"Study of low birth weight babies and their association with maternal risk factors."

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Objective: To study the prevalence of low birth weight babies and to find their association with maternal risk factors. **Methods:** This is a hospital-based prospective, observational, conducted in Kamineni Hospital, LB Nagar, Hyderabad. Data about maternal exposure to different risk factors were recorded using a preformed questionnaire. The information included the socio-demographic profile of the mother and her family, obstetric history of the mother especially about previous births, abortions, pre-pregnancy weight, height, weight gain during pregnancy, antenatal services obtained by the mother. **Results:** Out of 286 newborns 77 newborns were of low birth weight i.e., the prevalence of low birth weight in my study was 26.9% Prevalence of low birth weight was more in female babies, mothers from rural areas, illiterate mothers(40.54), more in mothers who had pregnancy-induced hypertension(54.28), more in multigravida mothers, more in mothers who had irregular antenatal check-ups (45.65%) more in mothers who gained less than 6kgs during pregnancy, more in mothers who had oligohydramnios (50%). **Conclusion:** This study shows that bio-demographic and prenatal care variables have the strongest influence in determining the birth weight of a baby. However, Socio-economic and demographic factors are significantly associated with prenatal care, which is one of the behavioral factors associated with low birth weight.

Keywords: Low birth weight, Risk factors, Maternal risk factor, Preterm

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Introduction

Low birth weight is a major public health problem in developing countries including India. The epidemiological observations depicted that infants weighing less than 2500 grams are approximately 20 times more likely to die than heavier babies, closely associated with fetal and neonatal morbidity and mortality. In India, 30-35% of babies are low birth weight and more than half of them are full-term babies [1-3].

The reduction of low birth weight forms an important contribution to the Millennium Development Goal [MDG] for reducing child mortality. Activities towards the achievement of the MDG`s will need to ensure a healthy start in life for children by making certain that women commence pregnancy healthy and well-nourished and go through pregnancy and childbirth safely [4,5].

An understanding of the prevalence and also the factors contributing and sustaining the problem will go a long way in addressing this significant cause of neonatal mortality to reduce it and attain the Millennium development goals.

The identification of factors that underlay the continuing high percentage of low birth weight and institution of remedial measures to combat it must be perceived as a major challenge in the field of public health.

With this background, the present study is conducted to know the prevalence of low birth weight among term babies and to find out the maternal risk factors associated with LBW babies.

Materials and methods

Study population: All healthy term newborn babies delivered in Kamineni hospital with inclusion criteria during the study period.

Study design: This is a hospital-based prospective observational study.

Sample size and sample technique: 286 term newborns.

Data collection technique and tools: This is a hospital-based prospective, observational, conducted in Kamineni Hospital, LB Nagar, Hyderabad. Data about maternal exposure to different risk factors were recorded using a preformed questionnaire.

The information included a socio-demographic profile of the mother and her family, obstetric history of the mother especially about previous births, abortions, pre-pregnancy weight, height, weight gain during pregnancy, antenatal services obtained by the mother including antenatal visits, TT prophylaxis, Iron and Folic acid prophylaxis and presence of any systemic illness like hypertension, cardiovascular disease, chronic renal disease.

Adequate antenatal care was considered when the pregnant women were registered at any time, had at least 3 antenatal checkups, was adequately vaccinated against tetanus, had consumed at least 100 tablets of Iron and Folic acid, was not involved in hard work, and had adequate rest during pregnancy[minimum 2 hours sleep during the day and 8 hours sleep during the night].

Weight gain was calculated by subtracting the weight of the mother at 12 weeks or before from the weight of the mother at term considering negligible weight gain up to 12 weeks of gestation. All the babies were weighed within one hour after birth and birth weight was measured to the nearest 10 grams using a baby weighing scale.

Statistical analysis: The data is entered and analyzed in Microsoft Excel 2010. For analysis, descriptive statistics used were percentage, mean, and standard deviation (SD). Bivariate analysis was done using crude odd`s ratio, 95% confidence interval (CI), and Chi-Square test. A P-value of less than 0.05 was considered as statistically significant. All the analysis were carried out using SPSS 16.0 and EPI Info 3.5.1

Results

A total of 286 neonates were studied during the study period of 12 months. The prevalence of low birth weight in this study is 26.9%. The mean birth weight of the population was 2.85kgs.

Out of 286 newborns, 143 were female babies and 143 were male babies. Out of 286 newborns, 77 newborns were of low birth weight i.e., the prevalence of low birth weight in my study was 26.9%

The prevalence of low birth weight was more in female babies (32.8%) when compared to male babies (20.9%). The prevalence of low birth weight was more in mothers from rural areas (33.6%) when compared to mothers from urban areas (21.95%).

The prevalence of low birth weight was more in illiterate mothers (40.54%) when compared to literate mothers (18.28%). Prevalence of low birth weight was more in mothers who had pregnancy-induced hypertension (54.28%) when compared to mothers who had normal blood pressure.

(24.3%).The prevalence of low birth weight was more in multigravida mothers (32.11%) when compared to primi mothers (22.14%). The prevalence of low birth weight was more in mothers who had irregular antenatal checkups (45.65%) when compared to mothers who had regular antenatal check-ups (23.33%). The prevalence of low birth weight was more in mothers who gained less than 6kgs during pregnancy (82%) when compared to mothers who gained more than 6 kgs (15.25%).

The prevalence of low birth weight was more in mothers who had oligohydramnios (50%) when compared to mothers who had adequate liquor (22.03%). The mode of delivery did not show any significant effect on birth weight in my study.

Table-1: Distribution of the study population by residence.

Residence	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Rural	122	41	81	33.6
Urban	164	36	128	21.95

Table-2: Distribution of the study population by maternal education.

Maternal education	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Literate	175	32	143	18.28
Illiterate	111	45	66	40.54

P-value was 0.000023 which was statistically very significant.

Table-3: Distribution of the study population by maternal PIH.

PIH	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Yes	35	16	19	54.28
No	251	61	190	24.3

Out of 35 mothers with PIH 16 gave birth to LBW babies [54.28%]. Out of 251 mothers without PIH 61 gave birth to LBW babies [24.3%] p-value was 0.005 which was statistically significant.

Table-4: Distribution of the study population by primi/non-primi.

Primi/Non-Primi	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Primi	149	33	116	22.14
Non primi	137	44	93	32.11

Table-5: Distribution of the study population by ANC`S.

ANC	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Regular	240	56	184	23.33
Irregular	46	21	25	45.65

Out of 240 mothers with regular ANC`S 56 mothers gave birth to LBW babies [23.33%]. Out of 46 mothers with irregular ANC`S 21 gave birth to LBW babies [45.65%] p-value was 0.0014 which was statistically significant.

Table-6: Distribution of the study population according to parity.

Parity	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
First	149	33	116	22.14
Second	114	33	81	28.94
THIRD N MORE	23	11	12	47.82

Out of 149 primi mothers 33 gave birth to LBW babies [22.14%]. Out of 114 mothers with second parity 33 gave birth to LBW babies [28.94%]. Out of 23 mothers with third and more parity 11 gave birth to LBW babies [47.82%] p-value is 0.02 which is statistically significant.

Table-7: Distribution of the study population by oligohydramnios.

Oligohydramnios	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
Yes	50	25	25	50
No	236	52	184	22.03

Out of 50 mothers with oligohydramnios 25 gave birth to 25 LBW babies [50%]. Out of 236 mothers without oligohydramnios 52 gave birth to LBW babies [22.03%] p-value was 0.00006 which was statistically significant.

Table-8: Distribution of the study population by maternal weight gain.

Weight gain	Total no. of babies	LBW babies	NBW babies	Percentage of LBW babies
<6 kgs	50	41	9	82
>6 kgs	236	36	200	15.25

Out of 50 mothers with weight gain, less than 6kgs 41 gave birth to LBW babies [82%].

Out of 236 mothers with weight gain, more than 6kgs 36 gave birth to LBW babies [15.25%] p-value was < 0.0000001 which was statistically very significant.

Discussion

For reducing the prevalence of low birth weight, public health strategy needs to focus attention on better maternal nutrition and education. Interventional programs should be encouraged not only in health sectors but in all those sectors concerned with social development and social welfare programs. Women should be educated and encouraged for regular ANC checkups, which augments the detection of these risk factors at the earliest to improve the weight of a newborn. Good nutrition during pregnancy would result in increased birth weight [1-3].

A community-based study was conducted in the rural areas of Udupi taluk, Karnataka state of South India by Nair NS, Rao RP et al to identify the socio-demographic, maternal, and obstetric determinants of low birth weight. Information about social, demographic, and economic conditions of the families; maternal factors such as age, parity, quality of antenatal care, and previous obstetric history were collected by interviewing the mothers and family members and verifying the available medical records through the field investigators especially recruited and trained for this purpose. Primis, elderly mothers, and mothers who had not received good quality antenatal care were found to be more at risk of having low birth weight babies. Other significant determinants were family customs, socio-economic status, and environmental sanitation [1].

In a prospective hospital-based study, Raman TR, Devgan A et al newborns were studied for the incidence of low birth weight neonates and to evaluate the associated risk factors. Mothers belonging to the age group of 19-25 years delivered the maximum number of low birth weight babies. There were 48 neonates with low birth weight born to mothers below the age of 18 years. Primiparous mothers were found to contribute a higher number of low birth weight neonates (414/1014). Spacing as a factor did not show any major difference. A significant number of low birth weight neonates were born to mothers with significant obstetrical problems such as pregnancy-induced hypertension, bad obstetrical history, and premature rupture of membranes.

The incidence of 32.7% of low birth weight babies is high enough to ring alarm bells [2].

Mondal B. did a hospital-based study on Tangsa tribe from Arunachal Pradesh on Low birth weight to the sex of baby, maternal age, and parity. The occurrence of low birth weight was 28.48% and only 4.64% of newborns weighed 2000 g or less. The mean birth weight was found to be 2806.95±39.32 g. Female babies had a significantly higher incidence of low birth weight than male babies. Parity was found to be a significant influence on the incidence of low birth weight. An increase of low birth weight babies was noticed after the 4th parity and the best outcome was also observed at this parity. The higher incidence of low birth weight was found in the 5+ parity. Young mothers (< 20 years) had also a higher incidence of low birth weight and mother's age had no significant effect on the incidence of low birth weight [3].

De Bernabé JV et al did a review and concluded that low birth weight (LBW) is one of the main predictors of infant mortality. The global incidence of LBW is around 17%, although estimates vary from 19% in the developing countries (countries where it is an important public health problem) to 5-7% in the developed countries. LBW is generally associated with situations in which uterine malnutrition is produced due to alterations in placental circulation. There are many known risk factors, the most important of which are socio-economic factors, medical risks before or during gestation, and maternal lifestyles [4].

Agarwal K et al studied the prevalence and determinants of" low birth weight" among institutional deliveries. This study was planned to find out the epidemiological factors associated with low birth weight (LBW) among institutional deliveries so that suitable recommendations can be made to prevent LBW. In this study, 40.0% of mothers delivered LBW babies. Findings indicate that gestational age less than 37 weeks (76.5%), maternal age less than 20 years (58.5%), irregular antenatal checkup (70.5%), mother's height less than 150 cm (68.5%), mother's weight less than 50 kg (76.1%), hemoglobin less than 10 gm/dl (60.5%), severe physical work (78%), and tobacco chewing (58.5%) are significant determinants of LBW. It was concluded that gestational age, maternal age, regular antenatal checkup, mother's height, mother's weight, anemia, physical work, and tobacco chewing are significant determinants of LBW.

Prevalence of LBW can be reduced by increasing the gestational age, regular antenatal checkup, balanced diet during the antenatal period, adequate rest during the antenatal period, and avoiding tobacco chewing [5].

Lasker JN et al assessed risk factors for low birth weight deliveries. Results of the multivariate analysis indicate key variables that contribute to LBW: in particular, racial/ethnic background and specific medical problems during pregnancy, including preeclampsia, incompetent cervix, bleeding, low BMI, and lack of adequate weight gain.

Results were incorporated into training in best practices for prenatal care in the city's prenatal clinics [6].

Anil KC did a case-control study and concluded that low birth weight is a preventable public health problem. It is an important determinant of child survival and development, as well as long-term consequences like the onset of non-communicable disease in the life course. A large number of mortality and morbidity can be prevented by addressing the factors associated with low birth weight.

The main objective of this study was to identify associated risk factors of low birth weight. Having the kitchen in the same living house, iron intake less than 180 tablets during pregnancy, maternal weight gain less than 6.53 kg during the second and third trimester, co-morbidity during pregnancy and preterm birth were the risk factors associated with low birth weight [7].

Bansal P et al did a study intending to find out the prevalence of low birth weight babies among institutional deliveries and its association with socio-cultural and maternal risk factors. The low birth weight (LBW) is considered a sensitive index of a nation's health and development.

Socio-cultural and maternal risk factors like rest received in the afternoon during pregnancy, dietary intake, and period of gestation were found to be significantly associated with low birth weight babies.

The problem of low birth weight babies can be lessened down as most of these factors can be tackled easily by providing adequate and effective antenatal care services with its maximum utilization as well as home care by emphasizing upon the education of mothers and family members, hence decreasing infant and child mortality rates [8].

Mavalankar DV et al conducted a hospital-based case-control study that showed that low maternal weight. poor obstetric history, lack of antenatal care, clinical anemia, and hypertension were significant independent risk factors for both term and preterm LBW. The short interpregnancy interval was associated with an increased risk of preterm LBW birth while primiparous women had an increased risk of term LBW. This analysis suggested that a substantial proportion of term and preterm LBW births may be averted by improving maternal nutritional status, anemia, and antenatal care [9].

Wachamo TM et al did a case-control study and found that low birth weight at birth is an important underlying contributor for neonatal and infant mortality. It accounts for nearly half of all perinatal deaths. Identifying predictors of low birth weight is the first essential step in designing appropriate management strategies. Maternal weight during pregnancy, paternal education, previous obstetric complication, and place of antenatal follow-up were associated with low birth weight. The risk factors identified in this study are preventable. Thus, nutritional counseling, health education on the improvement of lifestyle, and early recognition and treatment of complications were the recommended interventions [10].

A matched pair case-control study was done by Mumbare SS et al on maternal risk factors associated with term low birth weight neonates. Maternal factors including birth spacing, height, pre-delivery weight, and pregnancy weight gain, age, parity, educational and economic status, type of family, antenatal care (ANC), maternal exposure to tobacco, hypertension, and anemia were studied. Maternal malnutrition, inadequate antenatal care, and poor weight gain during pregnancy are significant predictors for the delivery of a low birth weight neonate [11].

A case-control study, which was prospective in design, was carried out by Awoleke JO. in Lagos, Nigeria at the Lagos University Teaching Hospital. The aim was to determine the prevalence of and identify the risk factors for low birth weight deliveries. Using a pre-structured questionnaire, information about the sociodemographic, past obstetric history, and the index pregnancy were obtained. Pre conceptual care, efficient antenatal care, and effective treatment of pelvic infections (which may predispose to preterm births) could reduce the incidence of low birth weight deliveries in Nigeria [12].

Rafati et al studied maternal determinants of giving birth to low-birth-weight neonates which are universally used as an indicator of health status and is an important subject of national concern and a focus of health policy.

Similar studies were done by Sharma M, Mishra S et al, Poudel P et al in whom LBW is associated with a higher risk for childhood mortality and morbidity. After these studies, it was concluded that the majority of factors that lead to the delivery of LBW neonates are preventable [13-15].

Singh G, Anjum F et al also studied the maternal factors which adversely affect the fetus in utero and their impact on the fetus. Maternal factors like age, parity, pre-pregnancy body mass index, hemoglobin levels, bad obstetric history (history of stillbirth/neonatal death in previous pregnancies, three or more spontaneous consecutive abortions), pre-eclampsia, fetal distress, mode of deliveries were studied.

It was concluded that pre-pregnancy maternal body mass index, unbooked status, pre-eclampsia, and bad obstetric history are significant maternal factors resulting in low birth weight babies. Teen-age, illiteracy, poor antenatal care, maternal anemia, and pregnancy-induced medical ailments have a strong association with low birth weight.

To overcome these problems, the mother and child health care services in the country should receive special attention. Dasanayake AP et al evaluated the poor periodontal health of the pregnant woman as a risk factor for low birth weight. Rahman LA et al found an association between pregnancy-induced hypertension and low birth weight; a population-based case-control study [16-19].

Darmstadt GL et al did work on evidence-based, cost-effective A combination of universal—i.e. for all settings—outreach and family-community care at 90% coverage averts 18–37% of neonatal deaths. Most of this benefit is derived from family-community care, and a greater effect is seen in settings with very high neonatal mortality.

Reductions in neonatal mortality that exceed 50% can be achieved with an integrated, high-coverage program of universal outreach and family-community care, consisting of 12% and 26%, respectively, of total running costs, plus universal facility-based clinical services, which make up 62% of the total cost.

Early success in averting neonatal deaths is possible in settings with high mortality and weak health systems through outreach and family-community care, including health education to improve home-care practices, to create demand for skilled care, and to improve care-seeking.

Simultaneous expansion of clinical care for babies and mothers is essential to achieve the reduction in neonatal deaths needed to meet the Millennium Development Goal for child survival [20-21].

Alexander GR et al like the above study endorsed prenatal care. They took it as means to identify mothers at risk of delivering a preterm or growth-retarded infant and to provide an array of available medical, nutritional, and educational interventions intended to reduce the determinants and incidence of low birth weight and other adverse pregnancy conditions and outcomes.

Although the general notion that prenatal care is of value to both mother and child became widely accepted in this century, the empirical evidence supporting the association between prenatal care and reduced rates of low birth weight emerged slowly and has been equivocal [22].

Alderman H et al also advocated that reducing the incidence of low birth weight in low-income countries has substantial economic benefits. Reducing the incidence of low birth weight not only lowers infant mortality rates but also has multiple benefits over the life cycle.

This study estimates the economic benefits of reducing the incidence of low birth weight in low-income countries, both through lower mortality rates and medical costs and through increased learning and productivity.

They estimated gains are primarily from increases in labor productivity (partially through more education) and secondarily from avoiding costs due to infant illness and death. Thus there may be many interventions to reduce the incidence of low birth weight that are warranted purely on the grounds of saving resources or increasing productivity.

Lawn JE et al advocated Kangaroo mother care' to prevent neonatal deaths due to preterm birth complications. The objectives of this study were to review the evidence and estimate the effect of KMC on neonatal mortality due to complications of preterm birth [23-24].

It is suggested that programs that work to reduce the rate of low birth weight infants should focus on improving maternal lifestyle choices by increasing access, utilization, and quality of care while addressing the intractable socio-economic disparities that continue to indirectly contribute to the incidence of low birth weight.

Sociocultural factors influenced the growth of fetus and outcomes of pregnancies. Most women lacked knowledge of the pregnancy risk factors that adversely affect infant birth weight and the exact mechanisms by which the risk factors act to cause adverse effects.

Intervention programs and behavior change communication during pregnancy should focus on significant risk factors associated with low birth weight and target pregnant women at risk. Health education for pregnant women should be strengthened to promote care-seeking and demand for skilled care at all stages of maternity.

Since low birth weight is the prelude to protein-energy malnutrition and is generally followed by childhood morbidity and mortality, the problem of low birth weight needs to be tackled by adequate provision of primary health care strengthening of national programs like RCH-II to improve awareness level and health and nutritional status of the mother.

This way healthier infants are produced who have a better chance of surviving and becoming tomorrow's wealth. The results corroborate findings of several other studies, which underscore the association between anthropometric and reproductive variables and birth outcomes

Conclusion

- The prevalence of LBW babies was 26.9% in the present study. Many factors affect the birth weight of the baby. A single parameter cannot be attributed to the occurrence of LBW babies. Many risks for LBW can be identified before pregnancy occurs. Health education, socioeconomic development, maternal nutrition, and increasing the use of health services during pregnancy, are all important for reducing LBW.

- This study provides empirical support for the links that exist between maternal health and infant birth weight: maternal weight and height (anthropometric variables), maternal age, parity, gestational age, initiation of ANC.

- Of 286 mothers studied, a significant association was found between low birth weight and literacy level of mothers, sex of the baby, ANC check-up, the residence of the mother, weight gain of the mother during pregnancy, presence of medical complications like pregnancy-induced hypertension, oligohydramnios.

What does the study add to the existing knowledge

This study shows that bio-demographic and prenatal care variables have the strongest influence in determining the birth weight of a baby. However, Socio-economic and demographic factors are significantly associated with prenatal care, which is one of the behavioral factors associated with low birth weight. Women and girl child education should be given the desired attention as it has shown to strongly correlate with the risk of LBW.

Author's contribution

Dr. M. Sarika: Concept and data collection
Dr. Rashmi Vishwakarma: Data collection and statistical analysis
Dr. Rajasekhar Rao: Guidance and discussion

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