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RESEARCH ARTICLE

PREVALENCE OF VITAMIN-D DEFICIENCY IN SOUTHERN PUNJAB POPULATION–A HOSPITAL BASED STUDY

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ABSTRACT

Background: Many studies show a high prevalence of vitamin D deficiency across various populations the world over. There is relative lack of prevalence data in Southern Punjab, Pakistan. This cross-sectional study is carried out to assess the prevalence of vitamin D deficiency in Southern Punjab population of Pakistan.

Study Design: Single centre, Cross sectional study. Place and Duration of the Study: The study was conducted from June 2014 to December 2015, at diagnostic labs of MINAR, Multan, Pakistan.

Materials and Methods: 450 subjects were tested for vitamin D. About 3 ml bloods from all the study subjects were collected in EDTA tube and plasma was separated via centrifugation at 4,000 rpm for 5 minutes. The test principle is based on chemiluminescent emission which is measured by photomultiplier. The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with Procell. Statistical analysis was done using Chi-square test.

Results: Out of a total of 450 subjects tested for vitamin D, females were 386(85.77%) and males were 64(14.22%) of the total sample size. The mean age of respondents was 44.53 years (age range 10-90 years) .Levels of 25(OH)D level in ng/ml was measured in four categories. In total no's (both males and females) the vitamin D deficient range (<10ng/ml) was 148(32.88%), the insufficient range(10-19.9ng/ml) was 173(38.44%), the inadequate range(20-29.9ng/ml) was 70(15.55%) and desirable range(30-100ng/ml) was 59(13.11%). A high overall prevalence (86.87%) of vitamin D deficiency was observed in the study subjects. In the total subjects the deficiency of vit D observed was 88.33% in females and 78.11% in males. A significant gender-specific difference was also recorded at the cut-off level of 25 (OH) D, with women showing higher prevalence of deficiency compared to men ($P < 0.05$). Vitamin D level in age wise distribution showed that deficiency was higher in persons in age ranging from 50-90years as compared to age ranging from 10-49 years (P=0.11)

Conclusion: The study showed a high percentage of vitamin D deficient individuals. The frequency of vitamin D deficiency was greater in females as compared to males. The vit D deficiency was higher in people above 50y. There is a need to take immediate measures to tackle this growing public health problem.

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INTRODUCTION

Vitamin D (sunshine vitamin) belongs to the class of secosteroids which are fat-soluble and performs the important function of intestinal absorption of calcium and phosphate.

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The vitamin, first identified in 1921, has two main types namely Vitamin D3 and vitamin D2. These two vitamins are also called cholecalciferol and ergocalciferol respectively. Both these types are collectively termed as calciferol(1). Vitamin D is formed in skin by ultra violet light(290-315nm) which is the major source (80%) of Vitamin D and its dietary sources are egg yolk, oily fish, butter and milk (Mawer, 2001).

Vitamin D deficiency has been observed in developed and developing countries including Middle East (Pournaghshband, 2005). Factors such as skin hyperpigmentation, high pollution levels, and relatively poor nutrient intake could be responsible for nullifying the effects of greater sunshine. 25-Hydroxy forms of both vitamin D2 and D3 are easily measured in plasma. We will refer this collectively as 25-hydroxy vitamin D [25(OH) D]. The levels of 25(OH) D are considered to be a precise indicator of the vitamin D status (HF, 2004). The best indicator of vitamin D status is serum 25-hydroxyvitamin D3 (25(OH) D3) concentration, because it reflects both dietary intake from vitamin D and cutaneous synthesis of vitamin D. However, there is no absolute consensus as to what a normal range for 25(OH) D3 in pregnancy should be. Most authors agree that severe vitamin D deficiency should be defined by a 25(OH)D3 concentration ≤10 ng/mL (≤25 nmol/L) and mild vitamin D deficiency by a 25(OH)D3 concentration 10–20 ng/mL (25–50 nmol/L); but, recent evidence suggests that the optimal serum 25(OH)D3 levels may be even higher than >32 ng/mL (>80 nmol/L) (Hollis, 2004). There is increasing evidence that vitamin D insufficiency, by leading to sustained hyperparathyroidism, is prejudicial to the skeleton, particularly cortical bone; it is without symptoms until fractures occur (Mawer, 2001). The recommended dietary allowance of vitamin D falls in the range of 400–800 IU/day, the need increasing as the age advances. But this has been challenged by many authors who recommend a higher allowance of 800–1000 IU/day for all ages in the absence of adequate sun exposure (Holick, 2008; Vieth, 2007). Also, to treat vitamin D deficiency, a higher dose of at least 50,000 IU/week is recommended to achieve optimal levels (Vieth, 2007). Vitamin D deficiency has been a neglected disorder and not much work has been done on its demographic patterns, especially in the southern Punjab, Pakistan. This study aims to evaluate the demographic pattern of vitamin D deficiency in the local population of southern Punjab, Pakistan. Southern Punjab has a flourishing middle class society with a mix of agrarian, business, and service communities. Economic growth has brought about changes in the lifestyles as regards the dietary habits, work types and schedules. Whether these population characteristics influence the vitamin D levels needs to be explored

MATERIALS AND METHODS

This was a retrospective, cross-sectional study conducted from June 2014 to December 2015, at diagnostic labs of MINAR, Multan. During the study period, 450 subjects were selected through convenience sampling technique and tested for vitamin D. The inclusion criteria included all subjects referred to the hospital during the study period. About 3 ml bloods from all the study subjects was collected in purple top EDTA tubes and plasma was separated via centrifugation at 4,000 rpm for 5 minutes. The test principle followed the Competition principle in which total duration of assay was 27 minutes in fully automatic instrument Cobas. In this instrument the reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with Procell. Application of a voltage to the electrode then induces chemiluminescent emission which is measured by a photomultiplier. Results are determined via a calibration curve which is instrument-specifically generated by 2-point calibration and a master curve provided via the reagent barcode**.**

RESULTS

Of the total subjects enrolled (**N** = 450), 64 (14.22%) were males, 386 (85.77%) were females. The mean age of respondents was 44.53 years (age range 10-90 years) .Levels of 25(OH) D in ng/ml was measured in four categories. In Females Deficient were 129(33.41%), insufficient were 148(38.34%), Inadequate were 64(16.58%), Desirable were 45(11.65%). In males Deficient were 19(29.68%, insufficient were 25(39.06%), Inadequate were 6(9.37%), Desirable were 14(21.87%) as represented by Table-1 and Fig-1.When we compare the no. of persons < then desirable range and the no. of persons in desirable range the %age prevalence of vit D deficiency in male was (78.12%) and in females (88.34%).If we apply chi-square test in this case a significant gender-specific difference was recorded at the cut-off level of 25 (OH) D, with women showing higher prevalence of deficiency compared to men ($P < 0.05$) as shown in Table-2.

Table 1. Vitamin D deficiency in Males and Females

Gender	Subject N=450	25(OH)D level (ng/ml)			
	Category	Deficient	Insufficient	Inadequate	Desirable
	Ranges	<10ng/ml	10-19.9ng/ml	20-29.9ng/ml	30-100ng/ml
Male	64	19(29.68%)	25(39.06%)	6(9.37%)	14(21.87%)
Female	386	129(33.41%)	148(38.34%)	64(16.58%)	45(11.65%)

Table 2. Prevalence (%) of Vitamin D deficiency Males Vs Females

Gender	Subject	25(OH)D level (ng/ml)		Prevalence%(deficiency)
		<30ng/ml	30-100ng/ml	
Males	64	50	14	78.12%
Females	386	341	45	88.3488%
P value			0.02	

Table 3. Prevalence (%) of Vitamin D deficiency in Age Groups

Age Group	Subject	25(OH)D level (ng/ml)		Prevalence (%)
		<30ng/ml	30-100ng/ml	
10-49y	283	212	71	74%
50-90y	167	136	31	81.43%
P-value			0.11	

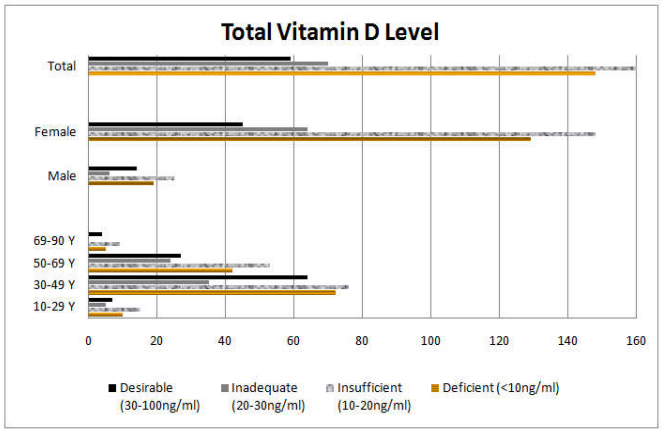

Figure 1. Graphical Representation

When we compare the no. of persons less than Desirable range and the no. of person in Desirable range, the Prevalence (%) of Vitamin D deficiency in Age Group 10-49Y is 74% and in Age group 50-90Y is 81.43%. In this case P= 0.11 which shows that this difference is considered to be not statistically significant as shown in Table-3.

DISCUSSION

Vitamin D deficiency is not an uncommon disease in the world; it has been widely reported in all age groups in recent years (Kamball *et al*., 2008). There are many factors which contribute to the vitamin D deficiency in general population worldwide. These factors include reduced exposure to sunlight, age-linked reduction in coetaneous synthesis, and intake of food with a reduced vitamin D level. Vitamin D deficiency is a new global epidemic among both children and adults (Bjelakovic *et al*., 2011). Use of fatty fish and cod liver oil or other fish oil supplements was independently associated with reduced or for vitamin D deficiency in all groups. Vitamin D supplements use is well known to influence 25(OH)D levels in blood, particularly when sun exposure is limited (Brustad *et al*., 2003; Davies, 1999). The results of vitamin D levels are also used as an aid for the assessment of bone metabolism. Vitamin D supplements are given to make the muscle strength better and lessen the fall percentage by around 50% (Bischoff *et al*., 2003). In cases, where the levels of vitamin D falls below 10 ng/ml, the clinicians prescribe a loading dose which include a 50,000 IU of vitamin D orally once a week for 60-90 days, or 3 times a week for 30 days (Kennel *et al*., 2010). Our study has reported a higher percentage of vitamin D deficient individuals in southern Punjab, Pakistan. The frequency of vitamin D deficiency escalated considerably with age and was found higher in women.

A study conducted in Australia in which 11,247 adults from 42 randomly selected districts were studied and exhibited 31% deficiency (Daly *et al*., 2012). Recent studies demonstrate safety and efficacy of community-based vitamin D supplementation trials and food staple fortification introduced in countries without fortification policies. Reliance on the world food supply as an alternative to UVB exposure will necessitate greater availability of fortified food staples, dietary supplement use, and/or change in dietary patterns to consume more fish (Calvo and Barton, 2007).

This deficiency raises the question that why we do not have sufficient vitamin D from sunlight or the normal values have to be re-considered. In fact these references ranges have been established based on foreign population. As references range may vary with age, sex, race, diet, and stress, efforts should be made to establish our own references ranges by testing a large number of healthy people and observing what appears to be "normal" for them. High prevalence of vitamin D deficiency in females might be because they are not exposed to sunlight properly and are mostly house-wives involved in domestic work. The chances to expose their bodies are not available even if they go out because they wear clothes covering most of their body except face and hands. This is due to the cultural, social and religious norms existing in our society. The lack of awareness regarding healthy balanced diet and the overcooking of food are a few other contributing factors to the prevailing vitamin D deficiency. The Government commitment and support are needed to combat this epidemic. A national programme on the supplementation of vitamin D and a public awareness campaign are urgently needed.

Conclusion

The study showed a high percentage of vitamin D deficient individuals. The frequency of vitamin D deficiency was greater in females and vit D deficiency was higher in people above 50y. There is a need to take immediate measures to tackle this growing public health problem

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