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Attitude of future healthcare provider towards vitamin D significance in relation to sunlight exposure



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Abstract *Objective:* Nature is the kindest of all to provide man with all the necessary components for a healthy life at easily accessible lengths. The deprivation arises with unawareness and lack of correct measures to extract the benefits. Medical education makes the youth aware of the numerous disorders and diseases, as well as their preventions and treatments. This awareness needs to be realized and implemented in the society, and it is not possible without the advisers acting on the same lines. Since doctors are the most trusted and their advice is adopted without much thought, it is extremely inevitable to analyze the attitude of medical students of various levels to understand the cause of their negligence toward their own deficiencies, the focus for this study being vitamin D (VD). *Method:* A cross sectional descriptive study was done on undergraduate medical students of health profession from different universities of Pakistan to access the awareness regarding VD deficiency associated with sunlight. Informed consent was duly signed by each participant after which self-constructed questionnaire was provided to them and data are collected. SPSS 17 was used for Statistical analysis. *Results:* Final students are well aware of VD significance, take food rich in VD but still suffer from fatigue and muscular pain. No treatment was taken for fatigue and muscular pain by majority of these sufferers and those who took treatment were VD supplement. The health sufferers were mostly those who avoided sunlight highlighting the role of VD in maintaining

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an active lifestyle as well as the significance of sunlight in maintaining VD levels. *Conclusion:* It can be concluded that in spite of awareness, the role of sunlight exposure and the proper time and duration of exposure cannot be ignored to create a healthy and active society.

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1. Introduction

The twentieth century served as an era of discoveries of vitamins and the establishment of the disorders pertaining to their deficiencies. Vitamins are organic compounds that are required in small quantities by the body for proper growth and development. There are 13 vitamins in which vitamin A, D, E and K are fat soluble vitamins while Vitamin C and B (all types) are water soluble. Since vitamin D is the focus of this survey, it would be of relevance to mention that vitamin D is one of the most critical compounds that mineralizes the skeleton and prevents hypocalcemic tetany. The effects of vitamin D deficiency (VDD) upon the skeleton are well known. VDD in adults for a long period of time is usually associated with osteomalacia while insufficiency is associated with various non-specific effects (Holon et al., 2006). VDD for longer period affects the calcium homeostasis that is found to be associated with the development of chronic bone disorder, such as osteoporosis (Holick, 2006; Reginster, 2005). Further on, calcium unrelated functions for vitamin D have also been revealed, that take its functions beyond the bone. The immune system too works greatly influenced by vitamin D, serving as an immunosuppressant (Deluca, 2004).

Vitamin D deficiency (VDD) is a very disturbing condition, leading to changes in the homeostasis and ultimately health deterioration. Awareness of the significance of vitamin D in the regulation of normal physiology as well as the consequences of its deficiency is the need of the hour to save our general population from widespread bone and other vitamin D deficiency disorders. Vitamin D deficiency is very common in Pakistan (Khan et al., 2012; Luqman et al., 2012; Zahid et al., 2010). The factors that contribute in high prevalence of vitamin D deficiency may include inadequate nutritional intake of vitamin D coupled with inadequate exposure to sunlight, interference in vitamin D absorption due to any disorder and malnutrition (Luqman et al., 2012). Various studies around the world have been conducted to evaluate the awareness among people regarding this vitamin. In a qualitative study by Pirrone et al. (2013) carried out on vitamin D deficiency awareness among African migrant women residing in high-rise public housing in Melbourne, Australia, the authors have concluded that participants were aware of VDD and could identify the impacts that VDD had on their health. Jain et al. (2011), through their survey on awareness of vitamin D supplementation among healthcare professionals' of different key groups like health visitors, general practitioners (GPs), and midwives have declared that less than half of the health visitors and fewer midwives routinely advised vitamin D supplementation to their patient groups. Of more interest was the finding that a majority of GPs were unaware of the various aspects of supplementation. According to a survey of awareness of vitamin D deficiency states and recommended supplementation doses among the faculty and staff at a medical school carried out by Agens et al. (2012), low self-reported

vitamin D levels were prevalent in their sample of MDs (physicians) and non-MDs (non-physicians) living in an area of the USA with plentiful sunshine. Christie and Mason carried out a qualitative exploration about the knowledge, attitude and practice regarding vitamin D deficiency among female students in Saudi Arabia. It was found that gaps in knowledge both in the population and in healthcare professionals may be a barrier to the prevention of vitamin D deficiency (Christie and Mason, 2011). Alemu and Varnam found that the majority of at-risk patients are aware of vitamin D, though there was a significant lack of knowledge among older people, who have higher morbidity (Alemu and Varnam, 2012). Sunlight is the most important factor, responsible for the replenishment of vitamin D pools. With the general awareness about the adverse effects of sunlight that includes cancers topping the list, vitamin D synthesis is vastly affected due to the prevailing photoprotection strategies of people. The photoprotection strategies include complete protective clothing as well as sunscreens. Further on, dark skinned people may even have melanin pigments to provide photoprotection, though its relationship with vitamin D status is yet to be extensively researched upon (Springbett et al., 2010). It was reported in a study by Mutairi et al. that people in Kuwait have enough knowledge and awareness about the helpful and harmful aspects of sun exposure. They have low levels of vitamin D but it is not influenced by their sunscreen based photo-protection strategies, in fact may be attributed to their dietary habits or lifestyle (Al-Mutairi et al., 2012).

The purpose of this research was to put into viewpoint the many health benefits of vitamin D and the role of vitamin D deficiency in increasing the risk of many common and serious diseases, including some common cancers, type 1 diabetes (Elina et al., 2001), cardiovascular disease (Suzanne and Vin, 2009) and osteoporosis (Mawer and Davies, 2001). This essential nutrient contributes to healthy bones and to control amount of calcium in the blood. But getting the recommended daily amount of vitamin D is not easy. One previous study suggested that Health education should be imparted to population and awareness should be created to increase the exposure to sunlight to permissible limits. Screening and vitamin D supplementation should be planned to decrease its varied and multi-dimensional ill effects on health (Luqman et al., 2012).

It is very important to create awareness about vitamin D sources and that deficiencies cause severe outcome. Therefore the medical students who would be future's healthcare professionals must know how to prevent VDD, the sign and symptoms and methods of eradication of VDD from Pakistan by educating their relatives, friends, patients and laymen, who do not belong to medical field. In the light of numerous studies based on the exploration of awareness regarding vitamin D importance and the significance of sun exposure, it was considered extremely important to conduct a survey about such awareness in medical students in Karachi.

2. Method

A descriptive cross-sectional study design was selected. The study was conducted on 100 students of both private and government sector medical Universities. The data collected from August 2013 to August 2014. A written consent form has been duly signed by each participant. Questionnaire regarding the awareness of vitamin D deficiency and the role of sunlight exposure in vitamin D deficiency was filled in by 1st to final year students of respective specialty including Pharmacy, MBBS and BDS program. The collected data are analyzed to conclude the knowledge level of these students about the awareness of vitamin D deficiency and sunlight exposure.

Random sampling technique was used for the data collection, as this technique is appropriate according to the required criteria. Sample size of 100 was selected from private and government sector medical universities in Karachi, Pakistan.^{1,2}

3. Results

Demographics of the collected data shows that out of 100 respondents, there are 82 females and 18 males fall in the age range between 20 and 26 years and highest percentage of 21 years of age that is 36%. All of them belong to medical field education including MBBS, Pharmacy and BDS at undergraduate level.

The analysis of data reveals that all the students have great knowledge regarding the importance of vitamin D as well as the significance of calcium absorption for our health and majority i.e. 93% of the students are well aware of its deficiency consequences in form of low mood, tiredness and muscle and bone pain.

On asking, what measures they take to fulfill their own VD requirement, through taking VD enrich food, by VD supplements or through sunlight exposure; Majority of the respondents replied that they accomplish their VD requirement either by taking vitamin D containing food such as milk, yogurt, egg or by taking vitamin D supplements whereas only 8% respondents said that they also take sunlight exposure for consumption of UV rays to achieve VD levels to satisfactory, outrageous.

Moreover many of the respondents do not even like to go into the sun. However, their daily routine exposes them to sunlight somehow and a drastic fact that was observed is that a big majority of respondents are found to be satisfied as they have sun exposure at any time of the day. This survey reveals that 54% students expose themselves to sunlight at afternoon while only 39% in the morning and 7% at the time of sunset. The results are surprising as sunlight is the major source of VD upsurge (see Table 1).

¹ Inclusion criteria for sample selection include 1st, 2nd, 3rd and final year students of their respective medical graduate programs were included in this study. However, teachers, medical professionals and general public were not included in the study.

² Data were analyzed on SPSS 17 for descriptive statistical analysis and cross was also performed to evaluate relationship between the year of students and their respective knowledge and attitude toward vitamin D deficiency.

- The data show that 69% avoid or do not take sunlight exposure at sunset. 31% of the respondents take sunlight exposure and only 15% population is exposed to sun at early morning when UVA rays are more predominant.
- The possible relation between time and duration for which the respondents take sunlight exposure. It is observed that majority of the medical students do not know about the timing of sunlight exposure which is an adequate source of vitamin D.

- The relationship between male and female and the duration for which the medical students take sunlight exposure show that, majority of the medical students do not have knowledge regarding duration of sunlight exposure.

1. From the data (Table 2) it is concluded that majority of final year medical students are aware about vitamin D importance and its related deficiency issues.
2. In the mentioned test of chi-square, p -value is .053 which is not significant. Therefore medical students did not have the necessary knowledge regarding vitamin D deficiency and hence did not take vitamin D supplements in their daily diet.
3. In cross tabulation the possible relation between the classes of medical students and their knowledge about vitamin D deficiency symptoms, shows that most of them are aware about the most of symptoms like tiredness, low mood.
4. According to cross tabulation, the possible relation between the classes of medical students and vitamin D enriched food is that most of them take vitamin D enriched food in their diet. According to the chi-square test, p -value is 0.006 that is significant; it elaborates that medical students do take vitamin D enriched food.

4. Discussion

Present study brings to knowledge that a significant number of final year medical students are aware about the importance of vitamin D (VD) and the deficiency issues. Being at the highest level of basic medical education, final year students have sound knowledge of the physiological role of vitamin D. Vitamin D deficiency (VDD) is being associated with a number of disorders and physical impairments related specially to the bones. Low levels of VD cause hypocalcemia, that leads to a reduction in the binding of calcium to the calcium sensing G-protein couples transporter system found on parathyroid glands resulting in an increase in secretion of parathyroid hormone (PTH). PTH in turn causes demineralization of bones, releasing calcium from them (Bradley et al., 2006).

In spite of their awareness regarding VDD, 4th year students suffer the most from muscle and bone pain. The possible cause may be the untiring efforts they make to maintain their grades and upgrade their achievements, ignoring their physical requirements in the due course. Moreover the use of tea and coffee to keep them awake to help them study more may be a major contributor to numerous deficiencies, with VD being one of them. (Rapuri et al., 2007), have demonstrated that caffeine decreases vitamin D receptor (VDR) expression thus effecting osteoblastic activity. This makes it easy to propose that VD function of bone formation and strengthening is highly influenced by the dietary habits of individuals.

4th year students prefer vitamin D enriched food on the basis that they are aware of the physical disorders that can

Table 1 Represents demographics and perception of sunlight exposure.

Variables	Groups (n)	Percentage (%)
Gender	Male	18
	Female	82
Class	1st year	7
	2nd year	27
	3rd year	17
	4th year	59
Sunlight Exposure	Yes	31
	No	69
Suffering from muscle pain and fatigue	Yes	33
	No	67
Take treatment for muscle pain and fatigue(who suffer)	Yes	52.9 <i>p</i> value 0.003
	No	47.1

Table 2 Crosstab chart between year of study and their attitude.

	Study year	<i>P</i> value
1.	VD def. knowledge	0.002
2.	Intake of VD supplements	0.053
3.	Symptoms of VD deficiency	0.037
4.	Take VD enriched food	0.006

arise in case of VDD. Although they try to maintain their VD pools, they fail to extract complete benefits of the vitamin against fatigue and bone mineral deficiency (BMD) due to the counter acting components of their keep awake beverages (coffee, tea and other drinks that contain caffeine). An increase in bone loss of -8% in women with VDR genotype *tt* as compared to VDR genotype *TT* was demonstrated by Rapuri et al. (2001) when their caffeine consumption was > 300 mg/day. This suggests a complex relationship between dietary caffeine intake, bone ossification and the genetic variation of the VDR.

67% respondents did not take treatment for muscular pain and fatigue, maybe due to the fact that they consider their lifestyle healthy and balanced, thus did not relate their pain and fatigue with any probable deficiency but to work load.

Those who took treatment, majority was vitamin D supplement takers. This proved to be positive in part suggesting that at least part of the population is aware and serious about maintaining the levels of vitamin D in their bodies.

Those who suffered from most health problems refrained from sunlight exposure the most. With an increasing awareness about the importance of sunlight for the synthesis of VD a parallel rise in the knowledge of the carcinogenic effect of sunlight is also seen. This usually renders an individual reluctant from going out in the sun, as VD deficiency does not seem to be as grave as cancer. A recent study was done in Karachi on the Prevalence of Vitamin-D deficiency and its correlates and it reveals that there is a high prevalence of vitamin D deficiency in females in Khan et al. (2012).

In the light of the results of the present study, the findings of the aforementioned study can be explained on the basis of suggestions related to sunlight exposures and lifestyle of the respondents. The most appropriate time for sunlight exposure is 10 am–2 pm, when the sunrays are most effective for VD synthesis. It may be possible that students are unable to make it out in the sunlight during this time due to class, duties and for females the dark colored body covering robes may be a hindrance in exposure to sunlight.

5. Conclusion

The knowledge of health related issues is most important for medical students, as they shall be responsible for the health of the society. Before the importance of VD and its sources is made known in the society it is of greater importance that the medical students be well aware of its significance in the wellbeing of humans and the sources that maintain its levels for efficient physiological functions. In communities, they can prevent vitamin D deficiency and correct the perception about sunlight exposure, in order to promote activities among the health professionals, taking a lead role in making people aware about vitamin D importance, and its abundant resources especially through sunlight.

All the students knew the importance of VD for good health and most of them were aware of its requirement for calcium absorption. Almost 93% knew about VD deficiency issues and 97% took VD enriched food in their diet. Muscle pain and fatigue was also experienced by some respondents, out of which very few took treatment. Most of the medical students were aware about the symptoms and causes of VDD. Majority of them did not like to have sunlight exposure, and the remaining individuals were unaware of the proper schedule and duration of exposure required for efficient VD synthesis.

Prevention (VD supplements) is better than cure (expensive diagnostic test for VD levels detection and treatment), and management of sources of acquiring and synthesizing VD is the key to prevention from diseases like hypovitaminosis D (deficiency of vitamin D), osteoporosis (adult), osteomalacia (bone pain) and rickets (child), not ignoring its role in boosting the immune system.

6. Recommendation

Strong bones are the basis of healthy life; humans make 90% of vitamin D naturally from sunlight exposure to skin, specifically, from UV B exposure to skin. Almost 5–30 mins sunlight exposure at least 2 times every week to synthesize vitamin D in skin.

UVB is the portion of sunlight that stimulates human skin to produce vitamin D, as well as timing of sunlight exposure plays an important role in vitamin D synthesis. 10 am to 2 pm is the time for more UVB than UVA. After 2PM UVA amount increases in sunrays that damage the skin.

There are some contributing factors for decreased perception about sunlight exposure which may be intense heat, infrastructure and covering the whole body (females by black abaya which reflect the light), homebound individuals, and people with occupations that limit sun exposure. A little consideration of these limitations and necessary adjustments may help in creating a healthy life for doctors and others as well.

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References

- Agens, J.E., Galasko, G.T., Purandare, A.V., Lin, J., 2012. Awareness of vitamin D deficiency states and recommended supplementation doses: survey of faculty and staff at a medical school. *e-SPEN J.* 7 (6), E215–E218.
- Alemu, E., Varnam, R., 2012. Awareness of vitamin D deficiency among at-risk patients. *BMC Res. Notes* 5, 17.
- Al-Mutairi, N., Issa, B.I., Nair, V., 2012. Photoprotection and vitamin D status: a study on awareness, knowledge and attitude towards sun protection in general population from Kuwait, and its relation with vitamin D levels. *Indian J. Dermatol. Venereol. Leprol.* 78 (3), 342–349.
- Bradley, R.J., Nelly, M., Shetal, H.P., Alan, C.D., 2006. Vitamin D Deficiency in Gastrointestinal Disease. In: *Nutrition Issues in Gastroenterology, Series #36, Practical Gastroenterology*. pp. 52–72.
- Christie, F.T.E., Mason, L., 2011. Knowledge, attitude and practice regarding vitamin D deficiency among female students in Saudi Arabia: a qualitative exploration. *Int. J. Rheum. Dis.* 14 (3), E22–E29.
- Deluca, H.F., 2004. Overview of general physiologic features and functions of vitamin D1–4. *Am. J. Clin. Nutr.* 80 (suppl), 1689S–1696S.
- Elina, H., Esa, L., Antti, R., Marjo-Riitta, J., Suvi, M.V., 2001. Intake of vitamin D and risk of type 1 diabetes: a birth-cohort study. *Lancet* 358 (9292), 1500–1503.
- Holick, M.F., 2006. High prevalence of vitamin D inadequacy and implications for health. *Mayo Clin. Proc.* 3, 353–373.
- Holon, R., Byers, M., Walker, B.R., Summerton, C., 2006. Environmental & nutritional factors in diseases. In: *Davidson's Principles and Practice of Medicine*, 20th ed. Churchill & Livingstone, Edinburgh, pp. 93–125.
- Jain, V., Raychaudhuri, R., Barry, W., 2011. A survey of healthcare professionals' awareness of vitamin D supplementation in pregnancy, infancy and childhood- midwives, gps and health visitors have their say. *Arch. Dis. Child.* 96, A16–A18.
- Khan, A.H., Iqbal, R., Naureen, G., Dar, F.J., Ahmed, F.N., 2012. Prevalence of vitamin D deficiency and its correlates: results of a community-based study conducted in Karachi, Pakistan. *Arch. Osteoporosis* 7 (1–2), 275–282.
- Luqman, M., Aziz, Kousar, N., Abid, S.M., 2012. Prevalence of vitamin-d deficiency in patients presenting with musculoskeletal manifestations in medical Opd of CMH Lahore. *J. Pak. Orthop. Assoc.* 24 (2), 50–56.
- Mawer, E.B., Davies, M., 2001. Vitamin D nutrition and bone disease in adults. *Rev. Endocr. Metab. Disord.* 2 (2), 153–164.
- Pirrone, A., Capetola, T., Riggs, E., Renzaho, A., 2013. Vitamin D deficiency awareness among African migrant women residing in high-rise public housing in Melbourne, Australia: a qualitative study. *Asia Pac. J. Clin. Nutr.* 22 (2), 292–299.
- Rapuri, P.B., Gallagher, J.C., Kinyamu, H.K., Ryschon, K.L., 2001. Caffeine intake increases the rate of bone loss in elderly women and interacts with vitamin D receptor genotypes. *Am. J. Clin. Nutr.* 74 (5), 694–700.
- Rapuri, P.B., Gallagher, J.C., Nawaz, Z., 2007. Caffeine decreases vitamin D receptor protein expression and 1, 25(OH)₂ D₃ stimulated alkaline phosphatase activity in human osteoblast cells. *J. Steroid Biochem. Mol. Biol.* 103 (3–5), 368–371 (Epub 2007 Jan 12) 368–371).
- Reginster, J.Y., 2005. The high prevalence of inadequate serum vitamin D levels and implications for bone health. *Curr. Med. Res. Opin.* 21, 579–585.
- Springbett, P., Buglass, S., Young, A.R., 2010. Photoprotection and vitamin D status. *J. Photochem. Photobiol. B* 101 (2), 160–168.
- Suzanne, J., Vin, T., 2009. Vitamin D deficiency and risk for cardiovascular disease. *Am. J. Med. Sci.* 338 (1), 40–44.
- Zahid, M., Qaiser, M., Khizar, T.A., 2010. Vitamin D deficiency-an emerging public health problem in Pakistan. *JUMDC* 1 (1), 4–9.