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RESEARCH ARTICLE
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FREQUENCY OF VITAMIN D DEFICIENCY IN WOMEN WITH PRE-ECLAMPSIA

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Abstract

Introduction: Preeclampsia (PE) is a multisystem disorder of pregnancy classically characterized by hypertension with significant proteinuria after 20weeks' gestation. Inadequate plasma 25(OH)-vitamin D concentration during early pregnancy seems to be associated with more pronounced changes in total cholesterol and low-density lipoprotein cholesterol throughout gestation, andwith an increased risk of developing hypertensive disorders.

Objective: To determine the frequency of vitamin D deficiency in women with pre eclampsia

Duration of Study: 11th June 2020 to 11th December, 2020.

Setting: Department of Gynecology and Obstetrics, Hayatabad Medical Complex,Peshawar.

Study Design: Cross sectional study

Materials and Methods: A total of 135 cases presenting with PE were selectedin a consecutive manner and checked for vitamin D levels.

Results: The mean age and standard deviation of the sample was 28.7 $\pm$ 4.7 years.
The mean parity was 1.3 $\pm$ 1.2 and mean BMI of the study sample was 26.3 $\pm$3.5kg/m^2. The mean period of gestation was 32.4 $\pm$ 2.5 weeks. The mean Vitamin D level was 18 $\pm$ 8.7mg/ml and vitamin D deficiency was recorded in 62.2% of women.

Conclusion: Vitamin D deficiency is a common problem in our local population with PE and is no significantly associated with age, BMI or period of gestation. More studies are required to develop association of vitamin D with PE after adjusting for factors which can aggravate vitamin D deficiency in PE patients.

Key Words: Pre-eclampsia, hypertensive disorders of pregnancy, body mass index, vitamin D deficiency

Introduction

Preeclampsia (PE) is a multisystem disorder of pregnancy classically characterized by hypertension with significant proteinuria after 20 weeks' gestation[1, 2]. This disorder affects 2%–5% of pregnant women and is one of the leading causes of maternal and perinatal morbidity and mortality. Worldwide, 76,000 women and 500,000 babies die yearly from this disorder[3]. PE can be subdivided into preterm PE (with delivery at <37 weeks' gestation) and term PE (with delivery at ≥37 weeks' gestation). Preterm PE is associated with a higher risk of adverse maternal and perinatal outcomes

than late-onset or term PE[4].
The desire to predict PE effectively in the first trimester of pregnancy is driven by the need to identify pregnant women who are at high risk of developing the disorder, so that preventive measures can be initiated as early as possible in order to improve placentation and reduce the incidence as well as severity of the disorder[5]. Despite the complex pathophysiology of PE, recent advances have made it possible to predict and prevent preterm PE in the first trimester of pregnancy[6].
Vitamin D deficiency, as measured by circulating 25(OH)-vitamin D concentrations, is reported to be as high as 40% among pregnant women and is also very common and profound during lactation[7]. In Mediterranean countries, where vitamin D deficiency is even more prevalent (up to 60–80%), neither vitamin D supplementation nor policies of food fortification are currently recommended during pregnancy, and they remain entirely absent from clinical practice[8]. As pregnancy progresses, the requirements of vitamin D increase and consequently, any preexisting vitamin D deficiency can worsen[9]. In particular, a compromised maternal vitamin D status has been associated with an approximately two-fold increased prevalence of congenital heart defects in offsprings and a higher incidence of fetal miscarriage, gestational diabetes, bacterial vaginosis and perinatal depression in mothers, other than impaired fetal and childhood growth[10]. Furthermore, inadequate plasma 25(OH)-vitamin D concentration during early pregnancy seems to be associated with more pronounced changes in total cholesterol and low-density lipoprotein cholesterol throughout gestation, and with an increased risk of developing hypertensive disorders[11]. In one study the prevalence of vitamin D deficiency was very high with more than 3 quarters (78%) of all participants with PE having a serum 25(OH) D level < 30 ng/ml[12]. In another study, 86.5% of women with hypertensive disorders of pregnancy had severe vitamin D deficiency[13]. In another study, 83.3% of women in PE group had severe deficiency (25(OH) D levels <10 ng/ml) compared to 68% women in normal pregnancy group[14].

Materials and methods

Study design: Cross-sectional study

Duration of Study: 11th June 2020 to 11th December, 2020.

Setting: Department of Gynecology and Obstetrics, Hayatabad Medical Complex,Peshawar.
Sample size: 135, using the following assumptions;

Anticipated proportion of vitamin D deficiency in PE patients: 78%[12]Confidence level 95%
Margin of error 7%

Sampling Technique: Non-probability Consecutive sampling

Sample selection
Inclusion criteria:
1. All women with age between 20-35 years and having singleton pregnancy.
2. Women presenting with PE before 37 weeks of gestation.

Exclusion criteria:
1. Patients with already diagnosed of osteomalacia or vitamin D deficiency(on medical records)
2. Patients who have hepatic diseases (as diagnosed by specific investigations or medical records)
3. Patients on vitamin D supplementation (on medical records and history)

Data collection procedure
The study was conducted after approval is obtained from hospital ethical and research board. All

pregnant women having singleton pregnancy and having PE was invited to participate in the study through OPD. The purpose and benefits of the study was explained to all women, they was assured that study is done purely for research and data publication, risk and benefits was explained to all women and if agreed upon, an informed written consent was obtained.

All women was subjected to detailed history and clinical examination. Routine lab investigations as per Antenatal protocols will also be done. 10cc of venous blood was obtained from all women under strict aseptic technique and wassent to hospital laboratory for measuring the vitamin D level. All women was managed as per RCOG guidelines under supervision of an expert obstetrician having minimum of five years of experience. All the laboratory investigations was done by single hospital laboratory under supervision of an expert pathologist having minimum of five years of experience. All this data was recorded on a specially designed proforma. Confounding factors and bias was controlled by strictly following exclusion criteria.

Data analysis procedure

Data was entered into SPSS version 20. Mean $\pm$ standard deviation was calculated for numerical variables like age, BMI, period of gestation, parity, serum vitamin D level and frequency / percentages was calculated for categorical variables like vitamin D deficiency. All the results were presented as tables and graphs.

Results

A total of 135 women presenting with pre-eclampsia(PE). The mean age and standard deviation of the sample was 28.7 $\pm$ 4.7 years. We distributed the patients in three different age groups (Figure 1) The mean parity was 1.3 $\pm$ 1.2 (see table 1 for categories) and mean BMIof the study sample was 26.3 $\pm$ 3.5kg/m^2. See table 2 for BMI categories. The mean period of gestation was 32.4 $\pm$ 2.5 weeks (see table 3 for categories). The mean Vitamin D level was 18 $\pm$ 8.7mg/ml and vitamin D deficiency was recorded in 62.2% of women (table 4)

Table 1: Age-wise distribution of sample (n=135)

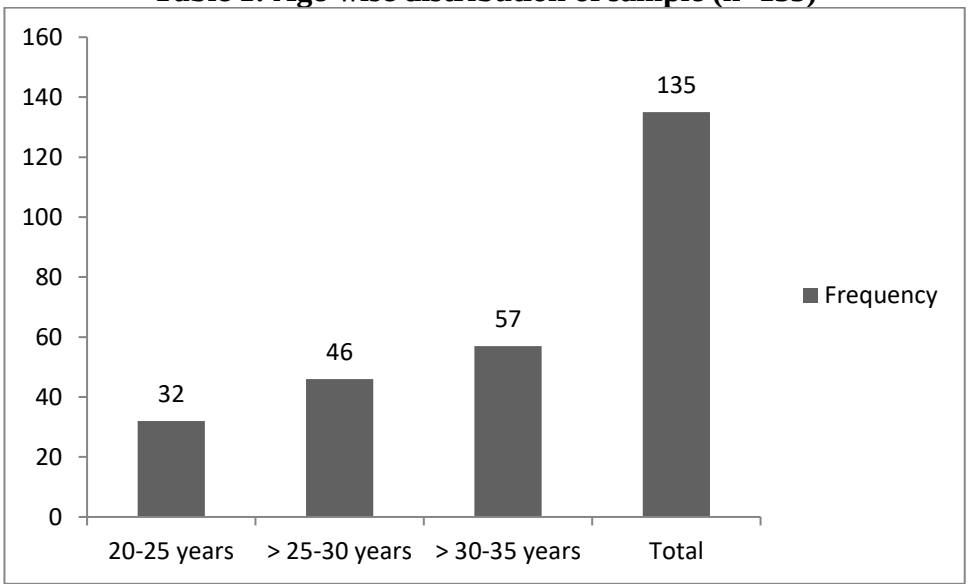

Table 1: Parity wise distribution of the sample: (n = 135)

Parity	Frequency	Percent
Nullipara	52	38.5
Multipara	83	61.5
Total	135	100.0

Table 2: Body mass index of sample (n = 135)

BMI	Frequency	Percent
Normal (20.4-24.9)	56	41.5
Overweight (25-29.9)	49	36.3
Obese (> 29.9)	30	22.2
Total	135	100.0

Table 3: Period of gestation (n =135)

PoG Categories	Frequency	Percent
29-33 weeks	85	63.0
> 33 to < 37 weeks	50	37.0
Total	135	100.0

Table 4: Frequency of vitamin d deficiency (n =135)

Vitamin D deficiency	Frequency	Percent
Yes	84	62.2
No	51	37.8
Total	135	100.0

DISCUSSION

The risk of preeclampsia increases with a history of preeclampsia in previous pregnancies [15-18]. The recurrence rate has been reported to be 13–18%[19, 20]. When the previous preeclampsia is severe, the recurrence rate has been reportedto be as high as 47%[16].

Maternal vitamin D deficiency is a widespread public health problem. Most research on vitamin D and preeclampsia has been conducted in predominantly white populations with small numbers of preeclampsia cases, and results have been inconsistent[21]. Vitamin D deficiency in pregnant women is due to inadequate sunlight exposure, limited vitamin D–rich food sources, and the use of prenatal vitamins with low doses of vitamin D. Vitamin D has diverse and protean functions that may be relevant in the pathophysiology of preeclampsia, including abnormal placental implantation and angiogenesis, excessive inflammation, hypertension, and immune dysfunction[22]. In the current study, 135pregnant women between 28-36 weeks of gestation were recruited in the study, they were subjected to measurement of 25(OH) vit D level.

Literature has reported a significant relation between obesity and serum level of 25(OH)vit D. Zhao et al.,(2017)[23], who performed a cohort study anddemonstrated that the serum 25(OH) D concentration was much lower in pregnant women with a pre-pregnancy BMI of ≥ 25 kg/m^2. Shantavasinkul et al.,(2015)[24] reported that being overweight or obese might have an adverse effect on nutritional 25(OH)vit D status. Also, Zoya et al. (2009)25 performed a study population to detect the dependency of 25(OH)vit D status on BMI and found that there is a significant decrese of 25(OH) vit D level with increasing BMI p value <0.01. Mrinal et al. (2014)[26], performed a cross sectional study to detect the dependency of 25(OH) vit D status on the anthropmetric data as BMI and found that deficient 25(OH)vit D <20 ng/ml is statsticaly related to BMI >30 p value =0.001. Our study found that 62.2% if women had vitamin D deficiency. Our result was in agreement with Wetta et al. (2014)[27], who performed case control study and measured serum 25(OH)vit D level and found that mean serum 25(OH) vit D levels was not significantly different between women with preeclampsia andcontrols p.value = 0.46. Whereas Powe et al. (2010)[21] performed case control study on first trimester serum total 25(OH) vit D and found that total 25(OH) vitD levels were similar in the preeclampsia group and contol

group p.value =0.435. Disagree with Singla et al.,(2015)[28], who measure serum 25(OH)vit D level in preeclampsia cases and normotensive cases and found that mean serum 25(OH) vit D was statistically significantly lower among preeclampsia cases (mean±SD 9.7± 4.95 ng/ml) as compared to normotensive controls (mean±SD 14.8 ± 6.68 ng/ml) p value =0.0001.

The result agreed with Lisa et al., (2014)[29] who performed case cohort study at ≤26 weeks' gestation and concluded that Maternal 25(OH)vit D deficiency may be a risk factor for severe preeclampsia but not for its mild subtypes. Arthur et al.,(2010)[30] found that maternal 25(OH)vit D concentration was lower in women who subsequently developed severe preeclampsia compared with controls. Maternal 25(OH)vit D of less than 50 nmol/liter was associated with an almost 4-fold odds of severe preeclampsia (unadjusted odds ratio, 3.63; 95% confidence interval, 1.52- 8.65) compared with levels of at least 75 nmol/liter. They concluded that maternal 25(OH)vit D deficiency was associated with increased risk of severe preeclampsia. 25(OH)vit D deficiency may be a modifiable risk factor for severe preeclampsia. Christopher et al.,(2010)[31], measured total 25(OH) vit D levels in early onset severe preeclampsia (EOSPE) cases group and normotensive groups and found that statistically significant difference in the 25(OH)vit D levels between the two groups EOSP (18ng/ml)control group (32ng/ml) p. value<0.001. In agreement with Zhao et al. (2017)[23] found that the serum 25(OH)vit D concentration was significantly lower in pregnant women who subsequently developed severe preeclampsia compared with those who did not. They concluded that maternal 25(OH)vit D deficiency was strongly associated with increased odds for severe preeclampsia. Sima et al. (2017)[32] performed case control study on 75 healthy pregnant women and 74 pregnant women with preeclampsia (46 mild preeclampsia and 28 severe preeclampsia). They found that mean serum 25(OH) vit D level was 27.7±15.3, 22.9±15.9 and 27.6±16.6 in normal, mild preeclampsia, and severe preeclampsia groups P >0.05, so 25(OH)vit D deficiency was not different between the groups. There was no association between 25(OH)vit D deficiency and preeclampsia severity in the study. Mohammad et al (2015)[33] found that comparison of 25(OH)vit D levels between normal primigravida women and severe preeclampsia women groups showed no significant differences (P >0.05). Their results were also in contrary to our results.

Conclusion

Vitamin D deficiency is a common problem in our local population with PE and is no significantly associated with age, BMI or period of gestation. More studies are required to develop association of vitamin D with PE after adjusting for factors which can aggravate vitamin D deficiency in PE patients.

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