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Prevalence of Vitamin D deficiency among infertile women Saad Abo Al-Ela hospital

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Abstract
Background: Determining the relationship between vitamin D deficiency and infertility among infertile women and outcome of infertility treatment of great importance for better interventions to improve outcome of infertility treatment. The aim of this work was to investigation prevalence of vitamin D deficiency among infertile women at (Saad Abu Ella Infertility Center August 2018, August 2019).
Methods: This is a descriptive prospective hospital based investigation conducted in Saad Abu Ella Infertility Center August 2018, August 2019. The investigation sample was 70 infertile women. Data was collected using questionnaire filled with women after taking informed consent.
Results: Normal titre more common among secondary infertility and deficient and insufficiency common in primary infertility (P-Value = 0.012 < 0.05). Pregnancy occurred for 39(55.7%) of the women, of them term labour 23(59%), preterm labour 13(33.3%) and miscarriage 3(7.7%). Occurrence of pregnancy and labour at term significantly associated with normal titre of vitamin D (P-Value < 0.05).
Conclusions: The investigation concluded that vitamin D deficiency and insufficiency significantly associated with primary infertility and non-occurrence of pregnancy as well as outcome of pregnancy in terms of miscarriage and preterm labour.

Keywords: Vitamin D deficiency, infertile women, polycystic ovary syndrome

Introduction

Infertility is commonly defined as the inability to achieve pregnancy despite engaging in regular, unprotected sexual intercourse for a duration of at least one year. Globally, it is estimated that over 70 million couples are affected by infertility, with male infertility remaining a subject of ongoing debate and scrutiny across different regions. Studies indicate that between 8% and 12% of couples experience fertility challenges [1].

The highest rates of infertility have been reported in Southeast Asia and Sub-Saharan Africa [2]. Within the African continent, various studies have identified a range of infertility types and causes, which differ by region and population [3]. Assessing these causes through targeted investigation is critical for generating reliable data that can inform public health strategies and intervention programs. While a wealth of information exists concerning infertility in high-income countries and several African nations [4], there is a significant lack of research specific to Sudan. Serum 25-hydroxyvitamin D [25(OH)D] is widely recognized as the most accurate marker for assessing vitamin D status in the body. However, there is no universal consensus on the optimal serum level required for maintaining overall health. Typically, titre below 50 nmol/L (20 ng/mL) are defined as deficient, 50-74 nmol/L (20-30 ng/mL) as insufficient, and titre equal to or greater than 75 nmol/L (30 ng/mL) are considered sufficient [5].

Polycystic Ovary Syndrome (PCOS) is one of the most frequently diagnosed endocrine disorders among women of reproductive age, affecting up to 18% of this population. PCOS is characterized by the presence of multiple ovarian cysts, irregular menstrual cycles, hyperandrogenism, acne, hirsutism, and infertility. Research suggests a strong correlation between PCOS and various cardiometabolic risk factors, including dyslipidemia, type 2 diabetes, impaired glucose tolerance, and subclinical atherosclerosis. Insulin resistance and obesity are also commonly associated with PCOS and contribute significantly to its clinical manifestations. The global rise in obesity may signal a corresponding increase in PCOS prevalence, potentially resulting in reduced fertility rates, slower population growth, and elevated cardiovascular risk. Consequently, PCOS has become a pressing public health concern [6].

Evidence also points to a potential link between vitamin D deficiency and impaired fertility in both men and women across diverse ethnic groups, excluding most Asian populations. As such, it is advisable to include vitamin D status in the routine diagnostic workup for individuals experiencing infertility. Supplementing vitamin D or encouraging safe sun exposure is recommended for individuals found to be deficient or insufficient, particularly because the supplement is cost-effective and safe for general use [7].

Although the specific role of vitamin D in female reproductive health is still under investigation, early studies from basic science suggest a significant biological function. Vitamin D receptors (VDRs) have been identified in both the ovaries and endometrial tissue of mice, and their expression varies throughout the reproductive cycle. Animal studies have demonstrated that mice lacking VDRs exhibit impaired uterine development and disrupted follicular growth. Additional *in vitro* research in human endometrial cells has confirmed the presence of VDRs and demonstrated that the enzyme 1α-hydroxylase, which converts calcidiol into the biologically active form of vitamin D (calcitriol), is upregulated during early pregnancy compared to non-pregnant states [8].

This work was designed to to investigation prevalence of vitamin D deficiency among infertile women at (Saad Abu Ella Infertility Center, August 2018, August 2019).

Patients and Methods

This descriptive prospective hospital based investigation was conducted in Saad Abo Alela Fertility Center. It is a governmental hospital (class-A hospital) during the period from August 2018, August 2019. A total of 70 infertile Sudanese women were enrolled to determine the prevalence of vitamin D deficiency among infertile women.

Ethical clearance from SMSB Ethical Committee. Agreement was obtained from the hospital administration. Informed consent was obtained from the ladies.

Inclusion criteria were infertile ladies (primary and secondary) who accept to participate in the investigation

Exclusion criteria were refused to participate in the investigation.

Data collection tools and methods: A questionnaire was designed to fulfill the objectives of the investigation. The questionnaire was filled directly with ladies. The first step is the taken of written consent after describing the purpose of the investigation and privacy as well as the confidentiality. The second step clarifying the questionnaire items and filling the questions with the ladies. Vitamin D level was determined based on laboratory test.

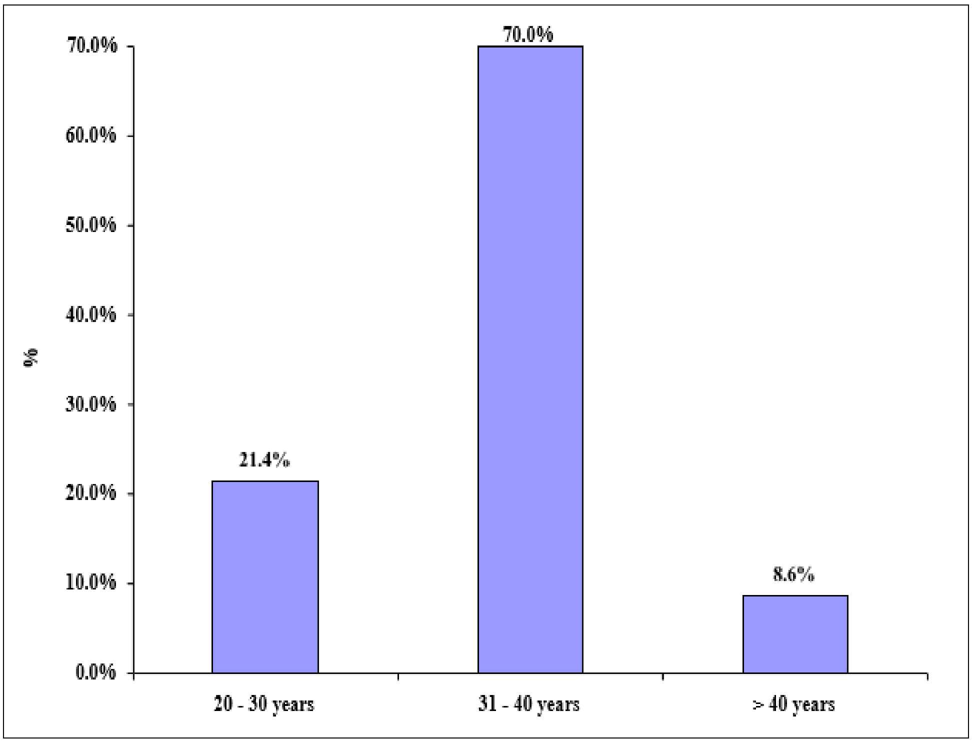
Investigation variables: Personal data about the ladies, type of infertility, vitamin D level.

Sample size and Sampling Technique: Total coverage taking all infertile ladies attending Saad Abo Alela Hospital infertility Center during the investigation period and fulfilled the inclusion criteria of the investigation. The available number was 70 women fulfilled the inclusion criteria of the investigation.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 23.0. The Chi-square test was applied where appropriate. A p of less than 0.05 was considered statistically significant, whereas a p greater than 0.05 was regarded as not significant. The findings were analyzed and discussed, and relevant recommendations were proposed accordingly.

Results



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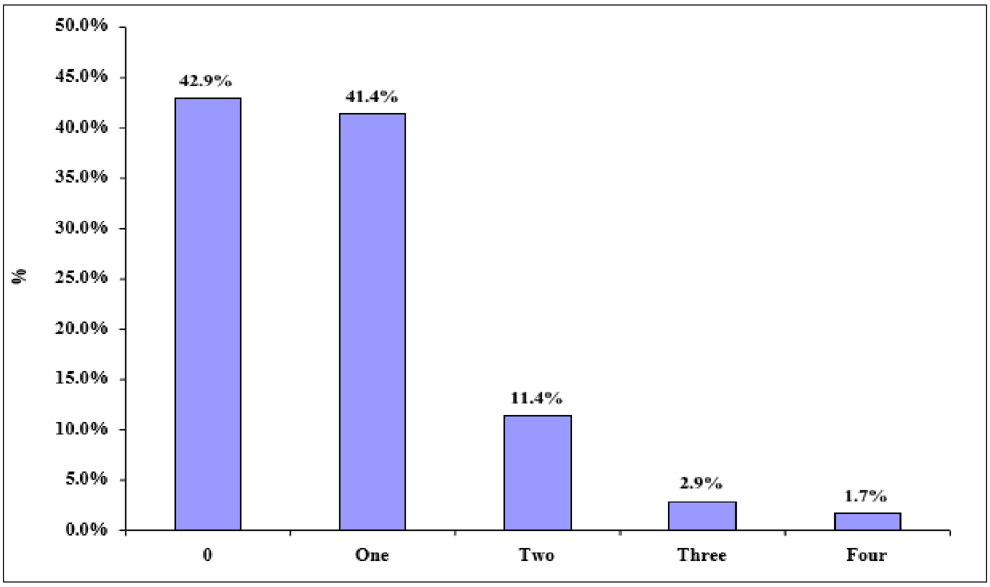

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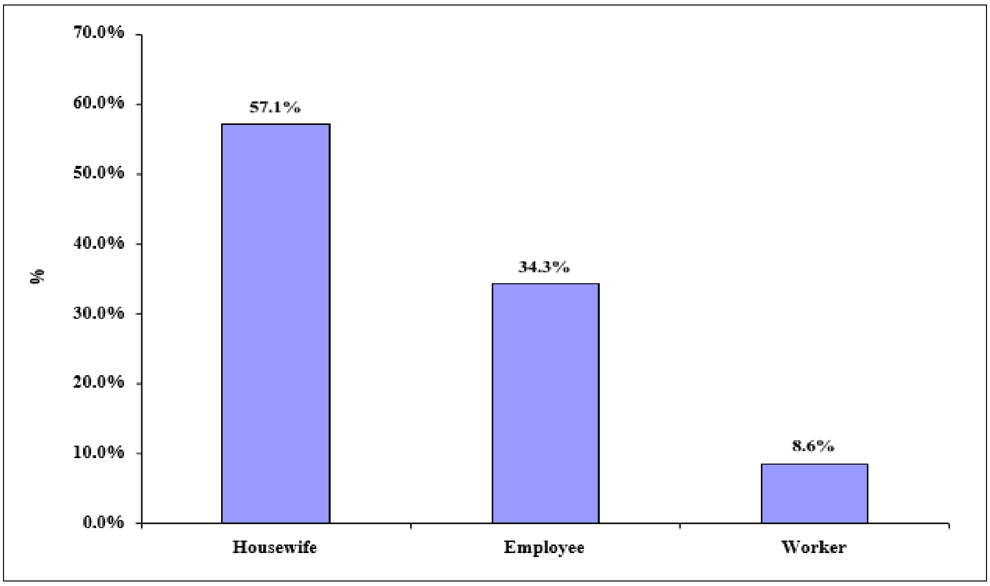

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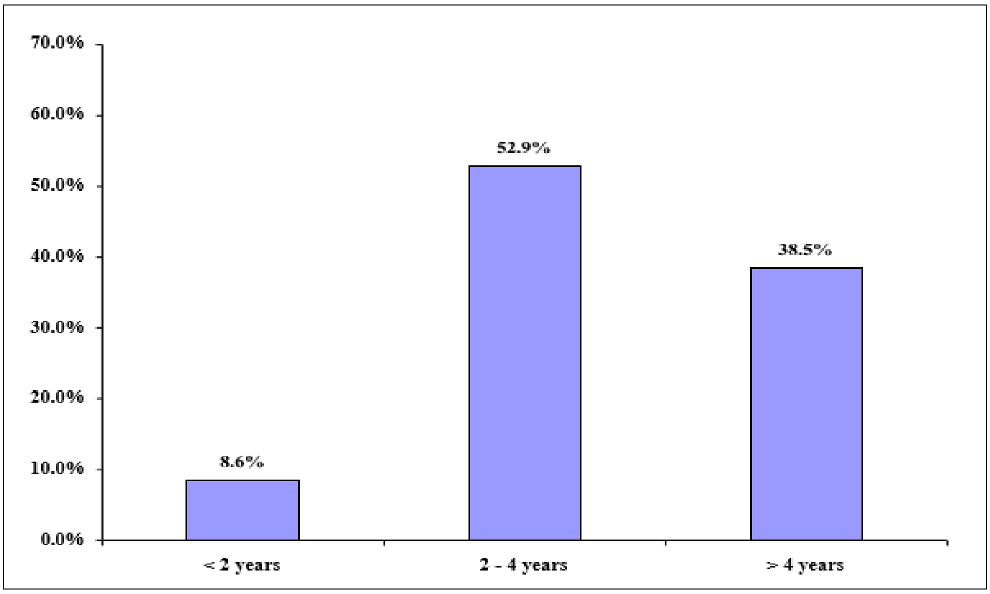

D

Figure 1: Shows distribution of the women according to age group, previous pregnancies, occupation and duration of marriage.

Figure 1 Distribution of infertile women managed at Saad Abo Alela Hospital (August 2018, August 2019) according to (A) age group, (B) previous pregnancies, (C) occupation and (D) duration of marriage.

Table 1 shows distribution of infertile women managed at Saad Abo Alela hospital (August 2018, August 2019) according to educational level, symptoms of vitamin D deficiency and to vitamin D level.

Table 1: Distribution of infertile women managed at Saad Abo Alela Hospital (August 2018, August 2019) according to educational level, symptoms of vitamin D deficiency and to vitamin D level

Educational level	N	%
Not educated	4	5.7
Primary	16	22.9
Secondary	22	31.4
University and post graduate	28	40.0
Total	70	100.0
Symptoms		
Fatigue	48	68.6
Pale or yellowish skin	16	22.9
Shortness of breath	15	21.4
Dizziness	13	18.6
Muscle weakness	12	17.1
Numbness or tingling in your hands or feet	11	15.7
Unsteady movements	11	15.7
Irregular heart beats	8	11.4
Weight loss	5	7.1
Mental confusion or forgetfulness	5	7.1
Personality changes	3	4.3
Vit D serum level ng/ml		
Deficient 0-40 ng\mL	30	42.9
Insufficient 40-80 ng\mL	18	25.7
Normal 80-100 ng\mL	22	31.4
Total	70	100.0

Table 2 shows distribution of infertile women managed at Saad Abo Alela Hospital (August 2018, August 2019) according to occurrence of pregnancy, treatment received, and outcome of pregnancy.

Table 2: Distribution of infertile women managed at Saad Abo Alela Hospital (August 2018, August 2019) according to occurrence of pregnancy, treatment received, and outcome of pregnancy (N=39)

	N	**%**
Occurrence of pregnancy	39	55.7
Treated by	N	%
Controlled ovarian stimulation (COS)	2	5.1
Intrauterine Insemination (IUI)	3	7.7
Inviro Fertilization (IVF)	6	15.4
Intracytopalsmic Sperm Injection (ICSI)	28	71.8
Outcome of treatment if pregnancy occurred	N	%
Miscarriage	3	7.7
Preterm labour	13	33.3
Term labour	23	59.0

Table 3 shows distribution of infertile women managed at Saad Abo Alela Hospital (August 2018-August 2019) according to type of infertility in relation to vitamin D titre and occurrence of pregnancy in relation to vitamin D titre.

Table 3: Distribution of infertile women managed at Saad Abo Alela Hospital (August 2018, August 2019) according to type of infertility in relation to vitamin D titre and occurrence of pregnancy in relation to vitamin D titre

Vit D Serum Level ng/ml	**Type of infertility**				**P-Value**
	Primary		**Secondary**		
	N	**%**	**N**	**%**	
Deficient 0-40 ng\mL	19	51.4	11	33.3	0.012*
Insufficient 40-80 ng\mL	12	32.4	6	18.2	
Normal 80-100 ng\mL	6	16.2	16	48.5	
Vit D Serum Level ng/ml	**Occurrence of pregnancy**				
	Yes		**No**		
Deficient 0-40 ng\mL	9	23.1	21	67.7	0.017*
Insufficient 40-80 ng\mL	11	28.2	7	22.6	
Normal 80-100 ng\mL	19	48.7	3	9.7	

*significant p-value

Table 4 shows distribution of infertile women managed at Saad Abo Alela Hospital (August 2018-August 2019) according to outcome of pregnancy in relation to level of vitamin D.

Table 4: Distribution of infertile women managed at Saad Abo Alela Hospital (August 2018-August 2019) according to outcome of pregnancy in relation to level of vitamin D

Vit D serum level ng/ml	Outcome of treatment if pregnancy occurred						P-Value
	Miscarriage		Preterm labour		Term labour		
	N	%	N	%	N	%	
Deficient 0-40 ng\mL	2	66.7	5	38.5	2	8.7	0.001*
Insufficient 40-80 ng\mL	1	33.3	6	46.2	4	17.4	
Normal 80-100 ng\mL	0	0.0	2	15.4	17	73.9	

*significant p-value

Discussion

This investigation aimed to assess the prevalence of vitamin D deficiency among infertile women attending Saad Abu Ella Infertility Center between August 2018 and August 2019. A total of 70 women were included. The predominant sociodemographic characteristics observed were: Age group 31-40 years, accounting for 49 participants (70%); housewives, representing 40 participants (57.1%); and those with a university-level education or higher, totaling 28 participants (40%). These findings are consistent with those reported by Husain and co-authors, whose investigation on Sudanese infertile women documented an age range of 18 to 85 years, with a mean age (±SD) of 40.2 (±14.06) years [9].

The research exhibited that the level of Vitamin D was deficient (0-40 ng/ml in 30(42.9%), insufficient (40-80 ng/ml) in 18(25.7%) and normal (80-100 ng/ml) in 22(31.4%). In our investigation primary infertility reported in 37(52.9%) of the women and secondary 33(47.1%). On the other hand, normal titre more common among secondary infertility and deficient and insufficiency common in primary infertility (P-Value = 0.012 < 0.05). In a related investigation, Husain and co-authors. assessed vitamin D titre and contributing factors among Sudanese women. The participants' ages ranged from 18 to 85 years, with a mean (±SD) age of 40.2 (±14.06) years. The mean serum vitamin D level was 13.4 (±6.72) ng/mL, with values ranging from 3.00 to 36.5 ng/mL and a median of 12.7 ng/mL. Out of 190 participants, 157 (82.6%) had serum vitamin D concentrations below 20 ng/mL, indicating deficiency. Among these, 52 women (27.4%) were within the 21-30 year age group (P=0.228). Significant associations were identified between vitamin D deficiency and residence outside Khartoum, as well as the extent of sun exposure, exposure limited to the face and hands or face and limbs compared to full body coverage (P=0.008, 0.023, and 0.036, respectively) [9]. A investigation conducted by Mohammed and co-authors. Assessed the prevalence of vitamin D deficiency among Sudanese women diagnosed with infertility. The results indicated that 64.5% of participants were deficient in vitamin D. Among these, a significantly higher proportion of women with primary infertility (45.7%) exhibited deficiency compared to those with secondary infertility (18.8%) [10]. In a separate investigation, Al-Assadi evaluated serum vitamin D titre in infertile and fertile women residing in Basra, a region known for its ample sunlight. Out of the 106 women assessed, 81 (76.4%) demonstrated vitamin D deficiency, while 25 (23.6%) maintained adequate titre. The recorded serum vitamin D titre varied widely, ranging from 0.3 ng/mL to 62 ng/mL. This variation was statistically significant, with a reported p of 0.000. [11].

In this investigation pregnancy occurred for 39(55.7%) of the women, of them term labour 23(59%), preterm labour 13(33.3%) and miscarriage 3(7.7%). Moreover, occurrence of pregnancy and term labour significantly associated with normal titre of vitamin D (P-Value < 0.05). Similar to Chu, and co-authors [11] he relationship between vitamin D titre and outcomes of assisted reproductive treatments was explored. Among 500 women undergoing fertility treatments, 53.2% (266) were identified with vitamin D deficiency, 30.8% (154) had insufficient titre, and only 16% (80) were classified as vitamin D replete. The live birth rates in the deficient, insufficient, and replete groups were 23.2%, 27.0%, and 37.7%, respectively (P=0.04). After adjusting for key prognostic variables, the rates were 24.3%, 27.1%, and 34.4%, respectively, with the difference no longer reaching statistical significance (P=0.25). Similarly, Butts, and co-authors [12] Butts and colleagues [12] investigated the relationship between vitamin D titre and reproductive outcomes in women undergoing ovarian stimulation for infertility due to either PCOS or unexplained causes. In the PPCOS II trial, women classified as vitamin D deficient defined as having serum 25(OH)D titre below 20 ng/mL (50 nmol/L) were found to have lower odds of ovulation and live birth, with adjusted odds ratios of 0.82 (95% CI:0.68-0.99; P=0.04) and 0.63 (95% CI:0.41-0.98; P=0.04), respectively, when compared to their non-deficient counterparts. In the AMIGOS trial, however, no statistically significant association was observed between vitamin D status and live birth outcomes. Across both trials, vitamin D deficiency was linked to an increased risk of early pregnancy loss, with an odds ratio of 1.6 (95% CI:1.0-2.6; P=0.05) among pregnant participants, reflecting a consistent pattern of adverse reproductive outcomes associated with insufficient vitamin D titre [9].

Conclusions

Vitamin D deficiency and insufficiency significantly associated with primary infertility and non-occurrence of pregnancy as well as outcome of pregnancy in terms of miscarriage and preterm labour.

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Conflict of Interest: Nil

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