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"EVALUATION OF THE CORRELATION BETWEEN ISLET β CELL FUNCTION WITH LIPID PROFILE AND BMI IN NORTH-INDIAN OBESE ADULTS"

General Medicine

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ABSTRACT

Introduction: Obesity is one of the major public health problems of the world wide. Obesity leads to insulin resistance and abnormal lipid profile and these are some of the attributable risk factors of cardiovascular disease. Pancreatic β cells dysfunction caused by dyslipidemia precedes the manifestation of type 2 diabetes mellitus (T2DM) and is an independent risk factor for the development of T2DM. Moreover, few studies have compared β cell function with dyslipidemia . The aim of this study is to find out the correlation of β cell function with lipid profile and BMI in North-Indian obese adults.

Material and methods: This was cross-sectional study conducted in total 100 obese adults of age group between 20-50 years with no obvious causes for obesity after taking informed consent. Anthropometric data, blood pressure, basic blood tests (CBC, LFT, RFT, FBS, Fasting Insulin, Lipid profile), ECG, CXR of the patients were done by standard method. Insulin resistance (HOMA-IR) and Beta cell function (BCF%) were calculated by using computer based HOMA2 calculator. All collected data were analyzed and the correlation between beta cell function with lipid profile parameters and BMI were studied.

Results: We observed spastically significant correlation of Beta cell function with lipid parameters (Total Cholesterol, Triglycerides, Low Density Lipoprotein, Very Low Density Lipoprotein and high Density Lipoprotein) and BMI in obese adults.

Conclusion: The current study concludes that there is statistically significant positive correlation of Beta cell function with lipid profile and BMI in north-Indian obese adults. . Consequently, dyslipidemia and high BMI with impaired β cell function should be paid more attention.

KEYWORDS

Insulin Resistance, Obesity, Lipid Profile, Body Mass Index(BMI), Dyslipidemia, Homeostasis Model Assessment Insulin Resistance Index (HOMA-IR).

Introduction:

According to the World Health Organization (WHO) the most common as well as most neglected public health problems in both developed and developing countries are obesity[1].Globally one in six adults is obese and nearly 2.8 million individuals die each year due to overweight or obesity according to the WHO World Health Statistics Report 2012[2].In India, the prevalence of overweight increased from 9.7% near the turn of the century to nearly 20% in studies reported after 2010.[3] Obesity is a clinical condition in which excess body fat accumulates to the extent that it may have an adverse effect on health, leading to reduced life expectancy and or increased health problems. In type 2 diabetes mellitus (T2DM) there is decreased beta-cell function on the background of increased IR[4],Hence, only putting emphasis on IR ignores the contribution of beta-cell dysfunction. Nonoxidative metabolic products of fatty acid spill over have been implicated in lipotoxicity and beta-cell dysfunction[5]. Beta-cell function has been not been well studied. So, we took the opportunity to conduct the present study with the aim to evaluate the correlation of beta-cell function with lipid profile and BMI, in North Indian obese adult population.

Material and methods

This was a cross-sectional study conducted on 100 cases of obese adults in the age group 20-50 years with no obvious causes for obesity like hypothyroidism, diabetes mellitus, and chronic diseases like CKD, CLD, HIV etc and those who were on anti-lipidemic agents excluded. The study was conducted for one year duration after taking informed consent of the concerned cases. The patient's history was taken and physical examination findings were noted. Anthropometric data, blood pressure, basic blood tests (CBC, LFT, RFT, FBS, Fasting Insulin, Lipid profile), ECG and CXR of the patients were done. Insulin resistance (HOMA-IR) and Beta cell function (BCF%) were calculated by using computer based HOMA2 calculator. Beta cell function was calculated on the basis of fasting serum insulin level and fasting serum glucose level using same computer based HOMA2 calculator. All collected data were analyzed and the correlation of beta cell function with lipid profile and BMI were studied.

Statistical Analysis : All the data was entered on a Microsoft Excel Sheet and analysed using SPSS 19.0 statistical software. Continuous data were summarised in forms of Mean and SD; and the difference in means were analyzed using Student unpaired t-test. Correlation of beta cell function with variable lipid profiles and BMI were found out using Pearson's correlation coefficient. Level of significance i.e. P value <0.05 was kept as significant whereas <0.001 was kept as highly significant.

SELECTION CRITERION OF PATIENTS

Inclusion criteria:

- The study will include 100 obese individuals (BMI>25 Kg/m^2, WHR >0.9 in men, >0.8 in women) between the age group 18-50 yrs.

Exclusion criteria:

- Patients with liver disease, renal disease, cardiac disease and endocrine disorders.
- Those not willing to give informed consent.
- Seriously ill patients.
- Patients already on Anti-hyperlipidaemia agent.

Result:

Table 1 shows the demographic and anthropometric parameters of the study population. The age range of study population is 20-50 years while the mean age is 37 years, mean weight is 83.96 kg (range: 59-112 kg) and mean height is 164.5 cm (range: 147-188 cm). Mean BMI is 30.97 (range: 25.9-42.9).

Table 1: Descriptive data of the study

	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	20.00	50.00	37.85	9.06
Weight	100	59.00	112.00	83.96	10.78
Height	100	147.00	188.00	164.5	7.39
BMI	100	25.90	42.90	30.97	3.63

Table 2: Descriptive data of gender

	N	Percent
F	50.0	50.0
M	50.0	50.0
Total	100.0	100.0

The above table2 shows the sex distribution of the study population. There are 50 male and 50 female subjects (male: female=1:1).

Table 3: Comparison of beta cell function (BCF) with BMI among the study

	N	Mean	Std. Deviation	P value
BCF	100	173.39	44.34	**<0.001 (S)**
BMI	100	30.97	3.63	
Total	200	102.18	77.98	

Test applied: unpaired t test

The above table3 demonstrate the relation between beta cell function (BCF%) and BMI of the study population was statistically significant correlation($p<0.001$). The following scatter plot also shows same positive correlation.

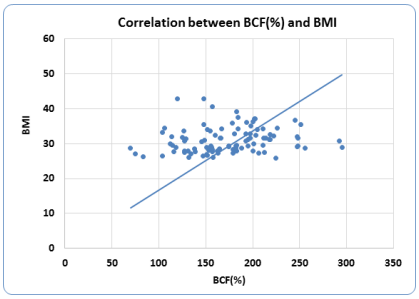
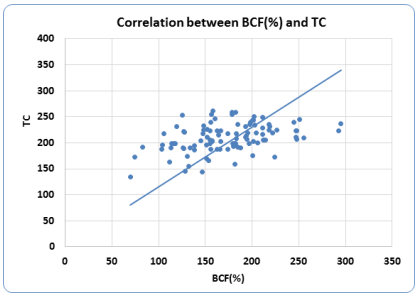


Table 4 shows the various parameters analysed in our study in form of mean and SD. Using statistical analysis, correlation beta cell function with lipid parameters were studied and all the correlations were statistically significant.

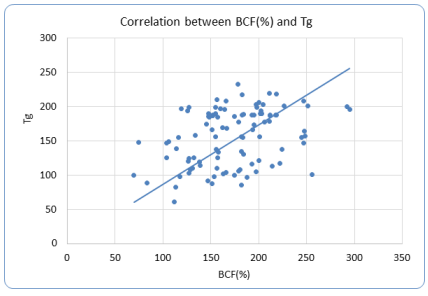
Table 4: Beta cell function and Lipid profile of the study

Parameter	Mean	Std. Deviation	P value
HOMA-IR	2.33	0.74	<0.001 (S)
BCF	173.39	44.34	<0.001 (S)
FI	18.303	6.01	<0.001 (S)
FBS	89.39	9.36	<0.001 (S)
TC	209.74	26.72	<0.001 (S)
TG	156.24	41.01	<0.001 (S)
LDL	136.37	23.37	<0.001 (S)
VLDL	31.26	8.25	<0.001 (S)
HDL	41.94	3.37	<0.001 (S)

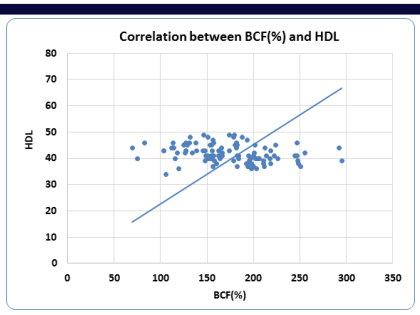
The below scatter diagram shows statistically significant correlation between BCF% and TC ($p<0.001$).



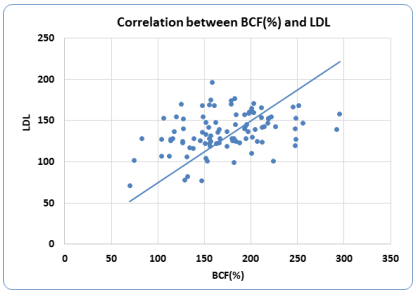
The below scatter diagram shows statistically significant correlation between BCF% and triglyceride (TG) ($p<0.001$).



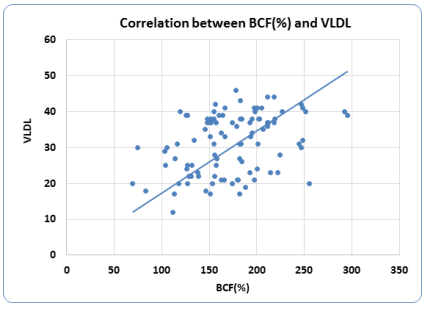
The following scatter diagram demonstrate statistically significant correlation between BCF% and high density lipoprotein (HDL) ($p<0.001$).



The following scatter plot shows linear correlation between BCF% and LDL variables and the correlation is statistically significant ($p<0.001$).



This scatter diagram shows the statistically significant correlation between BCF% and VLDL($p<0.001$).



Discussion:

BCF and BMI

In our study beta cell function was calculated on the basis of fasting serum insulin level and fasting serum glucose level using same computer based HOMA2 calculator. Mean value of BCF was 173.39%. Statistic analysis showed that BCF has significant correlation with BMI. As with increase in BMI, there is increase in insulin resistance, thus increases BCF value.

Similarly, Gang Chen et al (2010)[6], Chen X et al (2015)[7] and Lui J et al (2016)[8] found similarly positive significant correlation between BMI and BCF (HOMA-b) in obese non-diabetic patients.

Although BCF increases in response to increased insulin resistance in obese adults initially; with further progression to T2DM, the beta cell function (HOMA-b) decreases as there is exhaustion of beta cells.[9]

BCF and Lipid profile:

In our study we tried to find the correlation between BCF and different lipid parameters.

We found that BCF value had shown significant positive linear correlation with TG, TC, LDL, VLDL and negative correlation with HDL.

Hyun Yoon et al (2016)[10] in their study found that mean BCF was 138.03% for dyslipidemic group and reported that the variables showing a significant difference in the mean of HOMA-b were age, BMI, TG, HDL-C and FBS (for all $p<0.001$)

In one longitudinal study done by Fumiaki Imamura et al (2013)[11] it was found that age, BMI, HDL-C, and triglycerides(TG) were

associated with both IR and β-cell dysfunction ($p< 0.02$ for both), but in opposite directions. Higher BMI was independently associated with more β-cell function or high HOMA-b value in initial stage of obesity.

Conclusion:

Beta cell function (BCF%) was found to have positive correlation with both BMI and various lipid parameters in obese individuals. Our data indicate that β cell function is impaired not only in people with IFG, IGT, or T2DM, but also in individuals with high BMI and dyslipidemia. Consequently, dyslipidemia and high BMI with impaired β cell function should be paid more attention. We believe that exercise and diet therapy should be preferred to these people first because these two modalities of treatment have clear effect in control of BMI and blood lipids metabolism disorder.

REFERENCES

1. World Health Organization (WHO). Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser 2000; 894: i-xii, 1-253. .
2. World Health Organization (WHO).World Health Statistics 2012. Geneva: WHO;2012. Available from: http:// www.who. int/gho/ publications/ world_ health_ statistics/ EN_ WHS2012_ Full.pdf, accessed on November 28, 2012.
3. "National Family Health Survey"Mumbai: International Institute for Population Sciences. 2015.
4. Invitti C, Guzzaloni G, Gilardini L. et al. Prevalence and Concomitants of Glucose Intolerance in European Obese Children and Adolescents. Diabetes Care. 2003;26:1118–1124.
5. Alvarsson M, Wajngot A, Cerasi E. et al. K-value and low insulin secretion in a non-obese white population: predicted glucose tolerance after 25 years. Diabetologia. 2005;48:2262–2268. doi: 10.1007/s00125-005-1929-6.
6. Overweight, obesity, and their associations with insulin resistance and β-cell function among Chinese: a cross-sectional study in China Gang Chen Chune Lieu, and Jixing Liang, Liantao Li.
7. Role of insulin resistance and β cell function in the development of newly diagnosed type2DM,Chen X, Su M, Wang C, Wu Z, Li S, Ying X, Wei G, Fu C, Jiang Q, Wei Shang, Yan Jiu 2015 Nov.
8. Comparison of β-cell dysfunction and insulin resistance correlating obesity with type 2 diabetes: A cross-sectional study. Liu J1,Wang Y2, Hu Y1, Leng S3, Wang G4; J Diabetes Complications. 2016 Jul;30(5):898-902.
9. Insulin resistance, beta-cell function, and glucose tolerance in Brazilian adolescents with obesity or risk factors for type 2 diabetes mellitus. Da Silva RC1, Miranda WL, Chacra AR, Dib SA; J Diabetes Complications.2007 Mar-Apr;21(2):84-92.
10. Relationship between homeostasis model assessment of insulin resistance and beta cell function and serum 25hydroxyvitamin D in nondiabetic Korean adults Hyun Yoon1, Dae Jung Jeon2, Chang Eun Park3, Hye Sook You4 and Ae Eun Moon5.
11. Risk Factors for Type 2 Diabetes Mellitus Preceded by β-Cell Dysfunction, Insulin Resistance, or Both in Older Adults Fumiaki Imamura,*Kenneth J.Mukamal, James B. Meigs, Jose A Luchsinger, Joachim H. Ix, David Sick and Dariush Mozaffarian; Am J Epidemiol. 2013 Jun 15;177(12): 1418-1429.