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PREVALENCE OF VITAMIN D DEFICIENCY AND INSUFFICIENCY IN THE PAEDIATRIC POPULATION OF PUNJAB, PAKISTAN

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Abstract:

Vitamin D deficiency is labeled when level of 25-hydroxyvitamin D3 are <20ng per ml.[1] Etiology of vitamin D deficiency include acquired disorders, heritable diseases and reduce production of vitamin D by skin. Poor nutritional intake, less exposure to sunlight [2] and poor socio economic status can also cause vitamin D deficiency.

Objective: *To determine the frequency of children having vitamin D deficiency and insufficiency.*

Study Design: *Descriptive cross sectional study*

Settings: *Pediatric Ward, Allied and DHQ hospital, Faisalabad*

Duration of Study: *June 2017 to Feb, 2018*

Subjects & Methods: *Total 40 children of both gender between 6 to 36 months were recruited by non-probability consecutive sampling. Children with renal disease, liver disease, malabsorption, and children on vitamin D supplements or using any medication which can affect vitamin D metabolism in last three months were excluded. Clinical examination was conducted in each child to assess the general condition, nutrition status, signs of any illness and also to note the vitamin D deficiency related findings. Vitamin D level more than 20ng/ml were considered as sufficient, less than 15ng/ml was defined as vitamin D deficiency and level less than 5ng/ml was classified as severe vitamin D deficiency. Data was analyzed by using SPSS 23.*

Results: *Distribution of gender was males 53.8% (n=43) and females 46.2% (n=37). Mean age of the patients was 14.35±7.44 months. Children living in urban areas were 22.5% (n=18) while 77.5% (n=62) were from rural area. 20% (n=16) patients were poor, 72.5% (n=58) middle class and 7.5% (n=6) patients were of upper class. 25% (n=20) patients were severely deficient, 50% (n=40) were deficient and 18.7% (n=15) sufficient. While, 6.3% (n=5) patients were having vitamin D up to toxic level. The differences between age and socio-economic status were significant statistically (p= 0.013) and (p= 0.001) respectively, while gender and area statistically insignificant (p=0.386) and (p=0.963) with regards to vitamin D status.*

Conclusion: *Most of the children presenting at our tertiary care hospital, Punjab, Pakistan were having vitamin D deficiency. All children coming for clinical evaluation should be screened for vitamin D deficiency and vitamin D supplements should be started to prevent further comorbidities in later stage of life.*

Key Word*: Vitamin D deficiency, cholecalciferol, vitamin D3, vitamin D insufficiency, Children, Pediatric population*

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INTRODUCTION:

Vitamin D deficiency is labeled when level of 25-hydroxyvitamin D3 are lower than 20ng per milliliter.[1] Etiology of vitamin D deficiency include acquired disorders, heritable diseases and reduce production of vitamin D by skin. Poor nutritional intake, less exposure to sunlight[2] and poor socio economic status can also cause vitamin D deficiency. Vitamin D is very necessary for teeth growth, bone growth and remodeling. It is also necessary for enamel and pulp morphogenesis, development and differentiation.[3] There are two forms of vitamin D one form of vitamin D is cholecalciferol that is synthesized in skin after exposure of sunlight in skin and other form of vitamin D is found in some food items. In present situation, it is not possible to achieve sufficient vitamin D due to eating patterns and supply of food. In food the form of vitamin D is biologically inactive while its metabolite 1,25dihydroxyvitamin D is an active hormone responsible for physiological effects. [4] In general population level of vitamin D is maintained by sunlight exposure. If there is enough sunlight exposure, requirement of vitamin D in diet is unnecessary. Vitamin D production is also affected by change in season. In winter its deficiency is more common due to temperature, absorption of ultra-violate light and people wear more clothes.[5] Active form of vitamin D which is 1,25 dihydroxyvitamin D3 interacts with intranuclear receptor[6] at target site and produce its physiological effects by directly or indirectly gene expression. Major effects are to maintain calcium and phosphorous level in serum. Deficiency of vitamin d results in decrease absorption of dietary vitamin D and phosphorous from intestine.[7] Vitamin D deficiency cause low serum calcium which results in increase level of parathyroid hormone. Parathyroid hormone causes more calcium absorption from tubules and stimulate conversion of 25-hydroxyvitamin into active form of 1,25-dihydroxyvitamin D3. [8]

Vitamin D deficiency can affect skeleton and can cause inadequate mineralization or demineralization. In young children its deficiency it can cause rickets which manifests as bowing of legs and knocked knees. In adult population its deficiency it can cause osteoporosis, more bone turns over and also osteomalacia. Rate of fractures are also affected by vitamin D due to its influence on bone.[9] Vitamin D affects and maintain immune system and it also affects and maintain muscle strenghth.[10] Vitamin D also play a role in maintaining the healthy skin. Vitamin D deficiency can be associated with more incidence of tuberculosis and also with diabetes mellitus.

Purpose of this study was to determine the frequency of vitamin D deficiency in our local region of Punjab limited local data is available. This study will provide local awareness about the issue and its gravity; it will also help to educate clinician to address this important issue in children of Punjab.

MATERIALS AND METHODS:

This cross sectional and descriptive study was done our tertiary care hospital in Punjab Pakistan Punjab from June 2017 to February 2018 after obtaining authorization from institutional committee of ethics. Total 40 children were recruited for the study by non-probability consecutive sampling. Written permission of study was taken from parents of all children. Children of both gender with age between 6 months to 36 months were selected. Exclusion criteria of study were; 1) children with renal disease, 2) children with liver disease, 3) children with malabsorption, and 4) children using any medication which can effect vitamin D metabolism in last three months.

After registration detail history of all children were obtained from their parents, which also included birth history. History of previous hospital stay, any other systemic disease and drug history was noted. Clinical examination was conducted in each child to assess the general condition, nutrition status, signs of any illness and also to note the vitamin D deficiency related findings. Previous medical record of every child was thoroughly evaluated. Vitals were recorded at the time of registration. Weight and height was also recorded and body mass index was calculated. Personal information of each child like age, gender, area of living, socio economic status and weight was obtained by filling the proforma.

Venous blood was drawn in each child in sitting position. Plasma glucose, vitamin D levels, complete blood count was measured. Vitamin D level more than 20ng/ml were considered as sufficient, less than 15ng/ml was defined as vitamin D deficiency and level less than 5ng/ml was classified as severe vitamin D deficiency. Vitamin D level of >50ng/ml was considered vitamin toxicity.

Data was analyzed by using SPSS volume 23. Percentage and frequency were calculated for qualitative variables like gender, area of living and vitamin D deficiency. Significance was checked by using chi-square test. For quantitative variables like body mass index, age, plasma glucose and vitamin D were statistically measured and analyzed in mean and standard deviation and to check the significance, t-test

was applied. p value of lower than 0.05 was taken as significant.

RESULTS:

Total eighty patients were recruited in this study of both genders. Distribution of gender among population reported that there were more males than females i.e. 53.8% (n=43) and 46.2% (n=37) respectively. The Mean and standard deviation age of the patients was 14.35±7.44 months. There were 22.5% (n=18) patients were living in urban areas while 77.5% (n=62) were rural population. Socio-economic status of the patients noted as poor, 20% (n=16) patients, middle class 72.5% (n=58) patients and upper class 7.5% (n=6) patients. The differences between age and socio-economic status were significant statistically (p= 0.013) and (p= 0.001) respectively, while gender and area statistically insignificant (p=0.386) and (p=0.963) with regards to vitamin D status. (Table. 1).

The main outcome variable of this study was vitamin D level of the patients. Vitamin D deficiency status noted as; 25% (n=20) patients severe deficient, 50% (n=40) deficient and 18.7% (n=15) sufficient. While, 6.3% (n=5) patients noted as toxicity. (Table.2).

Table 1: Demographic characteristics

Variable	Characteristics	Test of Sig.
Age (months)	14.35±7.44	0.013
Gender	M=53.8%, F=46.2%	0.386
Socio-economic status	Poor=20%, Middle=72.5%, upper= 7.5%	<0.001
Area	Rural=77.5%, Urban=22.5%	0.963

Table 2: Distribution of Vitamin D

Vitamin D status	Frequency	Percentage
Severe deficiency	20	25.0
Deficiency	40	50.0
Sufficiency	15	18.7
Toxicity	5	6.3
Total	80	100.0

DISCUSSION:

Results of study showed that vitamin D deficiency in children in our tertiary care hospital in Punjab Pakistan is very high. According to results 25% children were severe vitamin D deficient and 50% children were deficient in vitamin D levels. This is very high percentage of vitamin D deficiency. Results of study supported another study done in Australia by Daly RM et al. which reported 31% vitamin D deficiency[11] which is almost one third population of Australia. In this study the cumulative prevalence is even 75%. Study done by Navaid Kazi et al. reported that 88% male adults presented in outpatient department of Isra Medical University showed vitamin D deficiency. These results closely resemble the results of this study[12]. From Faisalabad reported national data showed that vitamin D deficiency was present in 77.5% in Punjab. Another study from this city reported that 87% male adults were having vitamin D deficiency.

Throughout the world in general population, many factors are involved in vitamin D deficiency. In both adults and children, vitamin D deficiency is new global epidemic.[13] Studies had shown association of vitamin D deficiency with many other conditions. In one study results showed that obese individuals were more associated with vitamin D deficiency as compared to healthy individuals[14]. So this report declared inverse relation of obesity with vitamin D levels in blood. Similarly, another investigation done by Vimaleswaran KS et al. showed that greater body mass index leads to lower vitamin D levels.[15] Study done by Bischoff H et al. reported that vitamin D supplementation is associated with increase muscle strength and prevention of fall and fracture.[16] It was

investigated almost four decades ago that vitamin D deficiency was associated with decrease secretion of insulin from pancrease[17]. Similarly, it had been reported that vitamin D supplementation in diet was associated with decrease risk of type 1 diabetes mellitus. [18] Similarly, in one meta-analysis done by Yiqing Song et al. reported that there was inverse relation between risk of developing type 2 diabetes mellitus and vitamin D levels in blood. [19] In another study vitamin D deficiency was associated with incidence of type 2 diabetes. So many studies reported that vitamin D is linked with pathogenesis of diabetes mellitus.

Many investigations also reported link of vitamin D deficiency and risk of developing cardiovascular disease. Study done by Wang TJ et al. reported that incidence of cardiovascular disease is linked with vitamin D deficiency.[20] In one instigation it was reported that cardiovascular disease was associated with high prevalence of vitamin D deficiency.[21] Study was done by Lee JH et al. showed that vitamin D supplementation is linked with decrease chances of developing cardiovascular disease.[22]

Like diabetes and cardiovascular disease, it had been reported that there was link between vitamin D levels in blood and risk of malignancy. Study done by Scl'lwartz GG et al. reported that low vitamin D levels in blood may be a risk for development of prostate cancer.[23] Study reported that there was association between vitamin D levels and clinical outcome and survival of colorectal carcinoma after resection.[24] So plasma level of vitamin D has its effect on survival in many malignancies.

In the end of this discussion, it is obvious that prevalence of vitamin D deficiency is very high in Punjab and in children in Multan. Vitamin D deficiency is associated with much comorbidity. So this deficiency can have its clinical effects in later stage of life.

CONCLUSION:

Most of the children presenting our tertiary care hospital in Punjab Pakistan were having vitamin D deficiency. We recommend that all those children coming for clinical evaluation should be screened for vitamin D deficiency and vitamin D supplements should be started to prevent further comorbidities in later stage of life.

LIMITATION:

Limitation of study was that it was done only in one center and sample size was very limited. Study design was also a limitation.

CONFLICT OF INTEREST: None

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