INTRODUCTION
It was in 1921 that the sunshine vitamin called as vitamin D (calciferol) was first identified. Vitamin D has 2 main types viz cholecalciferol (vitamin D₃) and ergocalciferol (vitamin D₂), collectively termed as calciferol. Skin is the most important site of calciferol synthesis under sunlight exposure to UVB 290-315 nm. Serum 25-hydroxycholecalciferol (25-OH-D₃) is a marker of both endogenous production and exogenous supply. Of total circulating vitamin D, 5% is of vitamin D₂ type and remaining 95% is of vitamin D₃. Vitamin D is essential for bone health. It is claimed to be reducing mortality in aged women. Vitamin D deficiency produces rickets during childhood and osteomalacia in adulthood. Vitamin D deficiency has been linked to bone fracture due to decreased bone mineral density. Plasma 25-OH-D₃ is a marker of body’s total vitamin D₃ stores. Vitamin D deficiency in 36% of general population and 57% of out-patients has been reported from the United States. At present, vitamin D deficiency has taken shape of an epidemic in the United States. In Australia 1 out of 3 of normal healthy adults showed vitamin D deficiency.

Recent studies from Pakistan had reported severe vitamin D deficiency in normal adult population. Vitamin D deficiency is an endemic problem in Pakistan but the issue has never gained attention. The problem is further compounded by the lack of people who are not aware of the nature of problem. Vitamin D deficiency is a public health problem not accepted by most of organizations.

The problem is not yet evaluated completely in our country. Vitamin D deficiency may be prevalent in all age groups, social strata, and communities of Pakistan but is overlooked. The present study was conducted to determine the frequency of 25-hydroxyvitamin D₃ deficiency in healthy male attendants presenting at the outpatient department of Isra University Hospital, Hyderabad, Pakistan.

SUBJECTS AND METHODS
This descriptive study was conducted at the Outpatient Department, Department Medicine, Isra University, Hyderabad, Pakistan from September 2014 to March 2015. A sample of 180 normal healthy adult male of age 18–50 years was selected. Cases were selected through non-probability consecutive sampling according to predefined inclusion and exclusion criteria. Written consent was obtained from the participants. Biochemical analysis of serum 25-OH-D₃ was performed on ARCHITECT I 1000™ system. Data were analysed using Statistix 8.1. Continuous variables were presented as mean and standard deviation whereas categorical variables as frequency and percentages. Difference between categories was measured by using Chi-Square test for goodness of fit and a p<0.05 was considered significant. Results: Mean age of the subjects was 37.6±5.7 years. The mean 25-OH-D₃ was observed as 24.57±5.57 ng/dl (CI 23.19–26.39). Normal, insufficiency, and deficiency of 25-OH-D₃ were noted in 4.4% (n=8), 6.6% (n=12) and 88.8% (n=160) of the subjects respectively. Vitamin D₃ as low as 7.13 ng/dl were noted. Conclusion: There is high frequency of 25-hydroxyvitamin D₃ deficiency in normal healthy male adults.

Keywords: Vitamin D₃ deficiency, Male, Isra University
study. Study data was collected on a performa. Data was entered into Statistix 8.1. Continuous variables were presented as mean and standard deviation whereas categorical variables as frequency and percentages. Difference between categories was measured by using Chi-Square test for goodness of fit and a p-value of less than 0.05 was considered significant.

RESULTS

Mean age of study population was 37.6±5.7 years. The mean 25-hydroxyvitamin D₃ was 24.57±5.23 ng/dl with 95% confidence interval of 23.19–26.39 (Table-1).

Normal, insufficiency, and deficiency of 25-hydroxyvitamin D₃ were found in 4.4%, 6.6%, and 88.8% as shown in Table-2. (p=0.001). 25-hydroxyvitamin D₃ as low as 7.13 ng/dl was noted in our study population.

Table-1: Statistical parameters of 25-OH-D₃ (n=180)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Findings (ng/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean 25-OH-D₃</td>
<td>24.57±5.23</td>
</tr>
<tr>
<td>Range 25-OH-D₃</td>
<td>7.1–35.43</td>
</tr>
<tr>
<td>95% Confidence interval</td>
<td>23.19–26.39</td>
</tr>
<tr>
<td>Normal 25-OH-D₃ (=30 ng/dl)</td>
<td>30.55±0.7</td>
</tr>
<tr>
<td>Insufficiency 25-OH-D₃ (20–30 ng/dl)</td>
<td>25.13±1.3</td>
</tr>
<tr>
<td>Deficiency 25-OH-D₃ (=20 ng/dl)</td>
<td>14.91±4.8</td>
</tr>
</tbody>
</table>

Table-2: Frequency of individuals with normal, insufficiency and deficiency of 25-OH-D₃ (n=180)

<table>
<thead>
<tr>
<th>25-OH-D₃</th>
<th>Frequency</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>16 (4.4%)</td>
<td></td>
</tr>
<tr>
<td>Insufficiency</td>
<td>12 (6.6%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Deficiency</td>
<td>160 (88.8%)</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Worldwide, vitamin D deficiency has erupted as a new global epidemic among children, male and female. The 25-hydroxyvitamin D₃ deficiency is confounded by various factors in general population. Of various factors, some are lack of sunlight exposure, aging, dietary deficiency, lack of balanced diet and overcooking of food, increased demand, and drug related deficiency. The 25-hydroxyvitamin D₃ deficiency is associated with other morbidities such as intestinal cancer, prostate cancer, cardiovascular diseases, and diabetes mellitus, etc. The 25-hydroxyvitamin D₃ deficiency is associated with approximately 200 altered gene expressions in the human body. The 25-hydroxyvitamin D₃ deficiency is also an indicator of bone mass density and is used clinically for bone disease interpretation. The 25-hydroxyvitamin D₃ supplements increase muscle power and strength. Body’s vigour and vitality is also increased. The 25-hydroxyvitamin D₃ supplements lessen the frequency of body falls by around 50%.

It is recommended to supplement vitamin D₃ supplements every 3rd or 4th month when the levels fall below 10 ng/ml, or 3 times a week for 30 days. The present study showed high frequency of vitamin D₃ deficiency among healthy male attendants presenting at the outpatient departments of Isra University Hospital. Daly RM et al have reported 31% 25-OH-D₃ deficiency in Australians. The findings of 25-hydroxyvitamin D₃ deficiency in the present study are supported by a study from Faisalabad, which had reported 18% 25-OH-D₃ insufficiency and 77.5% 25-OH-D₃ deficiency. Another study had reported 3% had normal 25-OH-D₃, 10% 25-OH-D₃ insufficiency and 87% had 25-OH-D₃ deficiency, however, the study population comprised of pregnant women only. Still another study from Karachi reported 90.1% 25-OH-D₃ deficiency, the study population comprised of pre-menopausal women. The findings of above study are parallel to the findings of present study.

The 25-OH-D₃ deficiency is highly prevalent in both men and women irrespective of exposure to sunlight. It can be recommended to launch public awareness campaigns and vitamin D₃ supplementsations should be instituted.

CONCLUSION

There is high frequency of Vitamin D₃ deficiency in normal healthy adults. Vitamin D₃ supplementation is recommended. Further studies are warranted.

REFERENCES

11. Daly RM, Gagnon C, Lu ZX, Magliano DJ, Dunstan DW, Sikaris KA, "et al. Prevalence of vitamin D deficiency and its determinants in Australian adults aged 25 years and older: a


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