

Public Awareness of Vitamin " D " Deficiency among Children in Najran City and The Role of Primary Health Care Centers in Raising Their Awareness

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ABSTRACT

Background: Vitamin D is one of fat-soluble vitamins. It has of great importance in increasing intestinal absorption of calcium, magnesium, phosphate, and zinc. Sun is the main source for this vitamin and there are few foods that contain it, for example milk and egg. From a long standing, vitamin D deficiency has been a health problem in the world. Vitamin D has great importance in the growth of bone, so the deficiency of it or imbalance of its metabolism inside the body leads to major problems, most notably of them is rickets among children. **Objectives:** This is a cross-sectional study, aiming to study the awareness of public regarding vitamin D deficiency among children and to reveal the role of primary health care in raising people's awareness of vitamin D deficiency.

Materials and methods: Electronic questionnaires are used to collect data. They contain personal socio-demographic characteristics, information about vitamin D deficiency and the role of primary health care in raising people's awareness of vitamin D deficiency. The study recruits 500 participants; medical field workers were not included in the study. Data were analyzed using SSPS version 22.

Results: It was observed that 89% of the total sample size has knowledge on vitamin D where 94.3% of mothers heard about vitamin D, 68% knew that vitamin D is important, and 72.11% believed that vitamin D is manufactured in the body. More than two thirds (69.83%) said that the ultraviolet sun-rays is the main source of vitamin D and 68.88% of parents declared that they had attend a lecture given by a physician in in the primary health care center on the importance of vitamin D where, fathers (40.2%) were more than mothers (26.6%) in getting their information.

Conclusion: More research is needed to assess the level of community awareness as it is the best solution to reduce or eliminate the problem. Health education campaigns about vitamin D and its importance with more intensification in Men places as they had a low awareness. Training of primary health care physicians and their supervision for raising awareness of their community.

Keywords: Vitamin D, Deficiency, Awareness, Rickets.

INTRODUCTION

Definition

Vitamin D is one of fat-soluble vitamins. It has of great importance in increasing intestinal absorption of calcium, magnesium, phosphate, and zinc. Sun is the main source for this vitamin and there are few foods that contain it, for example milk and egg¹. The normal range of vitamin D is defined as a 25(OH)D. Concentration greater than 30 ng/mL (75 nmol/L), insufficiency range from 20 to 30 ng/mL (50 to 75 nmol/L) and deficiency is less than 20 ng/mL (50 nmol/L).²

Background information (global and local)

A) Global:

From a long standing, Vitamin D deficiency has been a health problem in the world. The first one who described the condition of vitamin D deficiency is Glisson and his colleagues during

the mid-17th century in London, England³. The problem of the situation described was skeletal deformities. Vitamin D has great importance in the growth of bone, so the deficiency of it or imbalance of its metabolism inside the body leads to major problems, most notably of them is rickets among children⁴.

B) Locally

Researches in Saudi Arabia have studied Osteomalacia and Rickets in different ages and both sexes^{5, 6}. Significantly more women than men suffered from vitamin D deficiency this was explained by the fact that men are more exposed to sunlight than women. Although Jeddah city is sunny most of the year, the rate of vitamin D deficiency is increasing³. So, we want to study the situation in Najran, which is also sunny most of the year. Studies^{5, 6} which evaluate awareness

of vitamin D deficiency among children are few in Saudi Arabia, and almost nonexistent in Najran. So, it is important to study the awareness of vitamin D deficiency among children in Najran region and reveal the role of Primary Health Care (PHC) in raising people's awareness of vitamin D deficiency. Risk factors which can lead to Vitamin D deficiency, which are darker skin, older age, less milk drinking, less sun exposure, sunscreen use and no vitamin D supplement use^{7, 8}.

Objectives:

- To compare the awareness between mothers and fathers regarding the importance of vitamin D.
- To assess the knowledge of families about sources of vitamin D.
- To reveal the practice of parents regarding vitamin D.
- To reveal the role of PHC in raising the awareness about vitamin D deficiency.
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PATIENTS AND METHODS

A cross-sectional study design is selected. An electronic questionnaire using WhatsApp and

twitter to collect the data from peoples in Najran city. The questionnaire included socio-demographic characteristic as education level, house type and monthly income. Sun Exposure/skin colour. Vitamin D sources. Role of PHC regarding awareness.

Sampling: Eight Hundreds and three questionnaires were distributed of them 527 were retrieved.

Data analysis: Data were analyzed using Statistical Package for the Social Sciences (SPSS) for data analysis (SPSS v.22.).

The study was done after approval of ethical board of Najran university.

RESULT

The study population includes people from Najran city where 803 questionnaires were distributed by WhatsApp and twitter, 527 questionnaires were retrieved (response rate of 65.6%). 174 (33%) of the total sample were males and 353 (67%) were females.

Table (1) and figure (1): showing the Socio-demographic characteristics of the participants

Table (1): Socio-demographic characteristics of the participants

Socio-demographic characteristics		Men		Women		Total		P-value
		No.	%	No	%	No.	%	
Educational level	Read and write	24	13.8	9	2.5	33	6.3	0.001**
	Primary	25	14.4	18	5.1	43	8.2	
	Preparatory	49	28.2	80	22.7	129	24.5	
	Secondary	54	31.0	210	59.5	264	50.1	
	Academic	22	12.6	36	10.2	58	11.0	
House type	Popular home	39	22.4	31	8.8	70	13.3	0.001**
	Apartment	73	42.0	169	47.9	242	45.9	
	villa	62	35.6	153	43.3	215	40.8	
Monthly income	Less than 3000	43	24.7	44	12.5	87	16.5	0.002**
	-3000	19	10.9	64	18.1	83	15.7	
	5000 - 10000	54	31.0	128	36.3	182	34.5	
	More than 10000	58	33.3	117	33.1	175	33.2	
Total		174	100.0	353	100.0	527	100.0	

Chi-square test: **Significant at 0.01

Education level

It is clear that two thirds (67%) of the respondents were women and one third (33%) were men and their distribution according to their educational level, 50.1% of them academic, 24.5% secondary, 11.1% preparatory, 8.2% primary and 6.3% read and write.

Men were more educated than women where 13.8% could read and write, 14.4% hold a primary education certificate, and 28.2% completed their preparatory education level compared to 2.5, 5.1 and 22.7 respectively.

On the other hand, more women than men (59.5% compared to 31%) holding a secondary education certificate. Regarding collectors 12.26% were men versus 10.2% were women, the differences are statistically significant ($p=0.001$).

Housing

Saudi people are now more civilized where 45.9% were living in apartments and 40.8% were living in villas the least (13.3%) were living in popular homes. Significantly ($p 0.001$) more women lived in apartment or villa than men who lived in popular homes (47.9%, 43.3% and 8.8% compared to 42%, 35.6% and 22.4%). The differences are statistically significant where ($P = 0.001$).

Monthly income

The monthly income of men who got less than 3000 SR/month was nearly double that of women (24.7% compared to 12.5%), a little more women than men got from 3000 to less than 5000 and from 5000 to less than 10000 SR (18.1% and 36.3% compared to 10.9% and 31% respectively). Those who got more than 10000 SR/month were nearly equal (33.3 % men and 33.1% women). The differences are statistically significant ($P = 0.002$).

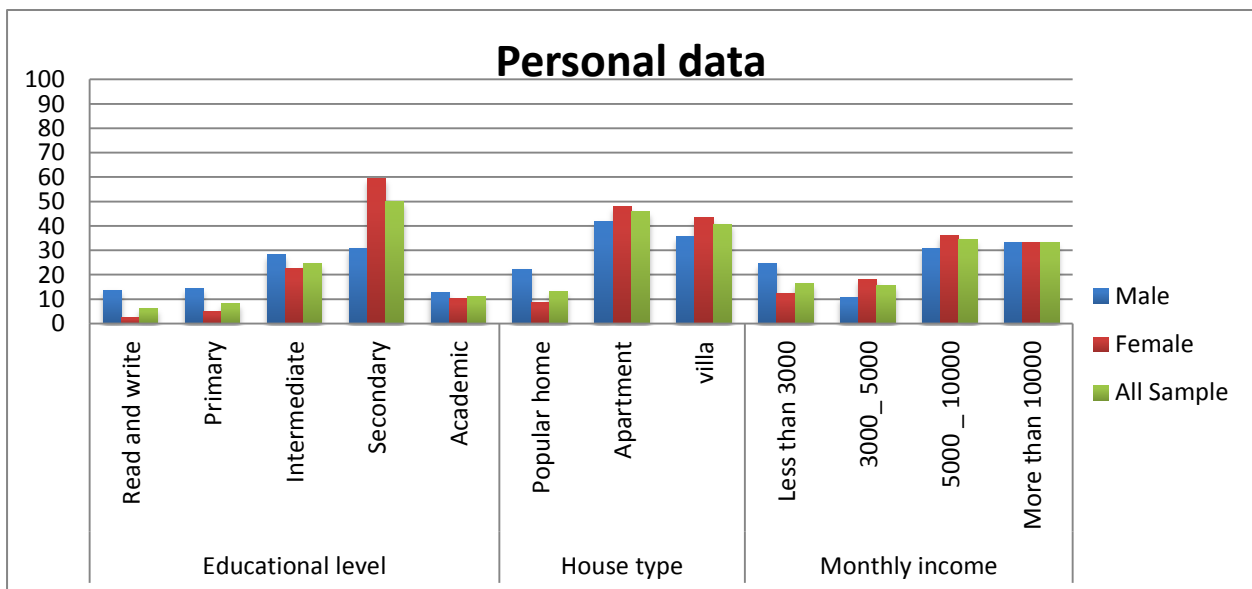


Figure (1): Socio-demographic characteristics of the participants.

Knowledge and opinion on vitamin D

Table (2) shows the knowledge and opinion on vitamin D where it was observed that 89% of the total sample size had knowledge on vitamin D, where 94.3% of mothers had knowledge about vitamin D compared to 79.3% of fathers. The difference is statistically significant ($P= 0.001$). As regards the importance of vitamin D; 68% knew that vitamin D is important however, there is no significant difference between men and women in this regard ($P= 0.525$).

The most important symptom of vitamin D deficiency from the participants' point of view (figure 2) is bone aches (24%) tooth decay (18%) bone fracture (16%) followed by delayed walking

(14%) the least were bow legs (11%), depression (10%), and obesity (6%). Only 1% did not know.

According to their opinion of manufacturing of vitamin D in the body; 72.11% believed that vitamin D is manufactured in the body. Although there were more women (74.8%) than men (66.7%) believed that, yet the gender difference is significantly weak (0.050). However less than half (41.75%) of the studied people believed that vitamin D is obtained from external source only. More women (43.9%) compared to 37.4% of men believed that, yet the difference is not statistically significant (0.151).

More than two thirds (69.83%) said that the ultraviolet rays of sun is the main source of vitamin D, the healthy diet is second in

rank(13.28%) and the dietary supplement ranked third (6.26%) while 10.63% did not know. More women than men (73.9% compared to 61.5%) said that the main source is the ultra violet rays of the sun; on the contrary, more men than women either said that it is dietary supplement or they did not know (7.5% and 17.8% compared to 5.7% and 7.1% respectively). Those who referred to healthy food were nearly equal 13.2% for men and 13.3% for women. The differences are highly significant (P=0.001). More than three quarters (78.37%) of the people believe that vitamin D is important for bones and

teeth. Significantly (P= 0.001) more women than men believed that rays (83.3% compared to 68.4%).

Regarding the colour of skin of the child, 47.06% believed that the colour of the child's skin can affect the manufacture of vitamin D, however there is no significant gender difference (P=0.275) Figure (3) shows that internet (29%) followed by social media (24%) and TV (14%) were the main source of information while public awareness campaigns, education subjects and health personnel came next (12%, 11%, 10% respectively).

Table (2): Distribution of participants' according to their knowledge and opinion of vitamin D.

Knowledge and opinion on vitamin D		Men		Women		Total		P-value
		No.	%	No.	%	No.	%	
Have knowledge on vitamin D	No	36	20.7	20	5.7	56	10.6	0.001**
	Yes	138	79.3	333	94.3	471	89.4	
Know the importance of vitamin D for the growth of the child	No	59	33.9	110	31.2	169	32.1	0.525
	Yes	115	66.1	243	68.8	358	67.9	
Think that vitamin D is made inside the body	No	58	33.3	89	25.2	147	27.9	0.051
	Yes	116	66.7	264	74.8	380	72.1	
Think that vitamin D is obtained from an external source only (food or medicine)?	No	109	62.6	198	56.1	307	58.3	0.151
	Yes	65	37.4	155	43.9	220	41.8	
The main source of vitamin D	Sunlight	107	61.5	261	73.9	368	69.8	0.001**
	Healthy food	23	13.2	47	13.3	70	13.3	
	Dietary supplements	13	7.5	20	5.7	33	6.3	
	I don't know	31	17.8	25	7.1	56	10.6	
Vitamin D is important for bones / teeth	No	55	31.6	59	16.7	114	21.6	0.001**
	Yes	119	68.4	294	83.3	413	78.4	
Think that the color of the baby's skin affects the manufacture of vitamin D	No	98	56.3	181	51.3	279	52.9	0.275
	Yes	76	43.7	172	48.7	248	47.1	
	Yes	95	54.6	216	61.2	311	59.0	

Chi-square test: **Significant at 0.0

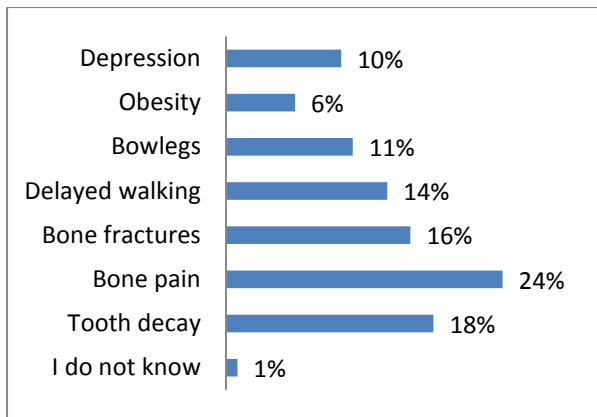


Figure 2: Distribution of parents according to symptom of vitamin D deficiency

Exposure of the child to ultra violet rays:

Table (3) portrays the opinion and practice of exposure of the child to ultraviolet rays. More than half (53.32%) of the studied parents believed that the child should be exposed to the sun light without significant difference between both groups ($P=0.148$) (table 3). However, mothers did not expose their children to ultra violet rays because; they preferred to stay in their homes (24%), did not have enough information about that (22%) or did not want to go in hot weather (22%) as well as fearing from skin cancer or sun burn (21%). Other causes included fearing from fever, and some of them said that supplements are more useful than sun exposure where they constituted 12% (Figure 4).

About one third of parents (33.40%) believed that the duration of exposure to ultraviolet rays enough to get vitamin D is 10 minutes and 32.64% said it is 15 minutes (17.84%) believed that it is 30 minutes and few (4.74%) said it is more than 30 minutes, while those who did not know were 11.37%. More mothers than fathers said that the suitable duration is either 10 or 15 minutes (34% and 36.3% compared to 32.2% and 25.3%). On the other hand, more fathers than mothers said that it is either 30 minutes or more (18.4% and 5.2% compared to 17.6% and 4.5%). Also, those who did not know were more among fathers (19% compared to 6.7%). These differences are highly significant. $P=0.001$.

The best time of exposure to ultraviolet was said by more than half (54.65%) the parents to be from 7 - 9 am and from 10 am - 3 pm by 16.51%; those who replied that it is from 3-5 pm were 15.94%. Those who did not know were 12.90%. Gender differences is seen ($P=0.014$) in this respect where 57.2% of women stated that the best time is from 7-9 am and 17.6% said that it is from 3-6 pm

compared to 49.4% and 12.6% among men. The men who said that it is from 10am to 3 pm were 19.5% or they did not know were 18.4% compared to 15% and 10.2% respectively.

It was observed that 12.7% of both women and men stated that arms and face should be exposed to sun to get the benefit of vitamin D. Few (5.7%) said that the hands, arms, and face that should be exposed. Also, fewer (5.4%) said that hands, arms, face, and legs should be exposed. More men than women declared that hands and face or hands, arms, and face (22.4% and 6.3% compared to 7.9% and 5.4% respectively). Although very few more women than men (6.5% compared to 2.9%) said that it is hands, arms, face, and legs that should be exposed. About one quarter (26%) did not know of them 27.6% were men and 25.2% were women. The differences are statistically significant ($P=0.001$).

Most (71.92%) parents agreed that breast feeding is the best method for the child to get vitamin D. Significantly (0.022) more mothers (75.1%) than fathers (65.5%) said that. Figure (3 5) reveals that the best sources of vitamin D according to parents is milk and eggs (28%) for each, Cheese 24% followed by Honey, olives, and meat (8%, 7%, and 6% respectively).

A little more than one fifth (22.20%) of parents supplemented their children with vitamin D, 79.6% were mothers and 74.1% were fathers. No significant difference was observed ($P=0.156$).

More than two thirds (68.88%) of parents declared that they had attend a lecture given by a physician on the importance of vitamin D where, more fathers (40.2%) than mothers (26.6%) had got their information. The difference is statistically significant. ($P=0.002$).

If a health education seminar on symptoms of vitamin D deficiency was organized by the primary health care unit/ center people were asked if they would attend; only 14.23% of them agree. Significantly ($P=0.001$) more fathers (21.3%) than mothers (10.8%) were ready to attend (table 3). According to their opinion, the best method to raise public awareness is social media (23%), internet (20%), campaigns and television (18% and 17% respectively), lastly education subjects and health personnel (14% and 8% respectively) (table 3). According to their opinion, the best method to raise public awareness is social media (23%), internet (20%), campaigns and television (18% and 17% respectively), lastly education subjects and health personnel (14% and 8% respectively) (Figure 5 6).

Table (3): Distribution of participants according to their practice and opinion of vitamin D.

Exposure to ultraviolet rays of sunlight		Men		Women		Total		P-value
		No.	%	No.	%	No.	%	
Exposure of the child to sunlight	No	79	45.4	137	38.8	216	41.0	0.148
	Yes	95	54.6	216	61.2	311	59.0	
Duration of exposure to get vitamin D when exposed to sunlight	11 10 Miminutes or less	56	32.2	120	34.0	176	33.4	0.001**
	15 minutes	44	25.3	128	36.3	172	32.6	
	30 minutes	32	18.4	62	17.6	94	17.8	
	more than 30 minutes	9	5.2	16	4.5	25	4.74%	
	do not know	33	19.0	27	7.6	60	11.4	
The best time to sun exposure	7-9 am	86	49.4	202	57.2	288	54.7	0.014*
	10-3pm	34	19.5	53	15.0	87	16.5	
	3-5pm	22	12.6	62	17.6	84	15.9	
	don't know	32	18.4	36	10.2	68	12.9	
Parts of the body that should be exposed to sunlight to get maximum benefit	Hands and face	39	22.4	28	7.9	67	12.7	0.001**
	Hands, arms, and face	11	6.3	19	5.4	30	5.7	
	Hands, arms face, and legs	5	2.9	23	6.5	28	5.3	
	do not know	48	27.6	89	25.2	137	26.0	
The method of feeding which is the most appropriate source of vitamin D	Breast feeding	114	65.5	265	75.1	379	71.9	0.022*
	Artificial feeding	60	34.5	88	24.9	148	28.1	
The child had ever taken vitamin D	No	129	74.1	281	79.6	410	77.8	0.156
	Yes	45	25.9	72	20.4	117	22.2	
Receiving advised of the importance of vitamin D by the in the primary health care physician	No	104	59.8	259	73.4	363	68.9	0.002**
	Yes	70	40.2	94	26.6	164	31.1	
Ready to attend a health education seminar about symptoms of vitamin D deficiency organized by primary health care unit/center	No	137	78.7	315	89.2	452	85.8	0.001**
	Yes	37	21.3	38	10.8	75	14.2	

Public Awareness of Vitamin " D " Deficiency...

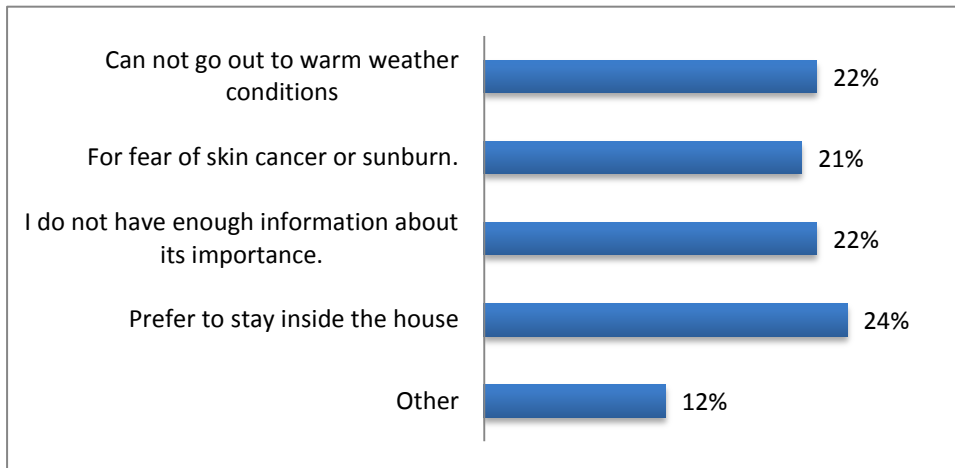


Figure 4: Distribution of mothers according to causes of none exposure of the child to ultraviolet of sunlight

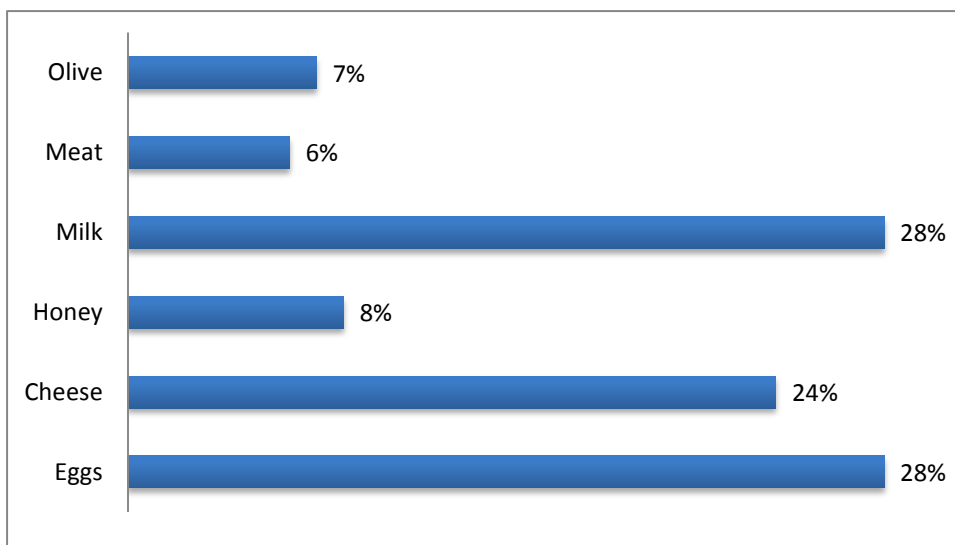


Figure (5): Shows the most important sources of vitamin D from the point of view of the participants

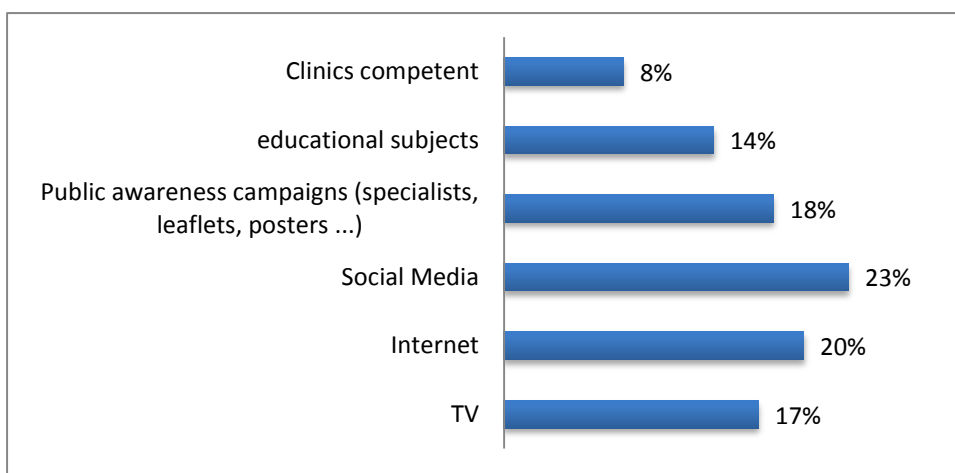


Figure (6): Distribution of the participants according to the best method of raising awareness about the importance of vitamin D for children's health

DISCUSSION

This study aimed to assess the awareness of public regarding vitamin D deficiency among children and to reveal the role of primary health care centers in raising people's awareness of vitamin D deficiency. We found that more than half of parents were aware about importance of vitamin D on child growth especially the females. We also found that the role of primary health care centers was weak where, 85.8% had not received health education regarding the importance of vitamin D.

Knowledge on vitamin D

In the present study, we found that mothers had knowledge on vitamin D more than fathers, in contrast with another study conducted in a Saudi school where male students were found to be more familiar with vitamin D; they found no difference between mothers and fathers in their knowledge regarding the importance of vitamin D⁹. In another research in China Hong Kong where there is a contradiction between knowledge and practices practiced by people to obtain vitamin D¹⁰.

Source of information and role of PHC

Principally, primary health care centers and providers are the first basic contact between the families and health system. Hence, the basic knowledge about healthy life and diet including primary sources of vitamin D and its importance are obtained from primary care centers. In the present study, the majority of participants had not received any information about vitamin D from primary care centers and they got their information from other sources like internet and social media. A recent study in Saudi Arabia demonstrated that parents and media are the main sources of vitamin D information for majority of students¹¹.

There are studies demonstrating that health care professionals from different countries have poor to weak nutritional knowledge^{12, 13}. A study conducted in Saudi Arabia showed that 75% of the physicians described that their knowledge about nutrition is poor and the rest of the physicians had moderate knowledge¹⁴. Another study recommended that nutrition needs to be included for medical curricula as an essential part¹³. Other studies^{14, 15, 16} indicated that awareness of vitamin D has low rates. A qualitative study conducted in Saudi Arabia found that awareness of vitamin D, its sources and functions is minimal¹⁵.

Sunlight exposure

Non-exposure to sunlight is one of the main causes of vitamin D deficiency^{17, 18}. More than half

of the studied parents believed that the child should be exposed to the sun light, In another study the Sun exposure to boys was much higher than for girls, but they did not study their awareness of that.⁷ Mothers did not expose their children to the sunlight because they preferred to stay in their homes, did not have enough information about the importance of exposing the child to sun light or did not want to go in hot weather as well as fearing from fever, skin cancer or sun burn . Some of them see that supplements are more useful than sun exposure. This was expected because in most part of the Middle East, including Saudi Arabia, the lifestyle and culture plays an important role in the exposure to the sun, making it insufficient for the needs of child or adult¹⁹. About one third of parents believed that the duration of exposure to ultraviolet rays enough to get vitamin D from ultra violet rays is 10 minutes. More mothers than fathers said that the suitable duration is either 10 or 15 minutes.

On the other hand, more fathers than mothers said that it is either 30 minutes or more. The best time of exposure to ultraviolet was said by more than half of the parents to be from 7 - 9 am and from 10 am to 3 pm. There was a great difference in knowledge about the parts of the body that should be exposed to the sun. The largest proportion said that it is the hands and face. In Saudi Arabia there is low awareness of the right time of exposure to the sun and which parts that should be exposed. This is supported by a study conducted on a group of students and found that most students believe that exposing the face and hands for 10 minutes a few times a week will be enough to get vitamin D²⁰.

Colour of skin

The darker the skin, the less vitamin D is produced by sunlight. In one study, an experiment was carried out by exposing a group of Negroes who has a dark skin and a group of Caucasians who has a light skin colour to the sunlight for same duration of time, they found that the Caucasians had more vitamin D synthesis²¹. In the present study, we found that 47.06% of participants were aware about the extent to which vitamin D is affected by the color of the skin.

Relationship between vitamin D and breastfeeding

Breastfeeding represents a critical period regarding vitamin D status in the lifecycle of a woman. **Fuleihan²² and Dawodu and Wagner²³** considered a strong link between maternal vitamin D levels and breastfeeding. In our study most of our participants agreed that breast feeding is the best

method for the child to get vitamin D with no gender difference. Female Saudi students in the study of Christie, Floor, and Linda Mason¹⁵ stated that there is a benefit of vitamin D and agreed that there are risks of vitamin D deficiency. A German–study²⁴ indicated that maternal vitamin D status affect not only mother's own health but also that of her breastfed infant. However, further recommendations to increase public awareness regarding that is required.

Food sources of Vitamin D:

As calcium and vitamin D are primarily important for bone growth and development, there are few dietary sources of vitamin D available to meet the daily recommended requirements²⁵ being fish oils, egg yolk, and certain types of fish and sea food²⁶. However, parents in the present study revealed that the best sources of vitamin D is milk, eggs, cheese followed by honey, olives, and meat. Our finding is supported by another study²⁷ where milk is a primary source of calcium and vitamin D. In contrast, there was lack of basic knowledge about sources of vitamin D among participants in the study carried out by **Al-Saleh *et al.***¹¹. However, currently bread flour and milk are fortified with vitamin D in Saudi Arabia.⁴ Rice which is the main meal for Saudis as a staple food in Saudi Arabia may need to be fortified in addition yet, it needs more research.

Vitamin D deficiency symptoms:

Manifestation of vitamin D deficiency in children is nutritional rickets, which results from inadequate mineralization of growing bone. Its symptoms include bone pain in the legs, delayed age of standing or walking, frequent falling, bone deformity and delayed growth²⁸. This finding is more or less goes in hand with the participant point view in the present study where they choose bone aches as the most important symptom of vitamin D deficiency, bone fracture, delayed walking and the least were bow legs, depression and obesity.

RECOMMENDATIONS

- 1- More research is needed to assess the level of community awareness as it is the best solution to reduce or eliminate the problem.
- 2- Health education campaigns about vitamin D and its importance with more intensification in Men places as they had a low awareness.
- 3- Training of primary health care physicians and their supervision for raising awareness of their community.

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