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A Study on Vitamin D3 in Pregnant Women and a Discussion of the Role of Some Other Parameters

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Abstract: The relationship between low levels of vitamin D and various unfavorable pregnancy outcomes has been the subject of extensive research in the last several years. The only source of vitamin D for the fetus is the pregnant lady. Oily fish, fortified dairy products, and dietary supplements are the primary sources of vitamin D for expectant moms.. A increased risk of issues during a late-term pregnancy as well as some adverse consequences for the newborn have been associated with pregnancy-related vitamin D insufficiency. While there is variation in the published research results regarding gestational diabetes mellitus and preeclampsia, multiple large trials have suggested that taking supplements of vitamin D during pregnancy could reduce the likelihood of both diseases. Additionally, studies point to a potential link between elevated risk of preterm test results and decreased vitamin D concentrations ours.We evaluate the literature The contributing factors to the prevalence of vitamin D deficiency during pregnancy that contribute to it, and potential issues that may arise from it in our manuscript.

Key points: Vitamin D3, Pregnant Women.

INTRODUCTION::

Many negative pregnancy outcomes have been linked to insufficient amounts of vitamin D; in the last few years, a great deal of research has been done to explore this link. Certain hypotheses suggest that a deficit in vitamin D may increase the possibility of developing bacterial vaginitis, gestational diabetes mellitus, cesarean delivery, and preeclampsia during pregnancy [1]. The role of vitamin D in pregnancy physiology The most widely measured and distributed vitamin D molecule is 25-hydroxyvitamin D (25(OH)D) [2]. The kidneys' la-hydroxylase enzyme transforms vitamin D into its active form, 1,25-dihidroxyivitamin D (1,25(OH)2D) [3]. In addition, the parathyroid gland, bones, dendritic cells, placenta, and epidermis are active sites for la-hydroxylase activity.[4.5]. Because of its impact on the metabolism vitamin D for metabolism and the mineralization of bones, and calcium and phosphate is crucial for preserving an appropriate amount of minerals [2].Throughout pregnancy, the concentration of 25(OH)D remains largely unchanged [6]. The fetus receives vitamin D exclusively from the mother.[7]. Typically, the umbilical cord's vitamin D concentrations range from 60 to 89% of what the mother's blood contains. Vitamin D in its active form does not pass through the placenta. Nonetheless, during pregnancy, its quantities in the mother's blood double, most likely as a result of its synthesis in the placenta and fetal tissues [1.8]. The la-hydroxylase and 24-hydroxylase enzymes' activities dictate amount of 1,25(OH)2D present [9]. The pregnancy-related kidney, decidua, and placenta The enzyme la-hydroxylase is produced

when the CYP27B1 gene is expressed.On the other hand, weaker forms of vitamin D metabolites are produced by the enzyme 24-hydroxylase, which is produced by the CYP24A1 gene. The catabolic gene CYP24A1 may be methylated, which would explain the pregnancy-induced increase in 1,25(OH)2D concentration. The methylation of the CYP24A1 gene promoter, according to Novakovic et al., decreases the activity of 24-hydroxylase by decreasing the activity of the gene [9]. 1,25(OH)2D concentration may rise as a result of elevated calcitonin levels during pregnancy.[10]. No matter how much calcium is present in the blood, calcitonin augments 1,25(OH)2D production and la-hydroxylase activity [10]. The absorption of calcium into the digestive tract increases as a result [1]. Even when the mother's 1,25(OH)2D concentration increases to 100%, her serum calcium content remains unchanged [11]. An increase in the concentration of vitamin D-binding protein is another significant change that occurs during pregnancy [12]. The kidney's glomeruli filter the vitamin D-binding protein, which then binds to the circulating form of vitamin D and is reabsorbed in the proximal tubules. The metabolism and activity of vitamin D during pregnancy may be impacted by vitamin D-binding protein. Because it has a higher affinity for 25(OH)D than 1,25(OH)2D and encourages the reabsorption of 25(OH)D from the glomerular filtrate, it is crucial for maintaining 25(OH)D [12]. For some people, sun exposure is their primary source of vitamin D. [12.26]. Living mostly indoors, wearing clothing to protect the skin from the sun, wearing sunscreen and staying in the shade, being in direct sunlight through windows, and air pollution with elevated ozone concentrations that absorb UV light are all factors substances inhibit the skin's capacity to synthesize vitamin D [12]. Sunscreen inhibits the production of vitamin D in the skin by 95–99%, while it reduces it by 90% in black skin.[27]. Higher geographic latitudes also result in less vitamin D being produced [12].

Analyzing Diabetes Glucose intolerance that is initially identified during pregnancy is known as gestational diabetes. 2–6% of pregnant women in Europe [33] and 14% of pregnant women Gestational diabetes in the US [34]. Vitamin D has a variety of potential effects on glucose metabolism. The vitamin D response element is present in the human insulin gene promoter, pancreatic B-cells express la-hydroxylase, and the active form of vitamin D binds to the vitamin D receptor on pancreatic κ-cells [35]. Studies on the effects of vitamin D on insulin production and sensitivity have also been linked to evidence supporting the preservation of glucose tolerance.36]. Many studies have looked into how vitamin D supplementation during pregnancy affects the prevalence of gestational diabetes. Researchers Yap et al. looked at the prevalence of poor glucose tolerance in Australian women of mixed ethnic backgrounds.. [56] on different dosages of vitamin D supplementation. Prior to the twentieth week of pregnancy, two groups of 179 pregnant women with vitamin D levels < 80 nmol/L were randomly assigned for the study's purposes. Vitamin D was given daily to one group (400 IU) and to the other (5000 IU). The incidence of impaired glucose tolerance was not different between the 26th and 28th week of pregnancy, according to their findings. [56].
Data from two prospective randomized trials including 504 people of mixed race were combined in a study done by American researchers [57]. The study's subjects were carrying children till the sixteenth week of their pregnancies. Three distinct supplementing approaches were contrasted. Every day, 400 IU, 2000 IU, and 4000 IU of vitamin D were given to the first group, the second group, and the third group. There was a trend toward a decreased incidence of gestational diabetes in the group that got higher dosages of vitamin D, even though there was no appreciable difference in the incidence among the three groups.[57].

These observational and supplementation studies have produced inconsistent findings, indicating that lifestyle factors, body mass index, and weight increase all have a role in the complicated illness known as gestational diabetes. Considering that women who are fat have more vitamin D insufficient and that gestational diabetes is more common in these women, analyzing the effect Effects vitamin D on the prevalence of gestational diabetes gets increasingly challenging [47]. Additionally, a major drawback of these studies is their cross-sectional design, which leaves open the question of how measured vitamin D links to the risk of developing gestational diabetes in the long run [53].

Complete Blood Count analysis Early in In order to determine whether the expectant woman has developed any potential health issues, a Complete Blood Count (CBC) test is conducted during pregnancy. In this examination, One can observe the red blood cells that transport oxygen throughout the body. You might be offered iron supplements if your blood iron level is low. The amount of red blood cells, white blood cells, and platelets is also ascertained by the CBC.

The CBC test is essential because it aids in the diagnosis of infections or diseases in the expectant mother. An overall assessment of the expectant mother's health can also be acquired, since the test also counts the three different types of blood cells.

Measurement of Blood TestRBCs, or red blood cells Her ability to transfer oxygen from her blood to the developing foetus can be inferred from her hemoglobin and red blood cell counts. Pregnant women with low hemoglobin levels are more likely to feel drowsy and ill. To remedy this, doctors recommend iron supplements. WBCs, or white blood cells The human body depends heavily on white blood cells, particularly during pregnancy. are vital components of the immune system, which is essential for preventing the mother and the kid from illness.This also determines whether the mother has any blood-related illnesses, such as leukemia or sickle cell anemia. platelets Although platelets are the smallest of the three blood cell kinds, they are quite important. Among the three types of blood cells are platelets. Platelets are responsible for clotting blood. If the mother has a high platelet count, she is more susceptible to unanticipated internal blood clots and hemorrhages. The blood won't clot rapidly enough if it is too low. Blood Type (Hb/Hgb) The oxygen-holding protein in your blood is called hemoglobin. Hematocrit (Hct): This determines how much beta-lactate (BLO) is inside your blood. Mean corpuscular volume, or MCV, is a measurement of the average size of your red blood cells.

MATERIALS AND WORKING METHODS :

We will talk about the practical aspects of our work in the hospital in this, including the materials and equipment we used to collect samples and conduct analyses.For the test CB, we used an EDTA tube. and the gel tube for the glucose and vitD3 tests Additionally, the hospital's laboratory staff assisted us in operating the Visible Spectrometer apparatus, which we used to analyze sugar. On the one hand, there are several varieties of both this gadget and other devices. A few formulae to compute the output are included in the visible spectrum instrument in a currency. The amount of light that flows through a particular solution is measured quantitatively by a spectrophotometer.A monochromator in a spectrophotometer chooses a single wavelength from the continuous spectrum when light from a lamp is sent through it. A photodiode or other photodetector is used to measure the intensity of the light after it has passed through the sample in order to [61]calculate the transmittance at this wavelength.The following steps might be used to summarize what occurs in the spectrophotometer: The sample reflects light back from the light source. Light is absorbed by the sample. The light that remains after it passes through the sample is captured by the photoelectron. The photometer turns the amount of light that the sample absorbs into a numerical value. The outcome is either sent to a computer for processing (curve smoothing, reference line correction) or plotted directly on a plot. The majority of spectrophotometers need to be zeroed, which is the process of recording each material's absorbance in relation to the beginning material that is yellow in order to determine the absorbance of all other materials. The absorbance [62]is then displayed by the spectrophotometer as a percentage.(the amount of light absorbed relative to the starting material)

The tools and supplies we used are as follows:

1. CBC Mindray
2. Afias-6
3. Spectrophotometer
4. Tube EDTA
5. Gel Tube

RESULTS AND DISCUSSION:

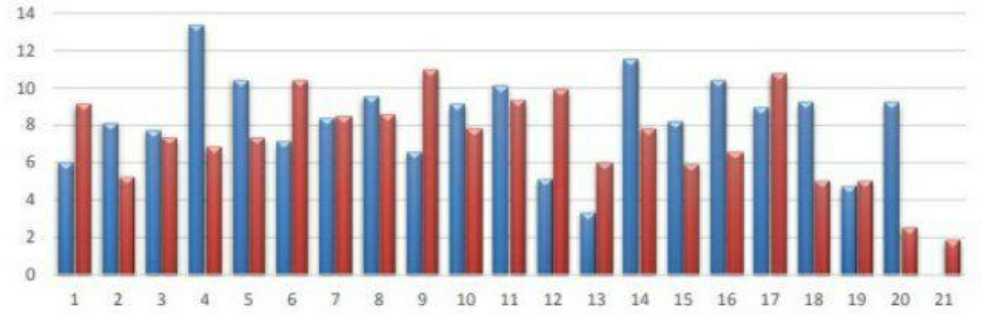
We completed our work in terms of working on our research after working in the hospital and becoming familiar with the equipment, performing analyses, and extracting results from each analysis. We then used the SPSS program to carry out the statistical analysis. We hope that the supervisor will obtain this research and that our work effort will be successful. first pregnancy trimester Third pregnancy trimester

	Mean	S.D	T-test	Mean	S.D.	T-test
WBC	**8.33**	**2.40**	**000.**	**7.24**	**2.49**	**000**
HGB	**11.25**	**0.84**	**.000**	**10.94**	**2.27**	**000**
HCT	**35.83**	**2.93**	**.000**	**34.42**	**6.98**	**000**
PLT	**217.8**	**70.51**	**.000**	**233.00**	**63.18**	**000**
VitD3	**18.77**	**12.79**	**.001**	**18.49**	**12.85**	**001**
Glucose	**89.15**	**11.85**	**.000**	**87.95**	**9.84**	**001**

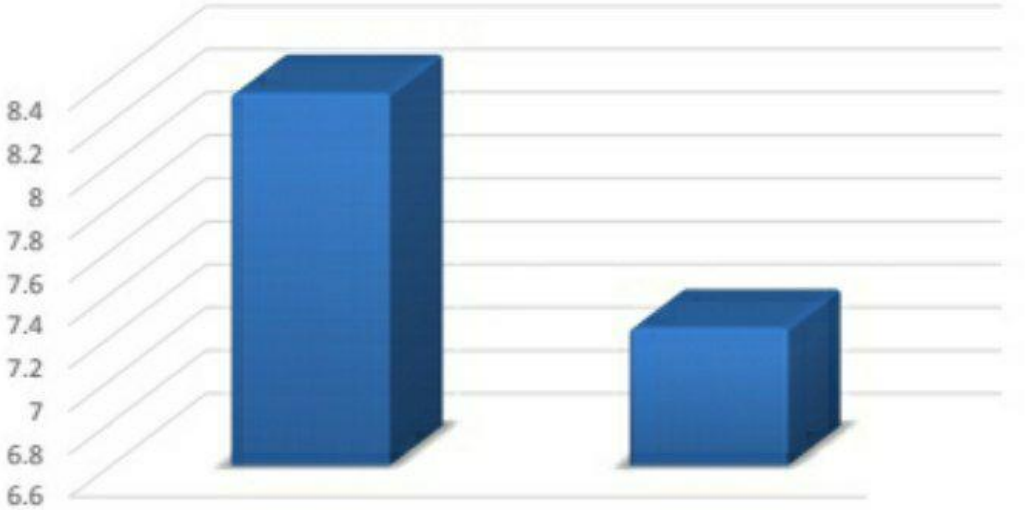
Table 1: The overall rate of pregnancy women in the first and third trimesters (WBC, HGB,HCT,PLT, VitD3, and glucose)

Following medical analyses and statistical analysis with the SPSS software, it was determined that pregnant women occurred as follows: WBC

WBC IN THE FIRST AND THIRD TRIMESTER OF PREGNANCY



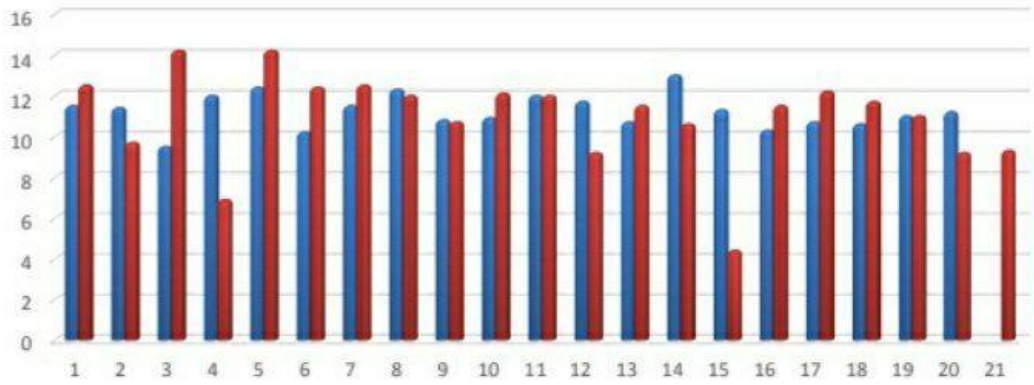
The WBC in the first and third trimesters of pregnancy is depicted in Figure (1). Significant differences were found at the significance level (p=0.000).



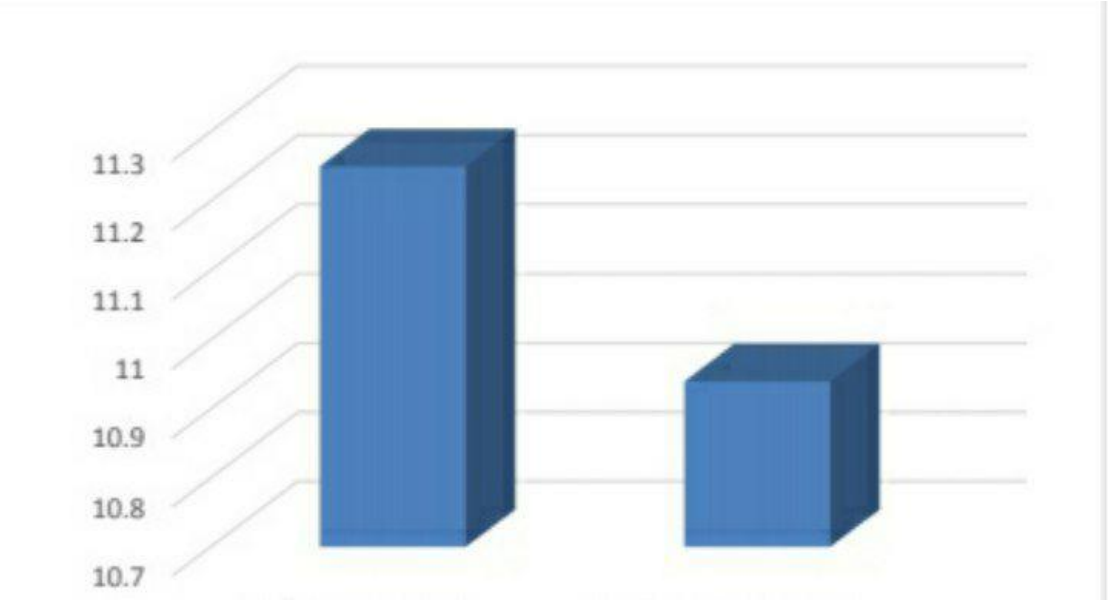
WBC (first pregnancy trimester)-

-WBC (third pregnancy trimester)

HGB : HGB DURING FIRST AND THIRD PREGNANCY TRIMESTER



The HGB in pregnancy's first and third trimesters is depicted in Figure (2). Significant differences were found at the significance level (p=0.000).



HGB(first pregnancy trimester)

HGB(Third pregnancy trimester)

HCT : PREGNANCY: HCT IN THE FIRST AND THIRD TRIMESTER

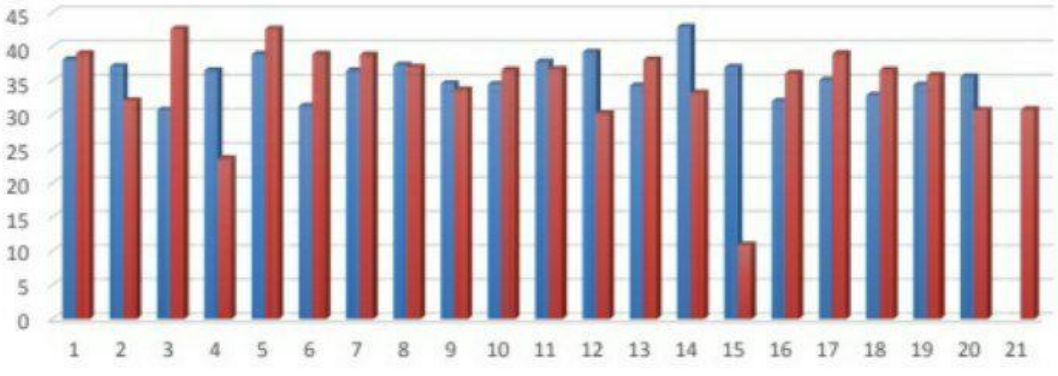
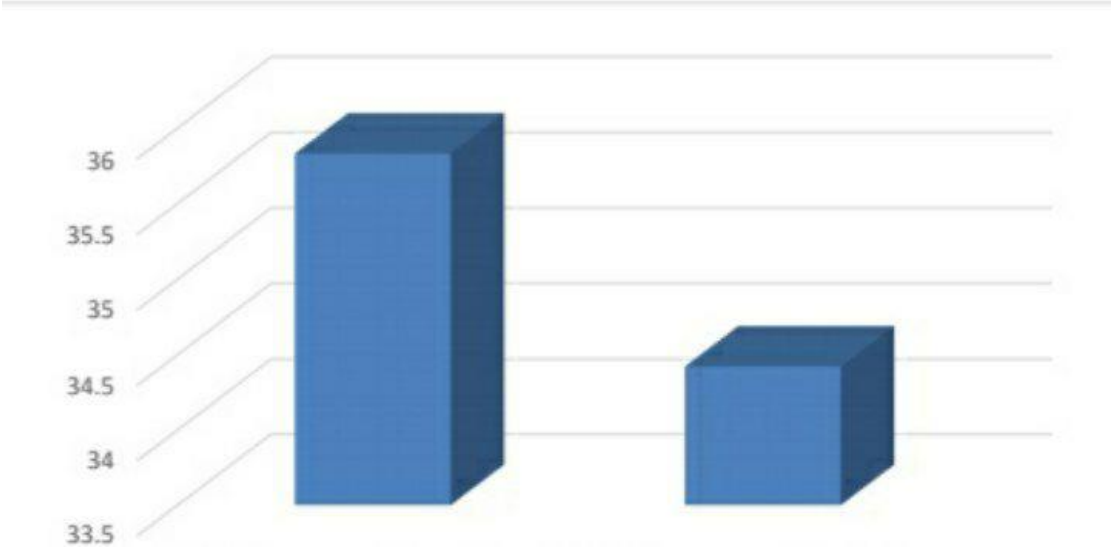


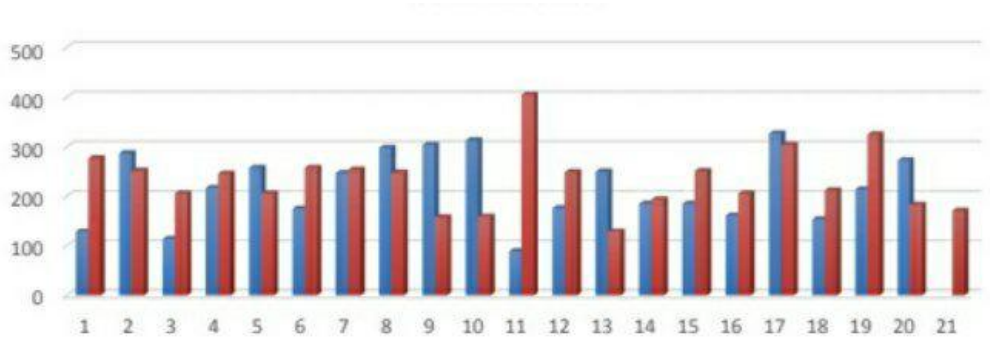
Figure 3 shows the HCT in the first and third trimesters of pregnancy. At the significance level (p=0.000), significant differences were discovered.



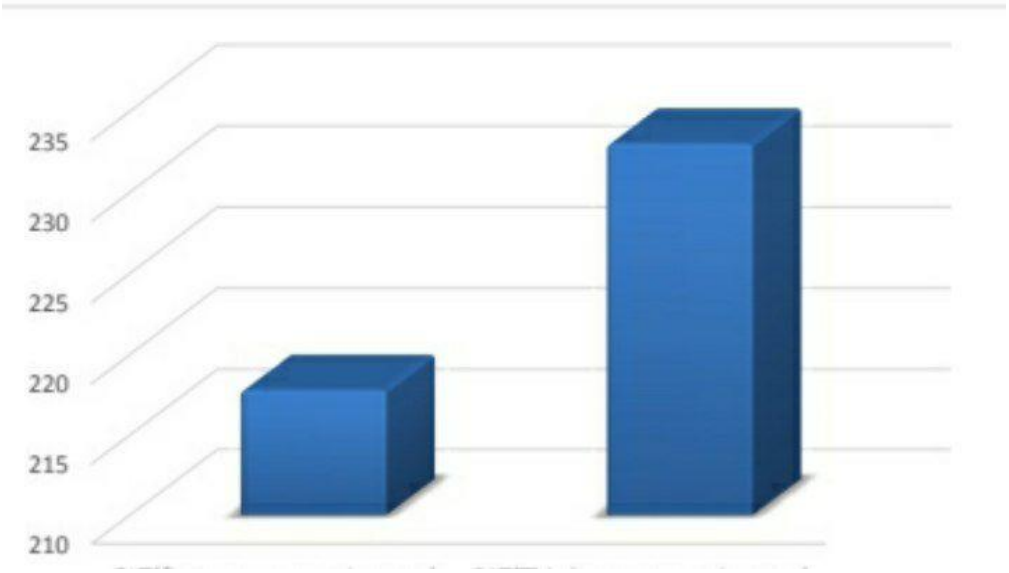
HCT first pregnancy trimester(

HCT(Third pregnancy trimester)

PLT : PLT DURING FIRST AND THIRD PREGNANCY TRIMESTE



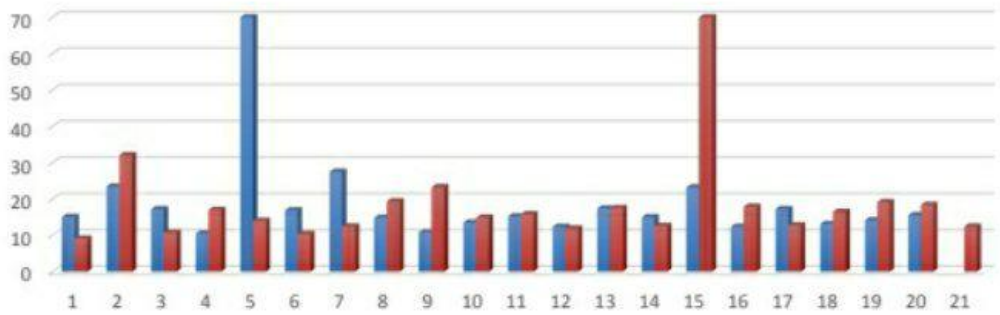
The PLT during pregnancy's first and third trimesters is depicted in Figure (4). Significant differences were found at the significance level (p=0.000).



PLT(first pregnancy trimester)

PET(Third pregnancy trimester)

VitD3 : VITD3 DURINF FIRST AND THIRD PREGNANCY TRIMESTER



The vitamin D3 levels in the first and third trimesters of pregnancy are depicted in Figure (5). Significant changes were found at the significance level (p=0.001).

VitD3 (first pregnancy trimester) VitD3 (third pregnancy trimester)

Glucose:GLUCOSE DURING FIRST AND THIRD PREGNANCY TREMISTER

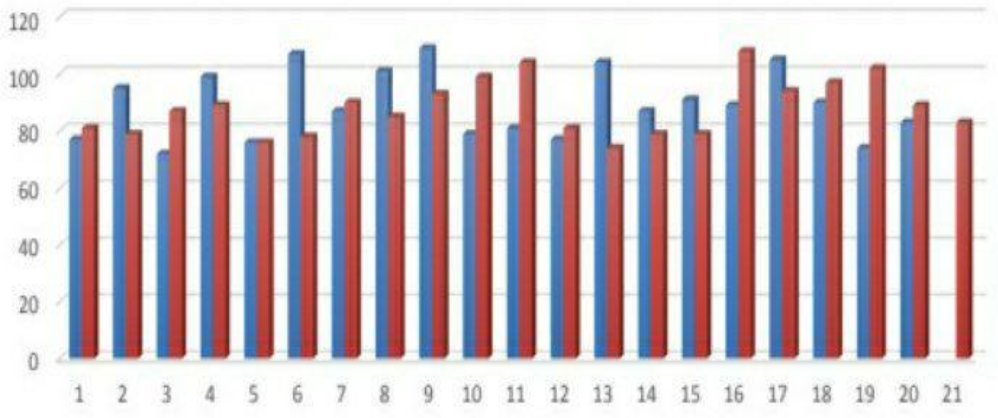
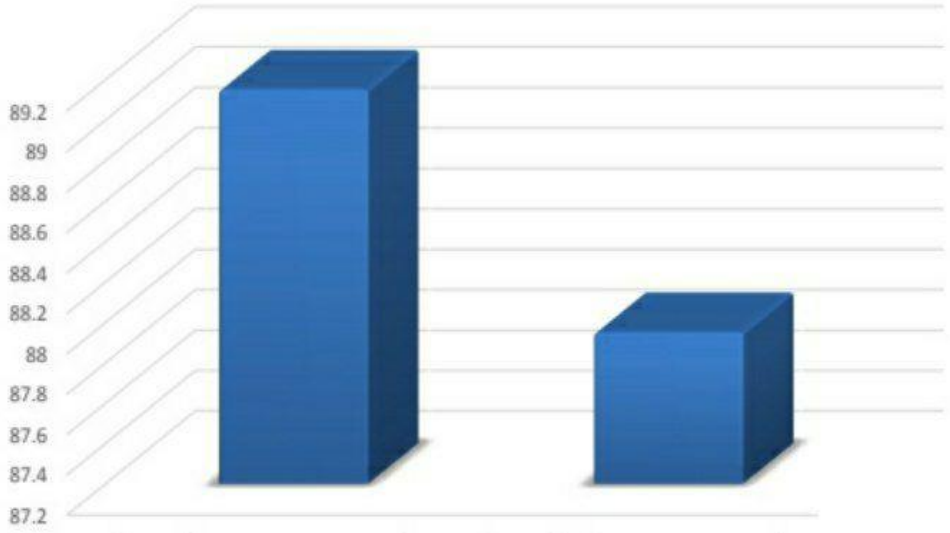


Figure (6) depicts the levels of glucose during a pregnancy's first and third trimesters. Significant differences were seen in the first trimester of pregnancy at the significance level of p=0.00, and in the third trimester at p=0.001.



Glucose (first pregnancy trimester)

Glucose (third pregnancy trimester)

DISCUSSION

The study's conclusions demonstrated that the white blood cell (WBC) levels were normal in the initial and third stages of gestation. Our findings demonstrated that all first- and third-trimester pregnant women had normal white blood cell counts, with 18 of the 20 White blood cell counts are typical in women in the first and third trimesters. A noticeable variation was observed (p=0.000) (1). It was discovered that in the first and third trimesters of their pregnancies, almost eight out of twenty pregnant women had decreased hemoglobin (HBG) levels. A noticeable variation was observed (p=0.000) (2).Expectant mothers in usual pregnancies experience a minor declinea significant increase in plasma volume in comparison to the rise in hemoglobin mass and erythrocyte volume, which results in hemoglobin levels, such as physiological or dilated anemia in pregnancy. The rate at which the mother's blood is supplemented with erythrocytes and plasma between the end of the second trimester and the start of the third trimester of pregnancy also exhibits a greater difference. 61%. The Centers for Disease Control and Prevention recognize anemia in the first and third trimesters of pregnancy as defined by hemoglobin values of less than 11 g/dL (hematocrit <32%) and less than 10.5 g/dL (hematocrit <32%) in the second trimester.[62] Anemia strikes between sixteen and twenty-nine percent of expectant mothers during the final three months of their pregnancy. avoid anemia when expecting. Ensure you are getting adequate iron. Consume meals that are well-balanced and increase your intake of iron-rich foods. Hematocrit (HCT) results showed that The outcomes of the initial and latter trimesters of gestation were typical. A noticeable variation was observed (p=0.000) (3). The women's ratios were all within normal limits in the first and third trimesters of their pregnancies.and did not experience a reduction, according to the results obtained using PCV (Packed Cell Volume). Out of 20 pregnant women, about 18 had normal blood cell volumes. There was a noticeable change (p=0.000) (4).similaradditionally, the initial PLT (platelet) results were normal. and the third stage of gestation All of the pregnant women had normal levels, according to our findings.of platelets Out of 20 pregnant ladies, about 18 were normal. The physiology of a typical pregnancy includes considerable alterations in the hematological parameters and biochemical coagulation system (p=0.000). A significant difference was noted (5). These modifications offer a safeguard during birth and seem to be connected to the uteroplacental circulation's growth.In this study, healthy pregnant women's primary hematological alterations in the first and third trimesters are examined in relation to HGB, HCT, and MCV. Comparing the current study's results to normal reference values, it revealed clinically significant (≤ 0.05) differences in HGB, HCT, and MCV. Many research undertaken among healthy pregnant women support our findings. This result validated the hypothesis that the total blood volume rises by roughly 1.5 L during pregnancy. (sugar test) Additionally, our glucose findings were normal because the levels of pregnant ladies were normal. In the third trimester, roughly 19 out of 20 pregnant women had a normal level, and one woman had a slightly higher percentage than the normal level. being pregnant throughout the first trimester Our usual was pregnancy. In the first trimester of pregnancy (p=0.000) and the third trimester (p=0.001), a significant difference was seen (6). When According to our findings, all pregnant women—roughly 18 out of 20—have a vitamin D3 deficit between the first and third trimesters of their pregnancy, with their levels being below normal. and there was a general drop in vitamin D3 throughout pregnancy, which affects pregnant women in the first and third trimesters. We discovered that most pregnant women have a vitamin D3 deficit, and a significant difference was seen (p=0.001) (7) that we came to the conclusion that vitamin D3 is impacted by pregnancy within the initial and latter trimesters. In order to supply the calcium required for the accretion of fetal bone mineral, the mother's vitamin D and calcium metabolism vary dramatically during pregnancy and lactation. During the first trimester, the fetus accumulates 2-3 mg/d in the skeleton; however, during the second trimester, this rate of accumulation rises.Pregnant women's bodies produce more calcium in response to the fetus's needs.

absorption throughout the first trimester of pregnancy, reaching a peak in the latter half. In addition to theDuring pregnancy, the elevated intestinal absorption of calcium is counterbalanced by an increase in calcium excretion in the urine, which keeps the level of ionized calcium in the blood constant. Compared to prepregnancy values, 1,25(OH)2D levels in plasma rose threefold during the first trimester of pregnancy, peaked in the third trimester, and then, in some small studies, rebounded to normal or below normal during lactation. Plasma 25(OH)D levels stay stable unless there is a change in intake or synthesis..[69]

CONCLUSION

This review's objective was to provide the results of several study types on vitamin D and pregnancy problems.

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