

# MATERNAL VITAMIN-D STATUS AND THE RELATIONSHIP WITH NEONATAL PROPERTIES AND ITS EFFECT ON CHILD HEALTH STATUS

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## ABSTRACT

*One of the common public health problems, nowadays related to nutritional status is Vitamin D deficiency (VDD) which occurs globally. This problem has a clear effect on vulnerable groups such as women in a motherhood state which has been associated with several adverse effects on maternal and child health. The aim of this study is to identify the frequency of deficiency and insufficiency of vitamin D among the maternal and their babies in EL-Marj City, Libya, and identify the correlation between a mother's vitamin D measure and some characteristics of mothers and their children.*

*Methods: An observational cross-sectional study was carried out on a sample of 56 maternal from EL-Marj City. All information and data were collected by data collecting form (questionnaire) during the period from 21st May to 24th August 2022.*

*Results: A total of 56 participants filled out the questionnaire. Almost all are Libyan. More than 57% of respondents they're aged between 26-35 years and had graduate degrees. 44% of participants live inside the city and approximately 60% of them live in an independent house. In our study, by determining the frequency of vitamin D values, we showed that 50.2 % of women had normal vitamin D values.*

*Conclusions: There is a deficiency in vitamin D among mothers and their children. There is no correlation between the mother's age and the child's feeding. Another comparison shows no relationship between the level of a mother's education and maternal vitamin D level, and non-relationship between a maternal vitamin D level and the breastfeeding period. Also, there are no correlations between the breastfeeding period, the child's birth weight, and the child's vitamin D level from one side and the child's growth retardation and the child's teething delay from another side.*

## المستخلص

نقص فيتامين د هو مشكلة صحية عامة شائعة في جميع أنحاء العالم. ارتبط تأثير نقص فيتامين د في الأمومة بالعديد من الآثار الضارة على صحة الأم والطفل. تهدف هذه الدراسة إلى تحديد وتيرة نقص فيتامين د) وعدم كفايته بين الأمهات وأطفالهن في مدينة المرج بليبيا، والتعرف على الارتباط بين قياس فيتامين د للأم وبعض خصائص الأمهات وأطفالهن.

طريقة ومواد البحث: كانت هذه الدراسة دراسة مقطعية أجريت على عينة من 56 أم من مدينة المرج. وتم جمع البيانات بواسطة استبيان خلال الفترة من 21 مايو إلى 24 أغسطس 2022.

النتائج: تم ملء عدد 56 استبيان بواسطة المشاركين في البحث وكان كلهن تقريبا لبيبات. تراوحت أعمار أكثر من

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57% من المشاركين بين 26 و 35 عامًا وحاصلين على درجة البكالوريوس. يعيش 44% من المشاركين داخل المدينة وحوالي 60% منهم يعيشون في منزل مستقل. في دراستنا، ومن خلال تحديد تكرار قيم فيتامين (د)، أظهرنا أن 50.2% من النساء لديهن قيم طبيعية لفيتامين (د).

الاستنتاجات: هناك نقص في فيتامين د بين الأمهات والأطفال. لا توجد علاقة ارتباط بين عمر الأم وتغذية الطفل. وأظهرت مقارنة أخرى عدم وجود علاقة بين مستوى تعليم الأم ومقياس فيتامين (د) للأم، ومقياس فيتامين (د) للام وفترة الرضاعة الطبيعية. ولكن هناك علاقة بين قياس فيتامين (د) للطفل وتأخر الطفل في المشي. وعند تقييم العلاقة بين حالة فيتامين (د) للام ووزن الطفل عند الولادة كانت هناك علاقة.

**Keywords:** Vitamin D Deficiency; Breastfeeding; Risk Factors; Neonate; Maternal

## 1. INTRODUCTION

Vitamin D was discovered more than a century ago by the effort of some scientists such as Mellanby, McCollum, Steenbock, and Windaus, the latter studied vitamins and their relation to sterols, and for this reason, he received the in1928 Nobile Prize in Chemistry, subsequently through research efforts which were done by many researchers and scientists has been converted to 1,25-dihydroxy vitamin D3 (1,25(OH)2D3), which is the active form of vitamin D [1]. It acts as a hormone (steroid hormone) and plays an important role in the maintenance and mineralization of bone and the homeostasis of calcium, where the active form of vitamin enhances the absorption of the intestine of calcium and phosphate [2]. The body synthesizes vitamin D via exposure to sunlight while the remaining can be from nutritional sources [3]. Vitamin D has other biological functions in addition to bone support including the regulation of differentiation and proliferation of several cell lines including lymphocytes, endothelial cells, keratinocytes, and osteoblasts [4]. Therefore, low exposure to the sun and bad nutrition intake of vitamin D cause deficiency of vitamin D conditions. also, because the vitamin has a role in many extra-skeletal functions there are multiple effects of vitamin D that don't relate to bone health [3].

For the reason that the essential role of vitamin D is preserving bone health by organizing calcium concentrations in the body, therefore The emergence of vitamin D deficiency is related to deteriorating skeletal health, such as rickets, osteomalacia, and hypocalcemia [5]. the vulnerable groups at greatest vitamin D deficiency risk include patients with chronic illnesses, malnutrition, and infants that depend on breastfeeding exclusively, also using certain drugs (e.g., glucocorticoids and anticonvulsants) has also been correlated to low vitamin D concentrations. As well the early life development of bone needs an adequate concentration of vitamin D and calcium serum. Furthermore, there has been an increasing concern about vitamin D in children because of the new epidemic studies proposing the role of vitamin D in innate immunity and against autoimmune disease [6].

D vitamins are known as Calciferol and are a group of fat-soluble secosteroids. Two types of vitamin D are of practical importance: vitamin D2 (plant-derived -- ergocalciferol) and vitamin D3 (animal-derived - cholecalciferol) [7]. Both the previous two forms are inactive biologically and need activation through reactions of hydroxylation in the liver and kidney. In the liver, they are transformed to 25-hydroxy

vitamin D (25(OH)D), and then it is stored in the liver and in adipose tissues of the body. When required, it is then transformed in the kidneys by the 1-alpha hydroxylase enzyme into the active form of vitamin D (1,25(OH)2D). These conversions are controlled by the parathyroid glands [8]. The active shape of vitamin D spread in the circulation is at most engaged with a protein known as "Vitamin D Binding Protein" (VDBP) [9]. Acting as a hormone, 1,25(OH)2D reaches the target cells where it exerts its effect through the cytosolic vitamin D receptor (VDR). The active metabolite of vitamin D is linked to VDR, enters the nucleus of the cell, and then activates gene expression [10]. Presently, the universal spreading of vitamin D deficiency is an epidemic and is deemed a common health problem in many parts of the world [11]. Recently, In Libya, it can be observed an extensive spread of vitamin D insufficiency was recorded in the various age and sex groups of this community, in spite of the lot of sunlight that is available over the year in this North African nation. Further, vitamin D deficiency is more noticeable in women of different ages in Libya [12]. Sundry factors can participate in the deficiency of vitamin D. Thus, it is important to define the risk factors that are related to vitamin D lack amongst that womankind so as to set up pertinent strategies to prevent and administer that grave health problem.

Mother's hypovitaminosis D might weaken fetal outgrowth and cause adverse conception results including intrauterine development fetter and neonatal low birth weight [13]. Therefore, this study aimed to determine the vitamin D status of the maternal and measure its frequency among the sample which represents the maternal in El-Marj city, Libya. Also, we intended to perform some objectives that concern identifying the association between maternal vitamin D status and the correlating factors with vitamin D deficiency and occurring of adverse outcomes in children, such as low birth weight, child growth retardation, and delaying teething and walking in children. In addition, it proves whether or not there is an association between breastfeeding and the child's vitamin D level.

## 2. MATERIALS AND METHODS

1. **Site of study:** This study was conducted in EL-Marj city, Libya, among mothers who have children and attended polyclinic and health centers, especially the maternal and child health care center (MCH) of EL-Marj city.
2. **The study design:** It was a Cross-sectional study.
3. **The study units:** The study units were a sample of 56 maternal residents from EL-Marj city in Libya.
4. **Data collection:** The collection of data was by a questionnaire developed in the Arabic language, which was based on 26 items. It contained questions about personal information, demographic and socioeconomic characteristics, personal habits, and measures of vitamin D levels of mothers and their babies, which already have been measured at public and private labs, so vitamin D was measured by different and traditional methods according to each lab. All participants gave informed consent before entering the study.
5. **Study period:** The study was conducted during the period from 21/5/2022 to

24/8/2022.

6. **Statistical analysis:** All the data has been analyzed by using the SPSS version 21 to perform the statistical analysis and form Tables to present results and do some inferential statistics. in addition to using Microsoft Excel to do diagrams.

### 3. RESULTS

A total of 56 participants filled out the questionnaire. Almost all are Libyan. More than 57% of respondents were between 26-35 years and had graduated degrees.44% of participants live inside the city and approximately 60% of them live in a independent houses.

**Table (1):**  
Number and percentage of mothers' serum vitamin D concentrations

Parameters		Mother's serum vitamin D concentrations	children's serum vitamin D concentrations
N	Valid	56	56
	Missing	0	0
	Mean	21.0714	29.9464
	Median	19.5000	30.0000
	Std. Deviation	8.24810	10.68630

**Table (2):**  
Distribution of sample according to mother's age

Cases	Frequency	Percent
from 18-20 year	1	1.8
from 21-25 years	8	14.3
from 26-30 years	18	32.1
from 31-35 years	14	25.0
from 36-40 years	10	17.9
from 41-45 years	5	8.9
Total	56	100.0

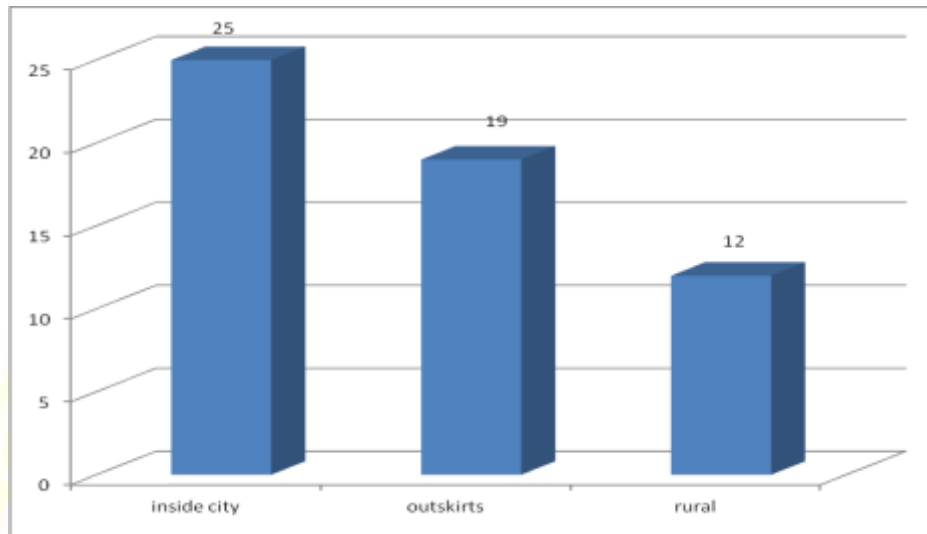
The participants in this study have been distributed according to their baby's gender 55.4 % female, as Table (3).

**Table (3):**  
Distribution of sample according to gender of child

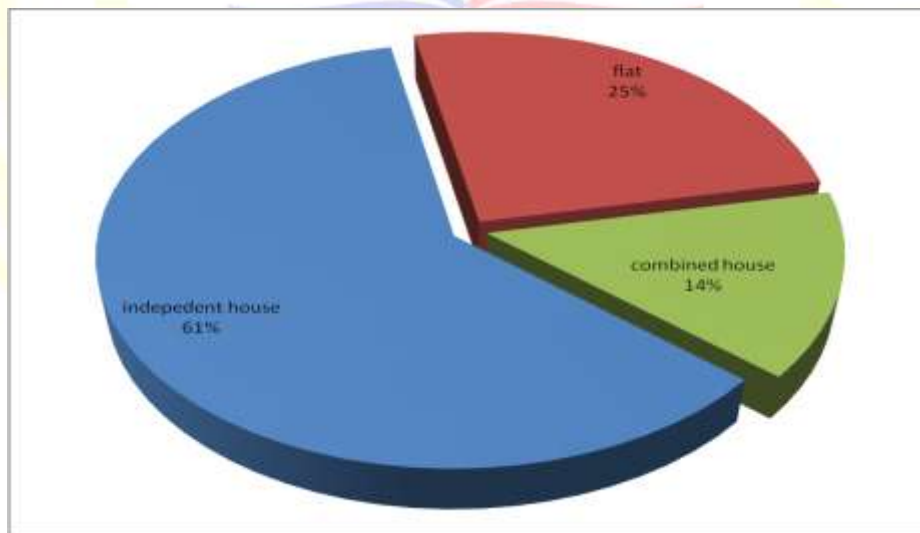
	Frequency	Percent
Male	31	55.4
Female	25	44.6
Total	56	100.0

In other hand, it has been distributed of sample according to the place of residence, to find any relation between the place of residence or habitation and vitamin D deficiency as Figure (1) and Figure (2).





**Figure (1):** Distribution of the sample according to the place of residence.



**Figure (2):** Distribution of sample according to the type of habitation

The most common occupation among mothers in the study was a housewife with a frequency of 60.7 % as in Table (4), while in considering the educational level, the graduate was represent a large percentage of 55.4 % this is show in a Table (5).

**Table (4):**  
Distribution of sample according to occupation of mother

	Frequency	Percent
Housewife	34	60.7
Officer	12	21.4
Health Field	9	16.1
Private Work	1	1.8
Total	56	100.0

**Table (5):**  
The sample distribution according to the education level of the mother

	Frequency	Percent
Primary	2	3.6
Secondary	19	33.9
Graduate	31	55.4
Postgraduate	4	7.1
Total	56	100.0

This research has studied the type of feeding of the baby, Table (6), and identified the period of breastfeeding, Table (7).

**Table (6):**  
Distribution of sample according to child feeding..

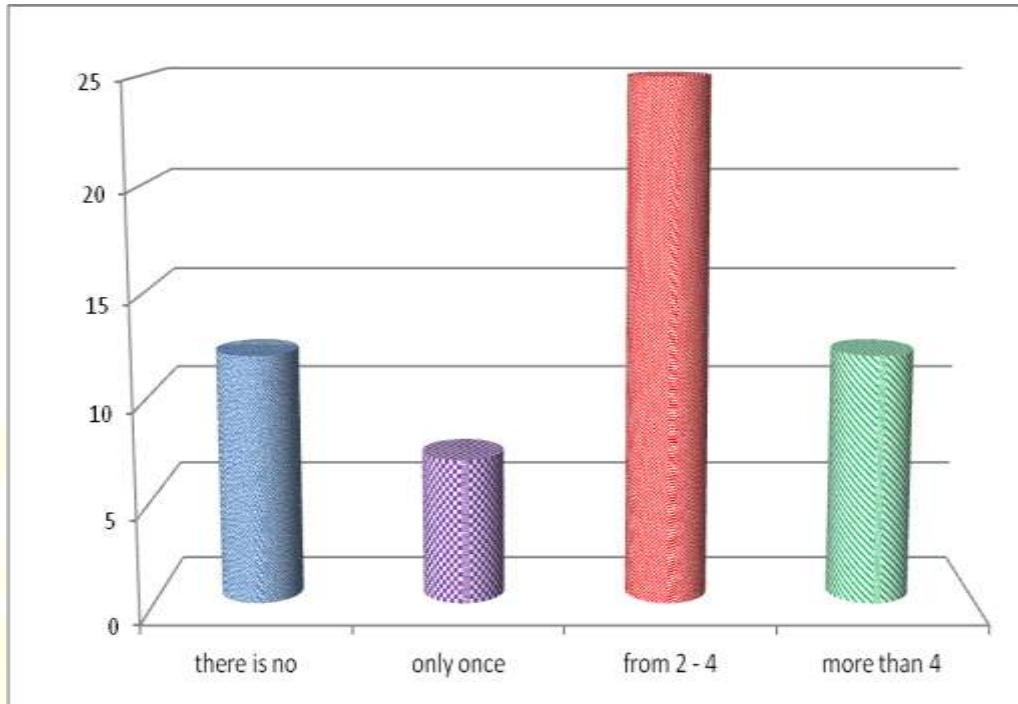
Cases	Frequency	Percent
Breastfeeding	13	23.2
The Combined *	22	39.3
Artificial Feeding	21	37.5
Total	56	100.0

\* the combination of breastfeeding and artificial feeding

**Table (7):**  
Distribution of sample according to the period of breastfeeding

	Frequency	Percent
There Is No	8	14.3
< 2 Months	17	30.4
From 2-4 Months	7	12.5
From 4-6 Months	8	14.3
From 6-12 Months	5	8.9
> 12 Months	11	19.6
Total	56	100.0

The distribution of the sample according to the number of previous deliveries and determining the order of the present child has been done, to identify how it affects on vitamin D vitamin and the variables of the child.



**Figure (3):** Distribution of sample according to the number of previous deliveries

Tables (8), and (9) show, that approximately, 28% of mothers indicated that the best time for exposure of children to the sun is before 10 a.m, while 32% of them said that it is from 10 AM to 3 PM. The highest percentage (40%) of mothers exposed their children to sun 1-3 times weekly.

**Table (8):**

The preferable period of the day to expose your child to the sun.

Time	Frequency	Percent
Before 10 AM	16	28.6
From 10 AM - 3 PM	18	32.1
After 3 PM	2	3.6
Don't know	20	35.7
Total	56	100.0

**Table (9):**  
How Often Do You Expose your Baby/Child to Sun?

	Frequency	Percent
1-3 times a week	19	33.9
3-5 times a week	11	19.6
More than 5 times a week	7	12.5
1-3 times a day	13	23.2
Total	50	89.3
Missing System	6	10.7
Total	56	100.0

We tried to find the association between maternal vitamin D levels and some characteristics of them and their children's as shown in the following Tables (10), (11), and (12) .

**Table (10):**

The relationship between maternal vitamin D levels and her child's birth weight

		child birthweight
Maternal Vitamin D levels	Pearson Correlation	-.291*
	Sig. (2-tailed)	.030
	N	56

**Table (11):**

The correlation between the mother's age and the child's feeding

		The Child's Feeding
Mother's Age	Pearson Correlation	.275*
	Sig. (2-Tailed)	.040
	N	56

\*. Correlation Is Significant At The 0.05 Level (2-Tailed).

**Table (12):**

The Correlation between the maternal vitamin D level and the breastfeeding period and the level of education of the mother

		Mother's Vitamin D Measure
Level of Education of Mother	Pearson Correlation	-.042-
	Sig. (2-Tailed)	0.760
	N	56
Breastfeeding Period	Pearson Correlation	-.047-
	Sig. (2-Tailed)	0.366
	N	56

And, in the next section, the study evaluated the association between the multivariable



of mothers to some problems of children. as explained in Tables (13), (14), (15)

**Table (13):**

the correlation between the breastfeeding period, the child's birth weight, and the child's vitamin D level with the child's growth retardation.

The character	The child's growth retardation		
	Pearson Correlation	Sig. (1-tailed)	N
Breastfeeding Period	.087	.261	56
childbirth weight	-.026-	.424	56
Child's Vitamin D level	.138	.156	56

**Table (14):**

the correlation of both the breastfeeding period and the child's vitamin D level and birth weight with The child's teething delay.

Parameters	The child's teething delay		
	Pearson Correlation	Sig. (1-tailed)	N
Breastfeeding Period	.070	.303	56
The child's birth weight	-.103-	.225	56
Child's Vitamin D level	-.019-	.443	56
level of education of mother	.018	.447	56

**Table (15):**

The correlation of both the breastfeeding period and the child's vitamin D level and birth weight with the child's walking delay.

	The child's walking delay		
	Pearson Correlation	Sig. (1-tailed)	N
Breastfeeding Period	.040	.384	56
The child's birth weight	.041	.381	56
the child's vitamin D level	.286	.016	56
level of education of mother	-.005-	.484	56

#### 4. DISCUSSION

Vitamin D Deficiency (VDD) (< 20 ng/ml) is becoming increasingly rife in the majority of the population worldwide. There is also a lot of research attention in studies estimating the agents that lead to VDD and its role in many diseases and conditions. VDD is a significant public health problem in Libya too. In our study, by determining the frequency of vitamin D values and extracting descriptive statistics for the sample, we showed that 50.2 % of women had normal vitamin D values. While the rest of the sample had a deficiency of vitamin D and the descriptive statistics of the sample showed the mean are 21.07 (SD=8.25) and 29.95 (SD=10.69) for vitamin D values of mothers and children respectively these results are similar to a study conducted in Karachi, Pakistan. Where in that study, 57% of women had VDD [14].

Sunlight is the main source of vitamin D which is well-known to most of the participants in the study. The results were different from that of a study conducted in

Jordan, where approximately one-third of the mothers (29%), in our study indicated that the time before 10 AM was the best time of day to expose the baby to the sun. also, In this study, approximately half of the participants were from inside the city, and 60 % of them were housewives living in an Independent house, and these findings are nearly similar to the previous Jordan study [15].

In regard to the feeding of the child, it is known that natural breastfeeding is the best choice for feeding of baby

This study found a correlation between the mother's age and the child's feeding is 0.275 with (p-value = 0.04). While there's no correlation between a mother's vitamin D level and the breast feeding period.

When we studied the correlation between the breastfeeding period, the child's weight-birth, and the child's vitamin D level with the child's growth retardation, there is no evidence of correlation. Also, there is no correlation between previous parameters (breastfeeding period, child's birth weight, child's vitamin D) and the child's teething delay. We found a correlation between the child's vitamin D level and The child's walking delay, where its value is 0.286 with (P-value = 0.016).

## 5. CONCLUSION

This study highlights the frequency of vitamin D deficiency and insufficiency among mothers and its effect on their infants and can conclude the following: There is a deficiency in vitamin D among mothers and their children. There is no correlation between the mother's age and the child's feeding. Another comparison shows no relationship between the level of a mother's education and maternal vitamin D level, and non-relationship between a maternal vitamin D levels with the breastfeeding period. Also, there are no correlations between the breastfeeding period, the child's birth weight, and the child's vitamin D level from one side and the child's growth retardation and The child's teething delay from another side.

However, there is a correlation between The Child's vitamin D level and The child's walking delay. Also, there is a correlation between maternal vitamin D levels and neonate's birth weight.

## Acknowledgment

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## Ethics

The study did not require a review board approval. Because this study does not involve any risk to participants and the participant's name is anonymous (no need to write the participant's name). All participants gave informed consent before entering the study. Our gathered data were confidential and no extra cost was constrained on our participants.

**Funding:**

We haven't received any specific funding for this work; therefore we were depending on personal efforts.

**Limitations**

A limitation of this survey was that some information was dependent on results from private labs which may be incorrect, and the answers to some questions in the questionnaire were dependent on respondents who misunderstood the requirements of the questions. Furthermore, There is no database about the nutritional status of a maternal and her baby. in addition to the hesitating and incomplete of the questionnaire by some respondents who were chosen in the study led to exclude a number of them consequently leading to a small sample.

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