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A STUDY TO ASSESS BODY FAT PARAMETERS IN PREDIABETICS AND NORMOGLYCAEMICS

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ABSTRACT Prediabetes is a state of hyperglycaemia with blood glucose levels above normal but below the diabetes threshold. The aim of the study was to determine whether there is any association between the body fat parameters and development of prediabetes. A descriptive cross sectional study was carried out in the department of physiology, Himalayan Institute of Medical Sciences with 90 subjects (60 prediabetic and 30 normoglycaemics). Their blood glucose was recorded using a glucometer and body fat parameters and BMI were recorded using bio-impedance method. The results of the two groups were compared using unpaired 't' test and correlation was tested using Pearson's correlation test. A p value <0 .05 was considered as significant. All parameters were found to be higher in prediabetics, although it wasn't statistically significant. However, fasting blood glucose had a positive correlation with the body fat parameters in the prediabetic group. The present study suggests that in susceptible individuals, percentage and distribution of body fat are deranged quite before frank diabetes develops.

KEYWORDS : Prediabetes, total body fat, visceral body fat.

INTRODUCTION:

Diabetes mellitus, which is a non communicable disease, is one of the commonest causes of death worldwide[1]. Prediabetes contributes greatly towards the discernable development of diabetes and is defined as fasting blood sugar (FBS) levels above normal (≥100 mg/dL) but below diabetes thresholds (≤125 mg/dL) [2]. The predictions in 2011 were that, the number of diabetics in India would be 62.4 million, while 77.2 million people will be prediabetic [3]. Around 5–10% of people with prediabetes develop explicit diabetes within a year[4]. It is well established now that the same type of changes, observed in type 2 diabetes like insulin insensitivity, pancreatic β-cell insufficiency, and increased production of hepatic glucose are also encountered in prediabetes [5]. The global epidemic of overweight and obesity are the important factors found to be associated with chronic diseases like type 2 diabetes mellitus [6].

For a diagnosed prediabetic, the line of management changes more towards initiating adequate prophylactic measures to either prevent or delay the rate of conversion to diabetes [7,8].

Various studies have shown that obesity is the prime cause of prediabetes which further in the due course of time may lead to development of overt diabetes[6]. As the prevalence of obesity is increasing so is the rise of overall burden of diabetes mellitus[6] and prediabetes is now growingly considered as a major contributor to it[7] .Hence the study was planned with the aim to analyze the association of body fat parameters with the development of prediabetes.

MATERIALS AND METHOD:

A descriptive, observational study was carried out in the department of Physiology, Himalayan Institute of Medical Sciences, Swami Ram Nagar, Dehradun, over a period of 12 months in which 90 subjects, aged 30 -50 years who were either visiting the medicine outpatient department, or residents or employees of Swami Rama Himalayan University, Dehradun were selected after prior approval from institutional ethical committee and taking written informed consent. Individuals with history of daily alcohol intake, tobacco chewing, daily smoking, and systemic diseases like hypertension, thyroid disorders, etc and those on medications like steroids, anti-psychotic drugs, etc were excluded from the study. Individuals who were fasting (religious or cultural cause) or who had consumed food in the morning were also excluded. In this way, 60 prediabetics and 30 normoglycaemics were selected for the study.

Their FBS were checked using glucometer (GlucOne BG 03 Auto by DrMorepan)[9] in early morning state without breakfast. Based on the working definition the clinically healthy adult male subjects of 30 -50 years were considered prediabetic if their FBS level was ≥100 mg/dl and ≤125 mg/dl and were normoglycaemic if their FBS was <100mg/dl.

Body weight, percentage body fat and visceral fat were measured using an impedance body composition analyzer. The principle of working of the instrument is based on patented foot to foot pressure contact electrode and Bioelectrical Impedance Analysis technique. Subjects after emptying bladder were asked to stand barefoot and with minimal clothing on the foot pad of the instrument. They were told to stand there till the reading is displayed on the panel[10].

Data thus obtained was subjected to statistical analysis using the software SPSS (Statistical Package for the Social Sciences), version 20.0 for Windows. Descriptive analysis was done for the variables of the control (normoglycaemics) and the study group (prediabetics), and was expressed as mean ± standard deviation. Their BMI, percentage body fat (%BF) and percentage visceral fat (%VF) were assessed by unpaired't' test. The association of fasting blood glucose levels with body fat parameters in prediabetes adults was observed by Pearson's correlation test. Level of Significance was set at $p<0.05$.

RESULTS:

There was no significant difference in the demographic and anthropometric parameters between the normoglycaemic and prediabetic group as depicted in Table 1. Although the mean values of BMI, percentage body fat and percentage visceral fat were increased in prediabetics but the values were statistically not significant as compared to normoglycaemics.

Table 1: Demographic, Anthropometric and Cardiovascular parameters among Normoglycaemics & Prediabetics (Mean±SD)

Parameters	Normoglycaemic (n=30)	Prediabetic (n=60)	p value
Age (years)	41.10±6.39	43.18±5.63	0.11
Height (cm)	169.13±4.81	170.81±4.67	0.12
Weight (kg)	72.13±8.20	75.20±6.11	0.07
BMI(kg/m²)	25.36±2.31	25.63±2.30	0.59
% BF	24.95±3.90	26.25±3.12	0.12
%Visceral fat	11.86±4.12	12.93±3.21	0.22

Values: Mean ± SD; "t" test. BMI: Body Mass Index; % BF: percentage of Body Fat; $p>0.05$ was considered statistically non significant; $p < 0.05$ was considered statistically significant.

In subjects with FBS ≥100 mg/dL, FBS was positively correlated with percentage total body fat and percentage visceral fat as shown in Table 2:

Table 2: Correlation Of Fasting Blood Sugar (FBS) With Body Fat Parameters Among The Prediabetic Males (N=60):

	FBS (mg/ dl)	Age (years)	% BF	% Visceral Fat
FBS (mg/ dl)	1	.093 (.482)	.083 (.529)	.091 (.488)

% BF			1	.536** (.000)
%Visceral Fat				1

Values are in correlation coefficient r; (p value). p>0.05 was considered statistically non significant; p value < 0.05*, p<0.01: **, p<0.001:*** was considered statistically significant.

DISCUSSION:

The annual rate of progression of prediabetes progresses to type 2 diabetes mellitus (type 2 DM) is about 10% [4].In a recent 8 year follow-up of the Chennai Urban Population Study [CUPS] in India, Mohan V et al. found that 40.5% prediabetic subjects developed DM within next 5 years [11].

The present study measured BMI, percentage body fat and percentage visceral fat in prediabetics and evaluated the relationship of variables of body fat parameters with FBS levels in prediabetic adult males. Our study observed that the weight, BMI percentage body fat and percentage visceral fat were increased in prediabetics as compared to the normoglycaemic healthy male adults, although the values. Increase in visceral fat % was also reported by Ian JN et al . [12]

The observation in our study finds support in the longitudinal study that tracked high risk subjects from the stage of normal glucose tolerance to prediabetes, which reported that the transition to prediabetes was associated with an increase in body weight[13]. Findings of our study are also in consonance with the findings of Gomez-Ambrosi J et al who concluded that percentage body fat helped to diagnose disturbed glucose tolerance beyond information provided by BMI and waist circumference specially in male subjects control[14]. The drawback of quantification of central obesity by measuring waist circumference is non specific as the readings can be inaccurate due to unequal fat distribution of subcutaneous fat in the waist. This can be rectified by accurate measurements of visceral fat[15]. Zeng Q et al. reported percentage body fat to be a better predictor of chronic disease risk factors than BMI[16]. Similar trends were also found by Jung HS and his colleagues [17].

The present study also highlights that fasting blood glucose was positively correlated with percentage of visceral fat in prediabetics. Similar results were also reported by Nagaretani H et al.[18]

CONCLUSION:

The study concludes that in the development of prediabetes there is no significant association between the body fat parameters of the prediabetics as compared to the age group matched normoglycaemics. Relation of FBS ≥100mg /dl with percentage body fat & percentage of visceral fat was positive but, the results were statistically not significant.

LIMITATION:

Since only male subjects were considered under the ambit of the study, the findings cannot be generalised for both the sexes. Also, the duration for which the subjects were prediabetic were not known. So the association cannot be objectively quantified. Larger studies of longitudinal design in susceptible individuals can paint a more holistic picture.

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