

Research Article

A study to assess the association of maternal factors and the outcome of pregnancy among mothers delivering in a tertiary care hospital in Haryana, India

Shveta Saini^{1*}, Mukhmohit Singh¹, Anshu Mittal²

¹Assistant Professor, Department of Community Medicine, MMMC&H, Kumarhatti, Solan, India

²Professor, Department of Community Medicine, MMIMSR, Mullana, India

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*Correspondence:

Dr. Shveta Saini,

E-mail: shveta.saini@gmail.com

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ABSTRACT

Background: Low birth weight is a major cause of infant mortality and is considered as a sensitive index of the nation's health and development. World Health Organization (WHO) defines low birth weight (LBW) as weight at birth of less than 2,500 grams (up to and including 2499 grams) irrespective of the gestational age. LBW is the leading cause of neonatal and postnatal deaths and as such it remains a worldwide issue and one of the most important public health problems, particularly in developing countries. The objectives of the study were to study the outcome of pregnancy whether normal, low birth weight, or still-birth, and to study the association of maternal risk factors-haemoglobin level, diabetes mellitus, hypertension and outcome of pregnancy.

Methods: It was a cross sectional study carried out among the pregnant females delivering in MM Institute of Medical Sciences and Research, Mullana, Haryana, India from January 2010 to December 2010. A total of 500 cases were interviewed for the study purpose by systematic random sampling, using a semi structured pretested questionnaire. Data was analyzed using SPSS17 software.

Results: Outcomes of pregnancy recorded were 28.8% low birth weight, 5.4% stillbirth and 65.8% normal birth weight. The mean birth weight was recorded as 2.556 ± 0.411 kgs. The incidence of LBW was maximum (54.3%) among the mothers who did not seek ANC while it was minimum (12.7%) in the ones who had sought ANC for more than 3 times. 57.6% mothers were anaemic and severe anaemia in 1.4% contributed towards more number of stillbirths and LBW infants (57.14% and 42.86% respectively). 4.2% mothers were found to be suffering from pregnancy induced hypertension (PIH). 69.41% of the mothers with any infection had delivered a low birth weight baby and 4.70% had a stillborn baby.

Conclusions: The present study confirms birth weight as an important determinant of neonatal and post-neonatal outcomes.

Keywords: Low birth weight, Pregnancy induced hypertension, Pregnancy outcome, Stillbirth, Diabetes mellitus, ANC

INTRODUCTION

Pregnancy and childbirth are generally times of joy for parents and families. Pregnancy, birth and motherhood, in an environment that respects women, can powerfully

affirm women's rights and social status without jeopardizing their health.¹ The type of maternity care which the mother gets during the course of her pregnancy determines the various outcomes of pregnancy. A multifactorial relationship exists between the

environment, health and nutritional status, social status of a woman and the growth of the foetus. All women, whether their pregnancies are complicated or not, need good quality maternal health services during pregnancy, delivery and in the post-partum period to ensure their health and that of their infants.²

World Health Organization (WHO) defines low birth weight (LBW) as weight at birth of less than 2,500 grams (up to and including 2499 grams) irrespective of the gestational age.³ It is well recognized that low birth weight (LBW) is one of the most important factors in infant mortality, as mortality of LBW babies is 40 times more than the normal-weight babies.

Moreover, it has been shown that low birth weight could predispose individuals to cardiovascular risk factors, such as hypertension, diabetes and obesity. Thus, the infant born with a birth weight under 2500 gm could be an 'at risk' individual for life. LBW is the leading cause of neonatal and postnatal deaths and as such it remains a worldwide issue and one of the most important public health problems, particularly in developing countries.⁴ Moreover, it has been shown that low birth weight could predispose individuals to cardiovascular risk factors, such as hypertension, diabetes and obesity. Thus, the infant born with a birth weight under 2500 gm could be an 'at risk' individual for life.⁵

The birth weight of an infant is dependent on the length of the gestation and the intrauterine growth of the fetus. LBW can result from preterm birth or intrauterine growth restriction (IUGR) or a combination of the two. It is generally assumed that prevention of IUGR and in-turn, prevention of LBW results in a corresponding reduction in perinatal mortality.⁶ Like low birthweight, it is also associated with maternal under-nutrition and ill health, among other factors. Preterm birth is also of significant public health importance because of its association with an increase in mortality and childhood morbidities such as developmental problems, cerebral palsy, learning difficulties, and an increased risk of sudden infant deaths.⁷ These are the babies born too early, before 37 weeks of gestation. Their intrauterine growth may be normal. That is, their weight, length and development may be within normal limits for the duration of gestation. Given good neonatal care, these babies can catch up growth and by 2 to 3 years of age will be of normal size and performance.⁸

According to WHO, the prevalence of low birth weight is estimated to be 15% worldwide with a range of 3.3-38% and occurs mostly in developing countries.⁹ For India, National Family Health Survey-3 (NFHS-3) data reveals that 72% of deliveries took place at home during the survey period from 2005-2006. Out of these only 34% of births were weighed at birth, and over one in five (22%) were of low birth weight (less than 2.5 kg).¹⁰ In spite of consistent efforts to improve the quality of maternal and child health LBW rate is still quite high. Many factors

affect the duration of gestation and fetal growth, and thus, the birthweight. It has been known that majority of the maternal factors that are contributing to adverse perinatal outcome are preventable and are called "preventable risk factors". The maternal factors include malnutrition, severe anemia, heavy physical work during pregnancy, hypertension, malaria, toxemia, smoking, low socio-economic status, short maternal stature, very young age, high parity, close birth spacing low education status and antenatal care during pregnancy.

Most importantly, added to malnutrition, too many and too frequent pregnancies contribute to the continued depletion of mother's body.¹¹ Early and good prenatal care increases the chances of having a healthy baby and provides an array of medical, nutritional and educational interventions.¹² The type of antenatal care that is required for a healthy outcome of pregnancy is already available in the country and is provided at the grass-root level through a network of anganwadi centers, sub-centers, primary health centers, community health centers, district hospitals, and medical colleges. However, due to inadequate utilization of these services, a normal pregnancy can take the path of "at-risk pregnancy" at any gestational age. This is especially true for the rural and the under-privileged and the socio-economically weaker sections of our society.

Maternal and infant health has been established as a top most priority in the health care system worldwide. Low birth weight being the root cause of all adverse perinatal outcomes needs special attention. Low birth weight is a topic of major concern in India. Since, Haryana state accounts for a major proportion of low birth weight babies nationwide, so it becomes imperative to study the distribution and determinants of low birth weight babies. It is an established fact that a large number of home deliveries conducted in the rural areas because of cultural beliefs and underutilization of the antenatal care services leads to gross under-reporting of births weights along with other related parameters, making it difficult to correctly estimate the burden of morbidity in the community.

Hence, it becomes important to study the associated, causal risk factors for low birth weight and other pregnancy outcomes in a hospital set up facilitating an authentic data for better understanding of web of possible associations and factors affecting the birth weight of the newborn. Keeping in mind the above said factors, the present study was conducted with the following objectives:

- To study the outcome of pregnancy whether normal, low birth weight, or still-birth.
- To study the association of maternal risk factors-haemoglobin level, diabetes mellitus, hypertension and outcome of pregnancy.

METHODS

Study area

This study was undertaken in all the three units of obstetrics and gynaecology department of MM Institute of Medical Sciences and Research, Mullana, Haryana, India.

Study design

It was a cross sectional study carried out among the pregnant females delivering in the hospital.

Study period

The study continued for a period of twelve months from January 2010 to December 2010.

The inclusion criteria includes the study consisted of only those females who delivered after the completion of 28 weeks of gestation, irrespective of the outcome. Stillbirths were also included in the study. The exclusion criteria include all the pregnancies which terminated before the completion of 28th week of gestation, irrespective of the outcome were excluded from the study. The females who did not give the consent for the study were also excluded.

A total of 500 cases were taken up for the study purpose as WHO recommends that the percentage of LBW be based on measurements on atleast 500 new born babies.¹³

Sampling technique

On an average, 150-200 deliveries, including normal, assisted and caesarean, take place in the hospital each month. Every fifth woman delivering in the hospital was taken up for the study purpose and thus a total of 500 women were taken up. These women were contacted and interviewed within last 24 hours of delivery to assess the association between maternal factors and the pregnancy outcome. In cases where the consent was not obtained due to any reason, the subsequent next case according to the delivery register of the labour room was taken for the study.

Study tools

A proforma with reference to the information being collected from each respondent was evolved and pretested on 30 newly delivered females. It was modified in the light of the experience gained during pretesting. The proforma was broadly categorized into following components:

- Socio-demographic profile of the mother.
- Medical history and family history.
- Obstetric history of present pregnancy.
- Outcome of pregnancy.

The available antenatal records and the documentation at the time of admission and delivery of the female were also consulted.

Methodology

An interview method was adopted to extract the desired information from the study participants. Before starting with the interview process, an informed consent was taken from each study participant.

Data analysis

Lastly, the data collected in respect of various variables was statistically analyzed by using statistical package SPSS 17.0. Chi square test was applied to see the association between the two attributes.

The study protocol was approved from the ethics committee of MMIMSR, Mullana, Ambala. Written informed consent was taken in local language from the study participants during the interview process.

RESULTS

With the motive of finding diverse pregnancy outcomes in relation to various maternal factors, the present study was conducted in the obstetrics and gynaecology department of MMIMSR, Mullana Ambala. The study included 500 mothers and they were interviewed within 24 hours of delivery by using a semi-structured questionnaire. Among the total mothers interviewed (n=500), 18.8% mothers were teenagers and 15.8% mothers were over 30 years of age.

The mean birth weight came out to be 2.556 kg with a standard deviation of 0.411 kg. Among the total births (n=500), it was seen that the occurrence of adverse pregnancy outcome was 34.2% which included 28.8% low birth weight babies and 5.4% stillborn babies. About two third of the mothers (65.8%) delivered a normal weight baby (Table 1).

Table 1: Distribution of outcomes of pregnancy among the mothers.

| Outcome | Number | Percentage (%) |
|---------------------|--------|----------------|
| Low birth weight | 144 | 28.8 |
| Stillbirth | 27 | 5.4 |
| Normal birth weight | 329 | 65.8 |
| Total | 500 | 100 |

Mean birth weight- 2.556 kg; SD 0.411 kg.

Prevalence of LBW was recorded to be 28.8%. Teenage mothers (68.08%) contributed more towards LBW as compared to the older mothers (64.55%), the difference being statistically significant (p <0.001) (Table 2).

The incidence of LBW was maximum (54.3%) among the mothers who did not seek ANC while it was

minimum (12.7%) in the ones who had sought ANC for more than 3 times (Table 3). Further, the incidence of low birth weight was found to be lesser among the mothers seeking ANC from a doctor (21.5%) in comparison to

42.2% when the antenatal care was provided by the ANM. These observations were found to be statistically highly significant (χ^2 118.354, df 8, p value <0.0001).

Table 2: Pregnancy outcome according to age of the mother.

| Age (years) | Pregnancy outcome | | | Total |
|-------------|-------------------|------------------|---------------------|------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| <20 | 15 (15.95%) | 64 (68.08%) | 15 (15.95%) | 94 (100%) |
| 20-25 | 2 (0.94%) | 12 (5.66%) | 198 (93.39%) | 212 (100%) |
| 26-30 | 4 (3.47%) | 17 (14.78%) | 94 (81.73%) | 115 (100%) |
| > 30 | 6 (7.59%) | 51 (64.55%) | 22 (27.84%) | 79 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

(χ^2 123.6; df 6; p value <0.001)

Table 3: Association of pregnancy outcome and frequency of ANC visits.

| ANC frequency | Pregnancy outcome | | | Total |
|---------------|-------------------|------------------|---------------------|------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| No ANC | 19 (20.7%) | 50 (54.3%) | 23 (25%) | 92 (100%) |
| Once | 0 (0%) | 17 (36.2%) | 30 (63.8%) | 47 (100%) |
| Twice | 4 (4.4%) | 28 (31.1%) | 58 (64.4%) | 90 (100%) |
| Thrice | 4 (2.4%) | 36 (21.3%) | 129 (76.3%) | 169 (100%) |
| Four or more | 0 (0%) | 13 (12.7%) | 89 (87.3%) | 102 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

Among the moderately anaemic mothers, stillbirths and low birth weight babies were 6.05% and 38.79% respectively and the normal birth weight babies were 55.16%. The mothers with normal haemoglobin level showed remarkable results with only 2.83% stillbirths and 15.09% low birth weight babies. The incidence of normal birth weight babies was seen highest (82.07%) among the mothers with normal haemoglobin level. Hence, a statistically significant association was found among the anaemic status of the mother and the pregnancy outcome, highlighting that, with an improvement in the haemoglobin level, the pregnancy outcome also improves (Table 4).

Table 4: Association of pregnancy outcomes and anaemic status of the mother.

| Anaemic status | Pregnancy outcome | | | Total |
|----------------|-------------------|------------------|---------------------|------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| Severe | 4 (57.14%) | 3 (42.86%) | 0 (0) | 7 (100%) |
| Moderate | 17 (6.05%) | 109 (38.79%) | 155 (55.16%) | 281 (100%) |
| No anaemia | 6 (2.83%) | 32 (15.09%) | 174 (82.07%) | 212 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

(χ^2 104.266; df 4 p value: 0.000)

Table 5: Pregnancy outcome in relation to pregnancy induced hypertension in mother.

| Hypertension | Pregnancy outcome | | | Total |
|--------------|-------------------|------------------|---------------------|------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| Yes | 4 (19%) | 10 (47.6%) | 7 (33.3%) | 21 (100%) |
| No | 23 (4.8%) | 134 (28%) | 322 (67.2%) | 479 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

(χ^2 13.768; df 2; p value 0.001)

Among the study subjects, 4.2% mothers suffered from hypertension during pregnancy. These mothers showed a higher occurrence of adverse outcomes as compared to the non-hypertensive counterparts. Two thirds of mothers with hypertension resulted in stillbirths and low birth weight infants (19% and 47.6% respectively) whereas it was only 4.8% and 28% respectively in the non-hypertensive mothers. This association was found to be statistically significant (Table 5).

Pre-existing diabetes mellitus in the mother did not seem to influence the occurrence of LBW. Among the known diabetics, 23.07% had LBW baby whereas only one mother encountered a stillbirth. However, the result was not statistically significant (Table 6).

Table 6: Pregnancy outcome in relation to pre-existing diabetes mellitus in the mother.

| Diabetes mellitus | Pregnancy outcome | | | Total |
|-------------------|-------------------|------------------|---------------------|---------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| Yes | 1 (7.69%) | 3 (23.07%) | 9 (69.23%) | 13 (100%) |
| No | 26 (5.33%) | 141 (28.95%) | 320 (65.70%) | 487 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

(χ^2 0.305; df 2 p value: 0.858)

Table 7: Association of pregnancy outcome and infection in mothers during pregnancy.

| Infection | Pregnancy outcome | | | Total |
|-----------|-------------------|------------------|---------------------|------------|
| | Stillbirth | Low birth weight | Normal birth weight | |
| Yes | 4 (4.70%) | 59 (69.41%) | 22 (25.88%) | 85 (100%) |
| No | 23 (5.54%) | 85 (20.48%) | 307 (73.97%) | 415 (100%) |
| Total | 27 (5.4%) | 144 (28.8%) | 329 (65.8%) | 500 (100%) |

DISCUSSION

The mean birth weight recorded in the study (2.556 ± 0.411 kgs) is in conformity with a mean birth weight of 2.53 ± 0.424 kg reported by Kiran et al at MCH centers of Kasturba Hospital, Wardha Maharashtra, India.¹⁴ Joshi et al in their hospital based study in Allahabad and Sachdeva et al in his study in Gujarat also reported the mean birth weight of all the new born babies to be 2.64 ± 0.44 kg and 2.63 ± 0.029 kg respectively.^{15,16} The prevalence of low birth weight was 28.8% in the present study which is lesser as compared to the NFHS-3 (2005-2006) figure for Haryana (32.7%). Lower prevalence in the present study could be attributed to the fact that this being a tertiary care center study, all the newborns were accurately weighted at the time of birth while in the NFHS-317 survey for Haryana, estimated birthweight was available for 29.9% of the total newborns and the prevalence was then calculated through the written records or maternal recall. Further, increase in the antenatal coverage could also have led to a decrease in the prevalence of low birth weight in the present study. The high incidence of low birth weight babies among the teenage mothers in the present study could be because of social factors such as very young age at the time of marriage leading to early child bearing. Saxena et al in Safdarjang hospital in South Delhi also found more number of LBWs among the teenage mothers (33.9%) as compared to 30% in older mothers; the difference not being statistically significant ($p=0.413$).¹⁸ Kiran et al also had similar findings in Wardha, Maharashtra and reported an increased incidence of LBW (41.5%) among the teenage mothers as compared to mothers in age more than 30 years (35%).¹⁴ The rate of stillbirths was also found to be higher among the teenage mothers (15.95%) as compared to mothers of age 30 years and above

It was seen that among the total mothers with any infection during the course of their pregnancy ($n=85$), more than two third (69.41%) had delivered a low birth weight baby. In comparison, mothers with no infection had only one fifth (20.48%) low birth weight babies and showed a favorable outcome with resulting 73.97% normal birth weight babies.

Hence it was concluded that the presence of any infection at any time during pregnancy led to adverse pregnancy outcomes as low birth weight and stillbirth. On statistical analysis, this association was found to be highly significant.

(7.59%). Results were found to be similar to that of Sharma et al in a resettlement colony of east Delhi, who found that 15.6% of adolescents had stillbirths as compared to 1.3% of adult mothers.¹⁹ The utilization of ANC services and in turn a favorable pregnancy outcome seen in the study could be because of better health care facilities, short distance to healthcare facilities, previous bad obstetric history and comparatively more literacy level of the mothers. Joshi et al found the proportion of LBW to be maximum (61.76%) in mothers who did not receive any antenatal care followed by those who received inadequate care (46.57%).¹⁵ Idris MZ et al in Lucknow observed highest incidence of low birth weight (56.25%) among mother who did not receive any antenatal care, followed by 49.43% in those taking inadequate care (1-2 visits).²⁰

Anemia has been identified as one of the important causes of LBW. One of the possible reasons for anaemia could be inadequate nutrition, lack of adequate knowledge about utilization of available antenatal care services, and recurrent infections. WHO has estimated the prevalence of anaemia in developed and developing countries in pregnant women as 14% and 51% respectively.²¹ Rohilla M et al in Chandigarh reported 33.33% small for gestational age neonates and 16.66% stillbirths among the mothers with severe anaemia (<7 g/dl).²²

The rate of stillbirths among hypertensive mothers in the present study was also found to be similar to Yadav S et al, in New Delhi, who reported an overall incidence of adverse pregnancy outcomes as 14.8% in the hypertensive mothers.²³ Among the diabetic mothers, it was found that low birth weight was prevalent in one fourth (23.03%) cases. This figure was higher than

quoted by Shefali AK et al (12.3%) in Chennai.²⁴ Any infection in the mother at any time during pregnancy was also significantly associated with adverse pregnancy outcomes. More than two third (69.41%) of the mothers with any infection had delivered a low birth weight baby and 4.70% had a stillborn baby. The results were found to be in agreement with Idris MZ et al in Lucknow who observed highest incidence (66.6%) of LBW among mothers who had significant acute infection during pregnancy.²⁰

CONCLUSION

The present study confirms intra-uterine environment as a determinant for the final outcomes of pregnancy including the favourable as well as adverse outcomes. As there are several factors interacting in this phenomenon so it is not feasible to single out any particular factor affecting low birth weight and the potential importance of any factor in preventing LBW should be interpreted with caution as these may be interrelated. Henceforth, it is suggestive that a substantial reduction in LBW can be achieved by selectively targeting the reproductive age group females and educating them regarding the importance of antenatal care which is the pivotal factor affecting the pregnancy outcomes. Improved female education can thereby help in delaying the age at first pregnancy and encouraging wider intervals between births and universal coverage of adequate antenatal care for all the mothers especially the high risk ones. Discouraging early teenage marriages is also essential in order to reduce the burden of LBW babies.

Recommendations

Though the current health care system of our country is focusing towards improved antenatal care services and institutional deliveries, still we need to go a few steps further to strengthen these services by creating more awareness among the general population specifically the rural Indian population. This can be achieved by enhancing our information, education and communication activities and by providing better packages to the grass root level workers for motivating the mothers to utilize the available ANC services throughout their pregnancy, thereby yielding better maternal outcomes.

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