High risk scoring in pregnancy using modified Coopland’s scoring system and its association with perinatal outcome

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Received: 06 February 2021
Accepted: 08 March 2021

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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 Coopland 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,
disproportionately high 70-80% of perinatal morbidity and mortality.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{5}

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

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 high-risk group, 36.36% of the babies had APGAR score <7 as compared to 10.15% in the low-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 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.

A statistically significant difference in adverse perinatal outcome was noted when the moderate-risk group was compared to the low-risk group.

Table 7: Modified Coopland’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                   | 0.00 | 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 low-risk group with odds ratio 3.573, 95% Confidence interval 1.555-7.936 and p value 0.0025 which was statistically significant.

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

In the high-risk group, 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 8: Modified Coopland’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 Coopland’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.

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

**ACKNOWLEDGMENTS**

Authors wish to acknowledge support received from the Principal, Government Medical College Ernakulam and the interns and staff of Department of Obstetrics and Gynecology.

**Funding:** No funding sources
**Conflict of interest:** None declared
**Ethical approval:** The study was approved by the Institutional Ethics Committee

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Cite this article as: Pillai SS, Mohan S. High risk scoring in pregnancy using modified Coopland’s scoring system and its association with perinatal outcome. Int J Reprod Contracept Obstet Gynecol 2021;10:1608-13.