

# PREVALENCE OF VITAMIN D INSUFFICIENCY AND ITS ASSOCIATED RISK FACTORS AMONG PREGNANT WOMEN IN SELECTED CLINICS IN MISURATA, LIBYA

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## ABSTRACT

This study was performed to investigate the prevalence of Vitamin D insufficiency and its associated risk factors among pregnant women in selected clinics in Misurata, Libya for the month of March 2018. A total of 90 pregnant women were included in this study. a self-made questionnaire was designed to gather data. The data gathered were classified, tabulated and analyzed using descriptive statistics. Fifty five percent of the respondents had insufficient vitamin D (serum concentration 25 (OH) D level  $\leq$  30 ng/ml ), Most of the respondents are aged 15-25 years old and are in college level, with fair skin and sometimes exposed to sunlight in the mid-day with less than one hour, sometimes use of sunscreen cream. In terms of dietary information, most of the respondents had regular intake of milk, omega 3 fish oil, Vitamin D and calcium supplements. Despite the increasing awareness of the importance of vitamin D in the recent period, and although pregnant women in Misurata hospitals are generally subjected to a course of supplements, but suboptimal levels of vitamin D is still common.

**KEYWORDS:** Vitamin D, insufficiency, risk factors, pregnant women.

## INTRODUCTION

Maternal vitamin D insufficiency is thought to be common among pregnant women. Vitamin D supplementation during pregnancy has been suggested to protect against adverse pregnancy outcome such as pre-eclampsia, low birthweight and preterm births<sup>(1)</sup>. On the other hand, Maternal vitamin D insufficiency is associated with childhood rickets<sup>(2)</sup> and childhood wheezing<sup>(3)</sup>. Maternal vitamin D insufficiency is common in mothers with highly pigmented skin.<sup>(2)</sup> Women who used vitamin D-containing supplements had higher vitamin D status than in non-supplement users. However, vitamin D insufficiency was still evident even with supplemental use. Given the potential consequences of hypovitaminosis D on health outcomes, vitamin D supplementation, possibly at higher doses than currently available, is needed to improve maternal vitamin D status<sup>(2)</sup>.

Indeed, vitamin D regulates >1000 human genes, and vitamin D receptors are found in most tissues and cells throughout the body<sup>(3)</sup>. Accordingly, in utero or early life vitamin D insufficiency has been linked to increased risk of respiratory infection,<sup>(4,5)</sup> type 1 diabetes,<sup>(3,6)</sup> multiple sclerosis,<sup>(7)</sup> schizophrenia,<sup>(3,8)</sup> and even placental development and function.<sup>(9)</sup> Vitamin D insufficiency in adults has also been linked to cardiovascular disease,<sup>(10)</sup> upper respiratory tract infection,<sup>(11)</sup> cancer,<sup>(12,13)</sup> and Cardiovascular Disease<sup>(14)</sup>. While relatively small amounts of vitamin D prevent nutritional rickets, larger doses and higher serum 25-hydroxyvitamin D (25[OH]D) levels appear necessary for optimal general health outcomes<sup>(15)</sup>.

The most abundant circulating biomarker of vitamin D status is 25-hydroxyvitamin D (25(OH)D), which also has a longer half-life (25 days) compared to the active metabolite; 1,25-dihydroxyvitamin D (7 h).<sup>(16)</sup> Vitamin D is acquired in three ways; from sun exposure,

diet and supplements, the greatest proportion is obtained from sun exposure.<sup>(17)</sup> However, Vitamin D deficiency and insufficiency are highly prevalent during pregnancy in some sun-rich areas such as India<sup>(18,19)</sup>, South Carolina<sup>(20)</sup>, Saudi Arabia<sup>(21)</sup>. The most important source of vitamin D is the skin synthesis of the vitamin by UV B solar radiation<sup>(22)</sup>. Any process that reduces UV B photons from entering the epidermis will diminish cholecalciferol (vitamin D3) production. The skin pigment melanin absorbs UV B photons and can reduce vitamin D-3 synthesis by more than 90%<sup>(23)</sup>.

Recently, vitamin D supplements have been used by high rate of pregnant women in Misurata, considering that the latitude of Misurata is (31.3478° N), this study was conducted to investigate the prevalence of vitamin D insufficiency among a sample of Libyan pregnant women in selected hospitals in Misurata. The results will reflect the possible success achieved to improve vitamin D status. Moreover, the study aimed to determine factors associated with vitamin D status during pregnancy.

## MATERIALS AND METHODS

### Research Design and Respondents:

The study employed a descriptive research design mainly because the present investigation is descriptive in nature. The main purpose of the study is to determine and identify the prevalence of Vitamin D insufficiency and its associated risk factors among pregnant women in selected clinics in Misurata, Libya.

Descriptive research design is appropriate for this study since it used procedures in quantitative research in which the researcher administers a survey or a questionnaire in collecting data from the respondents.

The respondents of the study were pregnant women in selected clinics in Misurata, Libya. A total of 90 pregnant women were included in this study during the month of March 2018.

**Data collection and statistical analysis:**

The data needed in this study were gathered with the use of a self-made questionnaire. a questionnaire was formulated to reflect the prevalence of Vitamin D insufficiency and its associated risk factors among pregnant women. It included 6 questions and 2 tables for the respondents to answer and explained in local dialect.

A letter requesting for a permit to conduct the study was submitted to the head nurse who was subsequently approved. a permit was secured from the clinic which includes the reading of the patient's file in order to gain more information on patient's profile. The data gathered were classified, tabulated and analyzed using descriptive statistics. These were utilized to derive profiles and established frequency distributions in the presentation of the prevalence of Vitamin D insufficiency and its associated risk factors among pregnant women. The statistical tools used were tally, frequency, count, and percentage (table 1) and (table 2).

**RESULTS**

In total, 90 pregnant women were participants in the current study. Vitamin D insufficiency (serum concentration of 25(OH)D ≤30 ng/ml) was reported in about (55%) of them, while the rest which is about (45%) had Vitamin D sufficiency (serum concentration of 25(OH)D >30 ng/ml). vitamin D insufficiency was defined as a 25(OH)D concentration of 30 ng/mL or less<sup>(24)</sup>. (56%) of respondents were aged 15–25 years and (98%) of them are living in Misurata, (40%) in their Second trimester, moreover the majority of respondents were house wives (62%), (41%) were at the university level, and (47%) were fair skinned.

**(Table 1)** Profile of the Variables and lifestyle characteristics and the prevalence of vitamin D insufficiency among respondents.

Variables	respondents n (%) N=90	Vitamin D insufficiency (%) N=49
Serum Concentration 25 ( OH ) D Level ≤30 ng/ml (insufficiency)	49 (55%)	
>30 ng/ml (sufficiency)	41 (45%)	
Age		
15-25	51 (56%)	30 (61%)
26-35	34 (38%)	17 (35%)
36-45	4 (4%)	1 (2%)
46-55	1 ( 2% )	1 (2%)
Location		
Misurata	88 (98%)	49 (100%)
Other	2 (2%)	
Age of Gestation		
First trimester	22 (24%)	12 (26%)

Second trimester	36 (40%)	23 (47%)
Third trimester	32 (36%)	14(27%)
Educational Level		
College	37 (41%)	22 (45%)
Secondary	11 (12%)	7 (14%)
Primary	16 (18%)	5 (10%)
Less than primary	26 (29%)	15 (31%)
Occupation		
Retired	3 (3%)	2 (4%)
Employed	18 (20)	8 (16%)
Student	13 (15%)	6 (12%)
House wife	56 (62%)	33 (68%)
Skin color		
Fair	42 (47%)	24 (49%)
Brown	29 (32%)	15 (31%)
Black	19 (21%)	10 (20%)
Sun Exposure		
Frequently	20 (22%)	9 (18%)
Sometimes	52 (58%)	26 (53%)
Rarely	18 (20%)	14 (29%)
Time of Exposure to Sunlight		
Early morning	29 (32%)	16 (33%)
Mid-day	46 (51%)	22 (45%)
Late afternoon	15 (17%)	11 (22%)
Amount of Skin Exposure		
No skin exposure	14 (15%)	8 (16%)
Less than 1 hour	42 (47%)	23 (47%)
More than 1 hour	34 (38%)	18 (37%)
Use of Sunscreen		
Most of the time	27 (30%)	19 (39%)
Sometimes	43 (48%)	21 (43%)
Nothing at all	20 (22%)	9 (18%)

As shown in table 1 (58%) of women are exposed to the sun sometimes, while (22%) are frequently exposed and (20%) are exposed rarely, The usual time of sun exposure was mid-day ( 51%), with less than 1 hour of skin exposure for (47%) of respondents, furthermore (48%) use sunscreen sometimes, but (30%) apply sunscreen most of time, and the rest (22%) do not use sunscreen at all.

**(Table 2)** vitamin D and dietary supplements intake and the prevalence of vitamin D insufficiency among respondents.

	All respondents n (%) N=90		25 ( OH ) D Level ≤30 ng/ml N=49		25 ( OH ) D Level >30 ng/ml N=41	
	Yes n(%)	No n(%)	Yes n(%)	No n(%)	yes n(%)	No n(%)
Milk	68 (76%)	22 (24%)	31 (63%)	18 (37%)	37 (90%)	4 (10%)
Omega-3	54 (60%)	36 (40%)	23 (47%)	26 (53%)	31 (76%)	10 (24%)
Multi vitamins	43 (48%)	47 (52%)	19 (39%)	30 (61%)	24 (59%)	17 (41%)
Vitamin D	60 (67%)	30 (33%)	31 (63%)	18 (37%)	29 (71%)	12 (29%)
Calcium	49 (54%)	41 (46%)	27 (55%)	22 (45%)	22 (54%)	19 (46%)

(Table 2) represents the dietary information of Vitamin D insufficiency among pregnant mothers which includes: milk intake, omega-3 fish oil supplement, multivitamin supplement, vitamin D supplement and calcium supplement per day. It is most evident that most of respondents takes milk (76%) and various dietary supplements. (60%), (48%), (67%), and (54%) of respondents takes Omega-3, Multi vitamins, Vitamin D, Calcium supplement respectively. This study shows that (63%) of pregnant women with vitamin D insufficiency drink milk as well as (90%) of pregnant women with vitamin D sufficiency. Similarly, (47%) who takes omega-3 supplements of insufficient group compared with (76%) in sufficient group.

Also, a lower intake of multi vitamins and vitamin D supplements was observed in the insufficient group on the contrary to the sufficient group, (39%) and (63%) of insufficient vitamin D pregnant women compared with (59%) and (71%) of sufficient ones respectively. For Calcium supplement intake, there was no difference observed between insufficient and sufficient vitamin D pregnant women.

### DISCUSSION

High prevalence of vitamin D deficiency among Libyan women was reported by several studies. One study was conducted in Benghazi region found that (75%) of women had  $25(\text{OH})\text{D} < 50 \text{ nmol/l}$  <sup>(25)</sup>, another from Tripoli reported that (61%) of nursing mothers had  $25(\text{OH})\text{D} < 30 \text{ nmol/l}$  <sup>(26)</sup>. F. Faid and her colleagues investigated vitamin D intake and status level and associated factors among 455 participants in Misurata region, according to their finding women (25-64 y) were identified as the most vulnerable group with vitamin D inadequacy present in (82%) <sup>(27)</sup>. In another study which was conducted on 79 Libyan pregnant women, Albakoush and azab reported that (84.8%) of participants had a vitamin D deficiency (less than 20 ng/ml) <sup>(28)</sup>.

In this study, Vitamin D insufficiency (serum concentration of  $25(\text{OH})\text{D} \leq 30 \text{ ng/ml}$ ) reported in about (55%) of participants. Although this percentage shows improvement in vitamin D status compared to other studies, Vitamin D insufficiency is still considered high in an area rich in sunlight throughout the year.

Vitamin D status is usually affected by several determinants, especially those that have an impact on the dermal synthesis rate of vitamin D, such as skin color, sun exposure, time of exposure to sunlight, amount of skin exposure and use of Sunscreen creams.

According to Mithal et al. <sup>(29)</sup>, the prevalence of a lower level of serum vitamin D ( $< 25 \text{ nmol/L}$ ) is most common in the Middle East and is associated with women, darker skin pigmentation, limited sun exposure, higher latitude and lack of foods fortified with vitamin D. A study done in Arab populations and some other countries such as South Asia which might have similar practices suggests that skin pigmentation is probably the biggest risk factor in vitamin D deficiency regardless of the ultraviolet (UV) light exposure <sup>(30,31,32)</sup>.

Although the greatest proportion of vitamin D is obtained from sun exposure <sup>(17)</sup> between approximately 09.00 and 15.00 <sup>(33)</sup>, Vitamin D deficiency and insufficiency are highly prevalent during pregnancy in some sun-rich areas <sup>(18-21)</sup>. The Middle East, have also shown a high prevalence of vitamin D deficiency, ranging from 50 to 97%. These findings have been explained as being mostly due to the customary clothing that covers almost the entire body <sup>(34)</sup>, however hypovitaminosis D was surprisingly common in people living in sunny countries and where the body is not covered entirely, such as the European countries bordering the Mediterranean. <sup>(35, 36)</sup> Regarding the application of sunscreen, Some studies have shown decrease in vitamin D with sunscreen use <sup>(37)</sup>, but most have not <sup>(38, 39)</sup>. This may be because the sunscreen has been applied incorrectly or irregularly or with low SPF <sup>(39)</sup>.

Vitamin D is found naturally in a limited amount in just a few foods, for example, fatty fish, eggs, organ meats and UV-irradiated mushrooms. Fortified food and vitamin supplements are needed <sup>(40)</sup>. There are few studies conducted in Libya that report on low vitamin D status in women and very low consumption of vitamin D supplements and vitamin-D-rich food, while there are not many fortified foods in Libya <sup>(25,26,27)</sup>. This study reveals relatively high consumption of supplements rich in vitamin D, which reflect a less vitamin D insufficiency compared to other studies. Many studies have shown that the consumption of vitamin D supplements has a clear role in reducing the prevalence of deficiency, in a study conducted on 65 Saudi women for one year into three groups. The first group received only advice for healthy food, while the second group received the same advice in addition to vitamin D supplements. The third group received exercise in a sport center in combination with advice for healthy food and vitamin D supplements. Results revealed that the first group had no significant change in the level of serum vitamin D. Vitamin D level in the second group increased up to 70% of the base readings. Interestingly, vitamin D level of third group increased up to 300% of the initial readings <sup>(41)</sup>. In another study Ganji and his colleagues found that Administering vitamin D supplement for 3 months led to a significant increase in serum level of 25-hydroxyvitamin D from  $10.4 \pm 4.2 \text{ ng/mL}$  to  $44.0 \pm 10.7 \text{ ng/mL}$  <sup>(42)</sup>. A study was conducted on elderly people also found that users of vitamin D supplements and/or sunlamps had higher 25 (OH) D (median 54 nmol/L) than none users (median 31 nmol/L) <sup>(43)</sup>.

With severe vitamin D deficiency; vitamin D supplementation may help to improve the vitamin D serum level as shown among study participants where their serum vitamin D level was elevated to sufficient range <sup>(44)</sup>.

However, consumption of vitamin D supplements in pregnancy have to be in proper dose, Bodnar and others suggest that black and white pregnant women and neonates residing in the northern US are at high risk of

vitamin D insufficiency, even when mothers are compliant with prenatal vitamins and Higher-dose supplementation is needed to improve maternal and neonatal vitamin D nutriture<sup>(45)</sup>.

Our study was limited by a small sample number, and lack data on the prenatal vitamin brand and dose used by our subjects. Such information would have allowed us to determine whether women were supplemented with vitamin D-2 or vitamin D-3 and the amount they received daily.

### CONCLUSION

This study was conducted to investigate the prevalence on vitamin D insufficiency and its risk factors among pregnant women in selected clinics in the city of Misurata. In conclusion, over half of participants had vitamin D insufficiency which considered high in area at latitude (31.3478° N).

Despite the increasing awareness of the importance of vitamin D in the recent period, and although pregnant women in Misurata hospitals are generally subject to a course of supplements, suboptimal levels of vitamin D is still common. More studies are needed to improve the vitamin D status among pregnant women in the city of Misurata.

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