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Original Research Article

High risk scoring in pregnancy using modified Copland's scoring system and its association with perinatal outcome

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ABSTRACT

Background: High-risk pregnancy is one in which the mother, foetus or the newborn has an elevated risk of experiencing an adverse outcome. These high-risk women form a special vulnerable cohort that can be identified in the antenatal period using a simple, easy to use, cost-effective tool- a maternal risk scoring system. Early identification of these high-risk mothers will facilitate effective intervention strategies to deal with the complications.

Methods: This study was carried out on 300 pregnant women with gestational age more than 28 weeks. Detailed history, examination and necessary investigations were done and then using the Modified Copland scoring system, each pregnant woman was assigned a risk score and stratified into 3 risk groups- low risk (0-3), moderate risk (4-6) and high risk (≥ 7) and followed up till delivery and 7 days postpartum. Subsequently, the maternal and perinatal outcomes were compared with their respective scores.

Results: In this study, 14.66% patients belonged to the high-risk category. Statistically, a significant difference was noted in the number of low-birth-weight babies, in 5 minutes APGAR score < 7 and in NICU admissions in the high-risk group compared to the low-risk group. Overall perinatal mortality was 13.33/1000 live births. In the high-risk group, a significant difference was seen in the occurrence of PPH and the need for operative delivery.

Conclusions: Significant association between high-risk pregnancy and the poor maternal and perinatal outcome was noted. Therefore, a simple, cost-effective high-risk pregnancy scoring system such as the one proposed in this study can be used to identify potential high-risk pregnancies, provide them with tertiary care facilities and also corrective measures can be undertaken to prevent or minimize the complicating factors.

Keywords: Birth asphyxia, High risk pregnancy, Low birth weight, Maternal mortality, Maternal risk score, Perinatal mortality, Preterm birth,

INTRODUCTION

A high-risk pregnancy (HRP) is a pregnancy complicated by a disease or disorder that may endanger the life or affect the health of the mother, the foetus or the newborn.¹ This disease or disorder may be existing before pregnancy, or it may be coincidental or unique to pregnancy.

In 2013, according to the United Nations Population Fund, about 2,89,000 women died of pregnancy-related

complications, of which more than 90% are in the developing world.² Most perinatal deaths too occur in low and middle-income countries. India accounts for nearly 1/4th of the total global burden of early neonatal deaths.^{3,4} The declining infant mortality rate in India has shifted the focus on perinatal outcome as a yardstick of good obstetric and neonatal care.¹

About 20-25% of all pregnancies fall in the high-risk category, but this small group is responsible for a

disproportionately high 70-80% of perinatal morbidity and mortality.⁵

Identification of patients at high risk for complications is the most fundamental aspect of good antenatal care. Obstetric risk scoring is a way of recognizing, documenting and analysing antepartum and intrapartum factors to predict the development of complications in the mother, foetus and infant. Several authors have proposed various high-risk pregnancy scoring systems. The risk factors are based on past obstetric history, present pregnancy, medical and surgical illnesses and each factor is assigned a score proportional to the degree of risk.⁶⁻¹⁰

An HRP needs to be identified at an early stage to have an effective intervention strategy to deal with its complications. Timely maternal and foetal surveillance is needed to ensure an optimal outcome for both the mother and her newborn.¹

Identification of HRP is beneficial to the health care system as well because valuable medical time, resources, access to tertiary care facilities and timely referral can be reserved for these high-risk pregnancies and the relatively low-risk ones can be managed with minimal intervention only.

In our study we have used a modification of the scoring system proposed by Coopland et al to score the pregnancies, to identify the HRPs and to correlate the various degrees of risk with the perinatal outcome.⁶

METHODS

This research study was carried out in the department of Obstetrics and Gynecology at Government Medical College, Ernakulam, a tertiary level teaching hospital in Kerala.

Table 1: Modified Coopland’s scoring system.

Parameter	Score	Parameter	Score		
Risk factor	Age <18	2	Bleeding before 20 weeks of gestation	1	
	Age 18-35	0	Bleeding after 20 weeks of gestation	3	
	Age >35	2	Anaemia Hb 6-10 g%	1	
	Parity 0	1	Anaemia Hb <6 g%	2	
	Parity 1-4	0	Rh isoimmunisation	3	
	Parity ≥5	2	Malpresentation at term	3	
Medical/surgical conditions	Chronic hypertension	2	Multiple pregnancy	3	
	Pregestational diabetes mellitus	2	Hypertension	2	
	Chronic renal disease	2	Eclampsia	3	
	Heart disease (NYHA- III or IV)	3	Present pregnancy conditions	Gestational diabetes	2
	Heart disease (NYHA I or II)	1	Placenta praevia	2	
	Previous gynaecological surgery	2	PROM	2	
	Other significant medical illnesses- TB, asthma, epilepsy, autoimmune disease	1-3 based on severity	PPROM	3	
Past obstetric history	History of infertility	1	Polyhydramnios (amniotic fluid index >24)	2	
	History of 2 or more first trimester abortions	1	Oligohydramnios (amniotic fluid index < 5)	2	
	History of second trimester abortions	2	IUGR (foetal weight <10 th centile for gestational age)	3	
	Previous child birth weight <2.5 kg or >4 kg	1	Abnormal Doppler	3	
	Previous caesarean section	1	Modified Coopland’s score		
	History of PPH or manual removal of placenta	1			
	Previous still birth or neonatal death	3			
	Prolonged/difficult labour	2			
	Gestational hypertension/preeclampsia	2	Total score	Low risk	0-3
	Eclampsia	3		Moderate risk	4-6
Gestational diabetes	2	High risk		≥7	

Duration of the study

The study took place from September 2019 to March 2020.

Study design

It was a prospective cohort study.

A total 300 randomly selected pregnant women with gestational age more than 28 weeks of gestation reporting to the department were recruited into the study after valid informed consent.

In all the selected pregnant women, a detailed medical and obstetric history was obtained. General, systemic and obstetric examination and relevant investigations were carried out. Subsequently, using the Modified Copland scoring system (Table 1), each selected patient was assigned a risk score. During subsequent visits, any change in the score was made as needed. Based on the total score, we categorized the patients into 3 risk groups: 0-3: low risk, 4-6: moderate risk, ≥ 7 : high risk.

The patients were followed up till delivery and for 7 days postpartum.

The maternal outcomes studied were the mode of delivery, postpartum haemorrhage (PPH) requiring blood transfusion, maternal morbidity- sepsis, wound infection and maternal mortality.

The perinatal outcomes studied were birth weight, prematurity, APGAR scores at 5 minutes, neonatal intensive care unit (NICU) admission and perinatal mortality. The risk scores assigned to the mothers were compared with the outcomes.

Statistical analysis

All the data was entered in MS Excel spreadsheet, percentages, mean and standard deviation calculated. Odds ratio was calculated for statistical significance and p value <0.05 was considered significant.

RESULTS

Out of the 300 pregnant women in the study, at the time of delivery, 14.66% were in the high-risk group with risk score ≥ 7 . Majority of the patients 65.66% belonged to the low-risk group (Table 2).

Table 2: Distribution of cases into risk groups on basis of scores.

Score	Risk group	No. of cases	% of cases
0-3	Low risk	197	65.66
4-6	Moderate risk	59	19.66
≥ 7	High risk	44	14.66

Table 3 to 7 shows the perinatal outcome in the 3 risk groups.

Table 3: Modified Copland’s scoring system in pregnancy and perinatal outcome: correlation between risk groups and preterm birth (<37 weeks gestational age).

Risk group	Total number	Preterm births	%	Odds ratio	95% confidence interval	P value
Low risk	197	24	12.18	Reference	-	-
Moderate risk	59	10	16.94	1.471	0.659-3.283	0.346
High risk	44	12	27.27	2.703	1.228-5.950	0.0135

Table 4: Modified Copland’s scoring system in pregnancy and perinatal outcome: correlation between risk groups and low birth weight (<2.5 kg).

Risk group	Total number	Low birth weight (<2.5 kg)	%	Odds ratio	95% confidence interval	P value
low risk	197	22	11.16	Reference	-	-
moderate risk	59	11	18.64	1.822	0.826-4.021	0.137
high risk	44	16	36.36	4.545	2.131-9.696	0.0001

Table 5: Modified Copland’s scoring system in pregnancy and perinatal outcome: correlation between risk groups and APGAR score.

Risk group	Total number	5-minute APGAR score <7	%	Odds ratio	95% confidence interval	P value
Low risk	197	20	10.15	Reference	-	-
Moderate risk	59	12	20.33	2.259	1.031-4.952	0.0417
High risk	44	16	36.36	5.057	2.344-10.909	<0.0001

The various perinatal outcomes- preterm births (Table 3), birth weight (Table 4), APGAR score at 5 minutes (Table 5), NICU admission (Table 6) and perinatal mortality (Table 7) were correlated to the risk groups.

In our study, the women in the high-risk group had a 27.27% risk of preterm births against 16.94% in moderate-risk group and only 12.18% in the low-risk group, but this difference was not statistically significant.

Table 6: Modified Copland’s scoring system in pregnancy and perinatal outcome: correlation between risk groups and neonatal ICU (NICU) admission.

Risk group	Total number	NICU admission	%	Odds ratio	95% confidence interval	P value
Low risk	197	19	9.64	Reference	-	-
Moderate risk	59	11	18.64	2.147	0.957-4.817	0.0639
High risk	44	12	27.27	3.513	1.555-7.936	0.0025

Table 7: Modified Copland’s scoring system in pregnancy and perinatal outcome: correlation between risk groups and perinatal mortality.

Risk group	Total number	Perinatal mortality	%	Odds ratio	95% confidence interval	P value
Low risk	197	0		Reference	-	-
Moderate risk	59	1	1.69	10.128	0.407-251.957	0.1580
High risk	44	3	6.81	33.813	1.689-657.233	0.0212

In the high-risk group, 36.36% of mothers had low birth weight (<2.5 kg) babies with odds ratio 4.545 95% confidence interval 2.131-9.696 and a significant p value of 0.0001.

in the low-risk group with odds ratio 3.573, 95% Confidence Interval 1.555-7.936 and p value 0.0025 which was statistically significant.

In the high-risk group, 36.36% of the babies had 5 minute APGAR score <7 as compared to 10.15% in the low-risk group with an odds ratio of 5.057 and p value <0.0001 which was statistically significant.

In this study, there were 4 cases of perinatal mortality: 1 in the moderate risk group and 3 in the high-risk group. Out of the 4 perinatal deaths, 2 were intrauterine foetal demise and 2 were early neonatal deaths due to complications of prematurity.

Among babies born to mothers in the high-risk group, 27.27% required NICU care as compared to only 9.64%

A statistically significant difference in adverse perinatal outcome was not noted when the moderate-risk group was compared to the low-risk group.

Table 8: Modified Copland’s scoring system in pregnancy and maternal outcome: correlation between risk groups and need for operative delivery.

Risk group	Total number	Operative delivery	%	Odds ratio	95% confidence interval	P value
Low risk	197	50	25.36	Reference	-	-
Moderate risk	59	24	40.67	2.016	1.095-3.712	0.024
High risk	44	29	65.90	5.684	2.819-11.459	<0.0001

Table 9: Modified Copland’s scoring system in pregnancy and maternal outcome: correlation between risk groups and occurrence of postpartum haemorrhage (PPH).

Risk group	Total number	PPH	%	Odds ratio	95% confidence interval	P value
Low risk	197	2	1.01	Reference	-	-
Moderate risk	59	3	5.08	5.223	0.852-32.036	0.074
High risk	44	8	18.18	21.667	4.419-106.225	0.0001

Table 8 to 9 shows the maternal outcome in the 3 different risk groups.

risk group- with odds ratio 5.684 and p value <0.0001 which was statistically significant. In the moderate-risk group too, the outcome of operative delivery was statistically significant p=0.024.

In the high-risk group, the need for operative delivery (Table 8) was 65.90% as against only 25.36% in the low-

In the high-risk group, 18.18 % of women had postpartum haemorrhage (PPH) requiring blood transfusion (Table 9) with an odds ratio of 21.667 and statistically significant p value 0.0001, while in the low-risk group only 1.01% women had PPH. The occurrence of PPH in the moderate risk group was not statistically significant.

There was no maternal mortality.

DISCUSSION

Each high-risk pregnancy scoring system consists of a set of conditions known to be poor prognostic indicators in pregnancy. Increasing risk scores were found to positively correlate with poorer maternal and perinatal outcome.

By using a simple, easy to use, non-invasive, cost-effective numerical scoring system, if we can identify high-risk pregnancies in the antenatal period, then these pregnant women can be provided specialized care and interventions aimed at preventing adverse maternal and perinatal outcome.

In our study, 14.66% of the patients were in the high-risk category. In a study by Mufti et al, it is 15%, the study by Anand et al reported incidence of 11.5%, while in an older study by Kaur et al the incidence is much lower at 9.2%.^{11,12,14}

In 2009, Haws et al reviewed various studies on the impact of high-risk pregnancy screening on perinatal mortality.¹⁰ They reviewed 10 studies from all over the world and found that most of them had good correlation with perinatal outcomes like preterm birth, birth asphyxia, low APGAR scores and perinatal mortality in high risk and extremely high-risk cases.

Coopland et al, found that low-risk pregnancy had a perinatal mortality rate of 4.8/1000 live births while in the high-risk category it was 112/1000.⁶ Mufti et al had perinatal mortality of 46.1/1000, while in our study it was 13.3/1000 but while there were zero perinatal deaths in the low-risk group, out of the 4 perinatal deaths, 3 were in the high-risk group.¹²

Also, in our study, concerning preterm births, birth weight <2.5 kg, APGAR score at 5 minutes <7 and number of babies needing NICU admission, statistically significant difference was seen in the high-risk group. Similar results were seen in the study by Datta et al, Kolluru et al, Mufti et al, Kaur et al.^{9,11-13} Most of the studies referred here compared only the perinatal outcome among the risk groups.

The study by Anand et al, correlated the maternal outcomes in the various risk groups and found statistically significant differences in the occurrence of PPH, operative deliveries, hospital stay in the high-risk

group.¹⁴ In our study we found the incidence of PPH in the high-risk group was 18.18%, the need for operative delivery was 65.90%, both of these parameters were statistically significant.

Thus, in our study, we were able to detect high-risk pregnancy using a simple, easily accessible numerical scoring system and found a positive correlation between higher risk scores and poor perinatal and maternal outcome.

CONCLUSION

A high-risk scoring system is simple, easy to use cost-effective modality to identify pregnancies at high risk for the poor maternal and perinatal outcome. Hence such a scoring system can be implemented at the level of primary and urban health centres to stratify pregnant women into different risk categories. The antenatal cards of the pregnant women can mention this risk score and all women with a high-risk score can be referred to tertiary care centres for timely intervention and appropriate management. Additionally, worsening of certain modifiable high-risk factors can be prevented if they are identified and picked up at an early stage.

The primary purpose of a formal risk assessment in obstetrics is the prevention and consequent reduction of maternal and perinatal morbidity and mortality through early identification and intervention.

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