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The effect of low serum vitamin d in pre-diabetic individuals

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Abstract

Diabetes and vitamin D are wide spread in the world. In order to control the incidences of vitamin D and diabetes we need to do certain amendments in diet and lifestyle. Low vitamin D levels give rise to insulin resistance. On correcting the serum vitamin D levels it is possible to either reverse the pre-diabetic state or delay the progression to diabetes in between the age of 15 to 55 years. The participants were briefed and taken the written consent from them. No one was obligated to be the part of the research. The inclusion and exclusion criteria were abstracted deliberately. The participants participated were lacking in vitamin D. Hence, they were prescribed the dose of vitamin D which was delivered either orally or in injectable form. The consequences of supplementation were incredible. It showed the reverse the pre-diabetic state to normal.

Keywords: Vitamin D, Pre-Diabetes, Vitamin D deficiency, impaired glucose tolerance levels, impaired fasting glucose levels

Introduction

The aim of the study is to improve the quality of life by keeping fit and free from lifestyle illness. It is performed in a single foundation. Each participant has gone via inclusion and exclusion criteria. Written consent was obligatory. Each participant has given blood samples for BS (F), (PP), HbA1c, 25(OH)D, Serum Calcium at the time of enrolment and the tests were repeated after 10 weeks of 60K IU per week for vitamin D 500 mg elemental calcium twice a day supplementation. All testing were done in the same foundation. Vitamin D test by sandwich ELISA method; Serum Calcium by ARSENAZO III; HbA1c by HPLC method and both the blood glucose levels (fasting and post prandial) by using Hexokinase was done.

Vitamin D is prominent among Indians. Nevertheless, the conveyed numbers of pre-diabetes have risen up. Pre-diabetes is interrelated with directly with insulin resistance, β -cell dysfunction and defects in glucose variations. Multiple considerations mark upraises the development of diabetes risk associated with non-interfering contemplations and blood based metabolic traits in the buildup to glycemic standards. For pre-diabetic persons, lifestyle alteration is the only option to control diabetes reserve with 40%–70% risk decline.

Review: D. Dutta & *et al.*, conducted a study in India on 115 individuals that exposed the connectivity between the vitamin D and insulin resistance in pre-diabetics^[1].

In 2012, a review study was done, where the investigators detected numerous researches based on the relation how vitamin D deficiency triggers Type II Diabetes. The conclusion of the research study showed the higher the levels of vitamin D the lesser chances of developing Type II Diabetes mellitus. The risk was reduced to 19%^[2].

Parildar H & *et al.*, in 2013 proves in his work that the lower levels of vitamin D are inversely proportional to insulin resistance, metabolic syndrome, and type 2 diabetes^[3].

Results

The research acclaimed that the levels of fasting and post prandial blood sugar, HbA1c got lowered, whereas, serum vitamin D and Serum Calcium raised post-intervention in males and females. The research study established that vitamin D supplementation plays a vital role in reducing insulin resistance and increasing the insulin sensitivity and helps pre-diabetics to revert as normal ($p < 0.001$). (Table 1).

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Table 1: Blood parameters pre and post intervention in pre-diabetics when classified according to gender

	Males (n=78)			Females (n=74)		
	Pre-intervention	Post-intervention	P value	Pre-intervention	Post-intervention	P value
Fasting blood sugar (mg/dl)	110.9±8.5	90.4±7.5	0.001	114.4±9.5	90.0±6.7	0.001
Post prandial blood sugar (mg/dl)	153.7±23.2	118.7±11.0	0.001	158.5±23.2	120.8±13.1	0.001
HbA1c (%)	6.1±0.2	5.1±0.2	0.001	6.2±0.2	5.1±0.2	0.001
Serum 25-hydroxy vitamin D (ng/ml)	11.8±9.2	40.9±9.0	0.001	13.2±9.9	38.7±6.4	0.001
Serum total calcium (mg/ml)	8.5±0.4	9.1±0.3	0.001	8.7±0.6	9.2±0.4	0.001

Data presented as Mean ± SD

Table 2, takes a note of presenting the downfall of Blood glucose levels (fasting and post prandial) and HbA1c along with serum vitamin D and calcium post-intervention in BMI categories (all three categories). It presented the inverse relation of vitamin D and insulin resistance; and direct

relation with insulin sensitivity and blood sugar parameters ($p<0.001$). A rise in serum vitamin D and calcium limits was dotted post intervention among 3 BMI categories ($p<0.001$) (Table 2).

Table 2: Change in blood parameters in pre-diabetics when classified according to Nutritional Status (BMI Categories)

	Normal weight (n=28)			Overweight (n=27)			Obese (n=97)		
	Pre-intervention	Post-intervention	P value	Pre-intervention	Post-intervention	P value	Pre-intervention	Post-intervention	P value
Fasting blood sugar (mg/dl)	114.1 ±10.3	88.9 ±7.3	0.001	110.7 ±9.7	90.1 ±7.4	0.001	112.8±8.6	90.6 ±7.0	0.001
Post prandial blood sugar (mg/dl)	147.2 ±26.3	120.9 ±10.8	0.001	151.2 ±18.3	118.4 ±13.1	0.001	159.9 ±22.8*	119.8 ±12.3	0.001
HbA1c (%)	6.2 ±0.2	5.2 ±0.2	0.001	6.1 ±0.2	5.0 ±0.2	0.001	6.1 ±0.2	5.1 ±0.2	0.001
Serum 25-hydroxy vitamin D (ng/ml)	12.2 ±8.9	38.2 ±7.7	0.001	13.4 ±10.1	41.2 ±6.5	0.001	12.3 ±9.7	40.0 ±8.2	0.001
Serum total calcium (mg/ml)	8.7 ±0.7	9.1 ±0.3	0.001	8.6 ±0.5	9.1 ±0.3	0.001	8.6 ±0.5	9.1 ±0.3	0.001

Data presented as Mean ± Sd. * $p<0.05$ for comparison between normal weight and obese pre-diabetics

Discussion

Vitamin D deficiency and diabetes are major emerging health issues. Due to common risk factors, the study is aimed in order to look up certain measures to control both the diseases. The study showed the glimpse of positive consequences. The significance of the study is to:

1. Validate the effect of Vitamin D in deteriorating insulin resistance.
2. Validate the effect of Vitamin D in augmenting insulin sensitivity.
3. Validate the effect of Calcium in deteriorating insulin resistance.
4. Validate the effect of Calcium in augmenting insulin sensitivity.
5. Role of diet.
6. Role of physical activity.

Conclusion

The research study clinched that pancreas gets stimulated by vitamin D for the production of insulin; in a way that it may either elongates the developmental risk of type II DM, or converts pre-diabetes into normal. The research acclaimed the fasting and post prandial blood sugar, HbA1c, serum vitamin D and Serum Calcium pre and post-intervention in males and females. The research study established that vitamin D supplementation plays a vital role in reducing insulin resistance and increasing the insulin sensitivity and helps pre-diabetics to revert as normal ($p<0.001$). (Table 1).

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