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Study of Serum Vitamin-D in Prediabetic Patients.

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Background-Pre-diabetes (PD) is a dysmetabolic state of glucose level between diabetes mellitus and normal glucose tolerance (NGT) which includes basically impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). Pre-diabetes is the important predisposition to the development of Type-2 Diabetes mellitus. In recent times, Vitamin-D is believed to reduce the risk of insulin resistance which is a precursor to Type-2 Diabetes mellitus.
Materials & Methods-In this study 62 Prediabetic, 62 healthy controls were enrolled. Biochemical analytes measured were Serum glucose (Fasting Blood Sugar & Post Prandial Blood Sugar), Glycosylated Haemoglobin, Serum Vitamin-D.
Results-The mean Serum Vitamin-D in Prediabetic subjects were (27.6 ±4.6) while in healthy subjects(controls) the values were (39.3±5.2) respectively. These values were found to be statistically highly significant($p<0.001$).
Conclusion-Serum Vitamin-D levels were decreased in Prediabetic subjects as compared to the values in healthy subjects(controls).
Keywords- Vitamin-D, Prediabetes, T2DM.

I. INTRODUCTION-

Individuals with impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) are referred to as having prediabetes.(1) Prediabetes is considered a harbinger of overt type 2 diabetes mellitus with annual rate of progression to diabetes ranging from 2.5% in the Diabetes Prevention Trial (DPT) to18% in the Indian Diabetes Prevention Programme-1 (IDPP-1).(2) Vitamin D deficiency has been extensively studied in the pathogenesis of insulin resistance. It has been found to be associated with increased risk of type 2 diabetes by various mechanisms including insulin resistance (IR), pancreatic β-cell dysfunction and inflammation(3-7).Vitamin D supplementation has been found to decrease the insulin resistance in normal healthy individuals and patients with type 2 diabetes. However, similar observations among individuals with prediabetes are not well documented. The aim of this study was to evaluate vitamin D levels in patients with prediabetes and compare them with healthy controls.

II. MATERIALS & METHODS-

Study participants-

It is an observational descriptive, cross sectional, hospital based study conducted J.L.N. Hospital, Ajmer. Total 124 individuals were enrolled, 62 Prediabetic(Group 1) and 62 healthy individuals as controls(Group 2). The subjects have been considered as Prediabetic based on the American Diabetes Association guidelines (ADA) 2017. Impaired fasting glucose(IFG)- Fasting plasma glucose between 100-125mg/dl or Impaired Glucose Tolerance(IGT)- 2 hour post-prandial glucose after 75gm oral glucose tolerance test values between 140-199mg/dl or HbA1C levels 5.7-6.4%. Individuals with any chronic disease, receiving any oral hypoglycemic medication or insulin, using bone active medications such as Vitamin-D, calcitonin, bisphosphonate, oestrogen, or lipid lowering drugs, pregnant and Post menopausal women, Type-1 diabetes patients were excluded. This study was reviewed by the ethical committee. Informed & written consent was taken from all the subjects at the beginning of study.

Anthropometric and laboratory measurements-

Participants were weighed barefoot and in light clothing, height measured using measuring tape. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2). Blood samples were collected after an overnight fast (at least 10 hour) to provide a fasting blood sample. After collecting fasting blood samples, the subjects were given 75g of glucose dissolved in 250ml of water. The blood was taken via venepuncture 2 hours after glucose load. After 30 minutes of collection, the blood sample will be centrifuged for 10-15 minutes at 3000 rpm to obtain the serum. Serum Glucose was measured by Glucose oxidase – peroxidase end point assay, Gycosylated Haemoglobin(HbA1c) evaluated by Ion exchange resin method & Serum Vitamin-D by ELISA

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Method.

Statistical analysis-

Data was analysed by SPSS Software and p-value < 0.05 was considered significant. The vitamin D levels among the two groups were compared by unpaired student t test.

III. RESULTS-

Basic anthropometric parameters of all subjects in Prediabetic & healthy controls are summarized in Table-1. The anthropometric parameters viz, age in years was (44 ± 4.5), (40 ± 2.5) in group-I , group-II respectively, BMI mean ± SD in kg/m2 in group-I , group-II was (25.3 ± 3.0), (19.6 ± 2.1) respectively (Table-1). There is also comparison of anthropometric parameters viz, age in years & BMI in Prediabetic & healthy controls. The mean age level was found not significant in any of the groups(p=0.644) and BMI was found significantly high in group-I , group-II (p< 0.0001).

Fasting blood sugar was found to be significantly higher in group-I(115.44 ±7.73, p<0.001) as compared to group-II(82.45 ±7.38, p<0.001).

Post prandial blood sugar was found to be significantly higher in group-I(173.13 ±19.58, p<0.001) as compared to group-II(127.27 ±7.31, p<0.001).

Glycosylated haemoglobin was found to be significantly higher in group-I(6.02 ±.25, p<0.001) as compared to group-II(4.99 ±.39, p<0.001)

Serum vitamin-D was found to be significantly low in group-I(27.61 ±4.67, p<0.001) as compared to group-III(39.33 ±5.27, p<0.001)

TABLE-1

Comparison of Anthropometric parameters of Prediabetic subjects and healthy subjects (controls).

Parameters	**GROUP-I** Prediabetic subjects Mean ± SD	**GROUP-II** Healthy subjects (controls) Mean ± SD	'P' Value
AGE (yrs)	44 ± 4.5	40 ± 2.5	0.644
Weight(kg)	58 ± 3.5	52 ± 4.2	--
Height(m)	156 ± 7.5	159 ± 10	--
BMI (kg/m^2)	25.3 ± 3.0	19.6 ± 2.1	<0.0001

TABLE-2

Comparison of Laboratory parameters of Prediabetic subjects and healthy subjects (controls).

Parameters	**Group**	**Mean ±SD**	**'p' value**
FBS	Prediabetic	115.4 ± 7.7	<0.001
	Control	82.4 ± 7.3	
PPBS	Prediabetic	173.1 ± 19.5	<0.001
	Control	127.2 ± 7.3	
HbA_{1C}	Prediabetic	6.0 ± .25	<0.001
	Control	4.9 ± .39	
Serum vitamin-D	Prediabetic	27.6 ± 4.6	<0.001
	Control	39.3 ± 5.27	

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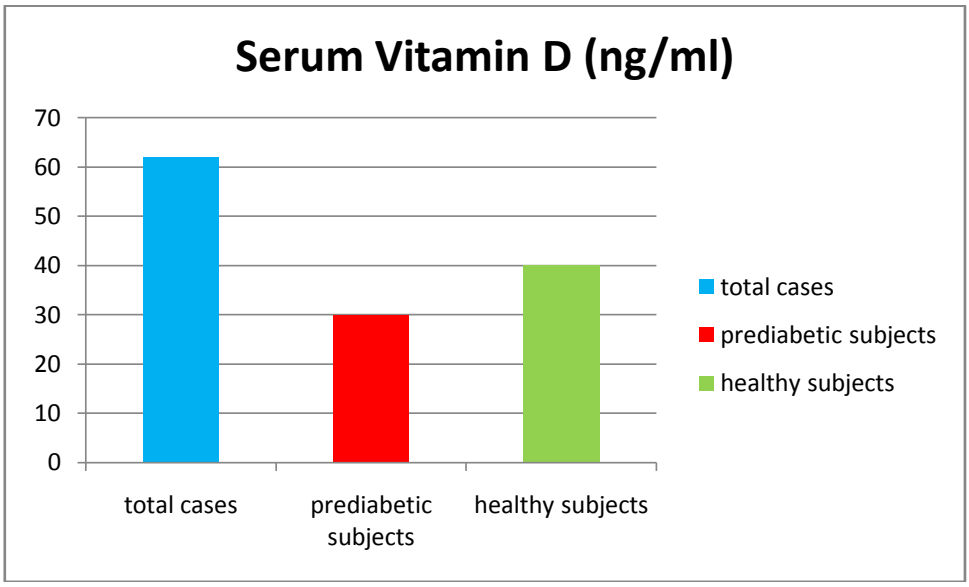

FIG.NO-1- Comparison of Serum Vitamin-D of Prediabetic and Type-2 diabetic subjects and healthy subjects (controls).

IV. DISCUSSION

Prediabetes is the the predisposition to the development of Type 2 diabetes mellitus. Recent studies have shown a relationship between vitaminD deficiency and development of tye 2 diabetes mellitus. Our study was an observational descriptive, cross sectional, hospital based study. In our study the values of Serum Vitamin D were highly significant in Prediabetic subjects. Zhang M et al. 2017 also concluded that lower serum vitamin D may play role in the pathogenesis of prediabetes. In this study the levels of fasting blood sugar, post prandial blood sugar, glycosylated haemoglobin values were higher in prediabetic subjects as compared to control group. This values were found to be highly significant.

V. CONCLUSION

In general, the study found that Prediabetic subjects were more likely to have a significant decrease level of Serum vitamin-D than the normal healthy subjects. Low vitamin D levels might have contributed to the incidence of prediabetes.

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