tried different numbers of units for the layers, training times, and batch sizes. We have implemented the neural networks with both Keras and TensorFlow.

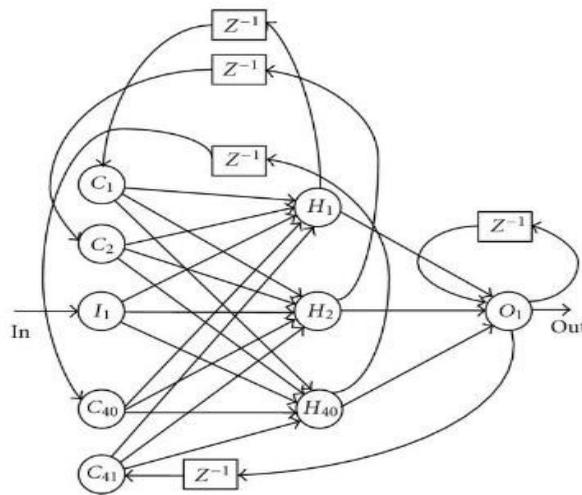


Fig 2 Diagram of RNN

## V.CONCLUSIONS

We have considered previous bitcoin transactions in which price and timestamp are used to estimate the price of bitcoin for the future. We used four methods for value predictions such as logistic regression, support vector machine, RNN and ARIMA. The prediction accuracy for these four methods is listed in Table 2. Of the four methods, ARIMA performs well for predictions for the following days, but performs poorly over the long term, such as forecasting prices for the next 5–7 days over the last few days. RNN performs continuously for 6 days. The assumptions of the logistic regression-based model were not violated, it is only able to accurately classify when a different hyperplane is present.



**TABLE II BITCOIN PRICE CHANGE PREDICTOR ACCURACIES**

Method	Accuracy
Logistic Regression	47%
SVM	48%
ARIMA	53%
RNN	50%

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## DESIGN AND FATIGUE ANALYSIS OF LEAF SPRINGS WITH DIFFERENT CROSS SECTION

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**Abstract.** Suspension system is the important part in the wheeled vehicles; it provides a smooth flow in the vehicles by absorbing the sudden loads and impact about the uneven road surfaces. There are several types of suspensions. When it comes to heavy vehicles leaf springs are used for suspension. The main advantage of these is that they can handle more weight when compared to the other types. Generally these springs fails because of heavy loads and fatigue, fatigue is caused due to repeated fluctuation of loads. Several researches and analysis have been done in order to reduce this fatigue and new materials are also added to study the behaviour of leaf spring with respective to the application of loads. In this paper we are mainly focusing on how the leaf springs respond or vary with the change in the cross section on member. We have varied the leaf spring cross sections to trapezoidal, rectangular and capsule. The cross sections are varied in such a way that they don't increase the weight of the vehicle in order to obtain better output results. Calculations have been done, the leaf springs are designed and analysis is done by using CATIA v5.

**Keywords:** Leaf Spring, Cross Sections, Fatigue, Frequency, Stability

### 1. Introduction

Now a day's several heavy machinery trucks and load carrying have been introduced to the market, the main success of these vehicles lies in how much amount of load they are carrying and ability to resist against shock absorptions. The drivers used to handle these vehicles by adding more amounts of loads without following the specification given to them. During this process evolution of suspension systems and the components in it have been developed the major component of this suspension system is springs and these are also developed on according to the type of load. The springs are basically classified as compression and expansion springs. Compression springs: The springs which carry compressive loads are known as compression springs. These springs compresses during the application of load and they return to the original shape when the load is removed, generally these are in the form of helical shape and these have a wide number of applications in industrial equipment, electronic instruments, toys, pens etc.,

Extension springs: These are also known as tension springs and these are wrapped closely together to hold the tension as much as possible. These springs have a hook to hold or to pull the load from two sides of the spring at each end. These spring include applications like farm machinery, toys, door assemblies, hanging weights etc., There several types' springs basing on their shape they are

1. Helical springs or coil springs
2. Torsion springs
3. Conical and volute springs
4. Disc or Belleville springs
5. Laminated or Leaf springs
6. Special purpose springs

## 2. Methodology

The cross sections that are considered in the paper rectangular, trapezoidal and capsule. Throughout the paper the thickness of cross sections are kept constant. The dimensions are as follows:

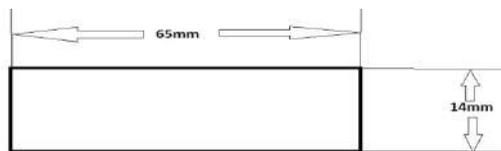


Fig-1: Rectangular Cross-section

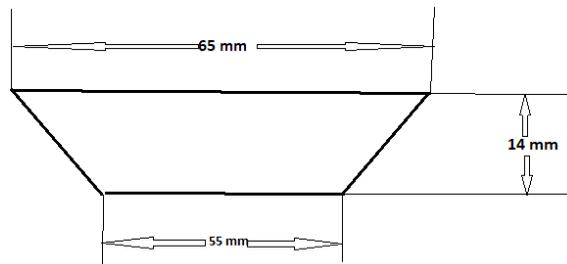


Fig-2: Trapezoidal Cross section

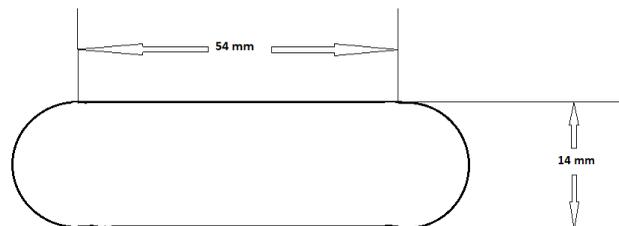


Fig-3: Capsule Cross Section

## 3. Material Specifications

Material	AISI 5150
Density	7850 kg/m <sup>3</sup>

Tensile Strength	1620 MPa
Yield Strength	1520 MPa
Modules of Elasticity	210 GPa
Possion Ratio	0.3

Table1: Material Specifications

#### 4. Design Parameters

Load	2000N
No. Of leafs	1
Thickness of leaf	14mm
Mesh size	5 mm
Mesh type	Tetrahedron

Table-2: Design Parameters



Fig-4: CAD Model of Leaf Spring with Rectangular Cross Section



Fig-5: CAD Model of Leaf Spring with Capsular Cross-section

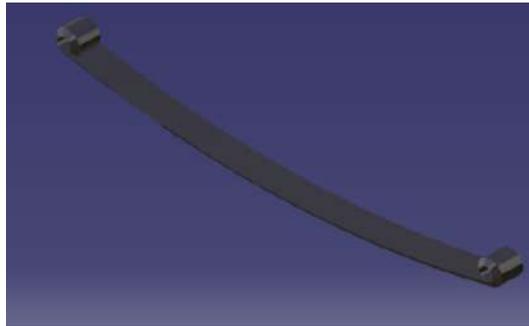


Fig-6: CAD Model of Leaf spring With trapezoidal Cross-Section

### 5. Static Structural Analysis

The Static analysis is carried out on the three cross-sections before fatigue analysis. The load of 1000N is acted on base and eyes are fixed.

The results are as follows

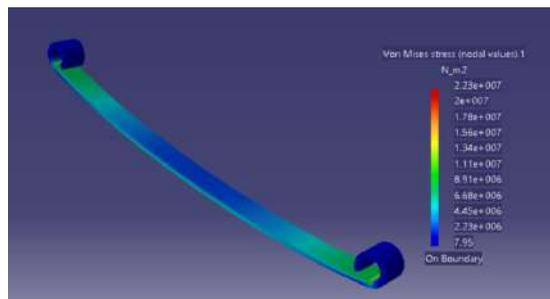


Fig-7: Stress in Rectangular Cross Section Leaf Spring

Max. Stress Induced = 2.23e+007 N/m<sup>2</sup>  
Max. Displacement = 0.122 mm

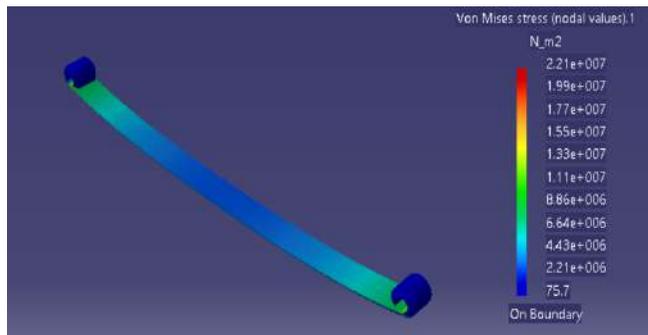


Fig-8: Stress in trapezoidal Cross-Section leaf spring

Max. Stress = 2.21e+007 N/m<sup>2</sup>  
Max. Displacement = 0.101 mm

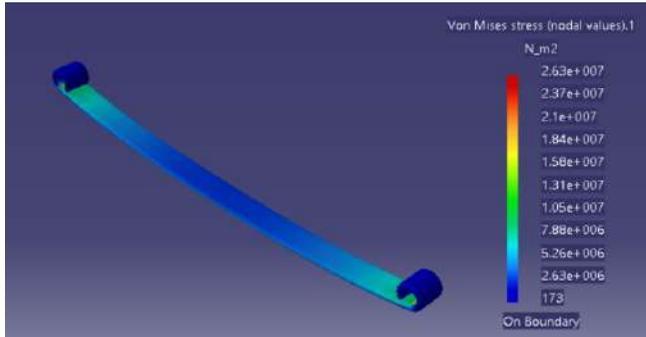


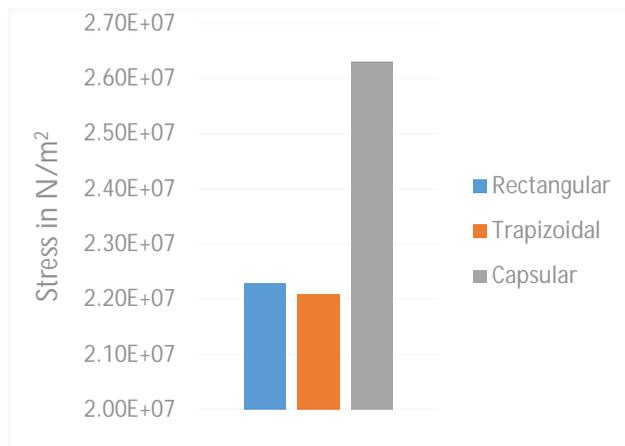
Fig-9: Stress in Capsular Cross-section leaf spring

Max. Stress = 2.63e+007 N/m<sup>2</sup>  
Max. Displacement = 0.0966 mm

## 6. Result of Static Structural Analysis

From the results of all three cross-sections the capsular cross-section leaf spring shown less deformation than other two cross-sections .Also, Trapizoidal cross-section Leaf spring shown less induced von mises stress compared to other two cross-sections.

Fig-10: Bar graph showing stress in different cross-sections



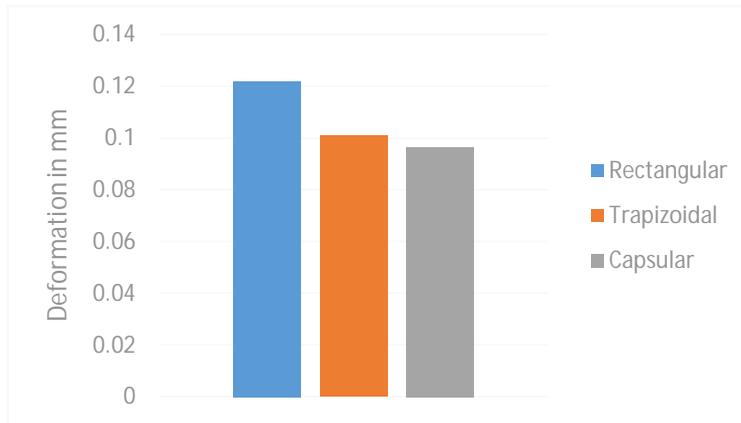


Fig-11: bar graph showing deformation in different cross-sections

### 7. Fatigue Analysis

With reference to static solution , the fatigue analysis is carried out. The result are as follows

S.No	Cross-Section	Life in Hz	Life in CPM
1	Rectangular	162	9720
2	Trapezoidal	149	8940
3	Capsular	151	9060

Table-3: Life of Different Cross-sections

#### 1. Calculation of life of Rectangular cross-section leaf spring

A) The CPM is further converted to CPD as follows

$$\begin{aligned} \text{CPD} &= \text{CPM} \times 60 \times 24 \\ &= 9720 \times 60 \times 24 \\ &= 139968000 \end{aligned}$$

B) Life calculation in days

Generally life is calculated for  $10^6$  cycles. So,

$$\begin{aligned} \text{Life in days} &= 10^6 / \text{CPD} \\ &= 0.07144 \end{aligned}$$

C) Let us consider the average speed of vehicle is 50Km/h

$$\begin{aligned} \text{Life in Km} &= 0.07144 \times 50 \times 24 \\ &= 85.73388 \text{ Km} \end{aligned}$$

#### 2. Calculation of life of trapezoidal Cross-section leaf springs

A) The CPM is further converted to CPD as follows

$$\begin{aligned} \text{CPD} &= \text{CPM} \times 60 \times 24 \\ &= 8940 \times 60 \times 24 \end{aligned}$$



$$= 12873600$$

B) Life calculation in days

Generally life is calculated for  $10^6$  cycles. So,

$$\text{Life in days} = 10^6/\text{CPD}$$

$$= 0.077678$$

C) Let us consider the average speed of vehicle is 50Km/h

$$\text{Life in Km} = 0.077678 \times 50 \times 24$$

$$= 93.214 \text{ Km}$$

3. Calculation of AISI 4130 steering shaft

A) The CPM is further converted to CPD as follows

$$\text{CPD} = \text{CPM} \times 60 \times 24$$

$$= 9060 \times 60 \times 24$$

$$= 13046400$$

B) Life calculation in days

Generally life is calculated for  $10^6$  cycles. So,

$$\text{Life in days} = 10^6/\text{CPD}$$

$$= 0.076649$$

C) Let us consider the average speed of vehicle is 50Km/h

$$\text{Life in Km} = 0.076649 \times 50 \times 24$$

$$= 91.97939 \text{ Km}$$

## 8. Conclusion

The paper analyzed by using different cross-section. Among in static structural analysis capsular cross-section leaf spring has shown less deformation and trapezoidal cross-section has shown less von mises stress.

When coming to the fatigue analysis, the rectangular cross-section can withstand the fatigue loads continuously up to 85.73388 Km, the trapezoidal cross-section can withstand the fatigue load continuously up to 93.214 km and the capsular cross-section can withstand the fatigue load continuously up to 91.97939 km.

Therefore, when the objective is to get minimum deformation the capsular cross-section is used and when the objective is to get maximum life it is prefer to use trapezoidal cross-section.

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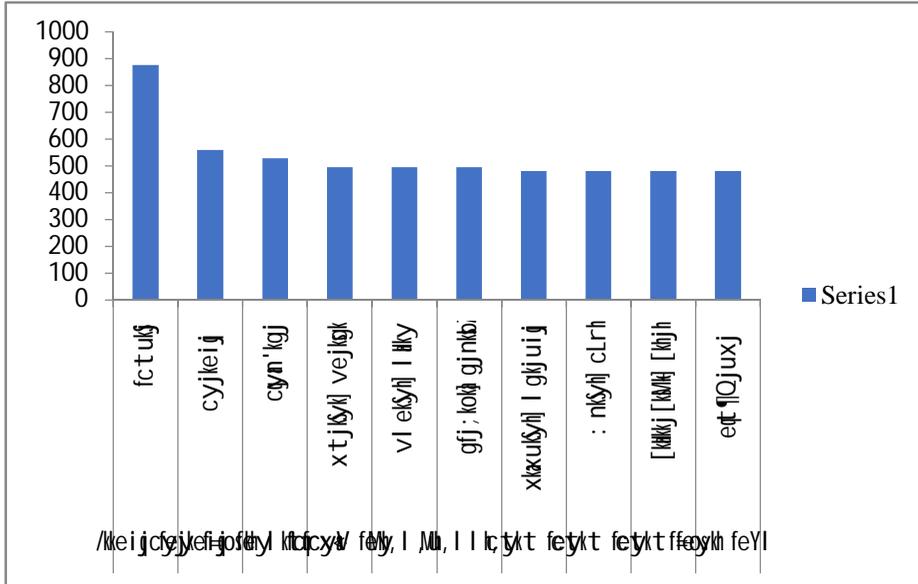
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## NON-VERBAL COMMUNICATION ACROSS DIFFERENT CULTURES

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### **Abstract:**

This article highlights on the cultural differences in the non-verbal communication. First of all it focuses on the types of non-verbal communication and then its importance both in our personal as well as our professional sectors. It also emphasizes on the cultural barriers, for which the meaning of the non-verbal communication differs according to different culture and at last how to overcome from those barriers through different examples.

**Key words:** Language, culture, communication, behaviour, travelling, interaction, barriers

### **I. Introduction:**

According to the anthropologist, E.T. Hall, 'Culture is a complex of communication systems'. And according to late Henry Lee Smith, Jr., 'Language and culture form a seamless web'. It clearly implies that, in real life situation they are the two sides of the same coin. It is only the anthropologists and the linguists who try to separate it for the sake of analysis. Along with these two indissoluble elements, there comes the third one, i.e., non-verbal communication. Man communicates exactly in the same way he plays, works, makes love, etc. So interaction is a very complex process which includes both verbal as well as non-verbal communication. And both these verbal as well as non-verbal communication are bound up with culture. Poyatos suggests on what he calls the 'Basic Triple Structure', which consists of paralanguage, language and kinesics i.e., non-verbal communication by body movement. While describing an interaction, he opined that, the verbal interchange will not only be noted but the paralinguistic and kinesics behaviour will also be recorded. Birdwhitstell, who has confirmed of the indissolubility of verbal and non-verbal behaviour, has noted that, when a typist works with a film, she/ he will always type a word which is never spoken.

Non-verbal communication differs from person to person and from culture to culture. Culture from different background defines their non-verbal form of communications like signs and signals as learned behavior.

As there are differences in meanings of non-verbal communication, miscommunication can occur when people from different cultures communicate. People can be offended without understanding its meaning due to their cultural difference in non-verbal communication. Facial expressions are mostly similar in most of the cultures as many of them like smile and cry as innate.

According to a research, there are six expressions which are considered to be universal; they are sadness, happiness, anger, surprise, disgust, and fear. But sometimes it might also be different according to the extent to which people show these feelings. In some



cultures, people express their feelings openly and in some people do not. For instance, you are an Indian and you are travelling to Japan. Neither you can speak Japanese, nor do you have a translator or a dictionary to help you. And the only thing you can use is the non-verbal communication to communicate with people.

Similarly, when you go to a hotel and order food by pointing at something. You then pay money and leave. The people bow to you as a sense of respect when you are leaving the place as a satisfied customer.

Generally, nonverbal communication is more contextual than verbal communication. People may lie verbally, but when it is a matter of nonverbal language, such as postures and eye contact, it is not easy to implicate. In our daily day-to-day life, we have definitely heard about all kinds of nonverbal habitual patterns of behaviour, temperament and emotions that are attributed to different cultural groups which give rise to stereotypes like Americans are not genuine; Asians do not express their true emotions; Japanese people are polite but uninhabited and so on. Different culture interprets differently towards nonverbal communication.

## **II. Objectives of the Study:**

To determine the role of non-verbal communication across different cultures is one of the major objectives of the study. Other objectives are:

- a) To assess the impact of non-verbal communication in order to adopt different cultures
- b) To point out the barriers to different cultures because of the non-verbal communication
- c) To get rid of the barriers

The word 'Communication' itself has been defined differently by various intellectuals. American Management Association defines, 'Communication is any behaviour that results in an exchange of meaning'. Similarly Baird Jr. E. John has defined, 'Communication is the process of involving the transmission and reception of symbols eliciting meaning in the minds of the participants by making their life experiences common.' George T. Vardaman has suggested that, 'Effective communication is purposive symbolic interchange resulting in workable understanding and agreement between the sender and the receiver.'

Similarly many scholars, researchers and writers have made interesting observations relating to the nature and significance of non-verbal communication. Like:

'Watch out for the man whose stomach doesn't move when he laughs'- Cantonese proverb

'The eyes of men converse as much as their tongues'- Ralph Waldo Emerson

'Mortals can keep no secret. If their lips are silent, they gossip with their fingertips, betrayal forces its way through every pose'-Sigmund Freud

Therefore, non-verbal communication, in a literal sense implies to those actions, contests and objects either to communicate directly or facilitate communication without using of words.

## **III. Types of Non-verbal Communication:**

- a. **Personal Appearance:** It is the way we appear before the audience; the way we look, the way we present ourselves, etc. And that's why it is said that, 'good



looking people are more confident', 'tall people are more prone to dominate' and 'unattractive people have to struggle and work harder to get noticed'. Nevertheless, the fact remains that the first impression is made through appearance of a person. Appearance includes attributes like accessories, grooming and attire where we can make a good impression apart from physical attributes which we cannot change.

- b. **Posture:** It is a particular approach in which almost all the parts of our body is used for communication. It is the position in which we hold our body when we stand straight or we sit in an alert manner. Standing straight is the best example of posture. In humans, posture reflects significant information. When we are confident enough, our legs becomes stiff and our walk bounces. Similarly, hands on hips indicate that we are aggressive.
- c. **Gestures:** It is a movement in which some parts of our body is used for communication. The movement that we make in our hands, head and face to express a particular feeling is an example of gesture. It can be considered as the substitute of oral communication. Gesture expresses a person's weakness and submissiveness. A person who is constantly fidgeting his fingers shows that he is weak and submissive.

**Gesture Clusters:** sometimes on the basis of the judgement of one or two gestures we cannot draw a conclusion. For example: yawning and knuckling of fingers implies that a person is not interested for doing the particular job; on the otherhand, yawning may also be the reason of a person's tiredness. So, the assessment should not always be done by taking one or two, rather than sets of gestures should always be taken into consideration. These sets of gestures are known as Gestures Clusters.

- d. **Facial Expression:** It is said that face is an index of our mind and is a reliable vehicle of non-verbal communication. It reflects clearly the hidden part of communication. Our face reveals everything even if we want to hide it. And that's why when a child tells lies; he always tries to hide his face so that he is not caught. Similarly, wrinkle on our face, facial hair, etc. also reflects our personality. And hairstyles and makeup implies our economic status and also our interest in fashion.
- e. **Eye Contact:** It is an important part of non-verbal communication which is considered to be very important not only in our personal lives but also in our professional lives. For example: too little eye contact implies that one is perceived as admission of guilt. But staring at a person continuously is not at all desirable because it is an indication of threatening. If we have a pleasant eye contact, it represents warmth and concern for the listeners. And that's why it is said that, in total body language, eye contact and facial expression plays a very vital role.
- f. **Space Distancing:** Space can be considered as a language by itself. Each individual always tries to maintain a personal territory around him. Normally he doesn't like it



to be invaded by others unless and until the relationships between the two persons are not very friendly or intimate. Generally a distance of 4 to 12 feet is maintained in a formal situation. This is known as space distancing.

**Intimate Space:** It ranges about 18 inches immediately around a person.

**Personal Space:** It ranges from 18 inches to 4 feet.

**Social space:** It ranges from 4 feet to 12 feet.

**Public Space:** All space beyond 12 feet. (Business communication By- P. Subha Rao, B. Anita Kumar & C. Hima Bindu Cengage Learning)

Although, the above four are categorized according to a common space zone, the space may vary with a person's power, gender and culture. Example: in India we maintain more space while a subordinate is having an interaction with our superiors and this can be proved since they have more furniture in their offices which will keep them away from their subordinates. But this is not the scenario as far as western countries are concerned. And in large organization, status is the basis in which one's office size can be taken into consideration.

**Kinesics:** The study of entire body movements and expressions are known as kinesics. It is broadly divided into five categories. They are body manipulators, emblems, illustrators, affect displays and regulators. Body manipulators are the body language which is characterised by fidgety gestures like: biting nails, tapping feet, etc. Emblems are the rings that generally we make with our thumb and index finger in order to indicate putting a finger to the lips, asking to maintain silence, etc. Illustrators are those signs which are related to the verbal messages. For example: showing of spreading our palms indicates the size and length while we talk about something. Affect displays are the non-verbal as well as verbal displays of affect. These displays can be through voice, pitch, body language, facial expression, laughing, crying, etc. Regulators are those which are helpful in regulating verbal communication. For example: nods, raised eye brows, gazes, etc.

**Paralanguage/ Vocalics:** The non-verbal part that is supplemented with the verbal communication is known as paralanguage. For example: pitch, voice quality, tempo, range, etc. It refers to the sounds and vocal characteristics.

**Touch Language/ Tactics:** It is a very important part of nonverbal communication related to touching behaviour that helps in sending wrong as well as right signals. For example: A superior patting the back of his subordinate implies that he is appreciating and encouraging. On the other hand, unwanted or unexpected touch basically in India sends a wrong message. And that's why people, in order to get rid of all such behaviours carry newspapers, files in order to have a barricade from other's touch.

**Proxemics:** The branch that deals with the amount of space that people feel should be maintained according to different relationship and upto what extend it is used. It is also important to manage ourselves and also arrange the objects.

**Chronemics:** the study of the concept of time and its usage by individuals is known as Chronemics. If a principal postpones one meeting to attend another one, it is clear that the second meeting is important than the first one.

**Olfactics:** the study that is associated with certain smells with different feelings and emotions in relation to the human communication. Our sense of smell plays a very vital



role in biological function. Delicious smell of food facilitates our hunger whereas foul smell coming from food keeps us away from eating them.

**Oculesics:** It is the study of using of eyes for human communication. Eyes are the most expressive part of our body that we have for communicating not only our physical condition but also our innermost feelings. Our reddish eyes indicates that we are tired, restless etc. And so it is often told that our eyes are the window of our soul.

#### **IV. Non-verbal Communication is Universal, but Culture Bound:**

There is absolutely no doubt about the fact that non-verbal communication is purely universal like a frown, smile or anger, since these are all reflexes of our emotions. But most of the signs of non-verbal communication differ from one culture to the other and so it's not possible on somebody's part to interpret it universally.

The signs of smell in different cultures: In Arab countries, people consider their natural body smell as normal and in Asian cultures people bathe frequently and so they criticize the people from western countries of not bathing regularly.

Eye contact and gaze in different cultures: people of Japan, India, Africa, etc. avoid eye contact as a sign to show respect; where as people in Arab countries consider prolonged eye contact as a sign of interest towards something. On the other hand, prolonged eye contact is often considered as a sign of sexual interest.

Facial expression in different cultures: When the Japanese think that if we turn down someone's request it causes embarrassment or loss of face, where as people from Asian culture suppress facial expression as more as possible

Postures in different cultures: When we bow it is not accepted or criticized by the people in US, whereas it shows a sign of rank in Japan. Similarly, slouching is considered to be the sign of rude in most of the North European regions. If we put our hands in the pocket, it is a disrespectful sign in Turkey. Sitting with our legs crossed is a sign of offensiveness in Ghana and Turkey and showing soles of feet is a sign of offense in Saudi Arabia and Thailand.

Paralanguage in different cultures: The people of Japan consider giggling as a sign of embarrassment and in India belch is a sign of satisfaction. Loudness in Germany indicates confidence and authority, where as it is considered as impoliteness to the people of Thailand and loss of control for Japan. For Asians shouting for any reason is not entertained.

Touch language in different cultures: Handshakes, hugs, kisses, etc. is accepted in US. But in African-Americans people typically don't touch on their head. People from Islamic culture generally don't touch members of opposite sex. People from Hindu and Islamic culture don't even use left hand in touching, since that is used for toilet functions.

#### **V. Barriers to Cross-cultural Communication:**

**a) Language:** There are a number of people in the entire world who neither can understand nor can communicate in English properly. Not speaking properly can cause various misunderstandings and be a barrier to communication. There are different cultures that have developed their own language considering it to be a part of their own heritage. People are very much comfortable in communicating in their own language whereas they have to work hard to learn new languages. Like: the language became totally different because of the separation for 40 years from East and West Germany.

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The dialect over there became different as people of East Germany had an influence of Russian language whereas people of West Germany had an influence of English. Therefore, they had a barrier in communicating with each other for decades. Even if people tried to speak in their own language, many misunderstandings came out.

**b) Signs and Symbols (Semantics):** We cannot depend upon non-verbal communication because it differs from culture to culture like a language; and signs, symbols and gestures, being a part of non-verbal communication also vary according to different cultures. For example, in most of the cultures, the sign “thumbs up” is considered as a sign of approval and wishing luck but the same sign is considered as an insult in Bangladesh. Similarly, the “V” hand gesture with palm faced outside or indicates peace and victory in US, whereas back of hand facing towards someone, showing the sign is taken as insulting in many cultures.

**c) Behaviour and Beliefs:** Cultural differences cause behavior and personality differences like body language, thinking, communication, manners, norms, etc. which leads to miscommunication.

For example, in some cultures eye contact is important whereas for some others it is rude and disrespectful.

Culture also sets specific norms which dictate behavior as they have guidelines for accepted behavior. It explains what is right and wrong. Every action is influenced by culture like ambitions, careers, interests, values, etc. Beliefs are also another cause for cultural barrier.

For instance, mostly, people who believe in God can cope with their lows of life easily than atheists but atheists are more hardworking at all times which relates to their behavior and communication.

Appropriate amount of emotion that must be displayed is also different in different cultures. Roles are defined by culture. Good communication only occurs between people with different cultures if both accept their differences with open mind.

**d) Presentation Style:** Culture is also responsible on how people belonging to different countries are capable of receiving information. Like: the way how we are going to reciprocate totally depends on the culture, which we belong to. Eastern Europeans are mostly acquainted with the formal style of presentation, while Japanese expect technical information. On the other hand, audience from Latin America prefer a high level of emotional appeal.

**e) Prejudices and Stereotypes:** Stereotyping is the method of getting an overall idea of a whole culture, generalizing all humankind belonging to the same culture as having similar features and distinguishing people accordingly. It is a belief taking a particular group into consideration, which is mostly negative. It can be considered on the basis of religion, caste, race, age, etc.



For example, Asian students are considered that they are generally strong in Maths, which is a positive stereotype. But, there is also cultural stereotype; like: people of Islam religion are generally violent in nature, which is negative stereotyping. Here, negative stereotyping helps in creating prejudices since it provokes judgemental attitudes. This results a negative impression on those cultures and people act accordingly.

#### **VI. Overcoming Cultural Barriers:**

There are a number of different cultural barriers like political opinions, frames of reference, age, priorities of life, etc. Cross cultural communication is not only a barrier but also an opportunity for creativity, new perspectives, and openness to new ideas and unity in the world.

To make communication effective, the causes of cultural communication barriers must be eliminated as much as possible. Cross cultural understanding must be increased as it decreases communication barrier caused by culture difference.

#### **VII. Summary of Findings, Conclusions and Recommendations:**

**Findings:** The study focused that non-verbal communication plays a very vital role in our daily day-to-day life across various cultures. Survey result shows that, non-verbal communication is stronger than oral/written communication. It was also observed that, eye contact is the one that is being given much priority as far as the entire body language and all other types of non-verbal communication are concerned. The study also shows that, hindrance to cross-cultural communication cannot be completely ignored because they too have a very important role to be played with.

**Conclusions:** The most essential weapon for the spread of different cultures is communication (both verbal as well as non-verbal). There is no doubt about the fact that, non-verbal communication sometimes results to confusion and chaos in the mind of the people. But it is different from person to person and especially from culture to culture. Cultural background implies their non-verbal communication as many forms of non-verbal communications like signs and signals are learned behavior.

**Recommendations:** After a certain consideration of the research findings and conclusions, the work recommends that, the study of culture should be made compulsory like all other subjects that will encourage the students of this era to get proper knowledge basically regarding the importance of not only our culture, but also the study of different cultures as a whole. In addition to this, students should also focus on the communication part which has already become the spinal cord of the educational system. And this will definitely minimize the barriers to different cultures through non-verbal communication.



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## DIASPORA AND THE STATE: EXPERIENCES OF INDIAN DIASPORA IN AFRICA

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### **Abstract**

The diaspora policy of a state reflects the nature of connectivity a country has towards its diaspora and, at the same time, it also reflects the status of that particular diaspora community in the adopted countries. Such move would indicate whether diaspora community are protected, and to what extent they have been allowed to exercise their rights as a diaspora community. Such policy moves not only deal with the socio-economic, cultural and political conditions of the diaspora community in the host countries but also strengthen the foreign policy framework of both countries. Within this backdrop, this paper analyses the experiences of Indian diaspora in Africa, especially in Zambia, Zimbabwe and Malawi, in socio-economic, cultural and political spheres with greater policy implications. This paper argues that, despite their enormous contributions especially in economic sphere, the Indian diaspora community has contentious relationship with native community of Zambia, Zimbabwe and Malawi, and thereby leading to the incompatible experiences.

**Keywords:** Diaspora, Identity, Development, Political Participation, India, Africa

### **Introduction**

The diaspora study has become one of the critical areas of political discourse in the current globalised world, where migration of people across the border has become a reality. The general understanding of diaspora refers to the group of people who migrate from one country to another for labour, profession, education, business, etc. The major factor that distinguishes a diaspora community from the migrants is the connection that the diaspora and the migrants maintain with their country of origin. The diaspora community, despite being an integral part of the country of their adoption, does maintain continuously some form of emotional, cultural, socio-economic and political connections with their native countries. On the other hand, such bonding is absent in the case of migrants. To put it differently, the central distinction arises from the shared commitment of a diaspora to a home place, somewhere other than where they reside.<sup>1</sup>

Taking the connection of the diaspora community with their country of origin into consideration, the Government of India considered to confer dual citizenship status to the people of Indian origin (PIOs) and every year celebrates the Pravasi Bhartiya Divas, generally in the month of January. The diaspora policy of a state reflects the nature of connectivity a country has towards its diaspora and at the same time it also reflects the status of that particular diaspora community in the adopted countries. Such move would indicate whether diaspora community is protected, and to what

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extent they have been allowed to exercise their rights as a diaspora community. Such policy moves not only deal with the socio-economic, cultural and political conditions of the diaspora community in the host countries but also strengthen the foreign policy framework of both countries. Within this backdrop, this paper analyses the experiences of Indian diaspora in Africa, especially in Zambia, Zimbabwe and Malawi, in socio-economic, cultural and political spheres with greater policy implications. This paper argues that, despite their enormous contributions especially in economic sphere, the Indian diaspora community has contentious relationship with native community of Zambia, Zimbabwe and Malawi, and thereby leading to the incompatible experiences.

### Understanding Diaspora

Understanding diaspora offers a critical space for thinking about the incongruous movements of modernity, leading to the massive migration that has defined the globe from the late colonial period through the decolonisation era into the twenty-first century. While understanding diaspora, the literature does not divorce itself from historical and cultural specificity. Recent understanding of diaspora also seeks to represent the lives that unfold in myriad diasporic communities across the globe. In literature, diasporic subjects are marked by hybridity and heterogeneity-cultural, linguistic, ethnic, national. These subjects are defined by a traversal of the boundaries, demarcating nations and diaspora. Diasporic subject experiences double (and even plural) identifications that is constitutive of hybrid forms of identity. Hybrid national (and transnational) identities are positioned with other identity categories and serves as an essential for native's identity that is affiliated with constructions of the nations or homeland.

The variable archives of diaspora, notwithstanding the Jewish diaspora, is the fundamental ethnic model for diaspora theory, and all serious study of diaspora will have to begin with it. But what we must now do is take away from that model its essentialist, regressive and defiantly millenarian semantics and re-read it through alternative models much more attuned to spatio-temporal issues and to a diaspora's own silenced discourses of disruption and discontinuity.<sup>ii</sup>

In this argument, the Jewish experience is simultaneously history's conscience, its allegory of the democratic nation-state,<sup>iii</sup> as well as a 'model of European transnationalism'.<sup>iv</sup> The understanding of diaspora also depends on the homeland theory, which occupies the central point in the whole discussion, which can be defined or redefined, constructed or reconstructed and imagined or reimagined, and, thereby, emerging as a reference point for further discussion. We need to replace it with a narrative of social interaction in the border zones of the nation-state. The positive side of diaspora is a democratic ethos of equality that does not privilege any particular ethnic community in a nation; its negative side is virulent racism and endemic nativism.

This is not to point out that Jews did not suffer in enlightened nation-states; nor should the argument be seen as a denial of the right to self-determination. What the argument does, however, is to emphasise that the religious fossilisation of the community is not its permanent condition. What the community undergoes is a process of social semiosis whereby the tribe from a particular ‘homeland’ interacts with other cultures over a long period of time to produce diaspora. Against the fictions of a heroic past and a distant land, the real history of diasporas is always contaminated by the social processes that govern their lives. Indeed, the autochthonous pressures within diasporas are of concern to diasporic subjects only when a state does not clarify its position in terms of dealing with diaspora community. Unfortunately, eye brows have been raised in reference to the position of the host states towards diaspora communities because of their unclear policy in socio-economic, cultural and political spheres.<sup>v</sup>

Table 1: Typologies of Actors and Models in the Indian Diaspora

Typology of Models		Typology of Actors										
		A						B	C	D		
		I	ii	iii	iv	V	vi					
I	PIO	Y	Y	Y	Y	Y	?					
	NRI	Y	Y	Y	Y	Y	Y					
II												
III												
IV												

Source: Khadria, B. (2005). Actors and models of the Indian diaspora in international relations: From social parasites to economic boon?. ARI working paper no.85. Singapore: Asia Research Institute.

Khadria (2005) interpreted Indian diaspora along the lines of actors and models (Table 1).<sup>vi</sup> The two alternative sets of descriptors reflect that the models could be based on how the actors in the Indian diaspora are going to be viewed in the arena of international relations in the twenty-first century-with suspicion or with awe. Secondly, they also reflect a transition from the first to the second that might have taken place over time or is in process. He began by constructing a framework of an underlying matrix, which comprises a limited number of typologies of models and a few typologies of actors. The former called Model I, Model II, etc., represented by the rows, and later called as actors A, B, etc., represented by the columns. This type of underlying matrix paves the way for addressing each of the binaries of models and actors in each typology of the matrix in order to place the issues in one cell or the other.



### Indian Diaspora in Africa

Out of the twenty-five million people of Indian Origin (PIO) across the globe, two million of them are in African continent. They are present in all regions of Afro-Anglophone, Francophone, Lusophone, Arab, Africa and Oceania. They migrated to Africa for various reasons such as part of slavery, trade, indentured workers, construction workers and businessmen. The bulk of them went during colonial period as indentured and construction workers. Some of them got settled as colonial Indian army soldiers. A good number of them went in post-independence India as teachers, skilled workers and professionals. They went from Indian states of Gujarat, Kerala, Tamil Nadu, Bihar, Uttar Pradesh, Punjab, etc.

The profiling of India's diaspora suggests the intersectional dimension indicating people from different communities and various communities ranging from skilled such as scientists and doctors unskilled manual labourers. The Indian diaspora who has much to contribute to the country's economy through remittance entered the host countries on various circumstances such as dire poverty and lack of economic opportunities, among others. The statistical profile of Indian diaspora, which includes Non-Resident Indians (NRIs) and People of Indian Origin (PIO), in Africa is being provided in Table 2.

Table 2: Statistical Profile of Indian Diaspora

Sl No	Country	Indian Diaspora	NRI	PIO
1	Algeria	450	447	3
2	Anglo	6000	6000	0
3	Botswana	11000	9000	2000
4	Burkina Faso	100	100	0
5	Burundi	250	200	50
6	Cape Verde Islands	12	12	0
7	Comoros	300	50	250
8	Democratic Republic of Congo	4000	3600	400
9	Djibouti	350	350	0
10	Egypt	3600	3450	150
11	Equatorial Guinea	100	100	0
12	Eritrea	500	0	500
13	Ethiopia	994	992	2



14	Gambia	333	329	4
15	Ghana	10000	10000	0
16	Republic of Guinea	550	550	0
17	Guinea Bissau	31	31	0
18	Ivory Coast	500	500	0
19	Kenya	75000	37500	37500
20	Kingdom go Lesotho	1200	800	400
21	Liberia	1501	1500	1
22	Libya	15000	14995	5
23	Madagascar	23000	3000	20000
24	Malawi	7000	1500	5500
25	Mali	201	200	1
26	Mauritania	30	30	0
27	Mauritius	882220	15000	867220
28	Morocco	300	300	0
29	Mozambique	21500	1500	20000
30	Nambia	160	140	20
31	Niger	60	60	0
32	Nigeria	30000	0	30000
33	Reunion Island (France)	275200	200	275000
34	Rwanda	1040	1000	40
35	Republic of SaoTome and Principle	4	4	0
36	Senegal	440	412	28
37	Seychelles	8500	4000	4500
38	Sierra Leone	710	700	10
39	South Africa	1218000	18000	1200000
40	Sudan	3599	3500	99
41	Swaziland	700	200	500

42	Tanzania	54700	5300	49400
43	Togo	510	500	10
44	Uganda	20000	15000	5000
45	Zambia	20500	12500	8000
46	Zimbabwe	10500	500	10000
Total		2693195	158605	2534590
Source: Ministry of Overseas Indian Affairs, Government of India (2012)				

Table 2 suggests that there are a total of 2693195 diaspora with an average of 62632.44 Indian diaspora living in 46 countries of Africa. Table 2 reflects that South Africa (12,18,000) has hosted the highest number of Indian diaspora in Africa, followed by Mauritius (882220). On the other hand, the lowest concentration of Indian diaspora in Africa can be found in Republic of SaoTome and Principle (four), followed by Cape Verde Islands (12). Out of 2693195, 158605 (5.88 percent) and 2534590 (94.11 percent) are NRI and PIO, respectively. The NRI and PIO bearing the average of 3688.48 and 58,943.95 in number.

The central Africa comprises three distinct territories, two of which are independent African countries (Malawi and Zambia independent since 1964) and the third the British colony (Rhodesia which seized independence unilaterally in 1965). In terms of land area, the three territories have a total almost 500,000 sq. miles. To consider separately, Zambia has nearly 300,000 sq. miles, which is the largest one. Rhodesia comes second with approximately 150,000 sq. miles (or half the size of Zambia). Malawi is the smallest territory with less than 50,000 sq. miles, of which nearly one-quarter is taken up by the lake.<sup>vii</sup>

Unlike South Africa or East Africa, there was no requirement for indentured labour in Zambia, which was known as Northern Rhodesia in British Colonial times. This territory was then regarded as poor and backward, with few or no attractions for any perspective British or Indian settlers. Its extensive copper deposits had yet to be discovered. But adventurous Indians from Gujarat who had ventured out in search of trading opportunities arrived there in 1905 through coastal Bechuanaland (now Malawi) to settle down in the north-western part of Zimbabwe. The initial wave of pioneering settlers was mostly of Muslims, but Hindu traders soon joined them. Gradually, both communities made their way to Lusaka to settle down in the region's administrative capital.

Indians were not then eligible for employment in the civil service of the colonial administration. Before the settlers could get involved in trading, they often had to



begin life in their new country as gardeners, tailors or other such occupations. Gradually, they able to reversed to their traditional occupation of trading, whereupon with patient diligence, they were able to make their presence felt in the local market. But economic perspective was still a distant dream. It came to them many years latter- in fact, after Zambia attended its independence in 1964 and started looking towards India for material and moral support. Thereafter, the Indian community began to play a meaningful role in the Zambia economy. Trading is still their primary occupation. Gradually, some of them became whole sellers.

A large number of shops all over Zambia began to be run by Indians. Others practiced occupations such as banking, farming and mining. The influence of Indian expatriate professionals also became visible in Zambia, especially in the fields of medicine and education. Meanwhile, above 10,000 Indians had adopted Zambian citizenship. There are currently four Indo-Zambian members in the parliament. Three of them have held ministerial position until recently. The fourth is currently minister of commerce, trade and industry. It has been observed that the role of the diaspora in these countries politics has not been effective due to their small numbers. However, Indians have been a useful source of election funding for the party in power.

On the other hand, in Zimbabwe, Indians arrived around the end of the 19<sup>th</sup> century. Due to continuous flow of diaspora community, immigration was restricted after 1923 when the colony became a self-governing territory under British rule. Out of the twenty-five million PIOs spread across 110 countries, Indian Diaspora presence in Zambia, Zimbabwe and Malawi is about 20500, 10,500 and 7000, respectively.<sup>viii</sup> Although this is a very negligible number as compared to Mauritius (882220), South Africa (1218000) and East Africa,<sup>ix</sup> they are immensely contributing to the Zimbabwean, Zambian and Malawian societies especially in the economic sphere. The study of the PIOs of these three countries needs special attention which has not received so far.<sup>x</sup>

### **Indian Diaspora, Insecurity and Racial Discrimination**

Diaspora community enters into a new country with enormous risks and uncertainty. They get exposed to the new environment, which requires adjustment both at the psychological and physical levels. These risks and uncertainty are spread over socio-economic, cultural and political spheres. The uncertainty also emerges in reference to the interaction between the diaspora community and the native population, where the later consider the former as 'outsiders'. However, continuous interaction may also lead to the emergence of cooperation and cordial relationship between them as well.

Indians are very vulnerable to attack by the original inhabitants of Zimbabwe, and thereby leading to the emergence of incompatible realtionships.<sup>xi</sup> As the Indians have tasted the economic success in Zimbabwe, such success is under threat as the militants and militant organisations often threaten to seize their hard-earned properties. In 2002, there were reports which spelled out cruelty against the Indians. A similar kind of repetition of the clampdown witnessed in 1970 on Indian



businessmen in Uganda. It was regarding the PIOs in Zimbabwe facing threats from the supporters of the President, Robert Mugabe to hand over their property or risk having it seized.<sup>xii</sup>

On the other hand, Malawi Indians are suffering from racial discrimination from the native communities irrespective of their contributions to national economy. The Chairman of Asian community in Malawi, Altaf Almad Muhamad, said that Indians especially women were being subjected to racial taunts from the public while giving an interview in the Capital Radio Straight Talk Programme of Nyasa. Muhamad also told that "We are abused, like minibus people use foul language to insult Indian women". He said: "We don't know why the native Malawians are doing this when they know we belong to this country". Further he said, being the Chairman of Asian Community in Malawi, he got enough evidence and proof about the abuse of native Malawians to Indian women whenever they are visiting public places like markets and shopping complexes. The Chairman said, despite being a minority group, the Indians contribute significantly to the economic development of the Malawi. "Most properties in Malawi, most shops, houses, warehouses, and industries belong to the Indians. The Indian community also assists in charity work and relief. They have largely contributed to support financially the victims of Karonga earthquake disaster."<sup>xiii</sup>

According to one of the reports, Indians are supposed to surrender a certain percentage of the land to the government as they are not there to develop the country or to work with their government. Mostly affluent businessmen and professionals, they have remained largely apolitical, apart from a few who took public office in the ruling Zanu-PF Party which came to power after the 2002 election. Government-backed militants have threatened to seize property owned by Zimbabwe's Asian community unless they willingly hand it over to blacks. The state-owned Herald newspaper says that the so-called 'war veterans' have given the country's Asians an ultimatum to reduce rents. They also want the 12,000-strong community to stop black market currency trading, bank their money locally and raise wages. Andrew Ndlovu, the leader of the Liberation War Veterans Association, told the newspaper: "Nothing will stop us from reclaiming commercial land from Indians. If they do not stop looting our economy, they will leave us with no choice but to go door-to-door making sure all Indians in the cities are complying with instructions from war veterans." The association has been at the forefront of a campaign by President Robert Mugabe's government to seize white-owned farms and hand them over to landless blacks. The two-year farm seizure campaign has sparked an economic collapse in Zimbabwe, resulting in soaring inflation and widespread food shortages. The government has blamed Zimbabwe's tiny minority of white farmers for the country's woes but is now also targeting the country's Asian and Jewish communities.

In February, Elliott Manyika, a senior ruling party official and provincial governor, said once the government had finalized the seizure of 5,000 white-owned farms, it would shift its attention to urban businesses and mines. He told to the pro-Government Zimbabwe Mirror: "Asians, commonly referred to as Indians, would

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also not be spared for what is said to be their role in the hoarding of essential commodities." Zimbabwean President Robert Mugabe's militias of so-called guerrilla war veteran are shifting their campaign of lawless seizure of white-owned farms to property owned by the country's small Asian community, the state press represented.

In 1980, when most whites left the country, Indians had money to buy nearly all the developed land in cities. Indians had properties in nearly in all the Country's towns and cities and charged indigenous business people high rentals, which beyond those stipulated by government laws. So, they are being targeted by Mugabe's supporter.<sup>xiv</sup>

### **Marginal Political Role versus Soico-Economic Insecurity**

The Indian diaspora in Zimbabwe are more insecure in the socio-economic sphere than in Zambia and Malawi. Although the field study experience reveals that the Indians as a minority community largely feel insecure at the social and economic sphere in all these above three countries and to some extent, it largely depends on the political situation of these countries. Political participation and representation no doubt provides social and economic security to a particular community which could be seen in the case of Indian diaspora settled abroad. The examples of Mauritius and Fiji can be demonstrated. In these countries, Indians feel quite safe and secure with certain exceptions and the reason behind that is their large representation in politics. Even among these three countries, the Zambia Indians feel much safer as compared to the Zimbabwe and Malawi. Zimbabwe is the worst case where Indians are being targeted by the political goons and their property is being destroyed, life got threatened. So, their insignificant role and participation in politics makes their social and economic life more vulnerable and is the biggest obstacle to economic prosperity and social security.

### **Government of India policy towards Indian Diaspora**

From 1990s onwards, the Government of India is playing a pro-active role to connect with the Indian diaspora. The PIOs are quite happy with the initiatives taken by the Government of India to increase the connectivity of Indian diaspora community to the native country. Starting from the introduction of dual citizenship policy to NRI Card facilities, visa on arrival etc. are major policies implemented by the Government of India towards its diaspora community.

### **Conclusion**

Although the diaspora policy in India has become a major stimulus to connect with the Indian diaspora across the globe but many initiatives needed to be taken at the national and international level to strengthen the relation between India and it's diaspora, between the native and the host countries which will help in bringing together the Indian diaspora across the world. The major challenges to this remain are the trust building, focusing more on the issues of the Indian diaspora residing in developing and under-developed countries like Zimbabwe, Zambia and Malawi



rather than focusing more on the Indian diaspora community of the developed countries.

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## THE BELT AND ROAD INITIATIVE OF CHINA: ITS IMPLICATIONS FOR INDIA

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### Abstract

The Chinese initiative of the multibillion dollar Belt and Road Initiative (BRI) has been called by some as a Chinese Marshall to promote the growth in its poorer western regions. It is a state-backed campaign for global dominance, a stimulus package for a slowing economy and a massive marketing campaign mostly in the Eurasian regions covering nearly 70 countries. It aims to strengthen Beijing's economic leadership through a vast programme of infrastructure building throughout China's neighbouring regions. Many foreign policy analysts view this initiative largely through a geopolitical lens, seeing as Beijing's attempts to gain political leverage over its neighbours. This initiative does not only represent a renewed and stronger coordinated push to the expand China's influence overseas but is also coupled with a huge domestic investment drive. While this initiative appears to be a mercantilist project, it is inevitably accompanied and synchronised with an expanding Chinese military footprint. The disruptions created by BRI can have a negative fallout for countries like India and this paper examines the nature and scope of the China led BRI in general and its implications for India in particular.

**Keywords:** BRI, CPEC, Territorial Integrity, Trade, Road, Development, China, India.

### Introduction

For a very long period of time, China has adopted a low profile stature at the global platform with relatively closed economy and strict media regulations. But China of today is different from China of yesterday in the sense that it had opened up its economy and has sought to have a bigger and prominent role in the world politics. As a result, Chinese companies have begun to move outside their home markets and are shifting to foreign territories with the objective of finding new avenues and consumers for their market and new technologies. The Chinese president XI Jinping is making all efforts to ensure the strengthening of China's position in the international arena. China has promoted varied high profile joint projects with an intention to project itself globally and to develop closer ties with more countries.

The OBOR (One Belt One Road) which is now popularly known by the name simply as BRI (Belt and Road Initiative) was announced in 2013 by Chinese President Xi Jinping during his visit to Kazakhstan. He called for the building of a Silk Road Economic Belt and a 21<sup>st</sup> Century Maritime Silk Road to connect China's less developed border regions with neighbouring countries. In 2015, an action plan was released by Chinese Ministry of Foreign Affairs which laid out a vision of the BRI. On land, Beijing aims to connect the country's underdeveloped hinterland to Europe through Central Asia. This road has been dubbed as the Silk Road Economic Belt which may be simply put as 'Onland Silk



Road'. The second leg of Xi Jinping's plan is to build a 21<sup>st</sup> Century Maritime Silk Road connecting the fast growing Southeast Asian region to China's southern provinces through ports and railways. This initiative does not only represent a renewed and stronger coordinated push to expand China's influence overseas but is also coupled with a huge domestic investment drive wherein almost all Chinese provinces have a stake. To simply put, the BRI revives an ancient trade route that once connected most of Asia to Europe and Africa in what is known as 'Silk Route'. The ideational and revival of the Silk Route is a step to revive the old channel and connect different countries with trade routes of both land and sea backed by huge amount of capital from the Chinese government.

### **The components and targets of the BRI**

The BRI is a set of two outward facing model introduced in late 2013 to promote economic engagement and investment along two main routes in the name of Silk Road Economic Belt and Maritime Silk Road. As per the recent reports, the Silk Road Economic Belt will be westward overland through Central Asia and onward to Europe. According to the Ministry of Foreign Affairs and the Ministry of Commerce, the second one is the 21<sup>st</sup> Century Maritime Silk Road probably loop south and westward by sea towards Europe with proposed stops in Southeast Asia, South Asia and Africa. The Maritime Silk Road would go through the South China Sea to the Association of South East Asian Nations (ASEAN) countries, Indian Ocean Region, East Africa, the Red Sea and then to the Mediterranean Sea and will be allegedly benefitted by more than 60 percent of the world population.

The present status of BRI appears to be a fairly loose combination of old projects, new schemes and future infrastructure development plans layered over by bilateral trade agreements that seek to promote Chinese trade to Europe and also to the Indian Ocean Region. However, the initiative started to take shape increasingly as a massive, centrally directed core plan under Xi Jinping's leadership to upgrade China into a hopefully new era of prosperity and power. If this enormous project took off well then China will soon become the dominant regional power in East and Central Asia in the near future and a major Indian Ocean power thereafter. The BRI is seen as the vehicle through which the Chinese economy will rebalance to achieve its goal of becoming a comprehensively well off country by 2049 which is the centenary of the founding of the People's Republic of China (PRC). The propose countries along the BRI range from Singapore to Syria and the companies involved under BRI framework could be heading into territories that may be strategically important for China's foreign relations but challenging to navigate.

However, the geographical reach of the BRI is expected to be ambitious. Apart from its political objectives, BRI has a strategic focus on the government's go out initiative which encourages Chinese firms to go abroad in search of new markets or investment opportunities. The BRI push is being led from the highest levels of the government and involvement will run across several ministries. Although China's approach is to open its markets window for new consumers, its first priority is to gain regional connectivity projects. The BRI is backed substantially by the financial power. With an initial focus on Central and Southeast Asia, the finances will be used to develop infrastructures and



improve connectivity among the countries around the BRI. The focus is mainly on the construction of railways, roads, airports and seaports.

It may therefore be asserted that China has championed its initiative of Belt and Road Initiative (BRI) as an ambitious design for the region. However, the project is yet to take off and has been long on expression but fails in gaining the confidence of the members as of yet due to its fuzzy details. Balding (2015) argued that the project is more like a diplomatic effort for China to win friends and influence people rather than a strictly economic programme.

The officially stated mission of the BRI is to develop links on the basis of mutual trust, equality and mutual benefits, inclusiveness and mutual learning and win cooperation. A Chinese scholar Wang Jisi has noted that BRI is aimed at organically linking the Chinese dream to the Global dream. However, many others see to it a Chinese Marshall Plan to promote the growth in its poorer western regions as well as adjacent and strategic Central Asia or as a pivot towards Eurasia in response to the American rebalance to Asia. Manoj Joshi (2018) asserted that BRI is aimed at promoting Chinese national interests and notwithstanding claims that they pursue a “win-win” model; there will be losers and winners in the process. In undertaking to build a Silk Road Economic Belt and Maritime Silk Road, China aims to kill several birds with one stone as noted below. Firstly, to develop ports, railways, pipelines and highways across Asia and the Indian Ocean so that China can utilise its ‘excess capacity’ in steel, cement and infrastructural engineering. Secondly, to create high speed transportation networks and crunch the vast distances of Eurasia to link rich Europe, a market for higher end goods being made in a steadily enriching and innovative China. Thirdly, to create an energy route from the Middle East and Africa that will be proof against the possibility of interdiction at the choke points like Hormuz and the Malacca straits. Fourthly, shed light manufacturing and go up the global value chains. So, the BRI will help China to send these jobs to target countries in Asia and Africa, even while integrating them in its value chain. Fifthly, to use Chinese cash reserve to promote Chinese led financial institutions like the Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB) and give a fillip to existing Chinese financial institutions. Sixthly, it also aimed to consolidate China as a maritime power in the South China Sea and Indian Ocean and its littoral countries. Seventhly, to develop China’s poorer western provinces, particularly Jinxiang which has a violent separatist movement and is view as a major vulnerability by China. Eighthly, to give China the wherewithal to compete with the Transatlantic Trade and Investment Programme (TTIP) or any future mechanisms that are seeking to set new trading norms and regimes. Some of these regimes are aimed at offsetting the gains China made from its entry into the World Trade Organisation (WTO). It was mainly with his project that China aims to build its trade relations and expand beyond Europe and link eastern world with the western world.

### **India and the BRI project**

Although many countries had subscribed to the massive BRI project of China, India expressed circumspection in participating in this China led belt and road initiative. When China organised the BRI summit in 2017, India boycotted the event by citing its



concern over the China-Pakistan Economic Corridor (CPEC) project which is basically an extension of the BRI's component namely Silk Road Economic Belt (SREB). It is basically clutch of projects valued as USD 51 billion project which aims at rapidly expanding and upgrading Pakistan's infrastructure and strengthening the economic ties between the People's Republic of China and Pakistan. The China-Pakistan Economic Corridor (CPEC) eventually aims at linking Kashgar in China's Jinxiang to Pakistan's Gwadar port in balochistan through a vast network of highways, railways, optic fibre links and petroleum pipelines. In addition, it comprises of a range of investments in other areas, mainly in the Pakistani energy sector. While the connectivity goals of the China-Pakistan Economic Corridor (CPEC) are aimed at serving China's interests, the energy and other investments are presumably aimed at giving a fillip to the Pakistan economy.

For India, this is not just a matter of economics as it has serious ramifications on the issues of its territorial integrity and security. Apart from its economic offerings, BRI is seen by India largely as a means through which Chinese will be upholding its political control in the region. Essentially, this initiative is a product of the Chinese ambition of political expansion and economic ambitions. On this note, the Ministry of External Affairs (MEA) issued a comprehensive statement of objection to the BRI such as, one; the corridor includes projects in land belonging to India; two, the project could push smaller countries on the road into a crushing debt cycle, destroy the ecology and disrupt local communities; three, China's agenda was not clear with the implied accusation that this was more about enhancing its political influence, not just its physical networks. All of India's neighbours, with the exception of Bhutan, have entered the BRI and India's concerns have been heightened by the growing presence of China in Nepal, Bangladesh, Sri Lanka and the Maldives.

India's main objection is on the principle that the BRI includes projects in the China-Pakistan Economic Corridor (CPEC) that are located in the Pakistan-occupied Kashmir (POK)'s Gilgit-Baltistan, including the Diamer Bhasha Dam, 180 MW hydel power projects, and more expressways and economic zones along the Karakoram Highway. Thus for India, the so called China-Pakistan Economic Corridor (CPEC) violates India's sovereignty and territorial integrity. Apart from POK, another neighbouring country of India i.e., Nepal is seen warming up its relations with China at numerous levels. China and Nepal have agreed to connect Nepal to Eurasian transport Corridor. To this effect, Nepal signed a four-point document with China in the year 2014. This has further caused irk in India's diplomatic relations with Nepal and leaves India on a back foot. The CPEC in general and the infrastructure development in particular manifest itself in terms of tactical threat to Ladakh areas. It provides well developed infrastructure connectivity to Shaksgam Valley and China is learnt to be threatening Siachen to have connectivity to the Shaksgam Valley from its western highway. For the record, Saksam Valley was ceded to China by Pakistan in 1963 when both countries signed a boundary agreement to settle their differences. It is thus contended that the sales pitch of the shared economic gains does not conceal the real purpose of BRI as it could end up creating Chinese logistics in the Indian Ocean linking already existing Chinese infrastructure around the Indian Ocean. As a result, India has taken a position that appears hostile to the BRI. This is not surprising because China's

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growing presence in the South Asia and Indian Ocean Region (IOR) reduces India's grip and traction on her foreign policy narrative.

### Conclusion

Based on the preceding accounts, for India, a formal nod to the BRI project in general and CPEC in particular will serve as a de facto legitimisation to Pakistan's rights to the POK and Gilgil-Baltistan which are regarded as parts of India. Joining the project on the part of India would also bring China more into the disputed area between India and Pakistan as a result of which the Indian Ocean will witness more activities and some significant influence of China in the name of Maritime Silk Road that would eventually challenge Indian foreign policy narrative. In a nutshell, for India it has never been a question of whether joining the BRI or not from day one as the CPEC which is the extended component of BRI is seen as an infringement over India's territorial sovereignty. It is thus imperative for India at this stage to check China's growing influence by gaining approval and trust of major powers such as United States, Japan and other European nations and pioneer an India led initiative of some sort to parallel that of China' BRI in general and CPEC in particular. The pace of India's engagement with the South and South East countries through the Act East Policy also has to be strengthened and pursued with greater vigour than has been the case till now to catch up, at least partially, with China's growing dominance and even importance in Asia in general and South Asia in particular.

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