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Prenatal Risk Score and Pregnancy Outcome: A Study in Nepal.

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ABSTRACT

Usually expectant mothers having risk factors experience more complications. Identification of high risk pregnancies at an early stage with a simple risk scoring system can anticipate complications. Timely appropriate intervention care can have an impact on maternal mortality and morbidity especially in a low resource country. The study objective was to screen the risk status of pregnant mothers at community level using a simple scoring system with 28 prenatal and 16 intrapartum factors and assess pregnancy outcome. Also to compare the sensitivity & specificity tests of pregnancy outcome by risk score at different cut off points, check effectiveness of the optimum score for this simple scoring system. Low birth weight and neonatal death were undesirable pregnancy outcome. Pregnancy outcome was analyzed with risk score of mothers ranging from 0 to 5. Cut off point at score of 3 was found to be ideal to identify high risk cases with optimum sensitivity and specificity of the test.The study suggests that it is possible to screen at risk expectant mothers using a simple scoring system. Appropriate timely intervention care can change the risk status of the expectant mother with a better pregnancy outcome thereby influence maternal mortality and morbidity rate.

Keywords: Prenatal Risk Scoring, Pregnancy Outcome, Nepal

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INTRODUCTION

Women and mothers are exposed to greater physiological and social risks than other groups in any country. The adoption of strategies to achieve health for all by the year 2000 and subsequently the millennium development goal is not possible without promoting the maternal and child health care at grass root level in developing and under developed countries [1,2]. Maternal Mortality is still comparatively high in many under developed and developing countries for various reasons despite health care activities to bring it down [3-9]. In Nepal, it was possible due to the appropriate strategy adopted by the Govt. of Nepal in Safe Motherhood Program to reduce maternal mortality from 850 maternal deaths per 100,000 live births in 1990 to just 281 in 2006 [10]. To achieve the millennium development goal (MDG 5) target of 213 maternal deaths per 100,000 live births by 2015 will warrant additional coordinated approach [11]. But the paucity of resources in the developing countries is hindrance to have a equitable distribution and caring more for those who need most. Adopting a risk care approach is the appropriate strategy to tackle the situation with available resources. For that, those in the vulnerable groups should be identified, although it is not easy to identify the individuals who are at different levels of risk [12, 13]. A number of characteristics are associated with high risk pregnancy which influence singly or in combination with each other maternal condition and neonatal outcome [2,12]. Identification of these characteristics or risk factors among groups or individuals leads to detection of vulnerable population in the community. For this, a proper sequential step to screen the risk factors in the target population is to be adopted. Several risk screening methods using different risk scoring technique have been tried out with encouraging results [13-22].

Objective of the Study: The objective of the study was

- To screen the risk status of pregnant mothers at community set up using a simple scoring system and assess pregnancy outcome.
- To find out the effectiveness of the simplified scoring system to identify high and low risk group of antenatal cases.
- To compare the sensitivity & specificity tests of pregnancy outcome by risk score at different cut off points.
- To see optimization takes place at what cut off score point, of specificity and sensitivity of the test and trade off of antenatal cases at risk.
- To find out association of undesirable outcome in neonates with risk factors present in expectant mothers.

MATERIAL AND METHOD

A prospective cohort of 187 prenatal cases at Khairenitar Health Post at Dulegauda of Tanahu District of Western Region of Nepal were followed up by the health workers and community health volunteers under the outreach care program and both the mother and the new born were assessed after delivery from August 2011 to July 2012 .

Key prognostic factors

The Scoring system was developed by the first author during 1983 and was used for screening antenatal cases at the “High Risk Pregnancy Clinic” of Govt. Medical College, Nagpur , India and applied in different prospective research studies either “Hospital Based ” or ” Community based ” under Nagpur University , Maharashtra, India.

The simplified scoring system contained 28 antepartum and 16 intrapartum factors under the broad heads as given below. The factors were assessed with weightage in numerical value of 0, 1, 2 or 3.

- Antepartum Factors like Marital & Biological factors, Past Obstetric factors, Associated conditions and Present pregnancy,
- Intrapartum factors like Labour, Surgical Intervention and Complications
- Post deliver, the new born was assessed with Neonatal factors and mother’s condition was assessed with Postpartum factors. These factors were not given any numerical score.

Setting and design

All the Cases were under continuous clinical surveillance throughout the period of pregnancy and followed up by the health workers and community health volunteers under the outreach care program and the outcome assessed.

A scoring system was used to assess the expectant mothers who were grouped into low and high risk categories. Follow up of both the mother and newborn was done after pregnancy. The score was from 0 to 5 & more with numerical weightage given to the risk factors separately present in the antenatal cases and added on for individual cases to group them either in low or high risk.

Inclusion exclusion criteria

All the cases reported and registered and could be followed till delivery and puerperal period were included in the study.

Outcome variable

The main outcome variable was 187 antenatal cases who reported for regular checkup and could be followed up till delivery and at least up to 6 weeks post delivery

Approval of Ethical committee

Prior the study, approval was taken from the institutional ethical committee, Manipal Teaching Hospital, Pokhara, Nepal. The Research was conducted in accordance to latest version of the Declaration of Helsinki.

Data management and statistical analysis

The data collected was analyzed using Excel 2003, R 2.8.0 Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc. Chicago, IL, USA) and EPI Info 3.5.1 Windows Version.

Sample size calculation for Sensitivity or Specificity

This being initial study in Nepal, in the pilot study specificity at pregnancy outcome by risk score and cut off point at total score level 3 was 80% in 20 cases.

Significance level $\alpha = 5\%$
Allowable Error E = 10%

$$N = 1.96^2 x 80 x 20/8^2 = 96$$

RESULTS

Out of 187 cases, initially 141 (75.4%) were in low risk group and 46 (24.6%) in high risk group. Subsequently 135 (96.5%) low risk cases remained low while 6(4.3%) were converted to high risk status.

While 37 (80.43%) initial high risk cases were converted to low risk group but in 9 (19.57%) status remained unchanged.

There were total 10 unwanted outcome, 10 (21.74%) out of 46 high risk cases and 5 (3.65%) out of 141 low risk cases.

Distribution of Pregnancy Outcome by Risk Score

The risk scores have been arranged in the descending order of magnitude and distribute 187 mothers and the neonatal outcome. If we consider to use a risk score of 5 to define the high risk group, the scoring

system would identify correctly only 4 i.e. 26.67 % of the 15 mothers who had unwanted outcome but it would include only 5.88 % of all births.

If we decide to use score of 4 to define the high risk group we would obtain 32 women of which 8 i.e. 53.33 % had a unwanted outcome and 24 a wanted outcome i.e. 8 "True positives" and 24 " False positives".

If we decide to use score of 3 to define the high risk group we would obtain 46 women of which 10 had unwanted outcome i.e. 66.67 % and 36 a wanted outcome, i.e. 10 "True Positives" and 36 "False positives" Thus different cut off score points would give different numbers and percentages in the four categories viz. true and false positive and true and false negative.

Table 1: Distribution of Pregnancy Outcome by Risk Score

Risk Score	Mothers		Unwanted Outcome		Wanted Outcome
	No	Cum %	No	Cum %	No
5	11	5.88	4	26.67	7
4	21	17.11	4	53.33	17
3	14	24.6	2	66.67	12
2	58	55.62	4	93.33	54
1	51	82.89	1	100.0	50
0	32	100.0	0	0	32
Total	187	-	15	-	172

The Table 2 gives the abstract derived from the Table 1 for all the cut off points from 0 to 5

Table 2: Distribution of Pregnancy Outcome by Risk Score and Cut off Points

	Cut off Point placed at a Score of					
	0	1	2	3	4	5
True + ve	15	15	14	10	8	4
False + ve	172	140	90	36	24	7
True - ve	0	32	82	136	148	165
False - ve	0	0	1	5	7	11
Total	187	187	187	187	187	187

The cutoff point gives a satisfactory balance between predictive powers of positive and negative tests and proves the effectiveness of the test. Using data from the Table 2 above, the predictive powers have been obtained and is given in the following Table 3.

Table 3: Predictive Power of Positive & Negative Test of Pregnancy Outcome by Risk Score and Cut off Points

Predictive Power	Cut off Point placed at a Total Score of					
	0	1	2	3	4	5
+ ve Test	8.02 %	9.68 %	13.46 %	21.74 %	25.0 %	36.36 %
- ve Test	Indeterminate	100 %	98.8 %	96.45 %	95.48 %	93.75 %

The choice of the cutoff point of risk score of 3 has also been reinforced by the levels of the relative risk scores and the "Sensitivity" and "Specificity" of the tests.

The relative risk, attributable risk, sensitivity and specificity of test obtained separately for different cut off points with score of 1 to 5 have been summarized in the Table 4.

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Table 4: Comparison of Relative Risk, Attributable Risk and Average of Sensitivity & Specificity Tests of Pregnancy Outcome by Risk Score at different Cut off Points

		Cut Off points at different score levels				
		1	2	3	4	5
A	Relative Risk	Infinite	11.13	6.12	5.53	5.8
B	Sensitivity of Test	100	93.33	66.67	53.33	26.67
C	Average of B & D	59.3	70.5	72.87	69.69	61.3
D	Specificity of Test	18.6	47.67	79.07	86.05	95.93
E	Attributable Risk	100	91.02	83.67	81.92	82.82

In the present scoring system, there is proper balance between the results of sensitivity and specificity of the test at score of '3'. The average between the test results is maximum at score '3' i.e. 72.87 in comparison to other scores. It is obvious that the cutoff point at score '3' is ideal to identify the high risk cases. The score of 3 taken as the "cut off point" was the optimum cut off score.

DISCUSSION

The study was carried out at community level in rural area. The categorization and pregnancy outcome gives an approximate idea of increased level of complications if there are preexisting risk factors. Similar studies in rural set up in Africa, 20% developed complications [16].The statistics will differ (58% sensitivity, 50% Specificity, 10% Positive Predictive Value on admission and at onset of labor 91% Sensitivity, 90% specificity and 50% Positive Predictive Value) when the expectant mothers were categorized on admission for delivery or at the onset of labor in "Knox scoring system" a study done in Turkey [17].

A simple scoring system can predict a reasonable number of patients with risk factors who can be grouped as high risk group ranging from 14.1% [19,23,24] to 24.6% in the present study. The Sensitivity of the test was 41% and Predictive Value 24.6%18 [23,24], while in the present study it was 21.74%.

Different scoring technique or color coding the risk status could not comprehend accurately prediction of the outcome. Where many of the risk factors with different score may overlap with wanted or unwanted outcome [25]. There are some risk factors which are directly significant in demographic variables like maternal age and bleeding per vagina [26].

This study attempted to identify at risk mothers, grouping them into Low and High Risk Categories with special care during prenatal period for those who are more at risk. It could demonstrate to assist the prediction to have more care for those in need similar to other studies [17, 22, 26], thereby limiting complications and adverse outcome later on.

It was possible with the simple scoring system to categorize prenatal cases into high and low risk group and followed up to reassess their risk status after intervention measures and then regrouping them.

The adverse outcome and complications were more related to the mothers having risk factors present in them.

At a particular cut off score level the predictive value, average of sensitivity and specificity test was optimum and balanced.

CONCLUSION

It was possible to categorize at risk expectant mothers by identifying risk factors present in them and allotting numerical values to the risk factors. Therefore it could help the health workers at the community level to identify at risk mothers during prenatal period. Appropriate timely care and referral in a low resource country like Nepal can have a positive impact in lowering the maternal mortality and morbidity and possibly better neonatal outcome.

The study suggests that a simple scoring system to screen out the at risk cases at community level is possible with the available resources within the frame work of present health care system.

Appropriate timely intervention care can change the risk status of the expectant mother with a better pregnancy outcome thereby influence maternal mortality and morbidity rate.

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