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Study Of C-Peptide Levels In Newly Diagnosed Young Type 2 Diabetes Patients And Non Diabetic Obese Individual In Tertiary Care Centre

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ABSTRACT

Background: Type II Diabetes mellitus results from a combination of insulin resistance and inadequate secretion. Its development can be prevented In many instances and persons at risk can be identified with few common risk factors. A family history of diabetes, an increase in body mass index and impaired insulin secretion and action are important risk factors. The great interest in C-peptide is due to the limitations of the use of serum insulin as a measure of insulin secretion. C-peptide determinations are disturbed to a lesser extent than insulin measurements by the presence of insulin binding antibodies. we are conducting this study to assess the endogenous Insulin secretory function in patients who are newly diagnosed with type 2 DM and non diabetic individuals.

Objectives

- To study the levels of C-peptide in newly diagnosed young type 2 DM patients and non diabetic obese individuals
- To compare the levels of C –peptide in newly diagnosed young type 2 DM with that of non diabetic obese individuals.

Methods 50 newly detected young type 2 diabetes mellitus patients and fifty non diabetic obese individuals meeting the inclusion and exclusion criteria were selected from Tertiary care centre were studied. Necessary investigations like C Peptide levels FBS PPBS RBS HBA1C LFT RFT LIPID PROFILE CBC were measured

According to a prestructured proforma, data was collected and analysed.

Results. In the present study, a total of 50 cases of newly diagnosed Type 2 Diabetes and 50 age and sex matched controls of non diabetic obese individuals were included in the study over a period of 1 year. C Peptide levels were measured among young newly detected Type 2 Diabetes mellitus and non diabetic young obese individuals.C Peptide levels were higher among non diabetic obese individuals when compared to newly detected type 2 diabetes individuals (age and sex matched)C-peptide levels were higher in obese T2DM patients and non diabetic obese individuals, which proves the presence of higher levels of insulin secretion in them compared to the non-obese group.

Conclusion: The present study has succeeded in demonstrating higher levels of C-peptide in obese T2DM patients and non diabetic obese individuals, which proves the presence of higher levels of insulin secretion in them compared to the non-obese group.

In spite of this hyperinsulinaemia, control of blood sugar is poor in the obese diabetic group as suggested by the significantly higher HbA1c values in them.

This positively demonstrates the presence of insulin resistance in this group. Thus, we conclude that obesity leads to insulin resistance and is an important risk factor for poor glycaemic control in T2DM.

Keywords: *Diabetes mellitus , c peptide, insulin resistance ,obesity*

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1. INTRODUCTION

Type II Diabetes mellitus results from combination of insulin resistance and inadequate secretion of insulin . Nearly 90% fall in type II diabetes mellitus. Type II DM is a major health problem worldwide. Its development can be prevented in many instances and persons at risk can be identified with few common risk factors. A family history of diabetes, an increase in body mass index and impaired insulin secretion and action are important risk factors.

South Asians have a one in three lifetime risk for the development of diabetes, developing the condition ten years earlier than Europeans. India has the highest number of patients with known diabetes worldwide, with a prevalence of 11.6% in urban areas. One in three of 50 to59 year old Indian is having diabetes.

The only way to avoid is by early screening and effective management of people who are at risk of developing type II DM.

The great interest in C-peptide is due to the limitations of the use of serum insulin as a measure of insulin secretion. After its secretion in to the portal vein, insulin passes through the liver where approximately 50% of the insulin delivered is extracted.

Peripheral insulin concentrations therefore reflect post hepatic insulin delivery rather than the actual secretory rates of insulin. Until the development of C-peptide assays, evaluation of cell function in insulin treated patients was impossible as the insulin assay is unable to discriminate between secreted and injected insulin.

With the advent of newer drugs to overcome insulin resistance it has become all the more important to know about the pathophysiology of diabetes, whether endogenous insulin secretion is normal and to know about insulin resistance. keeping this perspective in mind, we are conducting this study to assess the endogenous Insulin secretory function in patients who are newly diagnosed with type 2 DM and non diabetic individuals.

2. AIMS AND OBJECTIVES OF THE STUDY

- To study the levels of C-peptide in newly diagnosed young type 2 DM patients.
- To study the levels of C-peptide in non diabetic obese individuals.
- To compare the levels of C peptide in newly diagnosed young type 2 DM with that of non diabetic obese individuals.

3. MATERIALS AND METHODS

SOURCE OF DATA
Observation method of primary source of information in the department of general medicine at tertiary care centre.
Secondary source of information from published articles, journals, books, case sheets, discharge summary, related websites are used in planning, developing, synopsis and during dissertation as supporting document.

METHODS OF COLLECTION OF DATA
Sampling procedure: patients who were newly diagnosed with young(<40 years) type 2 diabetes (based on ADA criteria) their blood samples were collected and sent for fasting C-peptide levels. And subjects (age and sex matched controls) who were non diabetic obese individuals (based on BMI criteria) their blood samples were collected and sent for fasting C-peptide levels.

Sample Size: 100

Duration of Study:
Study period one year.

Inclusion criteria
Subjects who gave written informed consent
Subjects who were newly diagnosed with young type 2 diabetes mellitus (age less than 40 years)attending OPD and admitted for various other reasons in tertiary care centre.
Subjects who were non diabetic obese individuals (age less than 40 years) attending OPD and admitted for various reasons in tertiary care centre.

Exclusion criteria:
Subjects who are Pregnant woman
Subjects who are known cases of DM
Subjects who are critically ill.
Subjects on drugs causing insulin resistance
Subjects with chronic liver disease and kidney disease

Type of Study
Cross sectional comparative study
The study required blood samples to be collected from the subjects for estimation of serum C Peptide levels and routine investigations like RBS, FBS PPBS, HBA1c, LIVER FUNCTION TESTS ,KIDNEY FUNCTION TESTS, AND SERUM ELECTROLYTES.

- Statistical analysis was performed using statistical software package SPSS version 20
- The non parametric t-test and ANOVA test were applied in comparative analysis results between different groups and to find significance (p) value. Mean values, standard deviation were assessed wherever relevant.

SAMPLE SIZE ESTIMATION
Sample size: 100
The prevalence of diabetes is 8.8%. For the level of significance of 5 % and allowable error of 6 %, using estimation setup technique the sample size is estimated as 100 using the formula $4pq/d^2$.
Where P is prevalence, Q is 1-P.

4. RESULTS

In the present study, a total of 50 cases of newly diagnosed Type 2 Diabetes and 50 age and sex matched controls of non diabetic obese individuals were included in the study over a period of 1 year.

Table 1: AGE DISTRIBUTION

			Group		Total
			Case	Controls	
Ages	<25 y	Count	3	3	6
		% within Group	6.0%	6.0%	6.0%
	26-30 y	Count	8	10	18
		% within Group	16.0%	20.0%	18.0%
	31-35 y	Count	17	16	33
		% within Group	34.0%	32.0%	33.0%
	> 35 y	Count	22	21	43
		% within Group	44.0%	42.0%	43.0%
Total		Count	50	50	100
		% within Group	100.0%	100.0%	100.0%

Table showing age distribution of cases and controls

In our study total subjects 100
6 percent of subjects were less than 25 year
18percent of subjects were between 26 to 30 years
33percent of subjects were between 31 to 35 years
43percent of subjects were between 36 to 40 years

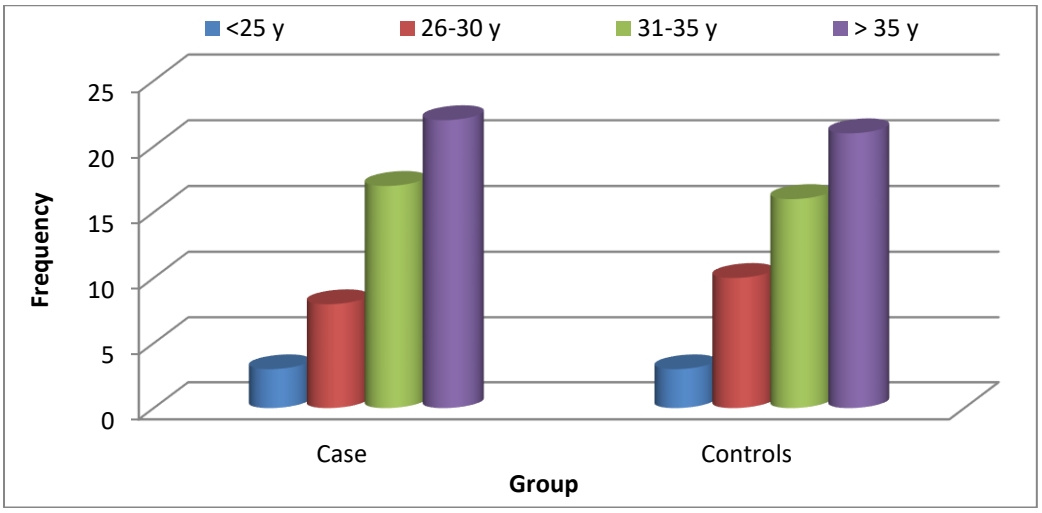

Figure 1: Bar graph showing age distribution among cases and controls

Table 2: SEX DISTRIBUTION

			Group		Total
			Case	Controls	
Sex	Male	Count	26	26	52
		% within Group	52.0%	52.0%	52.0%
	Female	Count	24	24	48
		% within Group	48.0%	48.0%	48.0%
Total		Count	50	50	100
		% within Group	100.0%	100.0%	100.0%

Table showing sex distribution among cases and controls

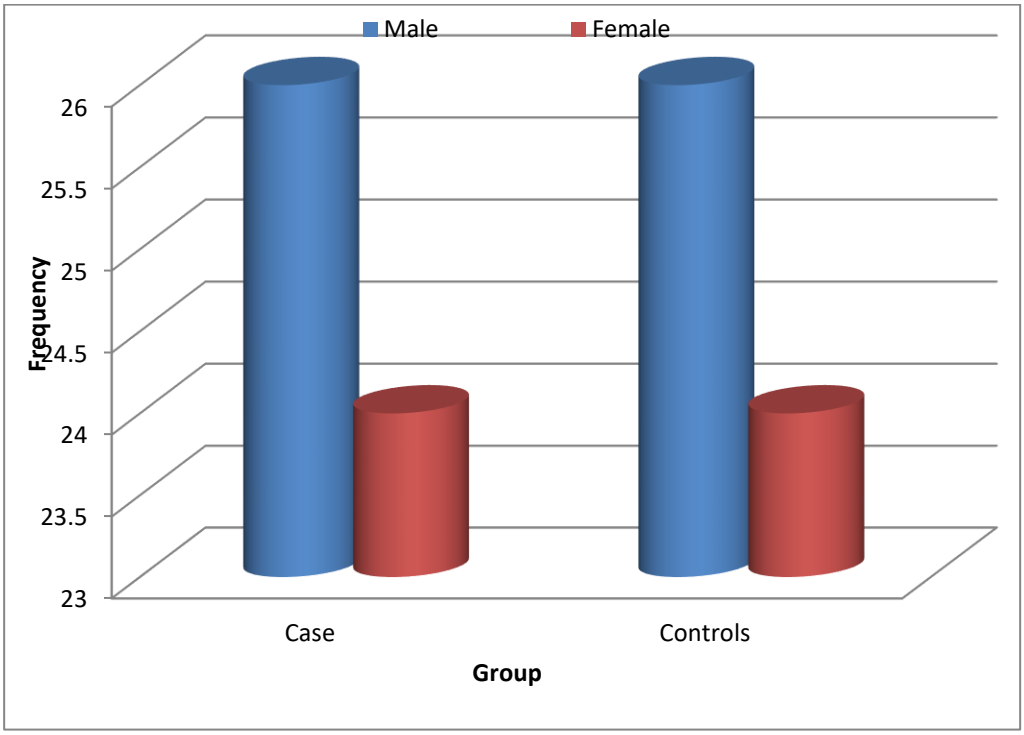

Figure 2: Bar graph showing sex distribution among cases and controls

In present study 52 percent of the subjects were males and 48 percent of the subjects were females.

Table 3: Distribution of BMI among cases and controls

			Group		Total
			Case	Controls	
BMI	<25	Count	25	0	25
		% within Group	50.0%	0.0%	25.0%
	25-30	Count	18	0	18
		% within Group	36.0%	0.0%	18.0%
	>30	Count	7	50	57
		% within Group	14.0%	100.0%	57.0%
Total		Count	50	50	100
		% within Group	100.0%	100.0%	100.0%

In present study
All controls were obese as the study required it.
25 percent of subjects were having BMI less than 25
18percent of subjects were having BMI between 25 to 30
57percent of subjects were having BMI more than 30

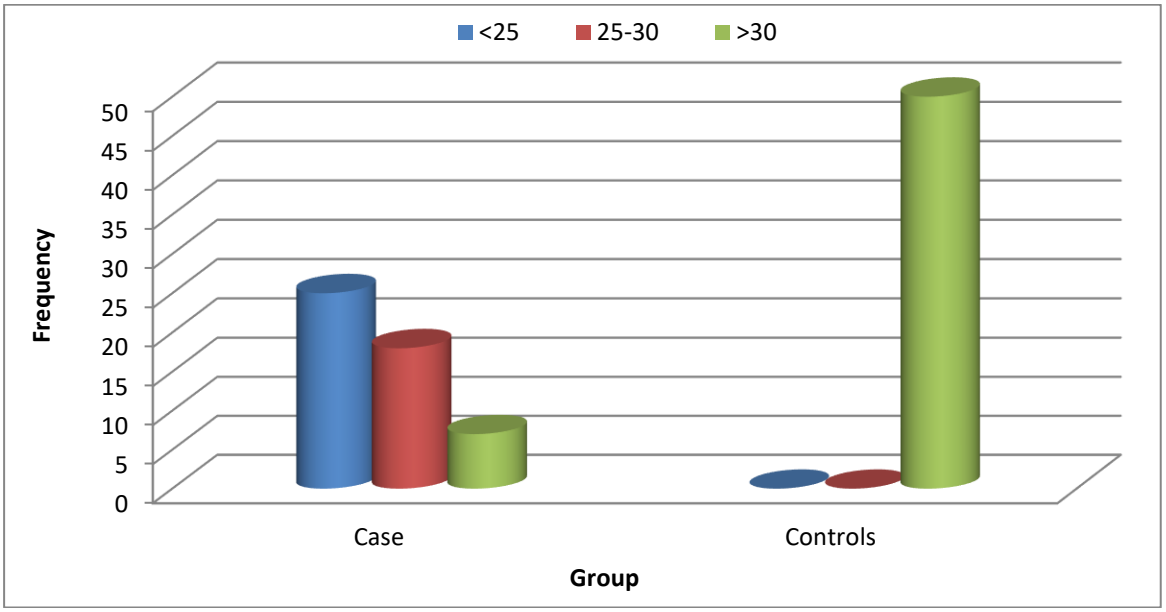

Figure 3: Bar graph showing distribution of BMI among cases and controls.

Table 4: Distribution of C Peptide levels among cases and controls.

			Group		Total
			Case	Controls	
C_Peptide (ng/ml)	<1	Count	4	0	4
		% within Group	8.0%	0.0%	4.0%
	1-7	Count	43	14	57
		% within Group	86.0%	28.0%	57.0%
	>7	Count	3	36	39
		% within Group	6.0%	72.0%	39.0%
Total		Count	50	50	100
		% within Group	100.0%	100.0%	100.0%

C Peptide levels were measaured in subjects
C peptide levels were more than 7 ng/ml in39 subjects
1 to 7 ng/ml in 57 subjects
<1ng/ml in 4 subjects

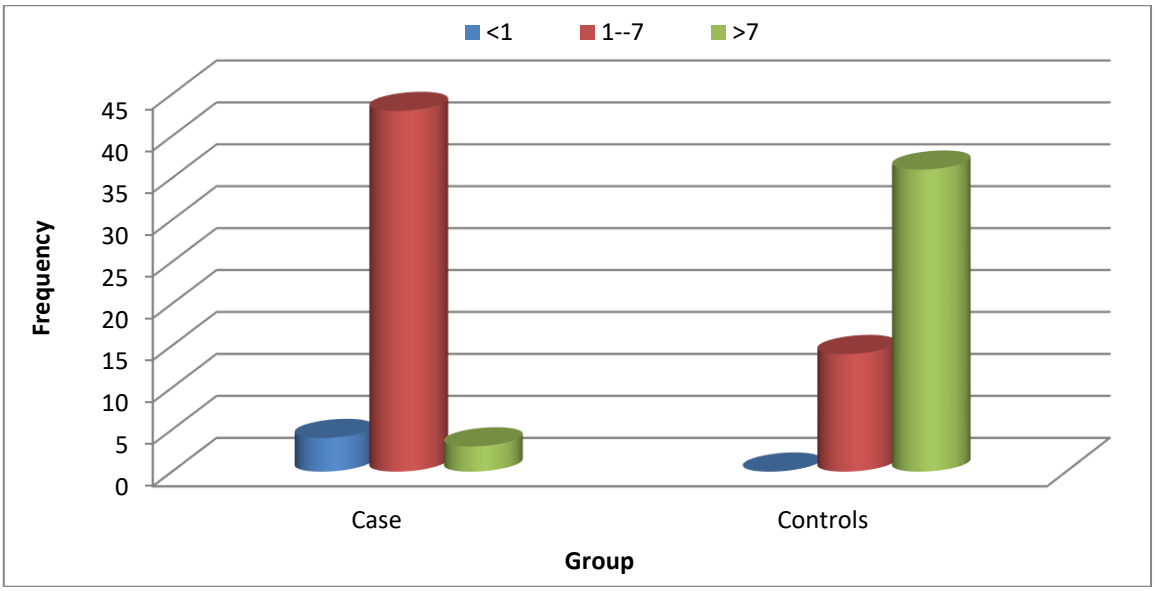

Figure 4:Bar graph showing levels of C Peptide among cases and controls.

Table 5: Comparison of BMI with C peptide levels among cases and controls

			C_Peptide			Total
			<1	1-7	>7	
BM Kg/m2	<25	Count	4	21	0	25
		% within	100.0%	36.8%	0.0%	25.0%
	25-30	Count	0	16	2	18
		% within	0.0%	28.1%	5.1%	18.0%
	>30	Count	0	20	37	57
		% within	0.0%	35.1%	94.9%	57.0%
Total		Count	4	57	39	100
		% within	100.0%	100.0%	100.0%	100.0%

In present study c peptide 137evels were higher in higher BMI group when compared to BMI less than 25

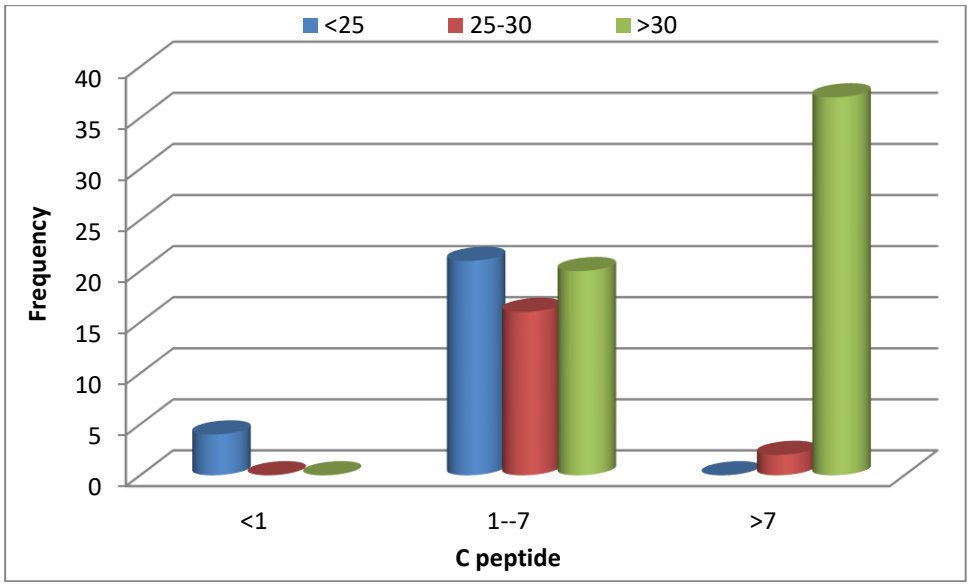

Figure 5: Bar graph showing comparison of BMI with C peptide levels among cases and controls.

Table 6: C peptide levels among males and females in cases and controls

Group				C peptide			Total
				<1	1-7	>7	
Case	Sex	Male	Count	1	25	0	26
			% within	25.0%	58.1%	0.0%	52.0%
		Female	Count	3	18	3	24
			% within	75.0%	41.9%	100.0%	48.0%
	Total		Count	4	43	3	50
			% within	100.0%	100.0%	100.0%	100.0%
Controls	Sex	Male	Count		8	18	26
			% within		57.1%	50.0%	52.0%
		Female	Count		6	18	24
			% within		42.9%	50.0%	48.0%
	Total		Count		14	36	50
			% within		100.0%	100.0%	100.0%

Above table shows c peptide levels between males and females there is no correlation between the values and sex of an individual

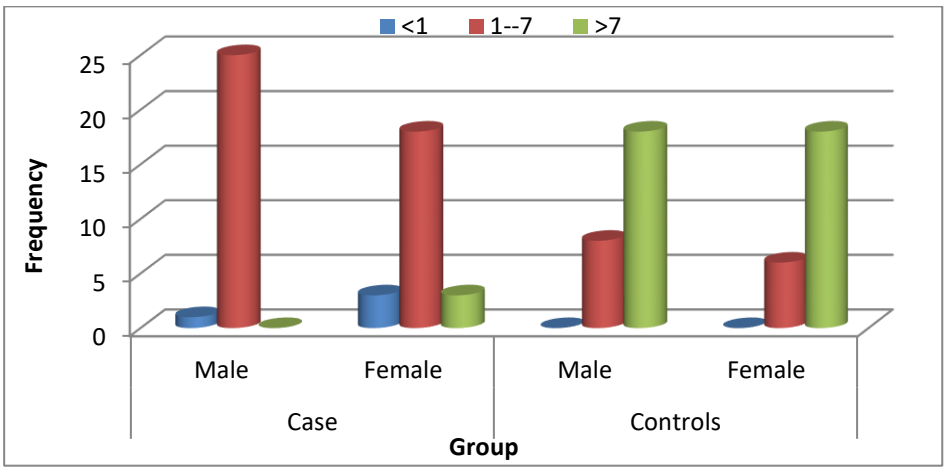

Figure 6: Bar graph showing C peptide levels among males and females in cases and controls.

Table showing positive correlation of c peptide levels with FBS PPBS HBAIC levels among cases

Table 7: Positive correlation of c peptide levels with FBS PPBS HBAIC levels among cases

		C_peptide
BMI	Pearson Correlation	.415
	Sig. (2-tailed)	.000
	N	50
RBS	Pearson Correlation	.173
	Sig. (2-tailed)	.003
	N	50
FBS	Pearson Correlation	.543
	Sig. (2-tailed)	.001
	N	50
PPBS	Pearson Correlation	.523
	Sig. (2-tailed)	.001
	N	50
HbA1C	Pearson Correlation	.513
	Sig. (2-tailed)	.002
	N	50

Table 8: Positive correlation of c peptide levels with FBS PPBS HBAIC levels among controls.

Correlation of c-peptide levels with BMI HBA1C FBS PPBS		C_peptide
BMI	Pearson Correlation	.414
	Sig. (2-tailed)	.003
	N	50
RBS	Pearson Correlation	.551
	Sig. (2-tailed)	.000
	N	50
FBS	Pearson Correlation	.460
	Sig. (2-tailed)	.001
	N	50
PPBS	Pearson Correlation	.643
	Sig. (2-tailed)	.003
	N	50
HbA1C	Pearson Correlation	.653
	Sig. (2-tailed)	.000
	N	50

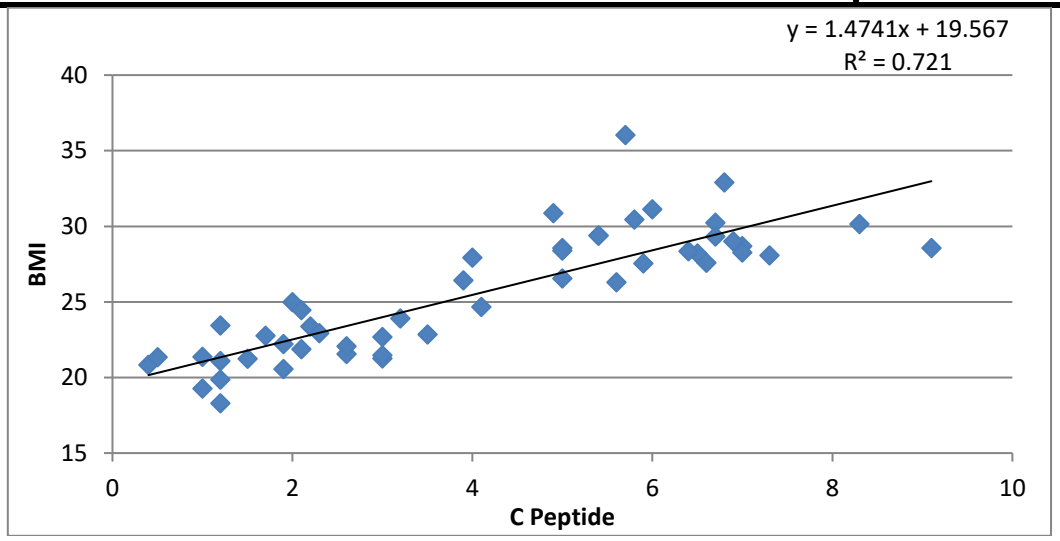

Figure 7: Graph showing positive correlation between C Peptide and BMI among cases

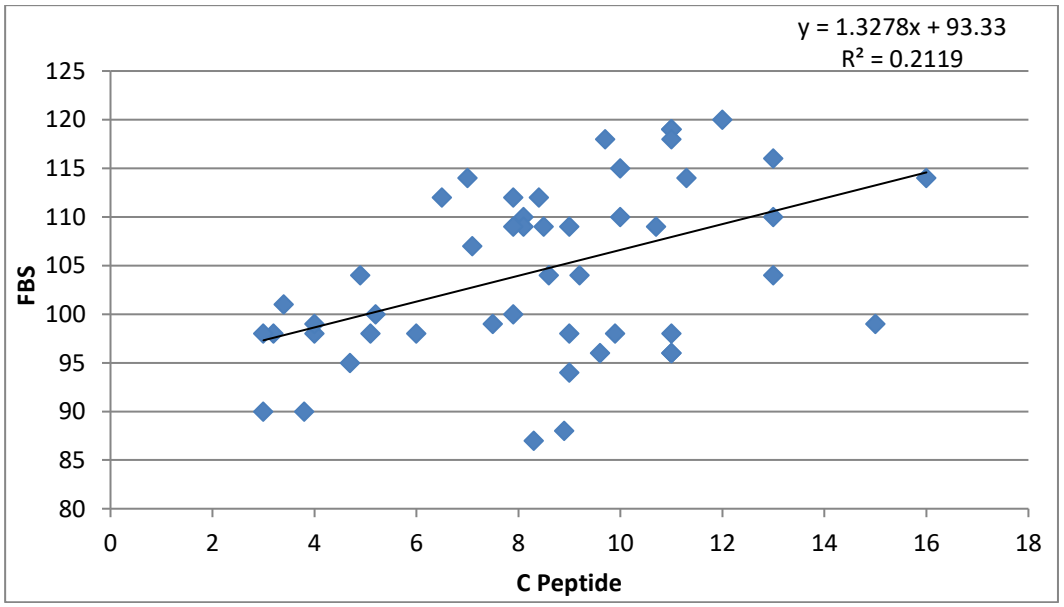

Figure 8: Graph showing positive correlation between c peptide and FBS among cases

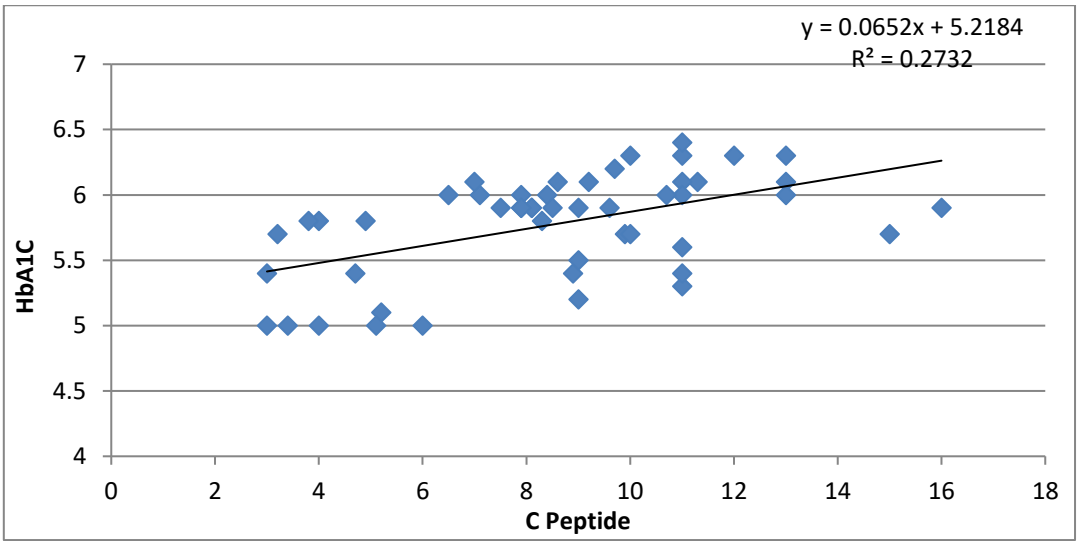

Figure 9: Graph showing correlation between HBA1C and c peptide levels among cases

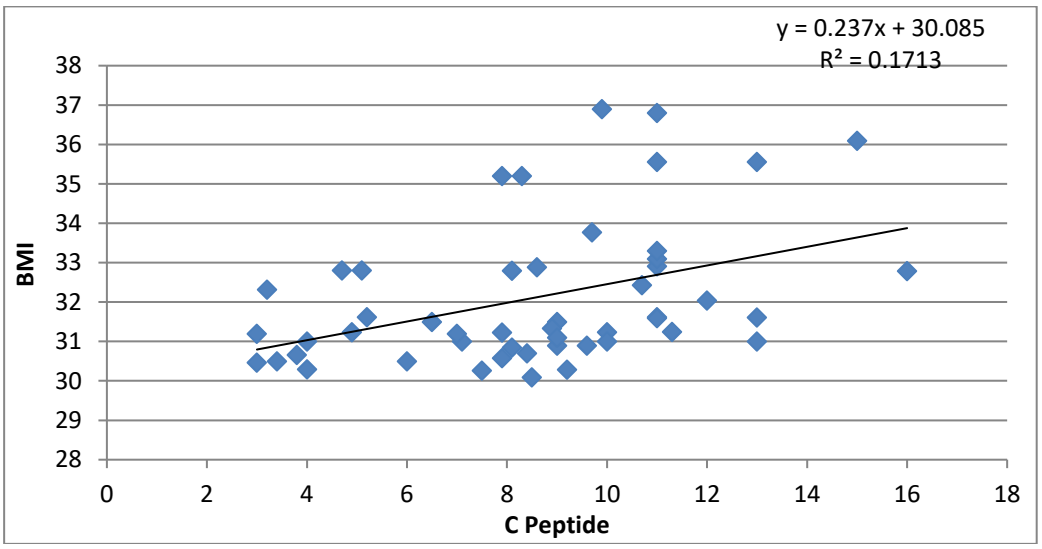

Figure 10: Graph showing positive correlation between BMI and C peptide levels among controls

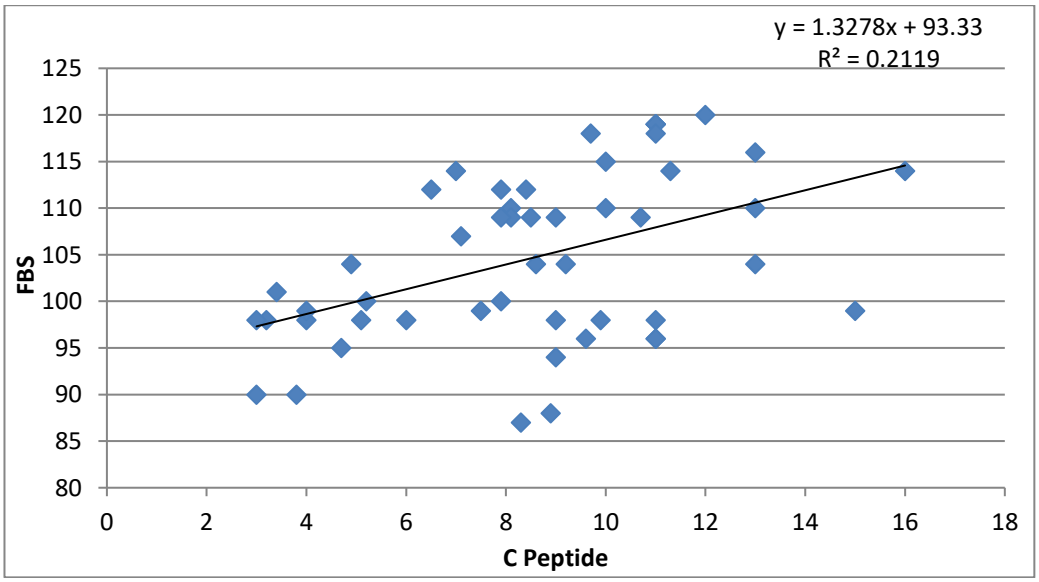

Figure 11: Graph showing positive correlation between FBS and C Peptide levels among controls

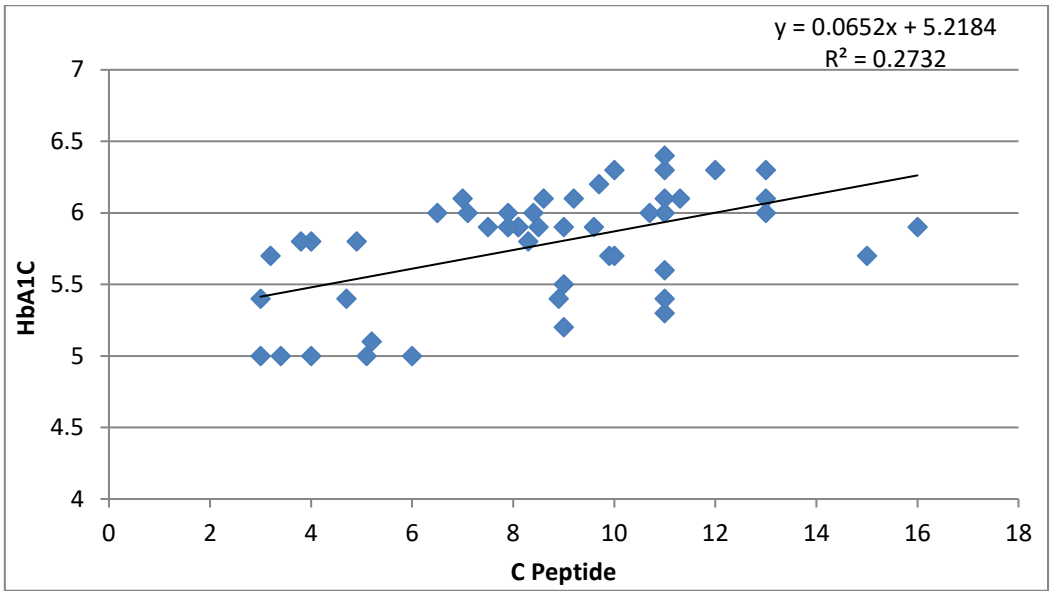

Figure 12: Graph showing correlation of C Peptide and HbA1C among controls

5. DISCUSSION

In our study C Peptide levels were measured among young newly detected Type 2 Diabetes mellitus and non diabetic young obese individuals.
C Peptide levels were higher among non diabetic obese individuals when compared to newly detected type 2 diabetes individuals (age and sex matched)

6. COMPARISON WITH OTHER STUDY

Table 9: Comparison of sex distribution with Bilal Bin Abdullah etal study[52]

Sex	Our study	Bilal Bin Abdullah etal**study** [52]
Males	52%	44%
Females	48%	56%

Table 10: Comparison of BMI among diabetics with Bilal Bin Abdullah etal study

BMI among Diabetics	Our study	Bilal Bin Abdullah etal study
<30	86%	61%
>30	14%	39%

Table 11: Comparison of C Peptide levels among diabetics with Bilal Bin Abdullah et al study

C Peptide levels	Our study	Bilal Bin Abdullah etal study
<1	8%	6%
1-7	86%	77%
>7	6%	17%

The present study has demonstrated that basal C-peptide level is significantly higher in obese T2DM and non diabetic individuals compared to non-obese T2DM patients. This reflects a higher insulin secretion in them.

This finding is in accordance with those reported by Sung Tae Kim et al,[56] which showed that basal Cpeptide concentration is mainly influenced by BMI.

Similar results reported by Michael H. Shanik k et al[55] concludes that obese patients are hyperinsulinaemic.

Correlation of C-peptide with other variables showed positive correlation of basal C-peptide with BMI and FBS. As BMI increases, serum C-peptide also increases. The increased insulin indicated by elevated C-peptide is unable to control the blood sugar, probably due to insulin resistance. This is indicated by a high HbA1c level in the obese diabetics. A crosssectional study in the North Karnataka population (Bilal Bin Abdullah etal study) yielded similar results.

To prevent the development of T2DM, early detection of impaired glucose regulation may represent an appropriate strategy, as subjects with impaired glucose tolerance are at increased risk of developing T2DM.

Intervention studies have demonstrated that adoption of a healthy lifestyle characterised by healthy eating, regular physical activity and subsequent modest weight loss can prevent the progression of impaired glucose tolerance to clinical diabetes. The Diabetes Prevention Program Research Group suggests that future approaches to diabetes prevention should preferably include approaches that enhance insulin sensitivity.

Lifestyle modifications aimed at weight loss may result in providing a better glycaemic status in established T2DM and also prevention development of diabetes among non diabetic obese individuals.

Prospective studies are needed to confirm the hypothesis that early therapeutic interventions aimed at reducing work load on beta cells and preserving even small residual beta cell secretion may modify the natural development of diabetes. Patients with adequate reserve may be managed with diet and exercise modalities to improve insulin sensitivity.

7. LIMITATIONS:

- Our study is observational study so no intervention has been carried out.
- Follow up was not done.
- Limited sample size.

8. CONCLUSION

The present study has succeeded in demonstrating higher levels of C-peptide in obese T2DM patients and non diabetic obese individuals, which proves the presence of higher levels of insulin secretion in them compared to the non-obese group. In spite of this hyperinsulinaemia, control of blood sugar is poor in the obese diabetic group as suggested by the significantly higher HbA1c values in them.

This positively demonstrates the presence of insulin resistance in this group. Thus, we conclude that obesity leads to insulin resistance and is an important risk factor for poor glycaemic control in T2DM.

9. SUMMARY

In the present study, a total of 50 cases of newly diagnosed Type 2 Diabetes and 50 age and sex matched controls of non diabetic obese individuals were included in the study over a period of 1 year.
C Peptide levels were measured among young newly detected Type 2 Diabetes mellitus and non diabetic young obese individuals.

C Peptide levels were higher among non diabetic obese individuals when compared to newly detected type 2 diabetes individuals (age and sex matched)

C-peptide levels were higher in obese T2DM patients and non diabetic obese individuals, which proves the presence of higher levels of insulin secretion in them compared to the non-obese group.

Inspite of this hyperinsulinaemia, control of blood sugar is poor in the obese diabetic group as suggested by the significantly higher HbA1c values in them.

This positively demonstrates the presence of insulin resistance in this group. Thus, we conclude that obesity leads to insulin resistance and is an important risk factor for poor glycaemic control in T2DM.

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