

# Neonatal Outcome of Expectant Mothers at Risk: A Community Level Study in Nepal

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**Abstract** Neonatal mortality is still high in Nepal with U5MR 54 and IMR 46 per 1000 live births. 1 out of 22 Nepali child dies before age 1 year and 1 in 19 dies before he or she turns 5 years. In a low resource country like Nepal if expectant mothers are screened for risk factors and extra care given within existing resources for those who need more, there will be an impact on their risk status and on the outcome of pregnancy. In this study 187 expectant mothers were grouped into low and high risk categories using simple scoring system and their neonatal outcome was observed. Neonatal Death and Low Birth Weight (LBW) were undesirable outcome. At risk mothers can be identified with a simple risk scoring system at community level and timely intervention has definite impact on neonatal outcome.

**Keywords:** at risk expectant mother, neonatal outcome, Nepal

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## 1. Introduction

In Nepal the neonatal mortality and maternal mortality is still comparatively high although the democratic republic government has started different health care program interventions.

Health for all by 2000 and achieving the millennium development goal is not possible if the maternal and neonatal mortality pattern in the developing and underdeveloped countries remain unchanged. It is of paramount importance that the child health and maternal conditions and indicators need to be improved a lot to have an impact in the health care indices.

In Nepal, during the last twenty years (1990-2011) childhood mortality declined. Under five mortality (U5MR) dropped from 162 to 54 and so did IMR from 106 to 46 per 1000 live births. Yet the scenario is not bright. Still before the age one year, one out of twenty two Nepali Child dies and one in nineteen dies before reaching the age of five years. There is variation in the mortality figure region wise while the IMR and U5MR is highest in the mountain, lower in the plains and the figures are lowest in the hilly region. It is hard task and challenging to achieve the overall MDG target by 2015 [1,2,3].

In a developing country like Nepal the main problem is lack of fund, resources, inequity of women in society,

priority of health care in taking a decision, in reaching the health care institution and delay in receiving an appropriate protocol of treatment to tackle the emergency situation for various reasons. All these facets of problems need to be tackled adequately by the policy makers with appropriate health care infrastructure in both capacity building, material and technical support [3,4].

It was seen that in the expectant mothers it is possible to identify the risk factors present in them. Usually those mothers having risk factors encounter more complications during labor and in their newborns as well.

If during prenatal period expectant mothers are screened for their risk factors and grouped and followed up with extra care for those at risk, there will be an impact on the outcome of pregnancy [5,6].

This strategy is possible within the limited resources available in any developing country like Nepal.

At risk antenatal cases can be identified with a simple risk scoring system at community level and appropriate timely more care for the needy has a definite impact on neonatal outcome and overall maternal and child health care indices [6-13].

The study was to identify at risk expectant mothers at community level and observe neonatal outcome in Western Region of Nepal.

## 2. Materials and Methods

A prospective cohort of 187 expectant mothers registered at Khairnitar Health Post at Dulegauda in 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.

## 2.1. Setting and Design

The expectant mothers were regularly checked and under surveillance throughout the antenatal period, during intrapartum period and the newborns were assessed by the outreach medical team and the community health workers. All mothers and new born were followed up to puerperium.

The expectant mothers were grouped into low and high risk categories by using a simple scoring system with 28 prenatal and 16 intrapartum factors. Each factor was given numerical score 1 to 3 as per the impact it can have on the status of mother in the outcome.

The General and Socioeconomic factors like occupation, education and family income did not have any numerical score but were taken into account to assess the socioeconomic status scale of the family while marital and biological factors like marital status, height, weight, age, parity, blood hemoglobin, VDRL positivity, blood grouping, urine testing for presence of sugar, albumin, microscopic exam finding and blood pressure had numerical score. In Past Obstetric history of infertility, abortion, contracted pelvis, Rh sensitization, PET or eclampsia, lie, presentation of fetus previous history of assisted delivery or caesarian section, any antepartum or postpartum hemorrhage, outcome of pregnancy and baby. In associated conditions any metabolic disorders or diseases. In present pregnancy any history of bleeding, toxemia, presentation of fetus and other associated conditions and number of antenatal visits. In intrapartum factors, duration of labor, medical induction, premature rupture of membrane, prolapse cord, any surgical intervention like C.S, forceps, Vacuum extraction, complications like traumatic delivery, Postpartum hemorrhage, meconium stained amniotic fluid, any abnormal presentation or multiple pregnancy. Without any numerical score neonate was assessed with APGAR score, checked for asphyxia, body weight, major congenital malformation, still-born, neonatal death, presence of convulsion, sepsis, jaundice or any feeding problem. Mothers post delivery condition was assessed without any numerical score, presence of hemorrhage, retained placenta, subinvolution, infection, psychosis or breastfeeding problems.

## 2.2. Inclusion Exclusion Criteria

87 expectant mothers who were registered, reported for regular checkup and could be followed up till delivery and puerperal period were included in the study.

## 2.3. Approval of Ethical Committee

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

## 2.4. Data Management and Statistical Analysis

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 were used to analyze the data collected.

## 2.5. Sample Size Calculation

Sample size calculation showed for 95% confidence interval and, significance level  $\alpha=5\%$ ,  $P=80\%$ ,  $Q=20\%$ , allowable error=10%, required sample size was 96.  $P$ =percentage of 8 (80%) initial high risk cases were converted to low risk group. In the pilot study done prior to the original study with 10 expectant mothers.

## 3. Results

### 3.1. Proportion of Expectant Mothers in Risk Groups

There were total 187 expectant mothers. Using the simple scoring system they were grouped into high risk 46(24.6%) and low risk 141(75.4%) at the initial stage. Later on, from the high risk group 9(19.57%) mothers were still in high risk group despite intervention measures while 37(80.43%) came to the low risk group. 6(4.3%) out of the initial low risk group turned to high risk group, the remaining 135(96.5%) continued to be in the low risk group.

### 3.2. Pattern and Frequency of Complications in Newborn

Immediately after birth resuscitation, loose motion, feeding problems, jaundice and oral thrush were the complications encountered. These complications, are common in neonates and are not related to any antenatal risk factors. It was observed that the frequency of complications was higher 27.79% in the high risk groups as compared to 3.6 % in the low risk groups.

### 3.3. Pattern and Frequency of Undesirable Outcome in Newborn

The commonest undesirable outcome was low birth weight. Out of 46 high risk pregnancies 6 (13.04%) were low birth weight newborn. The corresponding number in the low risk group was 5 (3.55%). Neonatal deaths were 1 (0.7%) in the low risk and 3 (6.52%) in the high risk group. The causes of neonatal deaths were asphyxia and low birth weight. ( $X^2=0.01$ ,  $d:f=1$ ,  $P<0.92$ ).

**Table 1. Pattern and Frequency of Undesirable Outcome in Newborns**

Undesirable Outcome	Low Risk		High Risk		Total	
	No	%	No	%	No	%
Neonatal Death	1	0.71	3	6.52	4	2.14
Low Birth Weight	5	3.55	6	13.04	11	5.88
Total	6	4.26	9	19.57	15	8.02

### 3.4. Risk Factors and Undesirable Outcome for Newborn

Out of 46 high risk cases the newborns of 10 (21.74%) had unwanted outcome while out of 141 low risk cases 5 (3.65%) had the same. The unwanted outcome includes low birth weight and neonatal death.

The difference is statistically significant ( $\chi^2 = 13.19$ : d.f = 1,  $P < .0003$ ).

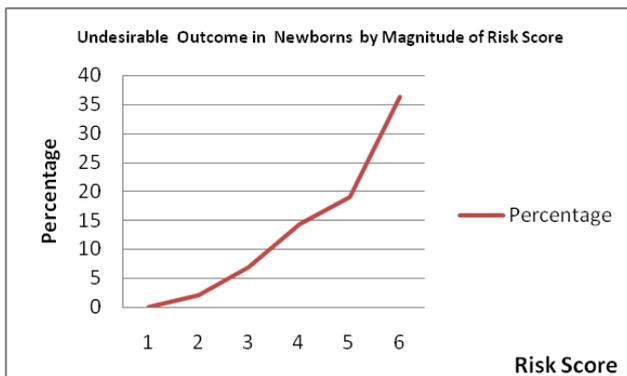
The relative risk of undesirable outcome for the newborn in high risk cases as compared to low risk works out to be 6.1. The attributable risk is 18.6. The population attributable risk is 83.69.

**Table 2. Risk Factors and Undesirable Outcome in Newborns**

Risk Factors	Undesirable Outcome				Total	
	Present		Absent			
	No	%	No	%	No	%
Present	10	21.74	36	78.26	46	100
Absent	5	3.55	136	96.45	141	100
Total	15	8.02	172	91.98	187	100

### 3.5. Undesirable Outcome for Newborn by Magnitude of Risk Score

The Graph 1 gives the distribution of 187 mothers and undesirable outcome for newborn according to the magnitude of risk scoring. It is seen that the frequency of unwanted outcome increases with the increase in risk score. For expectant mothers with no risk score the incidence is Zero. For expectant mothers having 5 risk factors the frequency is as high as 36.36%.



**Graph 1.** Distribution of Expectant mothers and number of Undesirable outcome in Newborns by magnitude of Risk Score

## 4. Discussion

Being a low resource country, for Nepal achieving child health indicator targets of millennium development goal (MDG5) by 2015 is a very hard task.

In fact, the U5MR target of 54 per 1000 live birth was achieved in 2011 then a new target of 38 was set for 2015. The IMR target was again lowered to 32 but the original target of 36 is yet to be reached. There is wide variation in the status of U5MR and IMR in urban and rural areas similarly in the mountain, hilly and plain areas in Nepal [1,2,3].

In almost all the developing and underdeveloped countries, safe motherhood and child survival strategy have been taken up by the respective governments of their countries to have an effective impact on the maternal and childhood mortality rates and ratios. But in most of the countries the reduction in parameters of the health

indicators expected in the millennium development goal (MDG5) is yet to be reached.

There are many deliberations, research studies and guidelines as how best to achieve the target of MDG5. In many studies at risk mothers usually constitute 20-30% of the expectant mothers group almost similar to this study. Special care and attention, change to a greater extent their risk status with a better impact on the neonatal outcome [11-17].

Although identifying risk factors in expectant mothers and special care for them gives health care givers time to anticipate and tackle any adverse situation in time resulting in better neonatal outcome. Yet the adverse neonatal outcome, status of newborns as assessed by APGAR score may be unfavorable even in case of mothers not having any risk factor [18,19].

It does make sense to use a simple risk assessment scoring system to identify at risk mothers which will help the healthcare givers to pull in existing means and resources to care more for those in need especially where facilities hardly exist.

There were various scoring system tried by different authors trying to relate risk factors present in mothers and their link with the neonatal outcome.

In 1965 Nesbitt developed Maternal and Child Health Care (MCHC) index based on scoring system whereby disadvantageous clinical features grouped in 10 major categories were given penalty points[20].

In 1969 Nesbitt regrouped abnormal conditions into eight categories. The degree of risk was expressed as a numerical value resulting from the sum of all such penalties subtracted from a perfect score of 100. The patient scoring 70 or less was identified as at risk. The parameters taken were, maternal age, parity. Past obstetrics history, Obstetrics disorders and nutrition, generative tract disorder, emotional and socioeconomic survey [10,20].

In 1969 Aubry, R and Nesbitt. R. et al devised a scoring system to objectively evaluate these and other factors such as socio-economic status, psychological adjustment, age and marital status [21].

In 1969, Goodwin, JW et al developed a simple scoring technique for the antepartum identification of the fetus. Points were awarded based on maternal health factors, conditions developing during pregnancy before the onset of labor and the gestational age obtained at the time of scoring. The lowest potential for risk to the fetus was indicated by a score of zero and the highest by score of ten [22].

In 1973, Hobel, CJ et al investigated a high-risk pregnancy screening system based on prenatal and intrapartum factors. Factors were assigned weighed values according to their assumed risk. he included antepartum factors, intrapartum factors, neonatal factors. Total score of prenatal, intrapartum and neonatal period were dichotomized to simplify scoring system and less than 10 score was placed in low risk and more than 10 in high risk categories respectively. The relationship between perinatal risk and neonatal risk status was calculated, increasing perinatal risk scores were positively correlated with higher neonatal risk scores [12].

In 1974, Stempera ZK devised a risk group scoring system to quantify the weight of risk factors for perinatal and infant mortality and morbidity. Risk factors were

compiled in a prospective study prior to conception, and during the antepartum and intrapartum periods. The neonates were evaluated for post natal risks immediately after delivery and through the first 18 months of life. To evaluate the weight of each of the 123 risk factors, frequency of occurrence in groups of children with different disorder and in healthy baby was calculated [23].

In 1975, Grella Pand Fedet studied the relationship of obstetrical risk to pregnancy outcome in pregnant women. The risk scoring technique used was based on those of Nesbitt and Aubry, Aubry and Pennington and Bompiani et al. Women were divided into three risk groups according to their score. Those in the highest risk category were found to have significantly increased incidence of malpresentation, lengthy labor duration, delivery intervention, and fetal and neonatal complications [24].

In 1976, Manual J and Septien G. calculated maternal and fetal risk separately for pregnant women upon admission to the hospital for delivery. The risk scoring system awarded points to the mothers and / or the fetus based on such factors as previous gynecological and obstetrical history, medical problems and characteristics maternal height, age and nutritional, socioeconomic and marital status [25].

In 1973, Mercier G and Desjardins P et al developed and assessed a simple scoring system to identify women with high-risk pregnancies, retrospectively. Points were awarded for maternal characteristics and habits, previous obstetric and gynecological history and medical complications during pregnancy Risk scores were compared with perinatal mortality and one and five minute Apgar scores [26].

In 1973, Wilsonn E. and Sill Het al evaluated a scoring system to identify the high risk pregnancy at the initial prenatal visit based on those of Nesbitt and Aubry and Goodwin et al using 298 pregnancies of which 148 were assigned scores prospectively and 150 retrospectively. Comparison of risk scores with incidence of caesarean section and rate of perinatal death showed a significant correlation in the former case but not in the latter [27].

In 1974, Haeri A et al applied to find a statistically valid easy to use scoring system for identifying patients at risk. Factors selected for inclusion in the scoring systems were based on the 1969 British Perinatal Mortality Survey and on clinical experience. Point values given to each factor varied according to scoring system [28].

In 1977, Coopland A et al described evaluation of a simple antenatal high-risk assessment form which took little time to complete. Its ability to assist in high-risk selection was measured by applying it retrospectively to antenatal factors of patients. The total risk scores were analyzed in respect to perinatal outcome. As the risk score increased, the percentage of favorable Apgar ratings decreased. Increasing risk score was associated with increasing percentage of low birth weight and premature Infants. Perinatal mortality increased as risk score increased as did the percentage of neonates requiring special care [11].

In 1977, Sokol R et al conducted a prospective study to evaluate antepartum and intrapartum risk scales based on those developed by Hobel et al The relationship of risk scale and risk score was calculated with outcome of 1275 women delivered consecutively. A high risk rating on both scales was found to be related to lowered one and five-

minutes Apgar score. These findings showed that the risk scoring system could be used in a clinical set up to identify patients at increased risk for perinatal death [29].

In 1979, Sokol R et al implemented, a risk scoring system adapted from Hobel et al to determine which patients would benefit from antenatal and intrapartum fetal monitoring, risk scores and specific risk factors were compared Thirty-six percent of perinatal deaths occurred in the high-risk groups. Intrapartum risk factors were correlated with low Apgar scores as a measure of pregnancy outcome [30].

In 1979, Edward evaluated the effectiveness of a simple antepartum risk-scoring system scoring Incorporated demographic, obstetrics, miscellaneous and medical factors, score ranging from 1-10 points for different risk factor. Risk scores obtained for each patient at the first prenatal visit were updated at 38 weeks gestation and finally on admission to the hospital for labor and delivery. The final risk score, fetal and neonatal mortality and neonatal morbidity were recorded, the data were analyzed to determine the sensitivity and specificity of the scoring system. The score sheet included demographic, obstetrics, miscellaneous, medical factors. The cases were assessed at first visit, at 36 weeks and on admission to labor ward [31].

In 1979, Morrison I introduced a simplified numerical form for the antepartum risk. The prenatal scoring form incorporated reproductive history, past obstetrics history, associated conditions, problems of present pregnancy with score point of 1 to 3 to each risk factor. Pregnant women who scored more than 3 were designated as high risk [32].

In 1980, Morrison I et al evaluated a simplified intrapartum scoring system to predict the outcome of labor as defined by three measurements, perinatal mortality, perinatal morbidity, and maternal morbidity. Two additional problems were investigated: the potential use of this intrapartum system in conjunction with an antepartum scoring form already in use [13].

In scoring for "poor outcome" of pregnancy the PAHO/WHO system allocated up to 3 points for a poor medical and/or obstetric history. Up to 3 for high parity and up to 2 for maternal age (very young or very old). Additional single points were awarded if the birth interval was short, the family income low, or the women unmarried and of poor education. Women who obtained 6 or more points out of a total of a possible 12 were designated "high- risk", while those with a score of 2 or less were termed "low- risk". This system calls the attention of women who may need special care and also helps in guiding the decision of primary health worker [33].

Various studies as discussed above had used different modalities and scoring system to identify and group at risk mothers. And with timely better management of expectant mothers resulted in encouraging neonatal outcome.

In the present study, the simple score card, developed by the first author, incorporates in a comprehensive way all the aspects like General and Socioeconomic factors, marital and biological factors, Past Obstetric history, associated conditions, present pregnancy and other associated conditions, intrapartum factors, complications like traumatic delivery and Postpartum hemorrhage. Neonate was assessed with APGAR score and for other

complications. Mother's post delivery condition was assessed without any numerical score.

The scoring system was tested and validated at the community and at hospital at Nagpur Govt. Medical College. It is being used in the Hospital and for research purpose at the Nagpur University, India. It was possible to identify at risk mothers with this simple score card. Thereby the mothers with risk factors could be taken care more with the present available resources. The improved neonatal outcome was encouragingly better than anticipated even in the community set up similar to other studies [8,9,11-15,34-38].

## 5. Conclusion

The study suggests that at community level, the present risk scoring system can be applied to identify at risk mothers during antenatal period. Timely appropriate care for those who needs most had definite impact on outcome for newborns.

## Declaration of Conflicting Interests

The authors declare that there is no potential conflicts of interest with respect to the research, authorship and /or publication of this article.

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