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Are Lowered Blood Platelets Count an Indicator of Hypertension Among Pregnant Women

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ABSTRACT

Background: Pregnancy-related hypertensive conditions, including gestational hypertension and preeclampsia, are leading causes of morbidity and mortality among mothers and fetuses worldwide. Potential, affordable hematological markers that could help with early detection and monitoring of these disorders include platelet count and platelet indices. **Objective:** In order to assess their potential as diagnostic and prognostic tools in prenatal care, the purpose of this study was to determine if decreased platelet counts and changed platelet indices are signs of hypertension in pregnant women. **Methods:** A six-month qualitative study was carried out at a Quetta, Balochistan, tertiary care hospital. Purposive sampling was used to enroll 130 pregnant women in total. Standard blood pressure criteria and clinical observations were used to categorize the participants into normotensive and hypertensive groups. Platelet count, mean platelet volume (MPV), and platelet distribution width (PDW) were measured by whole blood counts. Frequency distribution tables and group comparisons were used to analyze the data. **Results:** According to the study, pregnant women with hypertension disorders had far lower platelet counts than normotensive women. Of these, 31.5% had mild thrombocytopenia (100,000–150,000 cells/mm^3) and 23.1% had severe thrombocytopenia (<100,000 cells/mm^3). Furthermore, higher platelet activation and turnover were indicated by the fact that 40.0% of hypertensive participants had increased platelet distribution width (PDW >16%) and 46.2% had elevated mean platelet volume (MPV >11 fL). Particularly in cases of pre-eclampsia and eclampsia, these hematological alterations were associated with the degree of hypertension. **Conclusion:** Pregnancy hypertension correlates with lower platelet counts, higher indices, aiding early, affordable detection in resource-limited settings.

INTRODUCTION

It is believed that, the hypertensive diseases of pregnancy have a correlation with the short term and long term cardiovascular complications of the patient (ie: myocardial infarction and stroke and all-cause deaths during the pregnancy), but what relation this correlation has to the hypertensive diseases of pregnancy is quite unclear, wherein it is being thought of the relationship of the hypertensive diseases of pregnancy with the deregulation of the placental homeostasis, which is established through the inflammation and the microthrombi and the damage caused to the endothelium, part of which

The condition is compounded by hyper production of platelets in terms of immature platelets, which are more thrombogenic, enlarged and younger, than the platelets that are fully mature, [3, [9], [10], [11]] that prompt further endothelial injuries, platelet aggregation and also ample micro thrombotic activity which are matrix contributors of platelet activity leading to HDP pathophysiology.

The process of platelet activation is a challenging measure in platelets because of the sensitivity to cost, time-sensitive, cost-sensitive and ex-vivo manipulation (ex. centrifugation, ph and time post-collection). The results of some of the laboratory values of the platelets that are used in the reporting of the full blood count include the production /immaturity that is normal to the size of the count which are normal as well. The young (immature) and large more prothrombotic platelets are the sign of the enhanced platelet activity and are taken in connection with the concept of platelet size (mean platelet volume) and the production (immature platelet fraction). According to the measures of the platelet production and immaturity and the platelet size, the answer concerning the platelet antecedent formation and pathophysiology of the pregnant hypertensive conditions like preeclampsia might be found. [3, 8, 14].

The cases of maternal roads leading to hypertension in pregnancy are recorded in the countries under development by 10-15 percent of the cases [15]. It has been noted that the cause of such events that lead to 3 to 10 percent of all the pregnancy problems is topographic and geographic locations [16]. Regarding the hypertensive disorders of pregnancy, poor outcome and high-risk pregnancies are associated with maternal, fetal and neonatal complications of the disorder which include repetitive emergency abortion, preterm labor, preterm birth, antepartum and postpartum hemorrhage, intrauterine fetal deaths (IUFD), intrauterine fetal growth restriction (IUGR), cardiovascular diseases and renal or hepatic dysfunction.

Because of this dilemma, pregnancy has become an enigma to such an extent that right women stand a high possibility of dying during pregnancy and after it [17]. It is noted that pregnancy-related hypertensive disease is as follows; preeclampsia (PE), PE-eclampsia, the chronic hypertension, gestation hypertension, and superimposed PE on pre-existing hypertension4.

In pregnant women it is linked to the prevailing blood pressure of studying that is more than 140mmHg of the systolic blood pressure or 90mmHg of the diastolic blood pressure which is known to be called as hypertension when on course of pregnancy. The patient should start relaxing after which the readings can be taken using a cuff that has the right size. They are advised that re-taking and re-checking of the initial values will be done after 20 minutes or otherwise.

Blood platelets are highly important as far as a process of hemostasis is concerned and this is due to the reason that blood plates can intervene in the process of bleeding quite well enough by forming the clots knit through the slow process of forming the blood clots which are stabilized after the pro-duction of the clots knit with the help of the coagulation cascade that aids in initiating this process. They also prevent infection through the process of consuming food of the triggering germs as well as the production of the chemokines that attracts the leukocytes. Along their dominance, there are standard parameters that have been used in the process of establishment of functionality of the platelet and these include platelet count, bleeding period, platelet aggregation or platelet activation.

Up to this time in the in vivo studies of the platelets, the platelet has been measurable and quantifiable [18]. Platelet indices, which mean platelet volume MPV, platelet distribution ratio and platelet large cell ratio (P-LCR) have worked in predictive prognoses and resolved most of the disorders that include idiopathic thrombotic purpura, aplastic anemia, among others of hematological and myeloproliferative disorders. They have, however, not been utilized that much on the case of hypertensive crisis [19]. The acute thrombotic incidences have been identified to be because of the hyperactivity of the platelets alongside the local activation of the platelets. These measurements are deemed as objects that provide indirect insight regarding the side of the platelet activity that had been found to have been modelled by the size of the platelet itself. There is a direct correlation between the size of platelet, and its enzyme activity, and platelet metabolism [20].

Received parameters could be innovatively and productively applied in an exponential arena. The large platelet in the patient can also be screened when the regular hematological test is taken and the specific analysis can be performed in case impending thrombotic event is shown. In the next manner, it being possible that such patients could be cured, as they have been closely watched even before the crisis really gets into motion as far as changes are being taken place on the indicators [19].

The purpose of this research is to ascertain whether decreased blood platelet counts in expectant mothers can be a sign of hypertension.

LITERATURE REVIEW

All over the world, hypertensive disorders in pregnancy (HDP) remain a leading cause of a problem for the mother as well as the unborn child. The World Health Organization (WHO) has emphasized the need to have precise, early diagnostic indicators to detect the problem of hypertension among expectant women, especially in low and middle-income countries. One among them is the role of platelet parameters in both prediction and monitoring of HDP, namely preeclampsia and gestational hypertension.

The fundamental relation between the diseases of hypertension that could be associated with pregnancy and the platelet count has been explored in many studies and most of them suggest that the profile of platelets indeed undergo a significant alteration in pregnant women who have such diseases. The elevated volume of utilization and obliteration within the microvasculature, consequently, leads to the tendency of a drop in the number of platelets in preeclampsia. Earlier the researchers have indicated that platelet levels were much lower than that of pregnant women with normotension in preeclampsia pregnant women and as stages of the disease advanced greater decrease in the platelet levels was also witnessed. Based on the results of the study, platelets (more so platelet counts over time) can be a predictor of the early identified risk of preeclampsia [21].

Additionally, being indicators of platelet activity and turnover, some researchers have underlined the usefulness of platelet indices, such as plateletcrit (PCT), mean platelet volume (MPV), and platelet distribution width (PDW). According to a prospective observational study performed earlier, the level of MPV and PDW was quite elevated in pregnant women with pregnancy-induced high blood pressure in comparison with their well counterparts. This indicates that besides the platelet count, the platelet size and platelet reactive indices can also provide an additional understanding of the etiology and development of disease [22].

In addition to that, the abnormalities of platelets can be followed by clinical ones. A study done in Saudi Arabia indicated that moderate and severe preeclampsia could be differentiated with relative sensitivity and specificity when a tandem of significant PDW and diminished count of platelets was applied. This further enhances the possibility that the platelet measures might serve as a non-invasive and a low-cost screening mechanism in prenatal care especially in resource-poor settings [23].

Although results showed such encouraging outcomes, there are a few inconsistencies in the literature. Research is divided into whether platelet count is useful on its own in the diagnosis. The variance between the number of plates presents in the pregnant women having hypertension and those with normotension were statistically insignificant in case there was no variation in the values of platelet indices. The authors assumed that it is more reliable to determine the level of platelets by utilizing two options, i.e., count and indices, instead of relying on a single parameter [24].

Research objective

The aim of this study was to determine the connection between the presence of hypertension in pregnant women and the reduction of the blood platelet count. It aimed to establish the possible usage of platelets and related indices as reliable hematological indices in the early diagnosis of such hypertensive complication as prenatal hypertension and preeclampsia. This is because the research investigates how the parameters of platelets varied in hypertensive women as compared to the normotensive pregnant women to provide evidence to support the use of platelet count as a simple, cost-effective screening test in prenatal care.

METHODOLOGY

The present qualitative study was conducted within six months in a tertiary care establishment in Quetta, Balochistan. With a purposive sample design, a total of 130 pregnant women were taken. Participants were categorized as normotensive and hypertensive based on blood pressure readings according to the established diagnostic criteria. Semi-structured interviews were used to gather data, with an emphasis on the participants' perceptions of their knowledge on laboratory testing, including platelet count, their prenatal experiences, symptoms, and their comprehension of hypertension. Obstetricians' clinical opinions regarding the function of platelet parameters in hypertensive pregnancies were also obtained through key informant interviews. The informed consent was obtained by everyone who participated in the study and ethical approval obtained. After processing data using SPSS version 25 one comes up with frequency tables to analyze the distribution of platelet-related parameters of pregnant women with hypertension and normotension.

RESULTS

Table 1

Participants' Demographic Profile (n = 130)

Variable	Category	Frequency	Percentage (%)
Age (years)	18–24	38	29.2
	25–30	51	39.2
	31–35	26	20.0
	>35	15	11.6
Gravida	Primigravida	49	37.7
	Multigravida	81	62.3
Gestational Age	1st Trimester	14	10.8
	2nd Trimester	48	36.9
	3rd Trimester	68	52.3
Residential Area	Urban	74	56.9
	Rural	56	43.1

Table 2

Blood Pressure Classification of Participants

Blood Pressure Group	Systolic/Diastolic Range (mmHg)	Frequency	Percentage (%)
Normotensive	<140/<90	62	47.7
Gestational Hypertension	≥140/≥90 (after 20 weeks)	34	26.2
Preeclampsia	≥140/≥90 + Proteinuria	26	20.0
Eclampsia	Preeclampsia + Seizures	8	6.1

Table 3

Distribution of Platelet Counts by Blood Pressure Group

Platelet Count (cells/mm^3)	Normotensive (n=62)	Hypertensive (n=68)	Total (n=130)	Percentage (%)
>150,000 (Normal)	46	13	59	45.4
100,000–150,000 (Mild Thrombocytopenia)	13	28	41	31.5
<100,000 (Severe Thrombocytopenia)	3	27	30	23.1

Table 4

Mean Platelet Volume (MPV) Among Study Groups

MPV (fL)	Normotensive (n=62)	Hypertensive (n=68)	Total	Percentage (%)
<9 (Low)	21	1	22	16.9
9–11 (Normal)	33	15	48	36.9
>11 (High)	8	52	60	46.2

Table 5

Platelet Distribution Width (PDW) and Its Association

PDW (%)	Normotensive (n=62)	Hypertensive (n=68)	Total	Percentage (%)
<12 (Low)	22	5	27	20.8
12–16 (Normal)	30	21	51	39.2
>16 (High)	10	42	52	40.0

DISCUSSION

Gestational hypertension and preeclampsia are identified as hypertensive disorders of pregnancy and continue having a considerable impact on maternal and fetal morbidity and mortality. This is particularly so among the low resource settings such as Quetta, Balochistan. The purpose of this study was to analyze potential application of platelet counts and indices to determine cases of hypertensive conditions among women that are pregnant. The findings are remarkable, and they depict a significant difference in the platelet parameters in pregnant women with HDP and normotension with a consistency.

Results indicated that there was a marked reduction in the level of platelet counts in hypertensive pregnant women, more so with eclampsia and preeclampsia. A large number of people with hypertension had thrombocytopenia with the count being less than 100,000/mm 3 which is extremely low and a large

percentage has the count of less than 150,000/mm 3. Conversely, platelet count was maintained in the normal range in majority of women who were normotensive. This is also congruent to previous researches that associate preeclampsia with thrombocytopenia because of enhanced platelet consumption, vascular damages to the endothelium, and greater platelet clumping. One of the major issues in the pathophysiology of preeclampsia is that platelet activation and aggregation upon endothelial injury are involved, and they also help in microthrombus and intravascular coagulation formation. Thus, the reduction of the number of platelets may represent an important indicator of disease severity and progression in HDP.

The authors considered the size and heterogeneity of the platelets measured by mean platelet volume (MPV) and platelet distribution width (PDW), respectively, and platelet count. These measures give indirect indicators of platelet turnover and activity. Remarkably, most of the participants with normotension were in the normal ranges whereas a large percentage of hypertensive mothers during pregnancy in the trial were in the elevated MPV (more than 11 fL) and PDW (more than 16 percent). These findings confirm previous studies which associated such inflammatory and thrombotic mechanisms of hypertensive pregnancy diseases with larger and hyper-reactive platelets.

Namely, MPV serves as a surrogate of platelet reactivity and production. A compensatory response to enhanced peripheral platelet lysis is reflected by higher MPV meaning the release of younger, larger platelets into the circulation. Equally, the PDW points to platelet size variation which tends to increase with platelet activity. These alterations in platelet indices may occur during pregnancy weeks prior to the emergence of clinical manifestations of hypertension. Consequently, assessment of MPV and PDW can be used to show early diagnostic clues and as a marker of worsening disease.

These promising correlations still do not find their way to clinical practice when it comes to platelet parameters usage. It could all be due to the different cutoff levels between populations, variations in laboratory tests, and ignorance among healthcare professionals. However, in settings with low resources and limited access to sophisticated diagnostic methods, simple hematological parameters, such as platelet count, MPV, and PDW, which can be easily determined by routine CBC procedures, hold valuable data concerning the mother-risk classification. Being active in this means of these indicators could reduce the load of the issues as it would provide a closer observation of high-risk pregnancies and an early diagnosis.

It is also important to identify the limitations of this study. The findings of the survey may be inapplicable to other broader populations because it is qualitative research in a single center. Moreover, extrinsic factors including preceding hematological abnormalities, presence of other infections, and dieting conditions could not be controlled very well. In spite of these limitations, the study highlights an essential issue that should be examined further and considerable the need to introduce platelet measurements into routine prenatal testing.

CONCLUSION

In this research, the association between low levels of blood platelets and the hypertensive issues of pregnant women was investigated. Based on the findings, women in pregnancy with hypertensive disorders such as gestational hypertension, preeclampsia and eclampsia uniquely exhibited remarkably fewer number of platelets in comparison with those with normotension. Quite unexpectedly, thrombocytopenia was observed in a considerable proportion of hypertensive subjects, and it reached extreme levels (<100,000 cells/mm 3) in some. These results can be related to the pathophysiological information on the fact that endothelial dysfunction and the development of microthrombi in hypertensive pregnancies are the causes of the amplification of the consumption and destruction of platelets.

Increased platelet counts and indicators including mean platelet volume (MPV) and platelet distribution width (PDW) were also depicted in pregnant women with hypertension. The parameters are indirect markers of platelet turnover and activity which shows the size and variation of platelets. In reaction to rise in platelet destruction, high MPV and PDW imply more production of younger, larger and more active platelets. This compensatory approach is associated with the increased thrombotic and inflammatory factor coupled with the hypertensive pregnancy complications. Thus, the monitoring of these platelet indices combined with platelet counts provides more comprehensive hematological assessment that may be used in risk stratification and early diagnosis of issues of hypertensive pregnancy.

The prospective interest of these parameters in clinical practice concerns its likely application, at least in low-resource environments such as Quetta, Balochistan, since the platelet count and indices are readily supported by standard complete blood count (CBC) tests, and they are affordable and convenient. Diseases related to pregnancy hypertension have the potential of reducing maternal and fetal morbidity and mortality in case the abnormality of platelets is identified early so that it avails closer observations and prompt remedies.

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