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To Predict The Adverse Maternal Outcome in Pre Eclampsia by using PIERS Calculator

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Abstract

Introduction: Preeclampsia is a hypertensive disorder of pregnancy, which usually manifests after 20 weeks of gestation with hypertension and proteinuria, with hypertension.

Aim: To predict the adverse maternal outcome in pre eclampsia by using PIERS calculator.

Methodology: This study is a prospective observational hospital-based investigation conducted in the Department of Obstetrics and Gynecology at SP Medical College and associated hospitals in Bikaner, commencing in 2023 and continuing for one year or until the desired sample size is reached.

Result: The study found that younger women (72% aged 20-29) and those with significant symptoms (swelling 66.67%, headache 60%) were more likely to experience adverse outcomes, with strong correlations to urine albumin levels (56.67% with 2+) and SpO2 levels (43.33% with 94-97%), and a high predictive accuracy of 87.33% for the PIERS score in identifying adverse outcomes.

Conclusion: The full PIERS calculator is a valuable tool for predicting adverse maternal outcomes in preeclampsia, enhancing timely care and improving maternal health in low-resource settings.

Keywords: Blood Pressure, Eclampsia, PIER Score, Preeclampsia, Hypertension

Introduction

Preeclampsia is a hypertensive disorder of pregnancy, which usually manifests after 20 weeks of gestation with hypertension and proteinuria, while hypertension being defined with blood pressure at least 140 mm Hg for systolic and/or 90 mm Hg for diastolic on at least two occasions and at least 4—6 hrs apart in women known to be normotensive beforehand[1-3]. Preeclampsia is a multisystem disorder that complicates about 3–8% pregnancies. The incidence is high in developing countries due to hypoproteinemia, malnutrition and poor obstetric facilities. Overall, 10–15% of maternal deaths

are directly associated with preeclampsia and eclampsia[5]. Preeclampsia is a complex two-stage[6] disease, beginning with asymptomatic placental insufficiency and progressing to symptomatic hypertension and potential severe complications like HELLP syndrome. Early identification and access to treatment are crucial for improving outcomes, though predicting the condition remains challenging due to the high cost and limited availability of biochemical tests in low-resource settings. To predict preeclampsia, many trials using a combination of the first-trimester uterine artery pulsatility index and various biochemical serum markers have been tried. However, facilities to assess these parameters are available only at tertiary levels and higher centers. The PIER score has shown strong predictive performance[15] in a cohort of 2023 women with preeclampsia, highlighting its potential for improving maternal care. The PIER score was developed to reliably predict maternal outcomes in preeclampsia by assessing signs, symptoms, and lab findings, helping caregivers make informed decisions about triage and treatment. Clinicians face the challenge of accurately identifying high-risk patients to ensure timely interventions while avoiding unnecessary treatments for those at lower risk, with the higher risk group demonstrating a strong correlation with the full PIERS model[16].

Aim

To predict the adverse maternal outcome in pre eclampsia by using PIERS calculator.

Methodology

This study is a prospective observational hospital-based investigation conducted in the Department of Obstetrics and Gynecology at SP Medical College and associated hospitals in Bikaner, commencing in 2023 and continuing for one year or until the desired sample size is reached. The study population comprises pregnant women attending the outpatient department of Obstetrics and Gynecology, with inclusion criteria consisting of women diagnosed with preeclampsia according to ACOG 2020 diagnostic criteria, who are at least 28 weeks gestational age and willing to participate. Exclusion criteria encompass complications of preeclampsia that occur before PIERS calculation or admission, adverse outcomes prior to admission, and known cases of heart disease, liver disorders, renal disorders, tuberculosis, uncontrolled diabetes mellitus, or chronic hypertension.

Sample Size:

A sample size of minimum 150 pregnant women required at 80% study power and alpha error 5%. MEDCALC statistical software was used for sample size. Prevalence of preeclampsia in pregnant women is not more than 8%% as per reference article.

N =4 pq/l2

Z= 1.96

p= 8% = 0.08

q= 1-p

d= margin of error = 5%

Calculations

N=(1.96)2(0.08)(0.92)/(0.05)2

N=115

After taking attrition of 20% cases and rounding off a minimum sample size of 150 cases were taken fulfilling the eligibility criteria.

Result

Table 1: Age wise distribution of study cases

Age group	No. of cases	%
<20 years	5	3.33
20-29 years	108	72.00
30-35 years	34	22.67
>35	3	2.00
Total	150	100.00
Mean	26.4 ± 4.91	

Table 1 shows age wise distribution of study cases, out of 150 cases, the maximum number of preeclampsia patients 108 (72%) were between the age group of 20-29 years followed by 34 (22.67%) cases were 30-35 years of age followed by 5 (3.3%) cases were <20 years of age whereas minimum 3 (2%) cases were >35 years of age group. Mean age of study subjects was 26.49 ± 4.91 years.

Table 2: Gestational age wise distribution of study cases

Gestational age	No.	%
<34 weeks	38	25.33
≥34 weeks	112	74.67
Total	150	100.00

Table 2 Shows gestational age wise distribution of study cases, out of 150 cases, 112 (74.67%) cases were ≥34 weeks and 38 (25.33%) cases were <34 weeks.

Table 3: Distribution of Maternal symptoms and adverse outcome

Symptoms	Total		No. of women without adverse outcome		No. of women with adverse outcome		P value
	No.	%	No.	%	No.	%	
Swelling	72	48.00	52	43.33	20	66.67	0.037*
Headache	45	30.00	27	22.50	18	60.00	0.006*

Nausea & vomiting	29	19.33	17	14.17	12	40.00	0.0001*
Dyspnoea	26	17.33	21	17.50	5	16.67	0.871
Chest pain	20	13.33	16	13.33	4	13.33	0.764
Epigastric pain	19	12.67	14	11.67	5	16.67	0.667
Visual disturbance	14	9.33	12	10.00	2	6.67	0.833

The study found a significant association between swelling, headache, and nausea/vomiting and adverse maternal outcomes, while dyspnea, chest pain, epigastric pain, and visual disturbances were not significantly associated.

Table 4: Urine albumin level in cases and outcome

Urine albumin level	Total subjects		No. of women without adverse outcome		No. of women with adverse outcome	
	No.	%	No.	%	No.	%
Nil	30	20.00	29	24.17	1	3.33
Trace	21	14.00	20	16.67	1	3.33
1+	35	23.33	33	27.50	2	6.67
2+	40	26.67	23	19.17	17	56.67
3+	24	16.00	15	12.50	9	30.00
Total	150	100.00	120	100.00	30	100.00
p value	0.0001**					

The study found a significant association between higher urine albumin levels and adverse maternal outcomes, with a higher proportion of women with adverse outcomes having urine albumin levels of 2+ and 3+ compared to women without adverse outcomes.

Table 5: Distribution of cases according to PIERS score

A	No.	%
<30%	113	75.33
≥30%	37	24.67
Total	150	100.00

Table 5 Shows distribution of cases according to PIERS score, out of 150 cases, 113 (75.33%) cases had PIERS score <30% whereas 37 (24.67%) cases had PIERS score ≥30%.

Table 6: PIERS score and adverse maternal outcome

PIERS score	No. of women without adverse outcome		No. of women with adverse outcome	
	No.	%	No.	%
<30%	107	89.17	6	20.00
≥30%	13	10.83	24	80.00
Total	120	100.00	30	100.00

Table 6 Shows PIERS score and adverse maternal outcome, out of 120 cases, 107 (89.17%) cases with normal outcome had PIERS score <30% and 13 (10.83%) cases had ≥30% PIERS score whereas out of 30 women with adverse outcome, 24 (80%) cases had PIERS score ≥30% and 6(20%) cases had PIERS score <30%.

Table 7: SpO2 and adverse maternal outcome

SpO2	No. of women without adverse outcome		No. of women with adverse outcome	
	No.	%	No.	%
≤ 93%	1	0.83	7	23.33
94-97%	46	38.33	13	43.33
>97%	73	60.83	10	33.33
Total	120	100.00	30	100.00
p value	0.0001**			

The study showed a significant association between lower SpO2 levels and adverse maternal outcomes, with a higher proportion of women with adverse outcomes having SpO2 levels below 94% compared to women without adverse outcomes.

Table 8: Prevalence of adverse outcome in different biochemical parameters

	No. of women without adverse outcome		No. of women with adverse outcome		P value
	No.	%	No.	%	
Platelet count					
<1.5 lakhs	45	37.50	23	76.67	0.0001**
≥1.5 lakhs	75	62.50	7	23.33	
Serum creatinine					
<1 mg/dl	58	48.33	11	36.67	0.346
≥1 mg/dl	62	51.67	19	63.33	
SGOT					
≤40 U/L	32	26.67	1	3.33	0.012**
>40 U/L	88	73.33	29	96.67	
SGPT					
≤40 U/L	37	30.83	2	6.67	0.014**
>40 U/L	83	69.17	28	93.33	

The study found strong correlations between low platelet count, elevated liver enzymes (SGOT and SGPT), and adverse outcomes in women, while serum creatinine was not significantly associated.

Table 9: Diagnostic value of PIERS score to predict adverse maternal outcome

Diagnostic value of PIERS score	% (95% CI).
Sensitivity	89.16%
Specificity	80.00%
Positive predictive value	94.69%
Negative predictive value	64.86%
Accuracy	87.33%

Table 9 Shows Diagnostic value of PIERS score to predict adverse maternal outcome, PIERS score had a sensitivity of 89.16%, specificity of 80%, PPV 94.69%, NPV 64.86% and accuracy of 87.33% to diagnose adverse outcome in preeclampsia patients.

Discussion

In our study, the maximum number of preeclampsia patients (72%) were between the age group of 20-29 years followed by 22.67% in 30-35 years whereas minimum 2% were in >35 yr age group. Mean age of study subjects was 26.49 ± 4.91 years. Similarly, Kulsoom Ahmad et al. (2023)[17] among 384 subjects, most patients (45.83%) were in the age-group from 23 to 27 years.

In our study,74.67% preeclampsia patients were ≥34 weeks and 25.33% were <34 weeks Also Dr. Indra Bhati et al. (2022)[18] found that mean gestational age of women with adverse outcomes was 37 weeks.

In the present study, Shows, major symptom with which women presented with adverse outcome was swelling (66.67%) and headache (60%) followed by nausea and vomiting (40%) whereas minimum 6.67% due to visual disturbances. The difference between outcome and symptoms P value was significant in swelling, headache, nausea and vomiting whereas non-significant for dyspnoea, chest pain, epigestric pain, visual disturbances. Shruti Agrawal et al. (2016)[16] found that Dyspnea, visual disturbances, epigastric pain, and SpO2 appeared to be highly significant risk factors.

In the present study, maximum 26.67% women had urine albumin 2+ followed by 23.33% had 1+ and minimum 14% had trace urine albumin. Women presented with adverse outcome were mostly had urine albumin 2+ (56.67%) followed by 3+ urine albumin in 30% cases whereas minimum 3.33% had trace urine albumin. The difference between outcome and urine albumin levels was significant (P value=0.0001).

In the present study, maximum 43.33% Women presented with adverse outcome had spO2 94-97% followed by 33.33% had >97% and minimum 23.33% had ≤ 93% SpO2. The difference between outcome and SpO2 levels was significant. Similarly Kulsoom Ahmad et al. (2023)[17] found that Out of 30 patients with SpO2 <88%, 25 patients (83.33%) had adverse maternal outcomes, while out of 287 patients with SpO2 >95%, 42 (16.67%) had the adverse maternal outcomes. (The p-value is < 0.0001). Also in the study done by Millman AL et al (2011)[19] showed that An SpO2 value of ≤ 93% confers particular risk.

In our study, on biochemical investigations with women presented with adverse outcome, 76.67% cases with adverse outcome had platelets <1.5lakhs, >40SGOT/PT were in almost all cases and significantly associated with outcome ($p<0.05$). only serum creatinine was not associated with adverse outcome. Our study was in line with Shruti Agrawal et al. (2016)[16] In the biochemical variables studied, serum creatinine and serum uric acid were found to have a significant association.

PIERS score had a sensitivity of 89.16% specificity 80% PPV 94.69%, NPV 64.86% and accuracy of 87.33% to diagnose adverse outcome in preeclamptic women. Similarly, Kulsoom Ahmad et al. (2023)[17] using the full PIERS calculator, 75 patients were categorized into high-risk groups (>30% predicted probability), among them 59 (78.67%) patients had the adverse fetal outcomes ($X2 = 96.413$, p value = <0.0001). Also Shubha Srivastava et al. (2017)[20] that the full PIERS calculator gave good results in prediction of adverse maternal outcome according to risk score in women with preeclampsia.

Conclusion

The full PIERS calculator demonstrated strong predictive capability for adverse maternal outcomes in women with preeclampsia in our study, highlighting its potential value in low-resource settings where complications are more prevalent. By aiding clinicians in managing high-risk patients and assisting healthcare workers in identifying those needing specialist care, it can significantly reduce

delays in access to appropriate treatment. This tool could ultimately improve maternal health outcomes in regions facing challenges such as malnourishment and limited antenatal care.

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