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STUDY OF VITAMIN-D STATUS AND INSULIN RESISTANCE IN OBESE ADOLESCENTS

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ABSTRACT

Vitamin D deficiency is a pandemic health problem and a risk factor for the development of impaired glucose tolerance in childhood obesity. The aim of the study is to determine the relationship between 25- hydroxy vitamin-D levels and insulin resistance in obese and non obese patients. The study group included 50 obese and 50 non obese adolescents aged 16-18 years. Anthropometric data were collected and fasting serum glucose, insulin and 25-(OH) D was measured. The homeostatic model assessment of insulin resistance was calculated in both groups. The levels of 25-(OH) D in obese group were significantly lower and ($p < 0.001$) HOMA-IR were significantly higher than non obese adolescents ($p<0.001$). The mean fasting insulin levels in obese adolescents were found to be lower than non obese adolescents. In the obese group vitamin D and insulin showed a positive correlation with insulin resistance. The finding suggests that insulin resistance plays a major role in obesity than vitamin D levels.

KEYWORDS: **25- hydroxy vitamin D, HOMA-IR, BMR.**

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INTRODUCTION

Vitamin D deficiency is a major cause of rickets in infants and osteoporosis in adolescents, is a fundamental micronutrients with major implications for human health[1]. The production of vitamin D in the skin is directly proportional to the exposure to sunlight and indirectly proportional to pigmentation of the skin[2]. Vitamin D plays a critical role in glucose homeostasis and insulin secretion[3]. Insulin resistance plays a major role in obesity and 25 (OH) D directly activates transcription of the human insulin receptor gene that stimulates the expression which enhances insulin- mediates glucose transport [4]. Vitamin D deficiency is a risk factor for development of impaired glucose tolerance in childhood obesity and low levels is found to be associated with insulin resistance in adults [5]. The study was conducted to find the relationship between Vitamin D deficiency and insulin resistance in obese adolescents.

MATERIALS AND METHODS

The study group consisted of 50 obese and 50 non obese adolescents aged 16-18 years students. Each participant underwent a detailed physical examination as well as laboratory evaluation. Standing height is measured to the nearest 0.1 cm with a Harpenden fixed stediometer. Body weight (kg) measured on a SECA balance scale to the nearest 0.1kg. BMI was calculated by dividing weight by height (kg/m^2). Obesity was defined as the BMI >97th percentile the definition of the International task force of obesity in childhood and population specific date [6]. All blood analyses were performed on fasting samples in both study and control groups. 25- (OH) D levels were determined by ELISA method. Glucose by glucose oxidase technique and insulin level were analysed with FEIA method using hormone analyzer TOSOH. Insulin resistance estimated from fasting plasma measurement using HOMA –IR (Insulin mU/L) X Glucose (mmol/L). Statistical analyses were performed using SPSS version 21.0. The statistical significance between obese and non obese adolescents were analysed by using student 't' test and correlation between vitamin D and insulin resistance were calculated using the Pearson correlation method. The study was approved by Institutional Ethical Committee and written consent was obtained from patients.

RESULTS

Table 1 shows the anthropometric data of the obese and non-obese groups. Age and gender distribution were statistically not significant between the two groups (p=0.8). Obese subjects had significantly higher waist circumference and BMI (p <0.001) compared to non-obese group. Table 2 presents the biochemical characteristics of all subjects. Compared with the non obese subjects, obese subjects had higher fasting insulin HOMA-IR than non obese subjects. The level of 25- (OH) D in obese adolescents were significantly lower than non obese (p <0.001). The fasting blood glucose level in obese adolescent is slightly higher compared to the non obese adolescents. The reduced levels of Vitamin D correlated negatively with insulin and insulin resistance. In correlation analyses of HOMA-IR correlated with higher insulin concentration and with higher body mass index independent of 25 (OH) D levels.

Table 1
Anthropometric data of the obese and non-obese groups

Parameters	Obese (n = 50)	Non-obese (n = 50)	'p' value
Age (years ± SD)	17.4 ± 2	17.0 ± 2	0.8
Male/ female	32/18	33/35	0.8
Waist circumference (cm)	85 ± 10	65 ± 12	<0.001*
BMI(kg/m^2)	29.6 ± 3.9	20.1 ± 3.0	<0.001*

p value <0.05 is considered to be statistically significant

Table 2
Metabolic marker's in obese and non-obese groups

Parameters	Obese (n = 50)	Non-obese (n = 50)	'p' value
Glucose (mg/dL)	91.2 ± 10.5	89.1 ± 10.4	0.18
Insulin (mU/mL)	17.66 ± 5.7	14.78 ± 2.0	<0.001*
HOMA-IR	5.63 ± 1.3	3.6 ± 0.7	<0.001*
25- (OH) D (ng/dL)	16.1 ± 4.3	39.3 ± 9.0	<0.001*

p value <0.05 is considered to be statistically significant.

DISCUSSION

Several studies have shown an increasing prevalence of vitamin D deficiency. In our study 25- (OH) D levels were significantly decreased in obese group compared to non obese. These findings revealed that obesity is one of the risk factor for hypovitaminosis and the rates of hypovitaminosis in healthy adolescents are around 59% and 65% in two different studies. Recent studies from different countries have demonstrated vitamin D deficiency due to low dietary intake [7]. Recent studies

researching the relationship between vitamin D and insulin resistance revealed controversial results. The limitation of the study is that vitamin D deficiency was defined only by its level. The lack of optimal vitamin D levels that disturbs glucose homeostasis is to be determined. Vitamin D also plays an important role in glucose homeostasis in insulin release. In our study IR were higher in obese subjects. Most studies suggested that vitamin D deficiency as a risk factor of disturbed glucose homeostasis in adults.

CONCLUSION

Our study concludes that in obese subjects, insulin resistance was more due to obesity than from low vitamin D levels. Vitamin D levels seen in obese adolescents were not an independent predictor of insulin resistance.

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REFERENCES

1. Holick M. F., Chen T. C., Vitamin D deficiency: a world- wide problem with health consequences. American Journal of Clinical Nutrition, 87: 1080-86, (2008).
2. Holick M.F, Resurrection of Vitamin D deficiency and rickets. Journal of clinical Investigation, 116: 2062-72, (2006).
3. Lee.S, Clark S.A ., Gill R.K., ChristakosS., 1, 25-Di-hydroxy vitamin D_3 and pancreatic ß- cell function: vitamin D receptors, gene expression and insulin secretion. Endocrinology, 134: 1602-10, (1994).
4. Scragg R., Holdaway I., Singh V., Metcalf P., Baker j., Dryson E. Serum 25- hydroxy vitamin D_3 levels decreased in impaired glucose tolerance and diabetes mellitus. Diabetes Research and Clinical Practice, 121: 297-300, (2010).
5. Matthews D.R., Hosker.J.P., Rudenski A.S., Homeostasis model assessment: insulin resistance and ß- cell function from fasting plasma glucose and insulin concentrations in man. Diabetologia, 28: 412-19, (1985).
6. Cole T.J., Bellizzi M.C., Flegal K.M., Dietz W.H. Establishing a standard definition for child overweight and obesity worldwide. International survey British Medical Journal, 320: 1240-43, (2000).
7. Valerio G., Licenziati M.R., Iannuzzi A. Insulin Resistance and impaired glucose tolerance in obese children and adolescents from southern Italy. Nutrition Metabolism and Cardiovascular Disease,, 16: 279-84, (2006).