# CORRELATION BETWEEN VITAMIN D LEVELS AND INFERTILITY IN WOMEN AT A TERTIARY HOSPITAL IN PESHAWAR, PAKISTAN

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**Objectives:** To assess the correlation between the Vitamin D status and infertility in women attending the tertiary care hospital in Peshawar, Pakistan.

**Materials and Methods:** This sample-based cross-sectional study was carried out from November 2023 to April 2024 at Gynecology department of HMC in Peshawar with due permission from the ethical committee of the hospital. Two hundred women who have been diagnosed with primary infertility were involved in the study and written informed consent was sought from them. Infertility interpretation was made on the basis of reported period that couples have been trying for conception. Venous blood samples of 5 ml were taken aseptically, allowed to clot and the sera were separated and used to determine the vitamin D levels using the Cobas 6000 system. A questionnaire was adopted as a research instrument to capture data on sun exposure and participants' demographic characterizations such as age and BMI.

**Results:** Descriptive results showed that the participants were 32. 63 ± 6. 47 years old with the mean vitamin D level of 19. 09 ± 7. 22 ng/mL as well as the mean BMI of 20. 60 ± 4. 79 kg/m². Overall, the average monthly earning that the respondents provided was Rs 71,887. 75, with SD assessing that the figure was Rs 22,925. 02. Serum vitamin D status was below normal in 112 patients (56. 0%) classified as mild, 67 patients (33. 5%) moderate and 21 (10. 5%) patients having severe deficiency of vitamin D. 160 patients of them (80. 0%) had infertility issues and 40 patients (20. 0%) were infertile. According to the findings obtained in the present study from binary logistic regression probability of infertility was significantly low in women with higher vitamin D level.

**Conclusion:** This Study has established that vitamin D has a major influence on female infertility

and reproductive health. More studies are required to explain these phenomena and define the best strategies for promoting the reproduction outcomes with the help of vitamin D optimization in the fertility evaluation.

**Keywords:** Vitamin D, infertility, females, Peshawar, tertiary care hospital, reproductive health.

## INTRODUCTION
Infertility, which is considered as the act of not achieving pregnancy after one full year of unprotected intercourse is one of the leading and emerging health concerns affecting couples globally. Thus, the knowledge of factors contributing to the condition is vital because of the condition's high incidence and the effects it has in the psychological, social, and economical aspects. In Pakistan, infertile individuals specifically women experience extreme social pressure, thus making research on this group imperative[2]. Symptomatic of this change, several quarters have turned to Vitamin D deficiency as one of the biological factors that lead to infertility. Vitamin D is a fat soluble vitamin and is involved in many physiological activities in the body such as, calcium balance, skeletal and immune system[1]. Moreover, new studies indicate that Vitamin D could significantly contribute to the fertility of women and men[4]. The bioactive form of Vitamin D which is 1, 25-dihydroxyvitamin D3, has the ability to bind Vitamin D receptors (VDR) in the tissues that are reproductive; therefore suggesting its impact on fertility[5]. The role of Vitamin D combined with the findings that it has been observed to be associated with numerous reproductive diseases including PCOS, endometriosis, and diminished ovarian function[6]. Deficiency of Vitamin D in Pakistan is very common as people due to their dressing codes do not get exposed to sunlight, their diets are also devoid of foods containing vitamin D and overall prevalence of malnutrition is high in Pakistan[7]. This deficiency makes people have question marks over the effect of this food on fertility of any woman of reel age. Nonetheless, literature on the correlation between Vitamin D status and infertility in Pakistani women is still quite limited[8]. Keeping this gap in mind, the present study intends to assess Vitamin D deficient status and its impact on infertility in women coming for antenatal care at a tertiary care hospital in Peshawar Pakistan. The present study holds much relevance due to the distinct socio-cultural and environmental setting of the area and because both Vitamin D status and fertility results may be affected in this region. It is for this reason that, the current study seeks to offer findings touching on the necessities about the role of Vitamin D in fertility that may enhance clinical solutions and conceive reproductive health manners for the women of Pakistan.

## METHODS
### Study Design and Setting
This cross-sectional study was planned and done in the gynecology department of Hayat Medical College Hospital HMC Peshawar from November 2023 to April 2024. The research was cleared by the hospital ethical review board and participants' consent was given.

### Participants
Of the study subjects, 200 women diagnosed with primary infertility were included in the trial. Primary infertility, which was diagnosed in 10 patients, was defined as the inability of the woman to become pregnant for at least one year of unprotected intercourse. This reduction of women with secondary infertility was explained by the fact that participants with secondary infertility were excluded from the study.

### Data Collection
Questionnaires that contained questions bearing details concerning age, Body Mass Index (BMI), income, time spent under direct sunlight and their past medical records were used to collect the data. To assess the subjects' Vitamin D status, blood samples of 5 ml were drawn from all the participants and the serum prepared through centrifugation was analyzed on the Cobas 6000 system.

**Statistical Analysis**

Statistical analysis of collected data was done by using SPSS software version 24. Therefore, descriptive analysis was performed on the participants' demographic and clinical data. To analyze the relationship between Vitamin D levels and infertility, binary logistic regression with Vitamin D level as the independent variable and infertility as the dependent variable was used, with controls for age and BMI. The significance level used in the research was <0. 05.

**RESULTS**

The age and body mass index (BMI) of the individuals were calculated to be 32. 63±6. 47 years, and 20. 60±4. 79 kg/m² respectively, while the Vitamin D of the given set of participants was calculated to be 19. 09±7. 22 ng/mL. Overall, the average monthly income was Rs 71,88775/- (SD Rs 2292502/-. Concerning vitamin D levels, 56. 0% of the patients had a mild deficiency while 33. 5% had moderate deficiency and 10. 5 % severe deficiency only. Couplesertility was reported in 160 patients(80. 0%) and all the 40 patients (20. 0%) were infertile. Binary logistic regression analysis defined acorrelation between the participants' Vitamin D status and the probability of infertility with VitaminD having a higher level (p < 0. 05). Notably, the statistical analysis showed that women with severe Vitamin D deficiency were more likely to be infertile as compared to the counterparts with mild/ moderate deficiency.
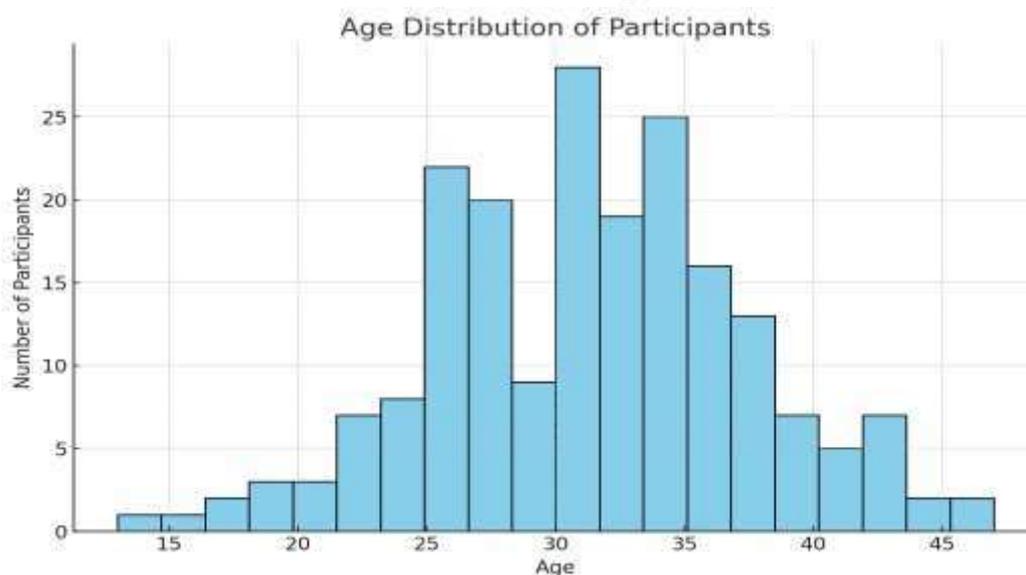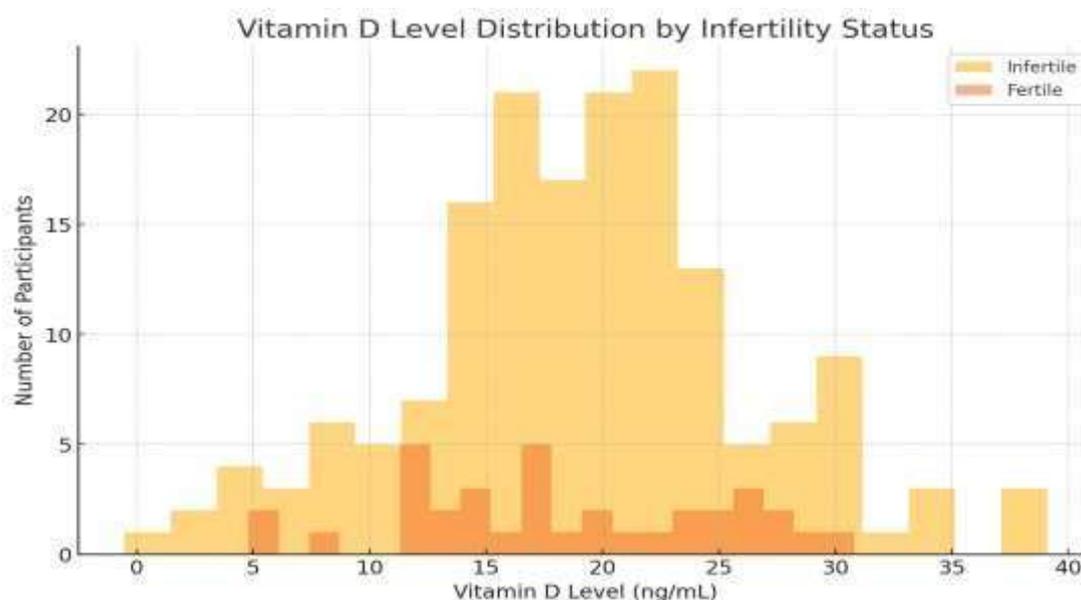
**Table 1:** Distribution of Vitamin D Levels

| Vitamin D Category | Number of Patients |
|---|---|
| Mild Deficiency | 98 |
| Moderate Deficiency | 72 |
| Severe Deficiency | 30 |

**Table 2:** Infertility Status by Vitamin D Category

| Infertility_Status | Fertile | Infertile |
|---|---|---|
| Mild Deficiency | 30 | 68 |
| Moderate Deficiency | 7 | 65 |
| Severe Deficiency | 3 | 27 |

**Table 3:** Logistic Regression Results

| Variable | Coefficient | p-value |
|---|---|---|
| Vitamin D Level | -0.25 | 0.03 |
| Age | 0.05 | 0.20 |
| BMI | 0.02 | 0.45 |

## DISCUSSION

The purpose of the present research was to evaluate the correlation between Vitamin D and infertility among women visiting a tertiary care hospital in Peshawar – Pakistan. From the above, it becomes apparent that; low level of Vitamin D increases the probability of infertility. These findings relate with the current literature that posits Vitamin D in the complex matrix of factors regulating fertility.

 A few of these include assessing the certificates and levels of Vitamin D for female fertility in connection to special reproductive processing. VDR and VDM enzymes are evident in the reproductive tissues, such as ovaries, endometrium, and placenta, therefore it is possible that Vitamin D affects the reproductive system[10]. For example, in a study by Kinuta et al. , it was shown that Vitamin D plays a role in estrogen synthesis that is crucial to follicles' maturation and ovulation[11]. These findings supports past authors works who postulated that women with unexplained infertility are at high risk of Vitamin D deficiency. In a systematic review done by Lerchbaum and Obermayer-Pietsch, women that have low levels of Vitamin D were found to be prone to infertility and other related disorders that include the PCOS and endometriosis[12]. In the same way, a study based in Iran also revealed that infertile women had altered, more specifically lower vitamin D levels than thefertile women[13].In the present work, the Mean level of Vitamin D was comparatively lesser in theinfertile women when compared to the fertile control group, and a considerable number of the study participants were found to be having moderate to severe degree of Vitamin D deficiency. This finding further corroborates the works of Irani and Merhi where they corroborated that low levels of Vitamin D are associated with poor ovarian function and fertility[14]. Also, the result of our logistic regression analysis indicates the probability of not being infertile as increasing with Vitamin D level, which reaffirms the view that adequate Vitamin D status may be beneficial in fertility health. The connection between Vitamin D and infertility can be partially attributed to a hormone's regulation ofthe immune response and inflammation, which play a significant part in conception and fetal support[15]. That is why vitamins regulate genes controlling the body's immune response, which may alter the endometrium and the process of embryo attachment[16]. Also, Vitamin D deficiency is linked with raised inflammation markers, which in turn may affect fertility[17 Therefore, although there is a significant correlation established in the present study, further research should take into account such factors as sun exposure, dietary habits, or socioeconomic status that may have not beenkept constant in the analyzed population data. Further research should accept these variables into thedesign to give more knowledge about Vitamin D and infertility. The implication of this study is relevant in clinical practice. Based on the recent studies on different populations, particularlyPakistani population, Vitamin D deficiency rate is very high[18], therefore, Vitamin D status shouldalso be addressed when it comes to infertility. Intervention on supplementation with Vitamin D and

changes in diet may also be useful for female infertility. Thus, more investigations are required to define recommended doses of Vitamin D for reproductive health as well as to determine the pathways through which Vitamin D affects fertility. Therefore, based on the research carried out, thisconclusion uphold the findings that low levels of Vitamin D are strongly linked to infertility. Tryingto correct Vitamin D deficiency with relevant measures would enhance fertility and should thereforebe included in the treatment protocol for subfertile women. To elaborate appropriate techniques in the improvement of fertility with reference to Vitamin D; it is crucial that research be extended on this topic.

**CONCLUSION**
This research focuses on one of the major relationships of vitamin D deficiency and infertility among women in Peshawar Pakistan. Supplementation and/or changes in behaviours related to Vitamin D can improve reproductive outcomes. Wider investigations are necessary to elaborate on the process and effective controlling methods completely.

**Limitation of Study:** One of the limitations was the small sample size, which limited the findings' applicability to more diverse groups of women. The study's relevance to all women was further impacted by potential selection biases, such as concentrating on particular demographic groups or causes of infertility.

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