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ASSESSMENT OF ADENOSINE DEAMINASE AS AN IMMUNOENZYME MARKER IN OBESITY WITH OR WITHOUT DIABETES MELLITUS

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INTRODUCTION

Obesity is a complex disease involving an excessive amount of body fat. Obesity isn't just a cosmetic concern; it is a medical problem that increases your risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers(1). A growing body of mechanistic evidence has accumulated linking obesity to changes of metabolism and immune responses (2).This concept provides an integrated inflammatory network based on the perception of obesity as a state of chronic low-grade inflammation(3).Elevated adenosine deaminase activity in metabolically healthy obese individuals may predict immune pathological transition of healthy obese to metabolically unhealthy.Obesity with or without its complications viz Diabetes mellitus (4).It has been well established that cells of the immune system play an important role in the pathogenesis of obesity (5). Hadis Sabouret.al (2017) (3) stated that Obesity is a condition resulting from fat accumulation, which is related to many chronic autoimmune and inflammatory diseases, particularly cardiovascular disorders and type 2 diabetes mellitus.To assess immune status based on Adenosine deaminase levels in obese subjects with or without diabetes mellitus.

METHODOLOGY

Selection of Subjects

A total number of about 90 subjects were randomly selected from various age between 30 to 60 years from various Fitness clubs/and or from morning walkers located nearby and within Hyderabad city. Both males and females were included in the study. After explaining the study protocol to the participants, informed written consent was obtained both diet counseling and anthropometric measurements were done using the standard protocol. BMI was calculated as weight (kg) divided by height (mts²). The details of the subjects obtained especially the BMI were categorizes as Normal weight (18-24.9 Kg/ mts²), Overweight (between 25-29.9 Kg/ mts²) and Obese (30 & above Kg/ mts²).

Laboratory Investigations

All the subjects were checked for the fasting blood glucose using Accu-check Glucometer to rule out any diabetes mellitus. For this small amount (one drop) was taken as per the protocol and glucose values obtained were recorded. Simultaneously about 2 ml of blood sample was collected and ADA biomarker levels were analyzed as it is well established that ADA is an immunoenzyme marker for assessing the immune status in an individual by the method of G. Giusti and B. Galanti (1984) (6). Data obtained was compiled on to an excel sheet and subjected for statistical analysis using computer software SPSS version 20.0.

RESULTS AND DISCUSSION

A total number of about 90 subjects were randomly selected from the city of Hyderabad. The characterized details of the subjects are depicted in Table-1 and details of laboratory parameters are given in Table-2. It can be observed that mean values of normal individuals for FBS is noted as 132.8±23.6, while the overweight subjects have an increased blood glucose levels with mean values of 203.7±34.7 indicating these subjects are suffering from Diabetes Mellitus (type-2) and further individuals with obesity BMI of 30 & above also have prolong history of Diabetes Mellitus.

As the study was focused on correlation of immune status with that of obesity therefore Adenosine deaminase (ADA) activity was used as an immunoenzyme marker. Since that overweight and obesity was mostly associated with diabetes mellitus therefore both Fasting Blood Glucose and ADA values along with BMI obtained are depicted in the Table-2 It can be observed that normal weight subjects who had good health status showed FBS levels with normal mean values of 132.8 +/-23.6 and their ADA activity were in the normal range as 20.81 +/- 2.56 U/L (normal ADA values15- 25 U/L) indicating they were non-diabetic with normal immune status. On the contrary the overweight individuals reported to have FBS as 203 .7+/-34.7 and altered immunity as the ADA levels were found to be 31.09 +/- 4.01 U/L whereas obese subjects had higher FBS levels with 256.6 +/- 67.19 and also highly abnormal values of ADA activity with 38.17 +/- 8.27 U/L.

Earlier the elevated adenosine deaminase activity in overweight and obese Indian subjects was reported by Ashish Anantrao et.al (2011) (7). Adenosine, an endogenous anti-inflammatory metabolite, is increased in response to inflammation produced by adipose tissue in obesity. ADA could therefore be used in daily routine laboratory assessment of most metabolic diseases especially in obese



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and diabetic patients. ADA level was more among diabetes patients having obesity than diabetes patients having no obesity and controls reported by A Nwankwo (2013) (8) on contributory role of Adenosine deaminase in metabolic syndrome viz Diabetes mellitus. In the present study the statistical analysis carried out showed significant differences for FBS (Fasting blood sugar) levels in all the groups' i.e. Normal weight vs. overweight and obese subjects indicating that body weight has a crucial role in the pathophysiology for the manifestation of diabetes mellitus in human.

Our findings clearly project an early detection of elevation of ADA levels may help in early prevention and management of metabolic syndrome including obesity and its complications make this finding conclusive and acceptable biochemical evidence. In our earlier study we hypothesized that increased ADA activity may be due altered immunity could be due to pre-autoimmune status of diabetes mellitus in obesity (9). A number of studies have found that ADA may serve as an immunoenzyme marker in the aetio-pathology of obesity associated with type 2 diabetes mellitus. Therefore, this has attributed to the abnormal immune status in these subjects and there was a severe alteration in the ADA values not only in obese subjects but also in overweight individuals. Further the serum uric acid, which is an end product in ADA reaction therefore factors have important contributory in obesity with pathogenicity as reported by Netravathi Basappa et.al (2013) (4). Therefore, this biomarker may help in nutritional counseling especially in overweight and obese individuals with or without diabetes mellitus in order to maintain good health and minimize any co-morbidity to occur.

CONCLUSION

Adenosine deaminase (ADA) activity was more in obesity with diabetes mellitus compared with non-diabetes. Therefore, ADA along with FBS can be implemented to obtain information on inflammation and immunopathology in these subjects. Further it can be noted both these are cost effective that be easily integrated as prognostic and diagnostic biomarkers to obtain clinical information for providing better treatment to diabetes mellitus patients.

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Table (1) Socio demographic Characteristics of the study sample (n= 90)

S. No.	Characteristics	STUDY GROUP
1	Males	F (%) 52 (57.7%)
	Females	F (%) 38 (42.3%)
2	Age (Mean ± SD)	39.45 ± 6.2
3	Weight (kgs) (Mean ± SD)	86.16 ± 0.83
4	Height (cms) (Mean ± SD)	167.66 ± 10.13
5	BMI (Mean ± SD)	33.64 ± 2.30

Table (2)-Showing association of Adenosine deaminase activity Normal, Overweight and Obese Subjects along with Diabetes Mellitus (n=90)

S.No.	Number of Subjects (N=90)	Fasting Blood Glucose	Adenosine Deaminase Activity
1	Obese BMI Subjects (30-36) (n= 34, BMI ≥ 30 kg/m ²)	256.6 ± 67.19 ^c (Increased)	38.17 ± 8.27 ^c (Severely altered)
2	Overweight BMI Subjects (25-30) (n = 36 BMI 25-29.9 kg/m ²)	203.7 ± 34.7 ^b (Increased)	31.09 ± 4.01 ^b (abnormal)
3	Normal BMI (Healthy Subjects) (18 -24.9) (n = 20, BMI < 25 kg/m ²)	132.8 ± 23.6 ^a (Near to normal range)	20.81 ± 2.56 ^a In normal levels

Normal plasma values ADA: 15-25 U/L, FBS: 70 -126 mg

*It can be observed that there was a significant increase in the Fasting Blood Glucose levels along with ADA in the obese subjects indicating alteration in the immune status similar trend was observed in overweight subjects however individuals with normal glucose levels had normal ADA values.