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# ORIGINAL ARTICLE

## STUDY ON VITAMIN D3 AND LIPID PROFILE LEVELS IN OBESE POPULATION OF NORTH INDIA

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**ABSTRACT:** There has been a worldwide increase in the prevalence of obesity and a parallel resurgence of vitamin D deficiency. Vitamin D deficiency and low calcium intakes are important risk factors for osteoporosis. The present study was done to find out the prevalence of Vitamin D and Lipid profile derangements in obese population of North India. 50 obese individuals (25M & 25 F) with WHR >0.85 and BMI> 30 were taken in study group in age group ranging from 25 to 60 years. Equal numbers of healthy subjects were taken (26M & 24F) and these patients were screened at Adesh Medical College Bathinda, Punjab, India. We observed significantly increased levels of Cholesterol ($p<0.006$), Triglycerides ($p <0.001$), S.L.D.L ($p <0.001$), S.V.L.D.L ($p <0.001$) & S.A.L.P ($p <0.001$) levels in obese Individuals as compared to normal individuals.

**KEYWORDS:** Lipid, Obese, Vitamin D.

**INTRODUCTION**: Vitamin D, a fat-soluble vitamin, is naturally present in a few food items like cod liver, fish oil, egg yolk etc. It is also produced endogenously from ultraviolet rays from sunlight. Recently there has been a worldwide increase in the prevalence of obesity and a parallel resurgence of vitamin D deficiency.[1] Vitamin D deficiency has been noted in both pale skin individuals as well as in pigmented ones.[2] Overweight/obese people commonly have a poorer vitamin D status than those with less body fat.[3] Vitamin D adequacy during adolescence helps to reduce the risk of osteoporosis later in the life. Vitamin D deficiency and low calcium intakes are important risk factors for osteoporosis. Inadequate intake of vitamin D makes its status worse in obese /overweight individuals thus showing low serum levels. As altered lipid levels are noted for increased risk for cardiovascular diseases and cerebrovascular diseases.[4] The present study was done to find out the prevalence of Vitamin D and Lipid profile derangements in obese population of North India.

**MATERIAL AND METHODS**: 50 obese individuals (25M & 25 F) with WHR >0.85 and BMI> 30 were taken in study group in age group ranging from 25 to 60 years. Equal number of healthy subjects were taken (26M & 24F). Patients were screened at Adesh Medical College Bathinda, which is a tertiary care institute in state of Punjab (North India).

Patients with diabetes mellitus, hypothyroidism, renal failure, hepatic diseases, acute illnesses, recurrent myocardial infarction, unstable angina & those not on any weight lose treatment were excluded from the study. The ethical committee approved the study and patients were well informed about the nature of study. The waist circumference and the hip circumference were measured and the WHR was calculated. Body weight was recorded in kg and height was recorded in meter square and BMI was calculated accordingly.

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**LAB ASSAYS:** Blood samples were collected under aseptic conditions after overnight fasting of 12 hrs. Blood samples were allowed to clot at 37 c and serum was withdrawn after centrifugation at 3000rpm. The separated serum was analyzed for the following biochemical parameters:

1. Total Serum Cholesterol: Serum cholesterol level was assayed as per the method given by Allain et al. 1974.[5]
2. S. Triglycerides: Serum triglyceride level was estimated by using enzymatic GPOPAP method given by Mcgowan et al.1983.[6]
3. HDL Cholesterol: HDL-C was determined by the method given by Burstein. et al. 1970.[7]
4. LDL Cholesterol: LDL-Cholesterol was analyzed by applying the method of Batesand Warren. 1989.[8]
5. VLDL- Cholesterol: VLDL-C was estimated by using the method of Lowenstein and Varrier. 1984.[9]
6. Vitamin D3 Estimations: estimated by ELISA from kit by EUROIMMUNE (Germany).
7. Serum alkaline phosphate was estimated by method of IFCC.[10]

The data was expressed as Mean ± SD. By using the Students unpaired 't'-test, the statistical analysis was carried out to assess whether the differences between the Obese individuals and the controls were significant and P values of <0.05 were considered as statistically significant.

**RESULTS**: The present study was done to find out Vitamin D3 and lipid levels in obese population of North India. There were equal number of males (25 M) and females (25F) in obesity group and their mean age was (41± 5.2). In comparison, in the normal individual group, there were 26 males and 24 females and their mean age was (42.5±6.4). (Table1). In this study, we found significantly raised levels of waist to hip ratio ($p < 0.001$) and Body Mass Index ($p < 0.001$) in obese individuals as compared to normal individuals (Table 2).

We observed significantly increased levels of Cholesterol ($p<0.006$), Triglycerides ($p < 0.001$), S.L.D.L ($p < 0.001$), S.V.L.D.L ($p < 0.001$) & S.A.L.P ($p < 0.001$) levels in obese Individuals as compared to normal individuals (Table 3). Whereas significantly decreased levels of S.H.D.L ($p < 0.02$) and Vitamin D3 ($p < 0.02$) levels were present in obese individuals as compared to normal individuals (Table 3)

**DISCUSSION**: In present study we observed significantly low levels of vitamin D3 as compared to normal individuals. Low levels of vitamin D3 have also been found earlier in obese individuals as compared to normal individuals. Obesity associated Vitamin D3 deficiency can be due to decreased bioavailability of Vitamin D3 as it is stored in body fat compartments.[11] It was unclear which fat compartments were involved. The low levels of vitamin D3 in obesity have also been attributed to factors like decreased exposure to sunlight, limited mobility, increased pollution and genetic predisposition.[12]

Slightly darker color of Indian population may decrease Vitamin D3 production due increased melanin by absorbing UV rays.[13] Vitamin D3 is a key factor for the absorption of calcium from our diet.[14] Increased activity of enzyme alkaline phosphatase in obese individuals can be due to increased expression of parathormone in response to decrease in VitaminD3 activity.[15] Thus our results are consistent with literature suggesting decreased levels of VitaminD3 associated with increased bone turnover thus having high alkaline phosphatase levels.[16]

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In present study, values of serum cholesterol and LDL-C were found increased along with deficiency of Vitamin D3 in obese individuals as compared to controls; these results are consistent with Karhapää et al[17] who related association of increased cholesterol levels with hypo vitamin D3. Auwerx et al reported similar results in Finnish people.[18] Martin et al noted similar association in blacks and Mexican Americans.[19] Photo metabolism may be the mechanism involved for this as the absence of sunlight causes squalene exposed skin to divert for cholesterol formation instead of forming 7 dehydro cholesterol and vitamin D.[20]

We observed decreased levels of serum HDL-C along with decreased levels in Vitamin D 3; these findings are supported by Choi et al who reported this association starting very early in life.[21] Similar findings were observed in Russian[22] and Spanish children.[23] High level of serum triglycerides and VLDL-C and decreased Vitamin D3, observed in our study, is found consistent with studies by Cigolini et al.[24] Hyponnen et al[25] and Botella-Carretero et al.[26] Possible mechanism of increased level of serum triglycerides associated with hypo vitamin D3 levels could be that, Vitamin D3 leads to increase in levels of serum calcium by increasing its intestinal absorption. This raised calcium decreases hepatic triglyceride formation and secretion, ultimately decreasing their levels in blood. Insulin resistance is also known to be present in Vitamin D3 deficiency, which leads to raised levels of serum triglycerides and VLDL-C.[27]

Suppressive effect of VitaminD3 on parathyroid hormone is also known to decrease serum triglycerides by decreasing plasma post heparin lipolytic activity.[28]

Low serum 25 hydroxy Vitamin $D_3$ (Vitamin $D_3$) is known to perturb cellular function in many tissues, including the endocrine pancreas, which is involved in obesity and type II diabetes mellitus (TIIDM). As obese individuals are already at increased risk of developing diabetes mellitus, autoimmune disorders, cardio vascular disease, osteoporosis, and some types of cancer and an inadequate vitamin D status in obese individuals can worsen the situation.[29]

**CONCLUSION:** In present study obese individuals are associated with increased levels of serum triglycerides and VLDL-C along with low levels of HDL-C and vitamin D3 levels leading to increased risk of various diseases and morbidity associated with them.

| SEX | NORMAL CONTROLS | OBESE INDIVIDUAL |
|---|---|---|
| MALE | 26 | 25 |
| FEMALE | 24 | 25 |

Table 1: SEX DISTRIBUTION IN NORMAL AND OBESE INDIVIDUALS

| PARAMETERS | NORMAL CONTROLS | OBESE INDIVIDUAL |
|---|---|---|
| WHR | 0.86±0.038 | 0.95±0.046<br>P< 0.001 |
| BMI | 24.85±0.48 | 34±0.40<br>P<0.001 |

TABLE 2: CHANGES IN WHR AND BMI IN OBESE INDIVIDUALS AND NORMAL CONTROLS

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| PARAMETERS | NORMAL CONTROL | OBESE INDIVIDUAL | P VALUE |
|---|---|---|---|
| S. CHOLESTEROL mg/dl | 140.88±28.92 | 158.7±34.57 | 0.006 |
| S.TRIGLYCERIDES mg/dl | 104.45±18.65 | 156.96±24.62 | 0.001 |
| S.LDL-C mg/dl | 94.85±15.4 | 109.5±20.6 | 0.001 |
| S.HDL-C mg/dl | 45.8±14.6 | 38±18.7 | 0.022 |
| S.VLDL.C mg/dl | 21.1±11.4 | 31.8±14.65 | 0.001 |
| VITAMIN D 3 ng/ml | 24.5±15.6 | 17.9±14.2 | 0.024 |
| S.A.L.P IU/L | 84.5±20.2 | 99.6±18.9 | 0.001 |

TABLE 3: CHANGES IN LIPID PROFILE AND VITAMIN D3 IN NORMAL CONTROLS AND OBESE INDIVIDUALS

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