



## Pregnancy Outcome in High-Risk Pregnancies - A Prospective Cross-Sectional Study with Reference to Maternal and Perinatal Outcome

Dr. Kusha Vashistha<sup>1</sup>, Dr. Mrityunjay Chandrashekhar Metgud<sup>2</sup>, Dr. Kamal Patil<sup>3</sup>,

Dr. Mahadevi Savanur<sup>4</sup>, Dr. Vinutha Hanji<sup>5</sup>, Dr. Anusha Malapure<sup>5</sup>, Dr. Apurva Singh<sup>6</sup>

<sup>1</sup>Junior Resident, <sup>2,3</sup>Professor, <sup>4</sup>Associate Professor, <sup>5</sup>Assistant Professor, <sup>6</sup>Senior Resident

Department of Obstetrics and Gynaecology, KAHER's Jawaharlal Nehru Medical College, Belagavi, Karnataka, India.

*corresponding author: Dr. Kusha Vashistha<sup>1</sup>*

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### KEYWORDS:

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### ABSTRACT:

Background: High-risk pregnancies can be classified into various categories based on risk factors which includes pre-existing medical conditions (viz. heart disease, diabetes, and hypertension); maternal age; obstetric complications (such as a history of preterm labour or caesarean deliveries); and lifestyle factors (viz. tobacco use or drug abuse).

Objective: To study the maternal and perinatal outcome in high-risk pregnancy.

Methodology: Prospective cross-sectional study with source of data for this study was the patients with all high-risk pregnancies admitted to the KLE Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

Results: Coopland's score assessment showed that majority of the women had high score (>7) i.e. 47.0% followed by 45.2% had moderate score (4-6) and 7.8% had low score (0-3). We observed significant association between Coopland's score with preterm birth, low birth weight, NICU admission, Perinatal Mortality in our study ( $p < 0.05$ ).

Conclusion: We observed statistically significant association between Coopland's score with maternal outcomes such as operative delivery, maternal mortality, maternal morbidity in our study ( $p < 0.05$ ). We observed significant association between Coopland's score with preterm birth, low birth weight, NICU admission & Perinatal Mortality in our study ( $p < 0.05$ ).

### Introduction

Pregnancy is a physiological condition that brings significant changes to a woman's body, often accompanied by a wide range of potential risks, complications, and adverse outcomes. While most pregnancies proceed without major difficulties, a substantial proportion of pregnancies are categorised as "high-risk" due to various medical, obstetric, or environmental factors. High-risk pregnancies which are of high risk involve the conditions or circumstances that elevate the risk of adverse maternal and perinatal outcomes, including premature delivery, postpartum haemorrhage (PPH), preeclampsia, and fetal growth restrictions.<sup>1</sup> Understanding the predictors of these adverse outcomes and their impact on pregnancy is very important in improving maternal as well as fetal well-being and ensuring better management during prenatal and intrapartum care.<sup>2</sup>

High-risk pregnancies can be classified into various categories based on risk factors which includes pre-existing medical conditions (viz. heart disease, diabetes, and hypertension); maternal age; obstetric complications (such as a history of preterm labour or caesarean deliveries); and lifestyle factors (viz. tobacco use or drug abuse). Multiple pregnancies, fetal anomalies, and infections during pregnancy also contribute to higher risks for both the mother as well as foetus.<sup>3</sup> According to World Health Organization (WHO), around 15% of all pregnancies worldwide are categorized as high-risk, and these pregnancies require close monitoring, intervention, and specialized care to mitigate potential adverse outcomes.<sup>4-6</sup>

In India, the burden of high-risk pregnancies is particularly significant due to the high prevalence of maternal and perinatal complications, such as anaemia, hypertensive disorders of pregnancy, and infections.<sup>7</sup>



Given the resource constraints in many rural and urban areas, improving the outcomes of high-risk pregnancies through evidence-based approaches remains a key priority for maternal healthcare services. Several studies have highlighted the need for better surveillance and tailored management strategies in high-risk pregnancy populations, especially in settings where healthcare resources may be limited.<sup>8</sup>

**Objective:** To study the maternal and perinatal outcome in high-risk pregnancy

### Materials and methods

#### Source of data

The **source of data** for this study was the patients with all high-risk pregnancies admitted to the KLE Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi. This setting provided the necessary clinical environment for the study, with the institution serving as a critical hub for managing high-risk pregnancies.

**Study Design:** A **prospective cross-sectional study was conducted by collecting the data** from patients over a specified period, allowing for the analysis of outcomes in a real-time setting with an aim to assess maternal and perinatal outcomes based on the risk profiles of the patients admitted to the hospital.

The study was conducted between **May 2024 to April 2025**, or until the sample size is met, whichever occurs earlier, offering a one-year timeframe for patient recruitment and data collection. This period was crucial for gathering a sufficiently diverse sample size to ensure that both immediate and delayed outcomes were captured.

#### Sampling technique

All high-risk pregnancies admitted consecutively to the Labour Room at the KLE Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, that met the inclusion criteria were considered for the study. The following formula was used to calculate the required sample size.

$$n = \frac{p(100 - p)Z^2}{E^2}$$

Where:

- n represented the required sample size,
- p was the percentage occurrence of the condition (prevalence),
- E was the maximum error allowed, and
- Z was the Z-value corresponding to the desired confidence level.

Given that the reported prevalence of postpartum anaemia was 34.2%, a similar prevalence was assumed in the current study. A 95% confidence level and a 10% margin of error were selected. Substituting these values into the formula yields

$$n = \frac{34.2 \times (100 - 34.2) \times (1.96)^2}{(10)^2}$$

This resulted in a calculated sample size of 229.6, which was rounded to 230. We have included 500 samples in the present study. By selecting a larger sample size, the accuracy of the results was expected to improve, ensuring more reliable findings in the study.

#### Inclusion criteria

The inclusion criteria for the study were as follows:

- Women with a gestational age of > 28 weeks with a live fetus, attending KLE Dr. Prabhakar Kore Hospital.
- Cases with any risk factor (medical or obstetric risk factors in present and previous pregnancies)
- All booked or unbooked cases

#### Exclusion criteria

The exclusion criteria were designed to eliminate cases that did not provide relevant data for the goals of the study.

- Women with a gestational age of < 28 weeks
- Antenatal cases with intrauterine fetal death before admission.

#### Study protocol

Pregnant women meeting the inclusion criteria were recruited from the KLE Dr. Prabhakar Kore Hospital and Medical Research Centre. As the study was based on data collection from existing case records, a waiver of informed consent was granted, as no direct interaction



with the patients was required. Women who met the criteria were assessed using the Modified Coopland's scoring system to assign risk scores, categorising them into three groups: low risk (scores 0-3), moderate risk (scores 4-6), and high risk (scores  $\geq 7$ ). These patients were followed-up during their hospital stay until discharge or death. The monitored maternal outcomes included delivery mode, occurrence of postpartum haemorrhage (PPH) which requires the transfusion of blood products, maternal morbidities such as convulsions, DIC, abruptio-placenta, antepartum haemorrhage, peripartum cardiomyopathy, respiratory distress, overt DM, etc. as well as maternal mortality. The study examined several perinatal outcomes, including the weight of infants at birth, premature delivery, APGAR scores measured at the 5 minutes mark, admissions to the Neonatal Intensive Care Unit, as well as mortality during perinatal period. The main aim was to evaluate the predictive accuracy of Coopland's scoring system by examining the association with allocated risk scores as well as actual maternal and perinatal outcomes.

#### Data collection procedure

The data collection procedure involved gathering patient information from the case records. The data collected included patient demographics, obstetric histories, labour details, and outcomes of both maternal and foetal health during the current pregnancy. This approach ensured that a wide range of factors contributing to pregnancy risk were captured and that data were comprehensive for analysis.

#### Data processing and statistical analysis

In terms of data processing and statistical analysis, the collected data were validated to ensure accuracy, with checks for inconsistencies or typographical errors. Quantitative data were tested for normal distribution using visual inspections of histograms and Q-Q plots, along with skewness and kurtosis Z-values and the Shapiro-Wilk test. The study utilised an independent sample t-test to compare the mean as well as the standard deviation of variables with normal distribution. For variables that did not follow a normal distribution, the Mann-Whitney U test was employed. The Chi-square test or Fisher's exact test was employed to analyse qualitative data comparisons. To account for confounding variables, regression analysis was utilised. Statistical significance was determined by a P-value of  $< 0.05$ , indicating that the results were both robust and reliable.

#### Results

**Table 1: Coopland's score**

Coopland's Score	Frequency	Percent
Low (0 to 3)	39	7.8
Moderate (4 to 6)	226	45.2
High ( $\geq 7$ )	235	47.0
Total	500	100.0

Coopland's score assessment showed that majority of the women had high score ( $>7$ ) i.e. 47.0% followed by 45.2% had moderate score (4-6) and 7.8% had low score (0-3).

**Table 2: Association of Coopland's score with maternal outcome as operative delivery**

Operative delivery	Coopland's score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Elective term	8	8.25	35	36.08	54	55.67	97	76.8	0.0001*
Emergency term	13	7.83	116	69.88	37	22.29	166		



Elective pre term	8	20.51	12	30.77	19	48.72	39		
Emergency pre term	0	0	12	26.09	34	73.91	46		

\*Indicates significant association

Out of 359 cases with caesarean delivery, low Coopland’s score was found in 8.1%, as against 48.7% with moderate score and 40.1% with high score. We

observed statistically significant association between Coopland’s score with maternal outcomes such as mode of delivery in our study ( $p < 0.05$ ).

**Table 3: Association of Coopland’s score with maternal outcome as maternal mortality**

Maternal mortality	Coopland’s score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Yes	1	11.11	2	22.22	6	66.67	9	83.07	0.0001*
No	38	7.74	224	45.62	229	46.64	491		

Association of Coopland’s score with maternal outcome like maternal mortality was studied and revealed that out of 9 deaths, low Coopland’s score was found in 11.11%, as against 22.22% with moderate score and 66.67% with

high score showing statistically significant association between Coopland’s score with maternal mortality in our study ( $p < 0.05$ ).

**Table 4: Association of Coopland’s score with maternal outcome as maternal morbidity**

Maternal morbidity	Coopland’s score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Yes	39	15.23	84	32.81	133	51.95	256	71.97	0.00001*
No	0	0	142	58.2	102	41.8	244		

Association of Coopland’s score with maternal outcome like maternal morbidity was studied and revealed that out of 256 cases, low Coopland’s score was found in 15.23%, as against 32.81% with moderate score and 51.95% with

high score showing statistically significant association between Coopland’s score with maternal morbidity in our study ( $p < 0.05$ ).

**Table 5: Association of Coopland's score with neonatal outcome as preterm birth**

	Coopland's score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Preterm	11	9.02	32	26.23	79	64.75	122	71.04	0.00001*
Term	28	7.41	194	51.32	156	41.27	378		

Association of Coopland's score with neonatal outcomes like preterm were studied and revealed that out of 122 preterm cases with early neonatal deaths, low Coopland's score was found in 9.02%, as against 26.23%

with moderate score and 64.75% with high score showing statistically significant association between Coopland's score with preterm in our study ( $p < 0.05$ ).

**Table 6: Association of Coopland's score with neonatal outcome as low birth weight**

Birth weight	Coopland's score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
<2.5	6	2.26	75	28.3	184	69.43	265	43.93	0.0001*
>2.5	33	14.04	151	64.26	51	21.7	235		

Association of Coopland's score with neonatal outcomes like birth weight were studied and revealed that out of 265 low birth neonates, low Coopland's score was found in 2.26%, as against 28.30% with moderate score and

69.43% with high score showing statistically significant association between Coopland's score with birth weight in our study ( $p < 0.05$ ).

**Table 7: Association of Coopland's score with neonatal outcome as NICU admission**

NICU Admission	Coopland's score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Yes	22	7.97	89	32.25	165	59.78	276	46.43	0.00001*
No	17	7.59	137	61.16	70	31.25	224		

Association of Coopland's score with neonatal variables like NICU admission was studied and revealed that out of 276 NICU admissions, low Coopland's score was found in 7.97%, as against 32.25% with moderate score

and 59.78% with high score showing statistically significant association between Coopland's score with NICU admission in our study ( $p < 0.05$ ).

**Table 8: Association of Coopland's score with neonatal outcome as perinatal mortality**

Perinatal Mortality	Coopland's score						Total	Chi-square value	p value
	Low (n-39)		Moderate (n-226)		High (n-235)				
	No	%	No	%	No	%			
Early neonatal deaths	5	19.23	9	34.62	12	46.15	26	5.96	0.036*
FSB	1	7.14	5	35.71	8	57.14	14		
MSB	0	0	1	16.67	5	83.33	6		
Live	33	7.27	211	46.48	210	46.26	454		

Association of Coopland's score with neonatal outcomes like perinatal mortality were studied and revealed that out of 26 cases with early neonatal deaths, low Coopland's score was found in 19.23%, as against 34.62% with moderate score and 46.15% with high score. Out of 14 cases with fresh still births, low Coopland's score was found in 7.14%, as against 35.71% with moderate score and 57.14% with high score. Out of 6 cases with macerated still births, low Coopland's score was found in 0%, as against 16.67% with moderate score and 83.33% with high score. Out of 454 live births, low Coopland's score was found in 7.27%, as against 46.48% with moderate score and 46.26% with high score. We observed statistically significant association between Coopland's score with neonatal outcomes like perinatal mortality in our study ( $p < 0.05$ ).

## Discussion

### Coopland's score assessment

Coopland's score assessment showed that majority of the women had high score ( $>7$ ) i.e. 47.0% followed by 45.2% had moderate score (4-6) and 7.8% had low score (0-3).

Chate SU et al<sup>14</sup> reported that, "women had high score ( $>7$ ) i.e. 45.6% followed by 40.1% had moderate score (4-6) and 13.6% had low score (0-3)."<sup>14</sup> Authors retrospectively made observations in Saudi Arabian cohort "533 pregnant women using a similar scoring system showed that their risk scores were 55.9% low, 34.7% moderate, and 9.4% high. Maternal and neonatal complications were significantly increased in high-risk

mothers, which suggested the use of a risk assessment method to prevent adverse pregnancy outcomes by early detection and treatment of HRP."<sup>17</sup> Jadhao AR et al<sup>9</sup> "conducted the study with 428 mothers using Coopland's criteria showed that 40.2% had high risk and 59.8% cases were low risk. None of the women were of the extreme risk category. The most commonly reported risk factors were thyroid disorders (27.3%, hypothyroidism 17.3%; hyperthyroidism 10%), gestational diabetes (16.1%), bad obstetric history (12.6%), and anaemia (10.7%)."<sup>9</sup> Findings of Jain S. et al<sup>16</sup> study, "observed low-risk group mothers had a 50% lower incidence of high-risk neonates (41.3%) when compared to high-risk group mothers, who had 84.4% of high-risk neonates."<sup>16</sup> "A retrospective Saudi Arabian cohort study of 533 pregnant women using a similar scoring system showed that their risk scores were 55.9% low, 34.7% moderate, and 9.4% high. Maternal and neonatal complications were significantly increased in high-risk mothers, which suggested the use of a risk assessment method to prevent adverse pregnancy outcomes by early detection and treatment of HRP."<sup>17</sup>

### Association of Coopland's score with maternal outcomes

Association of Coopland's score with maternal outcomes like of operative delivery revealed that out of 359 cases with caesarean delivery, low Coopland's score was found in 8.1%, as against 48.7% with moderate score and 40.1% with high score. We observed statistically significant association between Coopland's score with maternal outcomes such as mode of delivery in our study



( $p < 0.05$ ). Chate SU et al<sup>14</sup> reported that, “in a Nagpur rural study, there were 142 (66.36%) study subjects with low-risk pregnancy, and the prevalence of high-risk pregnancy observed was 33.64% and was significantly associated with caesarean section and low birth weight.”<sup>14</sup>

Association of Coopland’s score with maternal outcome like maternal mortality was studied and revealed that out of 9 deaths, low Coopland’s score was found in 11.11%, as against 22.22% with moderate score and 66.67% with high score showing statistically significant association between Coopland’s score with maternal mortality in our study ( $p < 0.05$ ). Association of Coopland’s score with maternal outcome like maternal morbidity was studied and revealed that out of 256 cases, low Coopland’s score was found in 15.23%, as against 32.81% with moderate score and 51.95% with high score showing statistically significant association between Coopland’s score with maternal morbidity in our study ( $p < 0.05$ ). A similar Pokhara study reported that, “among 700 participants using modified high-risk scoring method showed 67.3% of mothers in low-risk, 20% in high-risk, and 12.7% of them in severe high-risk groups and showed that identifying high-risk pregnancy using a scoring system is useful to identify women at risk of developing maternal and perinatal complications as caesarean deliveries, maternal complications, low birth weight, and NICU admissions were mostly seen in severe high-risk (60%) and high-risk pregnancies (26%) than in low-risk pregnancies (15%).”<sup>18</sup>

### Conclusion

- We observed statistically significant association between Coopland’s score with maternal outcomes such as mode of delivery, maternal mortality, maternal ICU admission, maternal morbidity in our study ( $p < 0.05$ ).
- We observed significant association between Coopland’s score with preterm, low birth weight, NICU admission, Perinatal Mortality in our study ( $p < 0.05$ ).
- A high-risk scoring system is a straightforward and cost-effective tool designed to identify pregnancies that are likely to lead to poor maternal and perinatal outcomes. This scoring system can be utilized in primary and urban health centers to categorize pregnant women into various risk levels. Antenatal

cards for these women can display their risk scores, allowing those with high scores to be referred to tertiary care centers for prompt intervention and proper management. Moreover, early detection and intervention can help prevent the deterioration of certain modifiable high-risk factors.

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