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ORIGINAL ARTICLE

Prediction of Adverse Outcomes in Pre-Eclampsia using FullPIERS calculator

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ABSTRACT

Keywords : Eclampsia, FullPIERS model, adverse maternal outcomes, Prediction model.

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Background: Pre-eclampsia complicates about 3% of pregnancies, and it's considered the second common cause of maternal mortality in Egypt. **Purpose:** This study's objective is to validate FullPIERS calculator in estimation of the adverse maternal outcomes in cases of preeclampsia. **Patients and Methods:** This prospective observational study was conducted at a hospital from June 1, 2022, to May 30, 2023, and included a total of 81 patients who were diagnosed with Pre-eclampsia. All subjects were selected from the attendants of Emergency room and outpatient clinic of obstetrics and gynecology department of Aswan university hospital to validate fullPIERS calculator in forecast for the adverse maternal outcomes associated with preeclampsia. The study design was approved by the Aswan Faculty of Medicine's Ethics Committee. **Results:** FULLPIERS calculator can be used to predict patients with maternal adverse effect at a cutoff level of > 1.9, with a sensitivity of 72.7%, specificity of 71.2%, PPV of 48.5%, and NPV of 87.4% (AUC = 0.76 & p-value < 0.001). **Conclusion:** The FullPIERS model can help in early detection of unfavorable maternal outcomes in preeclamptic women. It is convenient to employ, economically viable, and anticipates the likelihood of an adverse outcome.

INTRODUCTION:

Concerns regarding maternal risk have sparked debates regarding the appropriateness of expectant management, whether it be administered near or far from term. In the context of preeclampsia, the fullPIERS (Preeclampsia Integrated Estimate of Risk) was created to assist clinicians in assessing maternal risk and making decisions regarding triage, transport, and treatment. This assessment is done in conjunction with the evaluation of neonatal risk depending on the age of gestation at presentation (1).

The FullPIERS model (Preeclampsia Integrated Estimate of Risk) indicated that women admitted with preeclampsia at any gestational age were able to predict unfavorable maternal outcomes within 48 hours. There was evidence of internal and external validity in this paradigm. By improving care, we may be able to identify high-risk women early and perhaps avoid these unfavorable consequences (2).

In the FullPIERS calculation, the following factors are considered: symptoms associated with dyspnea and/or chest pain, the age of gestation at diagnosis, pulse oximetry's measurement of

oxygen saturation, and laboratory estimates of serum creatinine, count of platelets, and aspartate aminotransferase to alanine transaminase ratio (3).

SUBJECT AND METHODS:

This observational study was carried out prospectively in a hospital and ran from June 1, 2022, to May 30, 2023, and included a total of 81 patients who were diagnosed with Pre-eclampsia. All subjects were selected from the attendants of Emergency room and outpatient clinic of obstetrics and gynecology department of Aswan university hospital.

The selected cases comprised pregnant women 20 weeks of gestation complicated by preeclampsia, which is defined by blood pressure levels of 140/90 (two readings taken more than four hours apart) and proteinuria. The condition known as superimposed preeclampsia happens when there is already hypertension present and then there is also accelerated hypertension (a baseline systolic blood pressure of 30 mmHg or diastolic blood pressure of 15 mmHg) or new proteinuria.

Aswan University's Ethics Board gave its stamp of approval to the research (No. 639/6/22). Patients were not included in the analysis if they were hospitalized due to spontaneous labor, if they had adverse outcome before meeting the FullPIERS eligibility criteria.

After taking informed written consent, patients have been subjected to full history taking, general examination, obstetric examination, and ultrasound examination. The investigation performed has included hematology work up, liver function test, renal function test, and oxygen saturation.
The risk of adverse maternal outcomes has been determined using the FullPIERS calculator.
Antihypertensive drugs were used to control hypertension. Patients with severe pre-eclampsia has received magnesium sulphate. Mode of termination has been depending on the gestational period, favourability of cervix and the necessity of terminating.

Statistical analysis of the data:
All patient charts that meet our inclusion requirements have been examined. SPSS (Statistical Program for the Social Sciences) Version 24 was utilized for the data analysis. To represent qualitative data, percentages and frequencies were utilized. To represent quantitative data, the mean ±SD was utilized. When we take a set of discrete integers and divide them by the total number of values in that set, we get the mean or average. A group of dispersed values can be measured by looking at their standard deviation (SD). If the (SD) is little, then the values tend to cluster around the set mean; if it's large, then the values are more widely distributed.

The used tests were:
Independent sample T test (T): when comparing two groups of data that follows a normal distribution, the chi-square analysis was applied for non-parametric data comparison. Cutoff value, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were all determined using the Receiver Operating Characteristic Curve (ROC). Sensitivity is the likelihood that, in the presence of the disease, a test will come back positive. Specificity: the likelihood that a test will come out negative in the absence of the disease. If the test results are positive, the likelihood that the disease is present is known as the positive predictive value. If the test results are negative, the likelihood that the disease does not exist is known as the negative predictive value.

Probability(P-value)
P-value < 0.05 was deemed noteworthy.
P-value < 0.001 was regarded as extremely significant.
P-value > 0.05 was regarded as not significant.

RESULTS:

Table (1): Age, BMI, and obstetric data of the studied patients

		Studied patients (N = 81)	
Age (years)	Mean ±SD	30.9 ± 6.2	
	Min - Max	19 – 42	
Gestational age at admission (weeks)	Mean ±SD	34.1 ± 3.1	
	Min - Max	22 – 40	
Parity	PG	27	33.3%
	Multipara	54	66.7%
No. of fetuses	Single	70	86.4%
	Twins	11	13.6%
BMI (kg/m²)	Mean ±SD	31.6 ± 4.3	
	Min - Max	20.8 – 47.1	

Table (2): Adverse maternal outcomes in all studied patients.

		Studied patients (N = 81)	
Adverse maternal outcomes	No	59	72.8%
	Yes	22	27.2%
Adverse maternal outcomes	Eclampsia	9	40.9%
	Thrombocytopenia	9	40.9%
	Acute renal insufficiency	4	18.2%
	Pulmonary edema	2	9.1%
	Post-partum hemorrhage	1	4.5%
	Abruptio placenta	1	4.5%
	PRES	1	4.5%
	Stroke	1	4.5%

some patients experienced more than one adverse maternal outcome, so the total number of adverse maternal outcomes isn't the same as the number of the patients who experienced adverse maternal outcomes.

Table (2): Diagnostic performance of adverse maternal outcomes predicted by FULLPIERS calculator.

	Cut off	AUC	Sensitivity	Specificity	PPV	NPV	p-value
FULLPIERS	> 1.9	0.76	72.7%%	71.2%%	48.5%	87.4%	< 0.001

PPV: positive predictive value. AUC: Area under curve
NPV: negative predictive value.
With ROC curve, it was demonstrated that FULLPIERS calculator can be applied to predict patients with maternal adverse effect at a cutoff level of > 1.9, with a sensitivity of 72.7%, specificity of 71.2%, PPV of 48.5%, and NPV of 87.4% (AUC = 0.76 & p-value < 0.001).

DISCUSSION:

According to our results, the mean age of the women was 30.9 years, the majority of them were multipara, and their average BMI was in the obese category. The mean GA at the time of presentation was 34 weeks (3.1) weeks, while the mean GA at the time of termination was 31 weeks (6.2), Sagar et al. (4) reported the mean age (±SD) 26.5±4.4 in women with present adverse maternal outcome and 27.0±4.5 in women with absent adverse maternal outcome. 53% were primigravida, and 47% were multigravida, Mean GA (±SD) at the time of presentation 36.1±3.2 weeks in women with present adverse maternal outcome and 36.6 ±3.25 weeks in women with absent adverse maternal outcome. Mean GA at delivery (±SD) 36.3± 3.1 weeks in women with present adverse maternal outcome and 37.0 ±2.7 weeks in women with absent adverse maternal outcome. According to our study, the number (%) of women with adverse outcomes was 22 (27.2%); the most frequent were platelets counts below 50,000/ml (n=9, 40.9%), and occurrence of eclamptic fits (n=9, 40.9%). In a study conducted by Ahmad, Singh, and Yadav in 2023(5), among the 384 patients, 82 were classified as high-risk. Of those, 54 (or 65.85%) experienced adverse maternal outcomes, which is consistent with previous research showing that low platelet count, blood transfusion requirements, and acute kidney injury were the most frequently reported adverse outcomes. Thrombocytopenia was observed in 86 out of 384 individuals, or 22.40 percent.

According to our results, the overall AUC was 0.76 & p-value < 0.001. From the overall ROC curve, the best discriminatory cut-off of the FullPIERS score was determined at 1.9%. The FullPIERS model demonstrated strong discriminatory power in predicting complications at any time point between 48 hours and 7 days following admission, according to Sharma et al., 2023, (6) who found a ROC curve area under measurement of 0.843 (95% confidence interval: 0.789-0.897). Further, Boutot et al., 2020 (7) found that the FullPiers score accurately predicted 48-hour maternal events with an area under the curve at 0.80 (IC95% [0.74-0.85]). Regarding our results, the diagnostic test accuracy of the FullPIERS score of 1.9%. This cut-off point showed a satisfactory discriminatory potential, with sensitivity of 72.7%, specificity of 71.2%, PPV of 48.5%, NPV of 87.4%. That was close to Boutot et al., 2020 (7) who reported at 4.2 cut off, the sensitivity was 71% and specificity 88%. Additionally, Guida et al., 2021 (8) reported the FullPIERS score had an excellent performance to anticipate adverse maternal outcome. With a sensitivity of 75% and a

specificity of 83%, the optimal cutoff value for evaluating maternal unfavorable outcomes was 2.15%.

CONCLUSION

Using the fullPIERS model, preeclamptic women can have their adverse maternal outcomes predicted more accurately. It is quick to use, economically viable, and anticipates the likelihood of an adverse outcome.

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