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REVIEW ARTICLE

A Case Control Study on Maternal and Neonatal Factors Resulting in Low Birth Weight of Term Neonate at Selected Hospitals of the City

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Abstract

The study was conducted to find maternal and neonatal factors resulting in low birth weight of term neonate at selected hospitals of the city. The study is based on Multi factorial theory. After considering the factors related to the selected problem which were retrospective in nature, the researcher had selected the "case –control design" as suitable for this study. In this study Non probability Convenient Sampling Technique was adopted to select the sample. 100 mothers with term neonates, 50 in case group (mothers with low birth weight neonate) and 50 in control group (mothers with normal birth weight neonate) were selected as per inclusion criteria. In demographic variables education of the mother, residence of mother, monthly income of the family, maternal weight, and gender of the newborn were associated with low birth weight of term neonate. In maternal factors weight gain during pregnancy, and history of low birth weight in siblings was found to be associated with low birth weight of term neonate. In neonatal factors history of intra uterine growth retardation and history of multiple pregnancies was found to be associated with low birth weight of term neonate.

Keywords: Maternal Factors; Neonatal Factors; Low Birth Weight; Term Neonate.

Background of the problem

UNICEF says more than 20 million infants are born each year weighing less than 2,500 grams (5.5 pounds), accounting for 17 per cent of all births in the developing world [1].

According to WHO, World Health Statistics 2012, percentage of LBW births in India reported as 28 % during the period of 2005 – 2010. The reduction in the percentage of low birth weight also forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality [2].

Interventions to improve care during pregnancy, childbirth and the post natal period as well as feeding are likely to improve the immediate and longer-term health and well-being of the individual infant and have a significant impact on neonatal and infant mortality at a population level [3].

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Need of the study

LBW is closely associated with fetal and prenatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life. At the population level, the proportion of babies with a LBW is an indicator of a multifaceted public-health problem that includes long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy. On an individual basis, LBW is an important predictor of newborn health and survival and is associated with higher risk of infant and childhood mortality. Low birth weight constitutes as sixty to eighty percent of the infant mortality rate in developing countries. Infant mortality due to low birth weight is usually a direct cause stemming from other medical complications such as preterm birth, poor maternal nutritional status, lack of prenatal care, maternal sickness during

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pregnancy, and an unhygienic home environment [4].

A new survey carried out by leading weight Loss Company, has expressed concerns over the rising instances of babies with low birth weight of less than 2.5 kg in India [5].

There is significant variation in the incidence of low birth weight across regions. South Asia has the highest incidence, with 31 per cent of all infants with low birth weight, while East Asia/Pacific has the lowest, at 7 per cent. India is home to nearly 40 per cent of all low-birth weight babies in the developing world. Low birth weight is therefore an important indicator for monitoring progress towards these internationally agreed Millennium Development Goals which will need to ensure a healthy start in life for children [6].

Objectives

Objectives of the study were :

- To find the association between the low birth weight of term neonate and maternal factors in case and control group,
- To find the association between the low birth weight of term neonate and neonatal factors in case and control group.

Research design

After considering the factors related to the selected problem which were retrospective in nature, the researcher had selected the "case – control design" as suitable for this study. There are four basic steps in conducting a case control study: selection of cases and controls, matching, measurement of exposure, analysis and interpretation [7].

In present study full term neonates with low birth weight and their mothers were considered as case group. Neonates with normal birth weight and their mothers were considered as control group.

Sampling technique

In this study Non probability Convenient Sampling Technique was adopted to select the sample.

Sample size

In the study 100 mothers with term neonates, 50 in case group and 50 in control group were selected as per inclusion criteria.

Variables of the study

Independent Variable: The independent variable in this study was maternal and neonatal factors.

Dependent Variable: The dependent variable in this study was low birth weight of term neonate.

Description of tool

The tool used for data collection was a self structured interview developed by the investigator. The tool consists of two sections:

Section I: Demographic data for the mother and baby

Part A: Demographic data for the mother

1. General information: Education of mother, Occupation of mother, Area of residence, Type of family, Religion, Income of the family.
2. Nutritional variables: Maternal weight (in kg) at the time of registration, Maternal height (in cm), BMI status of the mother, Number of meals per day, Type of diet, Number of fasting days in a week, etc.

Part B: Demographic data for the baby: Sex of newborn, Birth order of the newborn.

Section II: Maternal factors and neonatal factors resulting in low birth weight babies.

Part A: General Factors: Maternal age (in years), Age at marriage, Parity of mother, Birth interval, Registration of pregnancy, Mode of present delivery, Personal habits, Daytime rest by the mother, Weight gain during pregnancy.

Part B: Specific factors (maternal) [records]: Pre conception counseling, History of consanguineous marriage, History of excessive vomiting, History of anemia, History of repeated abortions, and History of pregnancy induced hypertension etc. Total of 25 items were to be assessed.

Part C: Specific factors (neonatal) [records]: History of Intra Uterine Growth Retardation, History of Multiple Pregnancies, History of Congenital Abnormalities, History of Chromosomal Abnormalities, History of TORCH Infections in mother, History of HIV Infections in mother, History of VDRL Infections in mother.

Table 1: Comparison of birth weight in cases and controls

Group	n	Mean	S.D.	S.E.	z-value	p-value
Case Group	50	2.21	0.25	0.03	15.13	0.000
Control Group	50	3.00	0.27	0.03		S, p<0.05

Fig. 1: Bar diagram representing the mean birth weight and SD in case and control group

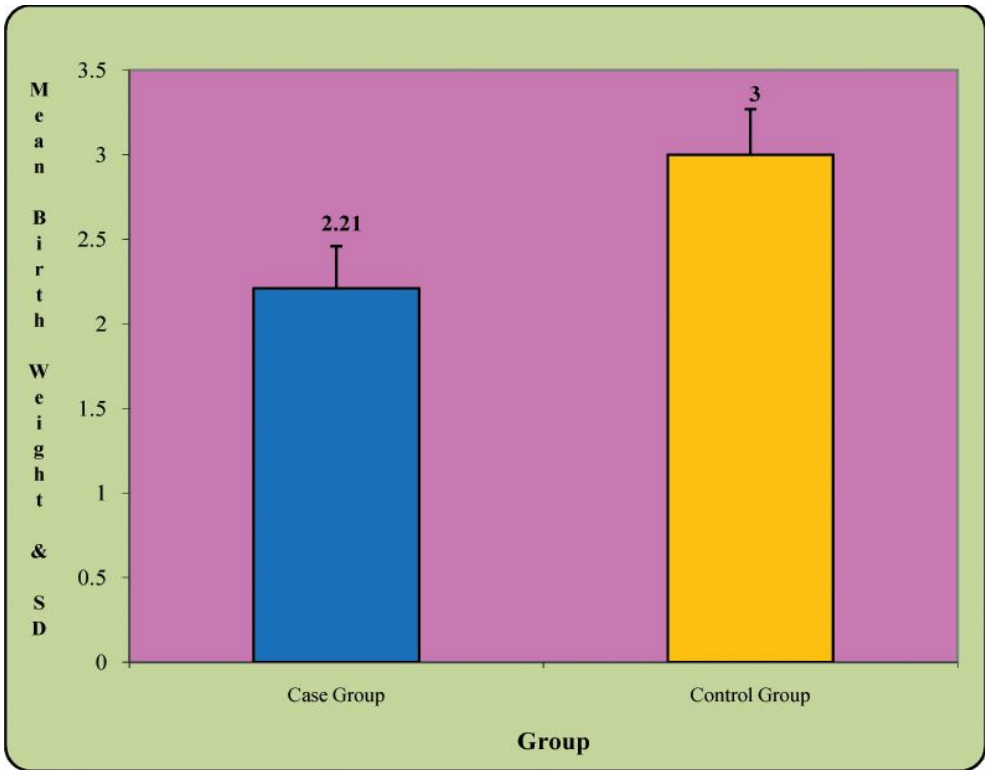

Table 2: Association between Maternal Factors and Low Birth Weight of Term Neonate in Case and Control Group

Maternal factors		Cases N = 50		Controls n= 50		χ^2 value	Df	P value	Level of significance
		Frequency	%	Frequency	%				
Maternal Age (yrs)	< 18	1	2	0	0	1.83	3	0.60	NS (p> 0.05)
	19 – 22	10	20	12	24				
	23 – 27	27	54	23	46				
	>27	12	24	15	30				
Birth Interval	1st time pregnant	22	44	27	54	1.57	3	0.66	NS (p> 0.05)
	< 2 yrs	10	20	6	12				
	3- 5 yrs	10	20	10	20				
	>5 yrs	8	16	7	14				
Weight gain during pregnancy	Upto 7 kg	24	48	16	32	9.59	3	0.022	S (p< 0.05)
	8 – 10 kg	21	42	18	36				
	11 – 13 kg	4	8	6	12				
	>13 kg	1	2	10	20				

S = Significant, NS = Not Significant, NA = Not Applicable

Data analysis and interpretation

The table shows that:

- The mean birth weight among the case group is 2.21 kg with SD of 0.25.
- The mean birth weight among the control group is 3.00 kg with SD of 0.27.
- The obtained z-value is 15.13 and p-value is 0.000 which is significant.

Above table explains the frequency, percentage, chi-square value and level of significance of maternal factors and low birth weight among cases and controls.

Regarding age of the mothers, majority of cases 27 (54%) and 23 (46%) were in the age group between 23 – 27 years. The obtained chi-square value 1.83 ($p > 0.05$) was not significant. Therefore there was no significant association between maternal age and low birth weight of the term neonate.

Regarding the birth interval, majority of cases 22 (44%) and controls 27 (54%) were first time pregnant. The obtained chi-square value 1.57 ($p > 0.05$) was

Fig. 2: Bar diagram representing the weight gain of mothers during pregnancy in case and control group

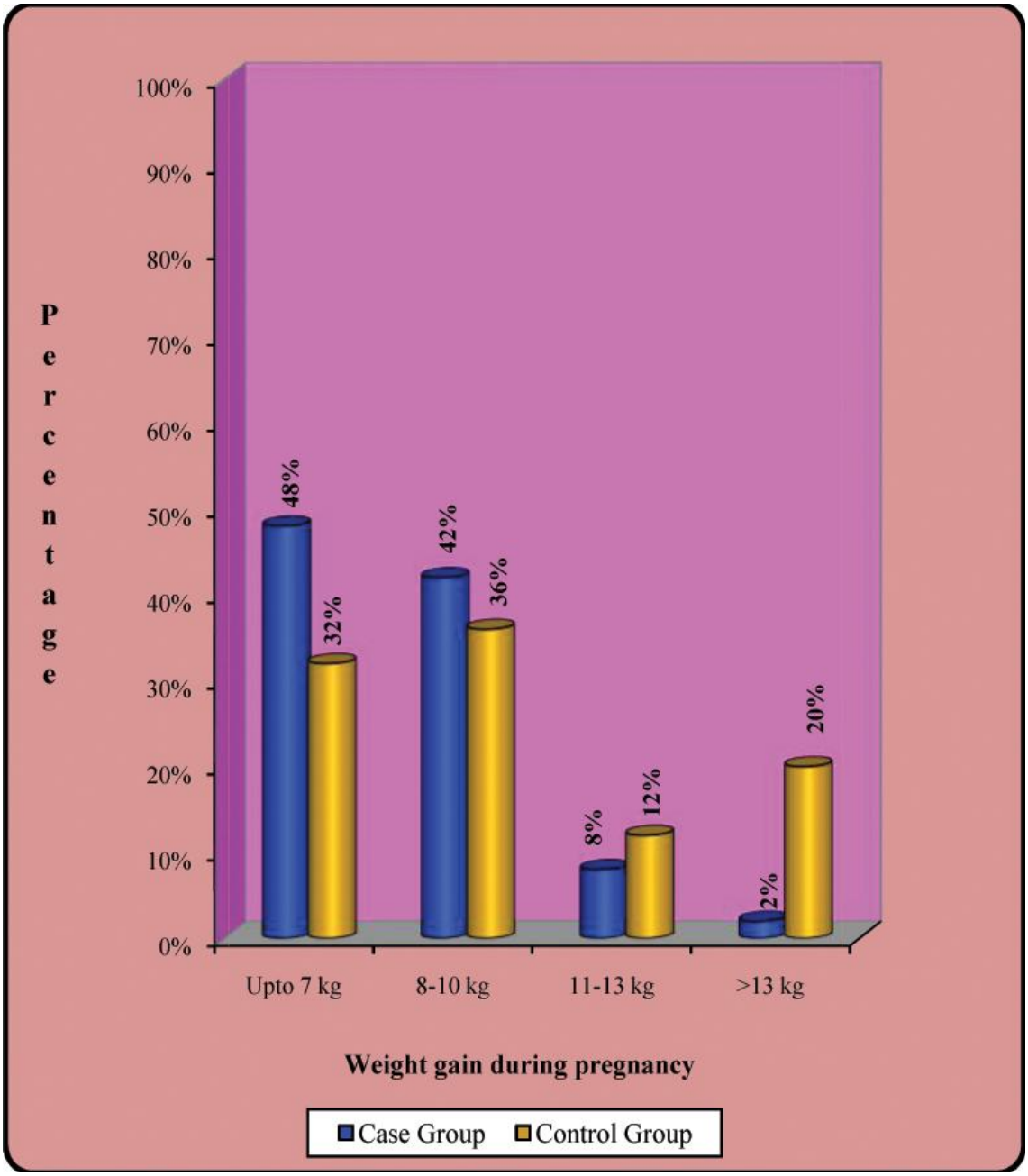

Table 3: Association between Maternal Factors and Low Birth Weight of Term Neonate in Case and Control Group

Maternal factors	Cases N = 50 Frequency	Control N= 50 Frequency	χ^2 value	Df	P value	Level of significance	Or
History of consanguineous marriage	8	6	0.33	1	0.56	NS	1.39 (0.44 – 4.36)
History of excessive vomiting	25	22	0.36	1	0.54	NS	1.27 (0.57 – 2.79)
History of anemia	44	36	0.02	1	0.87	NS	1.06 (0.46 – 2.48)
History of pregnancy induced hypertension	12	9	0.54	1	0.46	NS	1.43 (0.54 – 3.79)
History of Oligohydramnios	10	4	2.99	1	0.08	NS	2.87 (0.83 – 9.88)
History of low birth weight in siblings	22	5	14.66	1	0.0001	S	7.07 (2.40 – 20.82)
History of compliance of medications	49	46	1.89	1	0.16	NS	4.26 (0.45 – 39.57)

S = Significant, NS = Not Significant, NA = Not Applicable

not significant. Therefore there was no significant association between parity of mother and low birth weight of the term neonate.

Regarding weight gain during pregnancy, majority of cases 24 (48%) had weight gain up to 7 kg and among controls 18 (36%) had weight gain of 8 to 10 kg. The obtained chi-square value 9.59 ($p< 0.05$) was significant. Therefore there is significant association between weight gain during pregnancy and low birth weight of the term neonate.

The table shows 8 (16%) cases and 6 (12%) controls had history of consanguineous marriage. The obtained chi-square value is 0.33 ($P > 0.05$) was not significant. However, the obtained odds ratio is 1.39 suggested that the mothers with history of consanguineous marriage is 1.39 times at risk to deliver low birth weight baby.

25 (50%) cases and 22 (44%) controls had history of excessive vomiting. The obtained chi-square value is 0.36 ($P > 0.05$) was not significant. However, the obtained odds ratio is 1.27 suggested that the mothers with history of excessive vomiting is 1.27 times at risk to deliver low birth weight baby. 44 (88%) cases and 36 (72%) controls had history of anemia. The obtained chi- square value is 0.02 ($P > 0.05$) was not significant. However, the obtained odds ratio is 1.06 suggested that the mothers with history of anemia is 1.06 times at risk to deliver low birth weight baby.

12 (24%) cases and 9 (18%) controls had history of pregnancy induced hypertension. The obtained chi-square value is 0.54 ($P > 0.05$) was not significant. However, the obtained odds ratio is 1.43 suggested that the mothers with history of pregnancy induced hypertension is 1.43 times at risk to deliver low birth weight baby.

10 (20%) cases and 4 (8%) controls had history of oligohydramnios. The obtained chi-square value is 2.99 ($P > 0.05$) was not significant. However, the obtained odds ratio is 2.87 suggested that the mothers with history of oligohydramniosis 2.87 times at risk delivering low birth weight baby.

Table 4: Association between the neonatal factors and low birth weight of term neonate in case and control group

Neonatal Factors	Cases N = 50 Frequency	Control N= 50 Frequency	χ^2 value	Df	P value	Level of signifi-cance	Or
History of IUGR	36	2	49.07	1	0.0001	S	61.71 (13.18 – 28.9)
History of Multiple pregnancies	9	1	7.11	1	0.007	S	10.76 (1.80 – 88.52)
History of congenital abnormalities	1	0	1.01	1	0.31	NS	3.06 (0.12 – 77.01)
History of VDRL infections in mother	0	2	2.04	1	0.15	NS	0.19 (0.008 – 4.10)

S = Significant, NS = Not Significant, NA = Not Applicable

22 (44%) cases and 5 (10%) controls had history of low birth weight in siblings. The obtained chi-square value is 14.66 (P > 0.05) was significant. However, the obtained odds ratio is 7.07 suggested that the mothers with history of low birth weight in siblings is 7.07 times at risk delivering low birth weight baby.

49 (98%) cases and 46 (92%) controls had history of compliance with medications. The obtained chi-square value is 1.89 (P > 0.05) was not significant. However, the obtained odds ratio is 4.26 suggested that the mothers with history of compliance with medications is 4.26 times at risk delivering low birth weight baby.

The table shows 36 (72%) cases and 2 (4%) controls had history of intra uterine growth retardation. The obtained chi-square value is 49.07 (P < 0.05) was highly significant. However, the obtained odds ratio is 61.71 suggested that the mothers with history of IUGR is 61.71 times at risk to deliver low birth weight baby.

9 (18%) cases and 1 (2%) controls had history of multiple pregnancies. The obtained chi – square value is 7.11 (P < 0.05) was significant. However, the obtained odds ratio is 10.76 suggested that the

Table 5: Logistic regression regarding the association of maternal and neonatal factors and low birth weight of term neonates

	ß	SE(ß)	AOR	t	p-value	95% Confidence Interval for B	
						Lower Bound	Upper Bound
Education of mother	0.05	0.036	0.110	1.467	0.146 NS,p>0.05	-0.019	0.126
Area of residence	0.14	0.054	0.197	2.723	0.008 S,p<0.05	0.040	0.256
Income of family	-0.02	0.039	0.041	0.529	0.598 NS,p>0.05	-0.097	0.056
BMI status of mother	-0.03	0.065	0.036	0.466	0.643 NS,p>0.05	-0.159	0.099
Weight gain during pregnancy	0.04	0.038	0.087	1.169	0.246 NS,p>0.05	-0.031	0.121
History of low birth weight in siblings	0.15	0.084	0.140	1.879	0.064 NS,p>0.05	-0.009	0.325
IUGR	0.67	0.085	0.655	7.978	0.000 S,p<0.05	0.506	0.842
Multiple Pregnancies	-0.007	0.125	0.004	0.058	0.954 NS,p>0.05	-0.255	0.240

mothers with history of multiple pregnancy is 10.76 times at risk to deliver low birth weight baby.

1 (2%) cases and 0 (0%) controls had history of congenital abnormalities. The obtained chi-square value is 1.01 (P > 0.05) was not significant. However, the obtained odds ratio is 3.06 suggested that the mothers with history of congenital abnormalities is 3.06 times at risk to deliver low birth weight baby.

0 (0%) cases and 2 (4%) controls had history of VDRL infections in mother. The obtained chi-square value is 2.04 (P > 0.05) was not significant. However, the obtained odds ratio is 0.19 suggested that the mothers with history of VDRL infections in mother is 0.19 times at risk to deliver low birth weight baby.

The above table reveals the steps in logistic regression regarding association between maternal and neonatal factors resulting in low birth weight of term neonates among cases and controls.

- Low education of mothers had 0.110 times risk of delivering low birth weight term neonate (AOR 0.110, CI 95%, -0.019 – 0.126). The obtained p value is 0.146 which is greater than p > 0.05, thus not significant.
- Rural area of residence of mothers had 0.197 times risk of delivering low birth weight term neonate (AOR 0.197, CI 95%, 0.040 – 0.256). The obtained p value is 0.008 which is less than p < 0.05, thus significant.
- Low income of family had 0.041 times risk of delivering low birth weight term neonate (AOR 0.041, CI 95%, -0.097 – 0.056). The obtained p value is 0.598 which is greater than p > 0.05, thus not significant.
- Altered BMI of mothers had 0.036 times risk of delivering low birth weight term neonate (AOR 0.036, CI 95%, -0.159 – 0.099). The obtained p value is 0.643 which is greater than p > 0.05, thus not significant.
- Low weight gain during pregnancy had 0.087 times risk of delivering low birth weight term neonate (AOR 0.087, CI 95%, -0.031 – 0.121). The obtained p value is 0.246 which is greater than p > 0.05, thus not significant.
- History of low birth weight in siblings had 0.140 times risk of delivering low birth weight term neonate (AOR 0.140, CI 95%, -0.009 – 0.325). The

obtained p value is 0.064 which is greater than p > 0.05, thus not significant.

- ❖ History of IUGR in pregnancy had 0.655 times risk of delivering low birth weight term neonate (AOR 0.665, CI 95%, 0.506 – 0.842). The obtained p value is 0.000 which is less than p < 0.05, thus significant.
- ❖ History of multiple pregnancies had 0.004 times risk of delivering low birth weight term neonate (AOR 0.004, CI 95%, -0.255 – 0.240). The obtained p value is 0.954 which is greater than p > 0.05, thus not significant.

Implications of the study

The study findings can be used to bring about awareness among the midwives, mothers and family members etc regarding good antenatal care, identifying high risk factors early in pregnancy and managing them accordingly so as to lower the incidence of low birth weight neonate. The present study would help the nurses to understand the maternal and neonatal factors associated with low birth weight babies. In service education should be conducted to improve the knowledge of health professionals and nursing personnel.

Recommendations

- ❍ A similar study can be replicated on a larger population.
- ❍ A comparative study can be done on the mothers residing in rural and urban areas with low birth weight neonates.
- ❍ An exploratory study to find out the prevalence of low birth weight in selected city.
- ❍ A similar study can be done with inclusion of preterm neonates.
- ❍ A study to assess the effectiveness of planned teaching program on knowledge regarding factors resulting in low birth weight neonate among antenatal mothers in selected hospital.

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