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Original Research Article

An observational study to determine the efficacy of FOGSI gestosis score as a predictor of pre-eclampsia and Ecosprin prophylaxis as a preventive intervention

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ABSTRACT

Background: FOGSI gestosis score is a simple risk model devised for preeclampsia screening and prediction. Each risk factor is given score of 1, 2 or 3 based on severity. A total score of ≥3, implies 'at risk' for developing preeclampsia warranting closer monitoring and management. Also, Ecosprin prophylaxis in these high-risk pregnancies can reduce the incidence of early onset preeclampsia as well as maternal and neonatal morbidity and mortality.
Methods: This prospective OBSERVATIONAL study was conducted at GMC Amritsar, involving 100 pregnant women at ≤24 weeks of gestation (Group A), screened using gestosis score. Participants identified as high-risk (score ≥3) received prophylactic Ecosprin and monitored until 6 weeks postpartum for maternal and neonatal outcomes which were compared with 145 unbooked, already known cases of preeclampsia/eclampsia (group B).
Results: Among 100 participants screened as per gestosis score, 29% were high risk and 71% low risk. Preeclampsia developed in 31% of high-risk versus 4.2% of low-risk participants (IRR=8.98, p=0.0002). Significant predictors included anaemia, primigravida status, BMI>30 and MAP>85 mmHg. Preterm birth, FGR, unfavourable APGAR score and perinatal mortality were more common in the high-risk group. The score demonstrated 82.35% sensitivity, 82.69% specificity, 43.75% PPV, 96.63% NPV, and 82.64% accuracy in predicting Preeclampsia, indicating good screening potential.
Conclusions: Gestosis score is low cost, noninvasive screening tool for predicting preeclampsia and adverse pregnancy outcomes, particularly in resource-constrained settings. Early Ecosprin prophylaxis significantly reduces the incidence and severity of complications in high-risk pregnancies.

Keywords: Ecosprin, Gestosis score, Prediction, Preeclampsia

INTRODUCTION

Hypertensive disorders during pregnancy (HDP) include a range of conditions from chronic hypertension to severe multisystem disorders like preeclampsia, which significantly contribute to maternal and perinatal morbidity and mortality. In India, HDP affects around 11% of pregnancies- among the highest rates globally- and can lead to severe complications such as eclampsia, HELLP syndrome, acute kidney injury, pulmonary oedema, stroke, and cardiac dysfunction. The World Health Organization (2014) attributes 19% of maternal deaths worldwide to HDP. The National Eclampsia Registry (NER) by FOGSI-ICOG highlights the high prevalence of HDP and eclampsia in India, with many cases likely underreported in peripheral settings. As per the 2013 NER data, preeclampsia affects 10.3% of pregnancies and eclampsia 1.9%, with over half of the eclampsia cases occurring antenatally and 13% postpartum. Maternal mortality from eclampsia ranges between 4% and 6%.[1,2]

Early identification of women at risk for preeclampsia is critical for providing appropriate antenatal care, allowing for closer monitoring and timely preventive interventions.

Traditional screening methods based on maternal history and clinical risk factors, detect fewer than 30% of future preeclampsia cases and result in a high false-positive rate. Since preeclampsia is associated with abnormal placentation and maternal vascular dysfunction, combining maternal history with early pregnancy assessments-like blood pressure, uterine artery Doppler, and serum biomarkers- improves predictive accuracy and care efficiency.

The World Health Organization (WHO) and the International Federation of Gynecology and Obstetrics (FIGO) emphasize the importance of early risk identification. WHO supports simple, non-invasive screening methods based on history and blood pressure in low resource settings. FIGO proposes a more comprehensive screening strategy in the first trimester combining clinical risk factors, mean arterial pressure (MAP), uterine artery Doppler, and biomarkers like placental growth factor (PlGF).[3,4]

Numerous risk factors-age extremes, parity, comorbidities, ethnicity, and markers like PAPP-A and IGF- are associated with HDP. Given the variability in risk factor data, a consolidated risk scoring model is the need of the hour, especially in low-resource settings.

The HDP-gestosis score, developed by Dr. Gorakh Mandrupkar and refined by a FOGSI-ICOG panel, introduced in 2019 assigns 1, 2, or 3 points to clinical risk factors based on severity. A total score of ≥3 identifies women as high risk for preeclampsia and prompts timely management. This model proves practical, accessible, and cost-effective with high sensitivity and specificity and works well in both urban and rural setups, allowing early detection and intervention.

Preeclampsia remains a major cause of maternal and neonatal complications. Also, placing a significant burden on healthcare system. Preventive strategies include primary (health promotion), secondary (risk screening and early medication), and tertiary (managing existing preeclampsia).[5] WHO and FIGO both recommend low-dose aspirin (75-150 mg daily), starting between 11-14 weeks and continuing till 36 weeks. Calcium supplementation is also encouraged, particularly in populations with low calcium intake.

This study applied the FOGSI-gestosis score to assess its predictive value for preeclampsia and evaluated the effectiveness of prophylactic Ecosprin in preventing preeclampsia and related complications in women with scores ≥3.

METHODS

This prospective observational study was conducted in the department of obstetrics and gynecology, Government Medical College, Amritsar from September 2023 to December 2024. A total of 100 pregnant women ≤24 weeks gestation were screened as per the eligibility criteria with eligible participants enrolled after written informed consent and institutional ethics committee approval.

Inclusion criteria

Pregnant women ≤24 weeks of gestation.

Exclusion criteria

The patients not willing to participate in the study. Pregnant females >24 weeks of gestation. Pregnant females already having preeclampsia, eclampsia, chronic hypertension with superimposed preeclampsia. Pregnant females with acute emergencies like APH, ARDS, shock, etc. Pregnant females with preterm labor and PPROM. Pregnant females with fetal anomalies or IUD. Pregnant females with structural diseases of uterus like big fibroid and mullerian abnormalities.

Each participant was screened using the FOGSI gestosis score, and those scoring ≥3 were identified as high risk and started on prophylactic Ecosprin (75 mg OD) Participants were monitored throughout pregnancy and until 6 weeks postpartum. The study aimed to evaluate the sensitivity, specificity, PPV, and NPV of the gestosis score in predicting preeclampsia, as well as assess the effectiveness of Ecosprin in high-risk cases. Both maternal outcomes (eclampsia, HELLP, ARDS, ARF) and neonatal outcomes (preterm birth, IUD, low birth weight, perinatal morbidity and mortality) were compared with outcomes of patients with established preeclampsia admitted during the same period.

Statistical analysis

The data was documented, tabulated and analyzed by using appropriate statistical methods. Numeric valuable was expressed as mean±SD. Analysis of variance (ANOVA) was used to compare the two groups. Data was analyzed and p value of <0.05 was considered significant. All the statistical analysis were performed using Statistical Package for Social Sciences (SPSS) version 28.

RESULTS

There was statistically significant difference in mean gestational age at the time of recruitment and delivery, BMI, MAP and Hb among participants and the control group (Table 1) but mean maternal age was similar in both groups.

Out of 100 participants of cases group 71% had gestosis score of <3 (low risk) while 29% of them had gestosis score of ≥3 (high risk).

Table 1: Description and categorisation of study participants.

Vital parameters	Group A (n=100)	Group B (controls) (n=145)	P value
	Mean±SD	Mean±SD	
Maternal age (years)	28.55±3.29	28.79±4.07	0.647
Gest age (at the time of recruitment in weeks)	15.08±4.55	35.52±2.39	<0.0001
Gest age (at the time of delivery in weeks)	37.69±1.67	35.52±2.39	<0.0001
BMI (kg/m^2)	25.15±4.54	30.90±3.32	0.0001
MAP (mmHg)	100.71±12.35	126.63±4.50	0.0002
Hb (gm/dl)	9.97±1.2	8.52±0.57	<0.0001

Table 2: Prevalence of risk factors among participants of group A that developed HDP and PE and their contribution to gestosis score.

Risk factors	No. (n=100)	No. of HDP (n=38)	RR (HDP)	p-HDP	No. of PE/E (n=14)	RR(PE/E)	p-PE/E
Age>35 years	6	2	0.8	0.86	1	1.1	0.82
Age<19 years	0	0	2.5	0.63	0	6.7	0.33
Maternal anemia	29	21	1.9	0.002	9	2.2	0.001
Obesity (BMI>30kg/m2)	13	8	1.4	0.44	6	3.2	0.003
Primigravida	21	18	2.2	0.001	10	3.4	<0.0001
Short duration of sperm exposure (cohabitation)	4	2	1.3	0.74	1	1.7	0.59
Women born as Small for gestational age	2	2	2.6	0.32	0	1.3	0.81
Family history of cardiovascular disease	4	3	1.9	0.35	1	1.7	0.59
Polycystic ovarian syndrome	9	6	1.7	0.25	1	0.7	0.82
Interpregnancy interval >7 years	6	5	2.19	0.17	1	1.19	0.86
Conceived with assisted reproductive (IVF/ICSI) treatment	2	1	1.3	0.82	0	1.3	0.84
MAP>85mmhg	38	24	2.2	0.01	14	2.6	<0.0002
Dyslipidemia	10	9	2.3	0.03	3	2.14	0.19
Excessive weight gain during pregnancy	13	9	2.02	0.06	4	2.19	0.11
Maternal hypothyroidism	18	13	1.9	0.03	3	1.19	0.75
Family history of preeclampsia	7	5	2.6	0.05	3	3.06	0.07
Gestational diabetes mellitus	12	5	1.75	0.25	2	1.19	0.8
Obesity (BMI>35 kg/m^2)	2	1	1.3	0.82	1	3.51	0.28
Multifetal pregnancy	4	2	1.3	0.74	1	1.72	0.59
Hypertensive disease during previous pregnancy	13	10	2.3	0.02	4	2.19	0.11
Pregestational diabetes mellitus	6	3	1.5	0.51	1	1.19	0.86
Chronic hypertension	8	8	2.6	0.03	2	1.78	0.43
Mental disorders	0	0	2.5	0.63	0	6.73	0.33
Inherited/acquired thrombophilia	0	0	2.5	0.63	0	6.73	0.33
Maternal chronic kidney disease	2	2	2.6	0.32	0	1.34	0.84
Autoimmune disease (SLE/APLA/RA)	0	0	2.5	0.63	0	6.73	0.33
Pregnancy with assisted reproductive (OD or surrogacy)	0	0	2.5	0.62	0	6.73	0.33

Amongst 145 participants of group B (control group), 69.8% on admission were diagnosed with preeclampsia without severe features, 16.7% presented with Preeclampsia with severe features and 13.5% participants had eclampsia.

In the present study, amongst 100 participants screened with gestosis score who eventually developed PE/E, key significant predictors included maternal anemia [RR=2.2 (p-0.001)], obesity (BMI>30 kg/m^2) [RR=3.2 (p-0.0030] and primigravida status [RR=3.4 (p<0.001)] and MAP>85 mmHg [RR=2.6 (p<0.0002)] (Table 2).

Table 3: Efficacy of Ecosprin in decreasing the odds ratio of life-threatening complications amongst participants with PE/E in group A.

Life threatening complications of preeclampsia	G score ≥3 (n=11)		Group B (controls) (n=145)		OR (p value)	
	N	%	N	%	OR	P value
Eclampsia	0	0	29	20	0.17	0.227
HELLP syndrome	1	9.10	11	7.60	1.21	0.185
ARDS	0	0	10	6.90	0.56	0.696
ARF	0	0	2	1.40	2.49	0.562
Maternal mortality	0	0	13	9	0.42	0.563

Table 4: Numbers needed to prevent (NNP).

	Numbers needed to prevent (NNP)				
	Eclampsia	**HELLP syndrome**	**ARDS**	**Maternal mortality**	**Perinatal mortality**
Patients started on Ecosprin (group A)	0/29	1/29	0/29	0/29	2/29
Patient not on Ecosprin (group B)	29/145	11/145	10/145	13/145	31/145
NNP	5	66.7	14.5	11.1	6.9

Table 5: Overall comparison of pregnancy outcomes amongst the two groups based on gestosis score.

	G Score <3 (n=71)		G Score ≥3 (n=29)		
	N	**%**	**N**	**%**	**RR (p value)**
HDP	6	8.45	18	34.48	7.3 (p<0.001)
PE/E	3	4.22	11	37.93	8.9 (p-0.003)
APH	1	1.40	3	10.34	7.3 (p-0.078)
FGR	2	2.81	5	17.24	6.1 (p-0.024)
PTB	6	8.45	12	41.37	4.8 (p-0.0004)
CS	10	14.08	19	65.51	4.6 (p<0.0001)

Preeclampsia developed in 3 low risk and 11 high risk participants out of which 2 had severe features giving the incidence rate ratio of preeclampsia among participants with G score ≥3 (high risk) as compared to that of G score <3(low risk) as 8.9770 (p value =0.0002) which was statistically significant.

The incidence rate ratio of developing HDP among the two groups was 7.8889 (p value <0.0001) which was again statistically significant.

Notably, the 11 participants who developed PE/E with gestosis score ≥3 (37.93%) were on preventive Ecosprin therapy started at <20 weeks gestation. Thus, ecosprin prophylaxis was successful in preventing PE/E in 62% of the screened high-risk participants.

The gestosis score demonstrated the sensitivity of 82.4% (95% CI: 59.0-93.8%). Specificity was 82.7% (95% CI: 74.3-88.8%), positive predictive value (PPV) was relatively low at 43.8% (95% CI: 28.2-60.7%). In contrast, the negative predictive value (NPV) was high at 96.6% (95% CI: 90.6-98.8%). Overall diagnostic accuracy was 82.6% (95% CI: 74.9-88.4%).

In the present study among 14 participants; preeclampsia was detected earlier (mean gestational age (33.32±2.8 weeks) in 90.9% of the participants with G score ≥3 as compared to mean gestational age of (36.5±1.7 weeks) in 66.7% of the participants with G score <3 although the association between gestosis score and gestational age of detection of preeclampsia was not statistically significant.

Among 14 participants with preeclampsia/eclampsia (PE/E), evidence of end-organ damage was seen exclusively in high-risk participants. Out of which, 9.1% had raised liver enzymes and low platelet counts, while 27.3% exhibited elevated serum creatinine levels (≥0.09 mmol/l), with statistical significance (p=0.020). No cases of eclampsia, ARDS, ARF, or maternal mortality were reported in group A.

In contrast, the control group had significantly higher morbidity, with the most frequent end-organ damage involved CNS- 27.6% reported symptoms of impending eclampsia, and 20% developed eclampsia- followed by hepatic impairment (7.6%), renal dysfunction and pulmonary involvement (6.9% each), low platelet counts (2.8%), and maternal mortality rate of (9%).

The odds ratios (ORs) for life-threatening complications like eclampsia, ARDS and maternal mortality) in group A participants were reduced but not for HELLP syndrome and ARF and the reduction was statistically non-significant (Table 3). The overall difference in end-organ damage between groups was statistically significant (p=0.027), indicating that higher gestosis scores were associated with increased risk but still offered better maternal outcomes than control group.

Thus, Ecosprin prophylaxis was successful in decreasing the odds of life-threatening complications like eclampsia to 1/5th, ARDS to 1/2 and maternal mortality by 60%, although it was not statistically significant.

Also, Ecosprin prophylaxis did not seem to be preventive against complications like HELLP syndrome or renal impairment in preeclampsia, nor did it significantly reduce the risk of Antepartum complications such as FGR, IUD, APH, or preterm birth among high-risk participants who eventually developed PE/E.

Ecosprin prophylaxis needed to be started prophylactically to 5 high risk pregnant women to prevent one case of eclampsia, 14.5 for ARDS, 66.7 for HELLP syndrome, 11.1 to prevent one maternal death and 6.9 to prevent one perinatal death (Table 4).

Overall, pregnancy outcomes were significantly poorer in the high-risk group (G score ≥3) as compared to Low-risk group (G score< 3), with markedly higher rates of HDP (RR=7.3), preeclampsia/eclampsia (RR=8.9), preterm birth (RR=4.8), fetal growth restriction (RR=6.1), and cesarean delivery (RR=4.6), while the increase in incidence of antepartum hemorrhage was not statistically significant (Table 5).

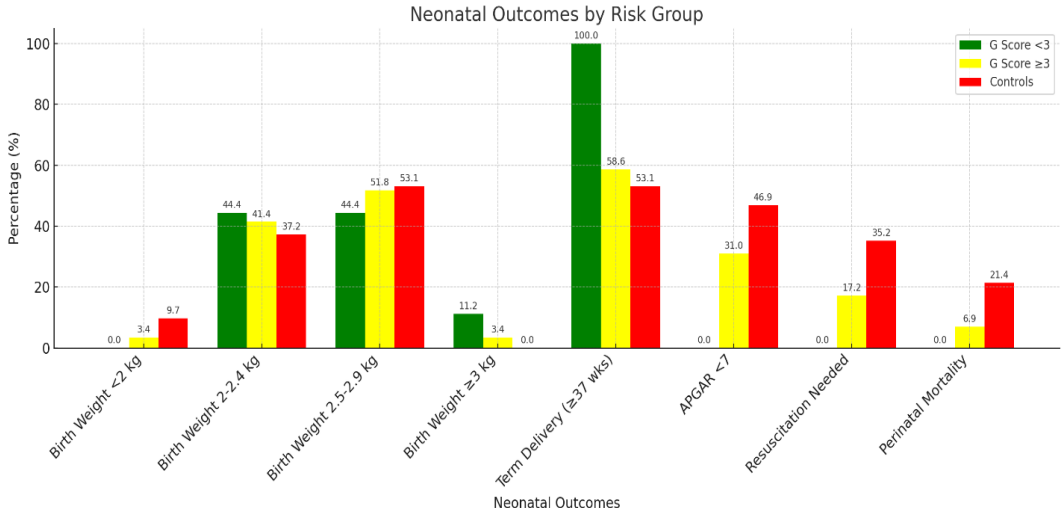

Figure 1: Neonatal outcomes amongst participants with HDP.

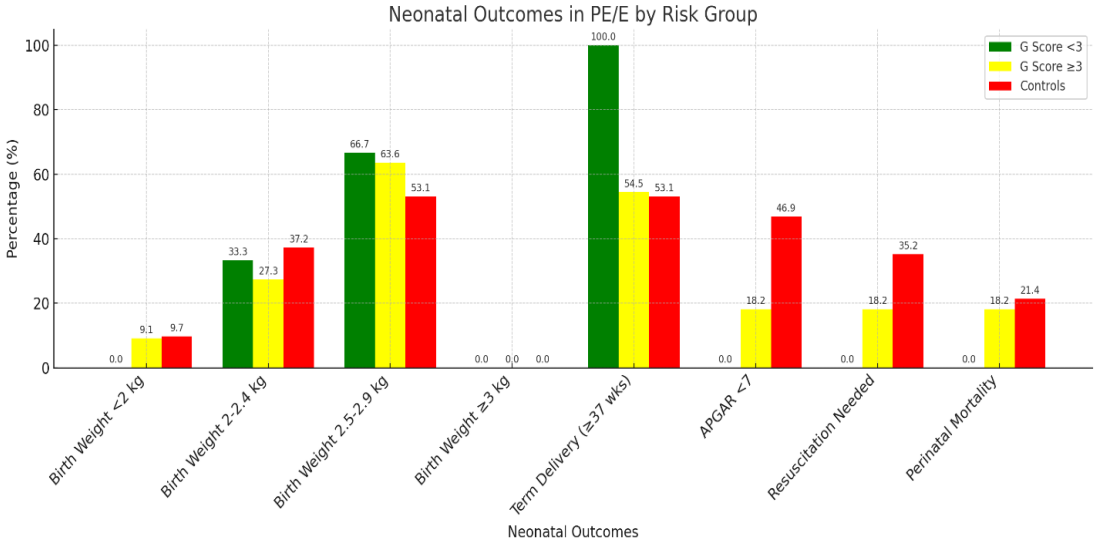

Figure 2: Neonatal outcomes amongst participants with PE/E.

Among participants with PE/E, emergency LSCS was most frequent in the G score ≥3 group (81.8%), followed by the control group (55.9%), while none occurred in the G score <3 group. Elective LSCS was performed only in the control group (4.1%). Overall, caesarean deliveries were markedly higher in women with higher gestosis scores and controls compared to those with G score <3.

Among 14 participants with preeclampsia, PPH requiring additional uterotonics was more frequent in the high-risk group (18.2%) than in controls (8.3%), though not statistically significant, while other complications like PPH requiring surgical repair, postpartum eclampsia, and respiratory distress occurred only in the control group without significant differences.

Neonates born to high-risk mother who developed HDP had a mean birth weight of 2.48±0.29 kg, lower than the low-risk group (2.52±0.33 kg) but slightly higher than controls (2.44±0.27 kg; p=0.035). Only 58.6% of high-risk neonates were delivered at ≥37 weeks, compared to 100% in the low-risk group and 53.1% in controls (p=0.01). APGAR scores <7 were significantly more common in the high-risk group (31.0%) than in the low-risk group (0%) but lower than in controls (46.9%; p=0.009). Additionally, high-risk neonates had higher rates of resuscitation (17.2% vs. 0% in low-risk and 8.2% in controls; p=0.020) and perinatal mortality (6.9%), while no perinatal deaths occurred in the low-risk group as shown in Figure 1.

Similar trends were seen in neonatal outcomes amongst the participants who developed preeclampsia in terms of higher mean birth weight (2.49±0.30kg), with 54.5% delivered at ≥37 weeks, while 18.2% had APGAR score ≤7, required neonatal resuscitation (versus 35.2% in control group) and had perinatal mortality as compared to 21.4% of control group, though differences were not statistically significant as shown in Figure 2.

Thus, neonatal outcomes in high-risk pregnancies affected by preeclampsia were notably better than those in the control group, likely due to quality antenatal care and close maternofetal monitoring initiated after the gestosis score identified them as high risk.

DISCUSSION

In our study, 71% of participants were categorized as low risk (gestosis score <3) and 29% as high risk (score ≥3), closely matching the distributions reported by Sravani et al (70% low, 30% high) and Reddy et al (67% low, 33% high).[8,16] Gupta et al and Imam observed a lower proportion of high-risk cases (14.59% and 13.77%, respectively), while Amrutiya SD et al.17 reported a higher high-risk distribution of 52%.

Maternal anemia, obesity, primigravida status, and MAP >85 mmHg were found to be significantly associated with the development of preeclampsia in our study, with relative risks ranging from 2.2 to 3.4. Other factors such as age <19 years, dyslipidaemia, and autoimmune diseases also showed elevated risk (RR≥2) but were not statistically significant. These findings were consistent with previous studies by Mishra SS6, Vingh S15, and Amrutiya SD17, emphasizing the multifactorial nature of preeclampsia and the importance of early risk identification through scoring systems like the gestosis score.[6,15,17]

In our study, 37.93% of high-risk women (G score ≥3) developed preeclampsia, significantly higher than the 2.82% in the low-risk group (IRR=8.98, p=0.0002). This incidence was lower than that reported by Vajreswari (76.47%) and Reddy (42.4%), but closely matched Vingh (37.9%).[11,15,16] Conversely, Gupta and Imam observed lower overall rates (15.01% and 17.43%).[5,10] Overall, the findings supported the effectiveness of the gestosis score in identifying women at risk.

In predicting preeclampsia, the gestosis score showed a sensitivity of 82.4%, specificity of 82.7%, and a high NPV of 96.6%, effectively identifying low-risk cases with a PPV of 43.8%. Table 6 compares these findings with similar studies across India in terms of sensitivity, specificity, and diagnostic accuracy.

Table 6: Compared table of results with similar studies.

Study	Year	Place	Incidence of PE in G score≥3 group	Sensitivity	Specificity	Diagnostic accuracy
Present study	2025	Punjab	48.2%	82.4%	82.7%	82.6%
Gupta et al[9]	2022	Jammu	85.5%	83.1%	97.5%	95.3%
Imam et al[10]	2022	Bihar	86.6%	86.6%	96.4%	96.1%
Vingh et al[15]	2023	Uttar Pradesh	37.9%	90%	85%	88%
Upadhyay et al[14]	2024	Uttar Pradesh	68.4%	72.7%	94.6%	91.6%
Reddy et al[16]	2023	Karnataka	42.4%	77.8%	76.8%	77%

In our study, hypertensive disorders were detected earlier in participants with a gestosis score ≥3 (approximately 34 weeks) compared to those with <3 (36 weeks), though not statistically significant. Preeclampsia before 37 weeks occurred in 90.9% of high-score cases versus 66.7% in low-score cases. These findings aligned with Kharodia et al, indicating a strong association between higher gestosis scores and earlier disease onset.[18]

No life-threatening complications occurred in participants with gestosis score <3 and only one case of HELLP syndrome (9%) was seen in the ≥3 group, with no eclampsia, ARDS, ARF, or maternal deaths. Although odds ratios for severe outcomes were low and not statistically significant, overall end-organ damage was significantly less (p=0.027). Ecosprin prophylaxis reduced the risk of major complications, though not significantly, and was less effective against hepatic and renal effects. Similar trends were observed by Ebrashy, with lower rates of preeclampsia and severe cases in the aspirin group.[19]

In our study, Ecosprin given before 20 weeks reduced the incidence of preeclampsia by 62% in high-risk women, with drops in eclampsia (OR 0.17) and ARDS (OR 0.56). Similar trends were seen in studies by Ebrashy and Surovi, where aspirin prophylaxis notably lowered the incidence of preeclampsia and severe outcomes.[13,19]

In group A, antepartum complications like APH, FGR, IUD and preterm birth occurred only in high-risk participants, though differences were not statistically significant. As compared to controls, prophylactic Ecosprin showed no significant protection against these outcomes. Ebrashy also reported lower IUGR rates with aspirin, though the difference was not significant.[19]

Cesarean deliveries in our study, were significantly more common in participants with gestosis score ≥3, with 81.8% undergoing emergency LSCS, while none occurred in the <3 group (p=0.053). Even among those without PE/E, women with higher scores had 4.6 times the cesarean rate compared to the low-score group. Similar trends were reported by Vingh, supporting the association between higher gestosis scores and increased obstetric intervention.[15]

Postpartum complications were more common in the control group, with PPH requiring surgical repair, postpartum eclampsia, and respiratory distress seen only in controls. Though not statistically significant, these findings suggest a potential protective effect of early identification and management in high-risk cases, as also observed by Vingh.[15]

High-risk HDP participants (G score ≥3) had significantly poorer neonatal outcomes, including lower term delivery rates, more frequent low APGAR scores (31%, p=0.009), and higher need for resuscitation (17.2%, p=0.020), with no adverse outcomes in the low-risk group. These findings align with Pahwa et al's data, highlighting the impact of HDP and elevated gestosis scores on neonatal health.[7]

In our study, neonates of high-risk PE/E mothers had better outcomes comparable than group B(controls), with lower rates of low APGAR scores, resuscitation, and perinatal mortality- likely due to early identification and close monitoring. Supporting studies by Vingh also found higher neonatal morbidity in high gestosis score groups, reinforcing its value in predicting adverse outcomes.[15]

Strengths of this article are: the study evaluated the gestosis score's effectiveness in predicting not only preeclampsia but the wide spectrum of HDP and assessed the role of Ecosprin in reducing preeclampsia and severe maternal and neonatal complications. Comparison with concurrent known PE/E cases helped to minimize confounding as both groups shared similar socioeconomic and cultural demographics.

There are some limitations also. The study conducted at single tertiary care hospital with small sample size, limits the generalizability and statistical power. Universal Ecosprin use in high-risk cases may have masked the full impact of elevated gestosis score on maternal and neonatal outcomes

CONCLUSION

The gestosis score is a cost-effective screening tool with up to 82% sensitivity and specificity for predicting preeclampsia and other hypertensive disorders of pregnancy. A score ≥3 indicates significantly increased risk for complications like abruptio placentae, FGR, preterm birth, and caesarean delivery. It is especially valuable in low-resource settings where it can be utilised by health care providers at all levels for early identification and management of high-risk pregnancies.

Ecosprin prophylaxis prevents preeclampsia in over 60% of high-risk pregnancies identified by the Gestosis Score and reduces severe complications like eclampsia, ARDS, and ARF. However, in those who still develop preeclampsia, its effectiveness in preventing APH, FGR, preterm births, IUD, and HELLP syndrome appears limited.

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