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HYPOVITAMINOSIS AND TUBERCULOSIS: A COMPARATIVE STUDY IN CHILDREN OF MEWAT

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ABSTRACT

The study population included 56 children screened for TB and vitamin D deficiency. Mean age of the study group is 6.5 years where about three fourth are male. No remarkable difference in weight and height was observed in both groups. Our study confirmed a high prevalence of hypovitaminosis D in the study population. 21.4% cases had severe deficiency in comparison to control group which is statistically significant (p=0.02), where as in the other sub groups of severity of vitamin D deficiency the correlation was not significant.

KEYWORDS : Children, Tuberculosis, Vitamin D

Tuberculosis is one of the oldest diseases which are still a major health burden in our country even in paediatrics age group. The coexistence of vitamin D deficiency and tuberculosis is being studied since long time. Vitamin D deficiency has been associated with increased risk of tuberculosis in different population groups (Williams et al.; 2008).Active form of vitamin D enhances the ability of macrophages to suppress the intracellular growth of mycobacterium tuberculosis; and the production of microbe killing cathelicidin (LL-37) is impaired in absence of adequate levels of vitamin D (Rivas-Santiago et al.; 2008).

It is now widely recognised that vitamin D deficiency is one of the common condition even in sunshine rich region. So this study is being done in Mewat district of Haryana which falls under subtropical semiarid zone where the incidence of tuberculosis is very high.

MATERIALS AND METHODS

This study was conducted in Department of Pediatrics SHKM GMC hospital, Mewat from october 2014 to may 2015. A total of 68 patients were admitted in this period who were diagnosed as case of tuberculosis either pulmonary or extrapulmonary as per WHO criteria (WHO et al.; 2006). Patients who were otherwise prone for vitaminD deficiency like malabsorption, renal/liver disorders, those on drugs which can cause vitamin D deficiency were excluded. Those patients who were predisposed to develop TB like HIV, severe malnutrition were also excluded from the study.

Among 68 patients 8 patients refused for vitamin D levels due to financial constraints and 4 patients were of severe malnutrition and hence not included in the study. All patients were enrolled in a prescribed format after taking informed consent. Prior approval was obtained from institutional ethical committee for this study.

A performa was filled in all patients. Patients were asked about the personal details, chief complaints and their duration of illness, history of contact with TB patient, dietary history specifically in reference to vitamin D containing food like oily fish, egg yolk, and liver. History of any chronic renal/hepatic disorder, malabsorption syndrome or prolonged drug intake like antiepileptic was also inquired. Patients were examined thoroughly for any clinical evidence of vitamin D deficiency. Their anthropometry and systemic examination was also done. Investigations to confirm the diagnosis of tuberculosis were done which included complete haemogram with ESR, mantoux, chest xray, gastric aspirate or sputum for AFB, pleural fluid/CSF/ascitic fluid analysis for AFB, CT head/thorax as per type of tuberculosis. Levels of 25(OH) vitamin D, calcium, phosphorus and alkaline phosphatase levels were done as a part of study. Vitamin D levels were done by chemilluminescent immunoassay method. Vitamin

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D levels were taken before starting antituberculosis treatment.

Patients with vitamin D levels of <37.5nmol/l were defined as vitamin D deficient and levels <12.5nmol/l as severe deficiency whereas >50nmol/l were considered as normal (Misra et al.; 2008).

A total of 56 patients, who fulfils the inclusion criteria were enrolled as case in study group. Equal number of subjects who were age, sex matched and comparable nutrition status but without tuberculosis were taken as control. These healthy controls were also examined for evidence of vitamin D deficiency and investigations were done to rule out TB in them.

All subjects with vitamin D deficiency or insufficiency were given injectable vitamin D3 600,000IU along with dietary advice and calcium supplementation. Antitubercular therapy was continued as per IAP categorisation.

Statistical Analysis

Statistical analysis was done using SPSS 17.5(IBM, Chicago USA). Average mean of vitamin D level in two groups was compared using student t test. Chi square test was used to find any difference in levels of vitamin D in between groups. p value <.05 was considered statistically significant. Any group having less than 5 study subjects were analysed using fisher exact test.

RESULTS

Baseline data of patients with tuberculosis and control are given in Table 1.

The value of 25(OH) vitamin D levels in TB patients ranged from <10- 56nmol/l with mean value of 24.69nmol/l. The control group had vitamin D levels ranging from <10-76nmol/l with a mean value of 31.6 nmol/l. Although the difference of means of vitamin D levels was not statistically significant in two groups (p>0.05), more number of patients in TB were having severe vitamin D deficiency (vitamin D levels <12.5nmol/l) and this was statistically significant. Comparison of vitamin D levels in cases and control are shown in table 2.

DISCUSSION

Our study shows that average mean of vitamin D level in patient with tuberculosis was lower than in control group, although this difference was not statistically significant. Most of the studies conducted also show similar results both in pediatric and adult population. A study done by Genmaa et al.; (2012) showed that 25 (OH) vitamin D

Table 1 : Baseline Data of Patients With Tuberculosis and Control

Baseline variables*	Cases(n=56)	Controls(n=56)
Mean age	6.5yrs	7.1 yrs
Sex male	38(67.8%)	30(53.5%)
Female	18(22.2%)	26(46.5%)
Average weight(kg)	15.31(3.6-44)	16.65(5-36)
Average height(cm)	101.94(58-138)	110(62-140)
Average MAC (cm)	12.7	13.1
Diet non vegetarian	41(73.21%)	48(85%)
Vegetarian	15(26.79%)	8(15%)

*p>.05 in all variables

Table 2 : Comparison of Vitamin D Levels in Cases and Control

Vitamin D levels(nmol/l)	Cases(n=56)	Control(n=56)	P value
<12.5	12(21.42%)	3(5.35%)	0.02
12.5-37.5	34(60.71%)	31(55.35%)	0.7
37.6-50	8 (14.28%)	15(26.78%)	0.16
>50	2 (3.5%)	7(1.25%)	0.16

level were low (<20ng/ml) in Mongolian children with tuberculosis. Likewise another study which was done in Australia included refugee children and showed that 25 (OH) vitamin D levels were significantly lower in children with latent TB and TB infection (Gray et al.; 2012). A meta analysis done in 2008 concluded that TB patients had about 0.70 SD(95% CI 0.42, 0.93) lower 25(OH) vitaminD concentration than non TB individuals (Nnoaham et al.; 2008). Moreover severe vitamin D deficiency (<12.5nmol/l) is significantly more seen in tuberculosis patients than healthy control in our study that may suggest more the severity of deficiency , more is the risk of acquiring tuberculosis.

Clinical evidence of vitamin D deficiency in the form of frontal bossing, wrist widening, abdominal distention was seen in seen in only 2 patients in study group and these patients had 23 nmol/l and 15 nmol/l vitamin D levels respectively. Vitamin D deficiency occurs without any symptoms, if at all any symptoms are present it indicates severe deficiency.

Mewat is a sunshine rich region predominantly occupied by meo population. Population is rural, of low socio economic status and majority people lives on farming and are non vegetarians. So vitamin D deficiency is not expected in this population but again 92 %(103/112) children are found to be deficient in our study. It has been reported that 75-85 percent of school going children have vitamin D deficiency or insufficiency (Harinarayan et al.; 2009). This may be attributed to poverty, poor maternal health, poor dietary habits with inadequate intake and recurrent infections in this region. In addition increased melanin in skin interferes with ultraviolet light mediated synthesis of vitamin D. Moreover, poor intake of vegetables result in magnesium deficiency which might lead to reduced parathormone secretion and consequent reduction of 1 hydroxylation of vitamin D (Richard et al.; 2008).

CONCLUSION

Our study confirms high incidence of hypovitaminosis D in this area. As in the study population, most of the children are engaged in outdoor activities, the deficiency is probably linked to some associated condition either in the form of some chronic disease or nutritional which needs to be clarified and further research is required.In our study hypovitaminosis D was significantly associated with TB infection. Further large multicentric studies are needed to evaluate association of vitamin D deficiency with tuberculosis and possible role of vitamin D in the prevention of tuberculosis in children.

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