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Study of Community Awareness Regarding the Effects of Vitamin D Deficiency on Pregnant Women and their Fetus, in Eastern Province, Saudi Arabia in 2023

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Abstract:
The vitamin D deficiency has an adverse impact in both maternal and fetal health. This research aims to study the community awareness regarding the effects of vitamin D deficiency in pregnant women and their fetus. It is a descriptive-cross sectional community- based design which was conducted in Eastern Province, Saudi Arabia,2023.Consecutivenone-probability sampling technique was used and 500 participants were enrolled. The study revealed that vast majority of the participants are female 93.4% in the age group of 18-30 years and 61.4% have a bachelor degree while small minority 6.6% are male with in the same age group. The community awareness about the relationship between vitamin D deficiency and low birth weight, gestational diabetes and preeclampsia is 46.4%, 23.2% and 27% respectively. The current study recommends increasing the community awareness regarding the effects of vitamin D deficiency on pregnant women and the fetus through deferent strategies that can meet the community needs considering the variation in their level of awareness.

Key words: *vitamin D deficiency, Community awareness, pregnant women and the fetus.*

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I. Introduction:

Vitamin D is defined as a group of fat-solubleseco-sterols which is responsible for absorption of calcium, magnesium, and phosphate.So, it is considered as an important element to maintain all body health. The deficiency of vitamin D affectsthe humans' body especially skeletal system, which is commonly cause bone disease, and associated with non-skeletal system disease such as cardiovascular and immune disease. Pregnant women are highly susceptible to vitamin D deficiency due topregnancy process, limited sources of vitamin D, and lack of exposure to the sunlight that can affect the mother and the child health. Prevalence of vitamin D deficiency in Saudi pregnant women is high and this is related to increased risk factors for pregnant women. .[1] Vitamin D has fundamental role in many organ systems, it's binding in regulation of calcium and phosphorus metabolism. [1,2] The pregnant women are special group because they are more susceptible to developing vitamin D deficiency specially during the 3rd trimester because of increased calcium demands needed to fetal development and therefore there's increase in nutrition's demands of the vitamin D to meet their own nutritional needs and the needs of fetus development. [2,3]

Although the primary etiology of vitamin D deficiency during pregnancy is limited sun exposure and lack of vitamin D intake, the vitamin deficiency considered a multi-factorial [4] which can be counted in numerous points:

1- Insufficient sun exposure during pregnancy can be related to hot climates, cultural practices and limited outdoor activities. [5]

2- Ethnicity, dark skin color because the increase in melanin skin pigmentation reduces the body ability to the synthesized vitamin D from the exposure to sunlight. [4,5]

3- Obesity and reduced consumption of the vitamin D and calcium. [4,5]

4- Inadequate oral consumption of vitamin D supplements during pregnancy which has a significant importance to meet increased demand of pregnancy. [4,5]

5- Socioeconomic status, repeated pregnancy and malabsorption syndrome, factors associated with vitamin D deficiency, and prevalence in pregnant Arab women. [5]

Vitamin D deficiency maternal complications are:

1. Elevated risks of gestational diabetes, pre-eclampsia.[6] According to previous studies vitamin D considered as independent risk factors for preeclampsia, the precedent known conditions of vitamin D deficiency can doubled the risk of developing preeclampsia during pregnancy if not treated. [4,7]
2. Postpartum depression. Women who have the lowest quartile of the vitamin D3 status are more likelyto develop and report postpartum depression more than women who are at acceptable levels of the vitamin D3.[9]
3. Premature rupture of membrane. [8] It is known as a main cause of preterm birth , the incidence of Premature rupture of membrane was higher in women with deficiency of the vitamin D3 (D3< 20 ng/mL) more than women with level of the vitamin D3 (D3 ≥ 20 ng/mL), so the levels of the vitamin D have a significant Association with Preterm premature rupture of membranes.[10]Fetusis totally dependent on maternal status , the neonatal vitamin D deficiency is always caused by maternal hypovitaminosis and the fetus which have deficiency of the vitamin D during intrauterine life are at a high risk to developing Hypocalcemia after birth which can affect both the nervous and musculoskeletal system resulting in development (seizures, Myopathy, Rickets).as consequence , low maternal serum levels of the vitamin D3 is directly associated with the morphology of the developing fetal femur. And the Changes in the distal femoral metaphysis are already apparent at the 2nd trimester of pregnancy. **It has many complications of the fetus like**:

1. Preterm birth which is a major cause of death among the neonates, the vitamin D is known as regulator of body inflammatory factor levels such as prostaglandin which plays a major role of elevation of uteruscontractions, thus causing preterm labor birth.[11]
2. Low birth weight, vitamin D is crucial element during the 3rd trimester to meet the fetus developmental needs, therefore the women who had vitamin D3level in the lowest quartile have an increased risk to give birth of the neonate with small size for gestational age at birth.[12]
3. Vitamin D has a main effect on development of fetal bones in which the deficiency of this vitamin can adversely affect the anthropometric measurements, the lowest levels of the maternal vitamin D3 concentration during the 3rd trimester has a direct proportional to fetus development, which can cause significant growth restriction leading to a smaller head circumference, shorter body length, and low body birth. Weight. [2,8,12] **Vitamin D deficiency can be manifested** by bone impairment, bone pain, and joints pain. Vitamin D also plays a major role in the mood of the pregnant, Fluctuation in the mood which may result in depression. gradually decreasing of the immune function so the pregnant women will get sick or infected often. In addition to fatigue, changes in sleep and hair loss. [13,14,15,16,17,18,19,20]**Factors affecting vitamin D levels in pregnant womenare:** skin pigmentation, season change, diet, exposure to sun, cultural behavior, latitude locations.[21]Vitamin D deficiency can be compensated through the richest food sources of vitamin D include (cod liver oil and fatty fish such as salmon, tuna or mackerel) and other sources from dairy products (milk, eggs). Mushrooms contain variable amounts of the vitamin D depending on exposure to sunlight to grow.[22] It is assumed at least 20 percent of the body's surface must be exposed to UVB for serum 25OHD levels to increase.[26]The normal value of vitamin d in pregnant women is ≥ 75 nmol/L, while (50 - 75 mol/L) is considered sufficient (25 - 50 nmol/L) is mild deficiency and (< 25 mol/L) is severe deficiency and need immediate care. Vitamin D and calcium Supplementations can be granted through routine vitamin Supplements for women with vitamin D level = 50 and more is 400 IU/day. Recommend doses of the pregnant women with mild deficiency of vitamin D levels is 1000 IU/day, and women with severe deficiency need 2000IU/Day plus calciumsupplements. The recommended calcium daily intake depends on the age, women with age group (14-18) years need 1300 mg/day, while the group (19-50) years need 1,000 mg/day. [23,24] Dietary sources of both calcium and vitamin D must be considered. Good sources of vitamin d include oily fish such as salmon, sardines and tuna, mushrooms, red meat, egg yolks, and fortified foods. The best sources of calcium are dairy products, soybeans, green leafy and calcium-fortified foods.[25]and sun exposure.**Nurses have a great role toward pregnant women with vitamin D deficiency** which includes educating the woman does not exceed the prescribed dose of the supplement, dietary sources of vitamin D, be cautioned against excess or unprotected sun exposure as a source of vitamin D due to the increased risk for skin cancer,Vitamin D toxicity signs and symptoms and keeping follow-up.[26]

Hypothesis:

H1: The Community is aware regarding the effects of vitamin D deficiency on pregnant women and fetus

H2: The Community is unaware regarding the effects of vitamin D deficiency on pregnant women and fetus.

Objectives:

General objective:

To Study the Community awareness regarding the effects of vitamin D deficiency in pregnant women and their fetus.

Specific objectives:

- To estimate the community awareness regarding the effects of vitamin D deficiency among pregnant women and their fetus.

- To correlate community awareness regarding the vitamin D deficiency with demographic data.

Materials and Methods:

Study design:

Descriptive-cross sectional Community- based design was used in this study.

Study area-setting:

The study was conducted in Eastern Province, Saudi Arabia,2023. **Sample size and Sampling technique:**

Consecutivenone-probability sampling technique is the suitable type for this study.

The sample was drawn from the population by the equation:

$n=z^2 pq / e^2$

Where:

n=sample size

z=1.96

p=Community awareness regarding the effects of vitamin D deficiency on pregnant women and their fetus=0.5

q=1-p=0.5

500 participants from the eastern province Community were enrolled in the curent study.

Data collection technique :

In this study the data collection technique was a web-based questionnaire which was distributed among the sample of the study online by using Google Drive Forms.

Data collection tools:

The tool of data collection was a structured questionnaire which was developed by the researchers. It is composed of two constructs the first one involved the demographic data and the second construct included the awareness of the community regarding the effects of vitamin D-deficiency on the pregnant women and fetus.

Validity:

Face validity was done by an expertise in nursing and the content validity was done by giving the tool to two expertise in maternity nursing and pediatric nursing all of the expertise reported that the tool is valid(0.8)

Main variables and measures:

Demographic: Age, level of education, marital status, living conditions,

Gender which are demographic and the community awareness regarding the effects of vitamin D deficiency on the pregnant women and the fetus

Data management and processing:

Data was collected, cleaned, coded, analysed, presented and by computer SPSS ver-26.0 andexcel, the significance was tested one way Anova ^{and} the P-value which is calculated `by the F in one way ANOVAwas accepted when it is less 0,05.

Ethical Consideration:

A written agreement was taken from the participants after full explanation of the study purpose and the data will be used for the research purpose with high level of confidentiality prior to starting data collection.

II. Results:

Table 1: Demographic data of the study participants(n=500)

Variables	**Number of Participants**
18-30 years	335(67%)
Female	310 (62%)
Male	25
31-50 years	128(25.6%)
Female	121
Male	7
More than 50 years	37(4.7%)
Female	36
Male	1
Grand Total	**500**
Level of Education	
Primary	5
Intermediate	29
High school	89
Diploma	61
Bachelor's	307 (61.4%)
Postgraduate (Master-Doctorate)	9
Grand Total	**500**
Marital status and the living condition	
Married	**237**
Alone	16

With The Family	221
Single	**263**
Alone	8
With The Family	252
With The Relatives	3
Grand Total	**500**

Items	Number of participants	Percentage %
Effects of vitamin D deficiency on the pregnant woman and her fetus		
I Don't Know	56	
No	9	
Yes	435	
Grand Total	**500**	**100%**
Vitamin D deficiency complications on the fetal health (Low-birth weight).		
I Don't Know	206	
No	62	
Yes	232	**46.4%**
Grand Total	**500**	**100%**
Vitamin D deficiency complications on the pregnant health (gestational diabetes)		
I Don't Know	279	
No	105	
Yes	116	**23.2%**
Grand Total	**500**	**100%**
Vitamin D deficiency complications on the pregnant health (Pre-eclampsia)		
I Don't Know	286	**57.2%**
No	79	
Yes	135	**27%**
Grand Total	**500**	**100%**
Importance of following the level vitamin D during the months of pregnancy for a pregnant woman		
I Don't Know	71	
Not important	14	
Very important	415	
Grand Total	**500**	**100%**
Recommended months during which a pregnant woman take a vitamin D supplement		
I Don't Know	183	
The first months	224	
The last months	93	
Grand Total	**500**	**100%**
The recommended period of sun exposure per day for pregnant women.		
(10-15 minutes)	272	
(20-30 minutes)	192	
One hour	28	
Two hours	8	
Grand Total	**500**	**100%**
The association of use the sunscreen and increased levels of melanin in the skin (dark skin color) with difficulty of benefiting from sunlight.		
I Don't Know	130	
No	197	
Yes	173	
Grand Total	**500**	**100%**
The symptoms of vitamin D deficiency		
Intermediate	329	
Strong	87	
Weak	84	
Grand Total	**500**	**100%**
Common symptoms of vitamin D deficiency associated with pregnancy.		
Fatigue, lower back pain, mood swings	427	
Fever, stomach ache, headache	46	
Vomiting, high blood pressure, skin allergy	27	
Grand Total	**500**	**100%**
Complications severity of vitamin D deficiency for pregnant women and their fetus.		
Less severity	47	
Moderate severity	270	
Very sever	183	
Grand Total	**500**	**100%**
The necessity of vitamin D supplementation during the pregnancy.		
I Don't Know	84	
No	22	
Yes	394	
Grand Total	**500**	**100%**
Food sources that contain the vitamin D.		

I Don't Know	81	
fatty fish and egg yolks	285	
Legumes and cereals	48	
Vegetables and fruits	86	
Grand Total	**500**	**100%**

Table 2: The community awareness regarding the effects of vitamin D deficiency on the pregnant women and the fetus(n-500)

Table 3: Age, Gender and education relation with increasing bone and dental health problems during pregnancy (n=500)

Item		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	7.099	2	3.549	.000	.000
	Within Groups	7.099	497	.377		
	Total	194.392	499			
Gender	Between Groups	.402	2	.201	.038	.038
	Within Groups	30.420	497	.061		
	Total	30.822	499			
Education	Between Groups	1.448	2	.724	.513	.513
	Within Groups	538.414	497	1.083		
	Total	539.862	499			

Table 4: Age, Gender and education relation with premature labor (n=500)

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	.133	2	066	.170	.488
	Within Groups	194.259	497	.391		
	Total	154.392	499			
Gender	Between Groups	.135	2	.068	1.097	.335
	Within Groups	30.687	497	.062		
	Total	30.822	499			
Education	Between Groups	20.309	2	10.154	9.714	.000
	Within Groups	519.553	497	1.045		
	Total	539.862	499			

III. Discussion:

The current study was conducted in Eastern province Saudi Arabia among 500 participants, the results revealed that 335(67%) aged 18-30years,128(25.6%) in the group of 31-50 years old and 37(4.7%) are more than 50 years old. The vast majority are females 467(93.4%) while 33(6.6%) of the participants is male gender. Regarding the level of education of the participants 307 (61.4%) have bachelor, 89(17.8%) high school, 61(12.2%) and 9 (1.8%) have diploma and qualification respectively Postgraduate. Vitamin D is very important for pregnant women and the fetus for the bones and dental health and the deficiency of it can be associated with low birth weight the participants are found to be aware about these effects, given the importance of vitamin D in the development of the nervous and musculoskeletal system of the fetus in these months, the study results agree with [12] who report a deficiency of vitamin D may lead to many disorders of the fetus small head circumference and lower body weight at birth. The best time for exposure to the sunlight ranges from 10 to 30 minutes,272 (54.4%) of the study participants are aware about this fact which is similar to [27] findings. Similar to [28] findings, our study shows that the participants are aware about transmission of the deficiency from the pregnant woman to her fetus. Only 116 (23.2%) of study participants are aware about the relationship between vitamin D deficiency and gestational diabetes which is proved by[29].

Table3 shows the association between age, gender and level of education and increasing bone and dental health problems during pregnancy, it is found that age is 000 level of significance while gender and level of education have levels of significance .038 and .513 respectively which means that age has strongest relation then gender but the relation between the level of education and the participants awareness regarding increasing bone and dental health problems during pregnancy is not significant.

Table 4revealed a strong relationship between the level of education and preterm labor, the level of significance is 0.00 while there no significance relation between the age and gender of the participants and their awareness regarding vitamin D deficiency and preterm labor.

Conclusion and recommendation:

The current study concluded that

There is a fluctuation in the participants awareness regarding effects of vitamin D deficiency on the pregnant women and the fetus.

The level of awareness of the participants needs to be increased through community sessions regarding vitamin D and it's importance on the pregnant women and the fetus, brochures and programs on the social media which can cover a large portion of the community.

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