

EPIDEMIOLOGICAL DETERMINANTS OF LOW BIRTH WEIGHT IN AHMEDABAD CITY: A FACILITY BASED CASE-CONTROL STUDY

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ABSTRACT

Background: Low birth weight (LBW) has been defined by the World Health Organization (WHO) as birth weight less than 2,500 grams. In India, 30-35% babies are LBW. LBW is closely associated with foetal and neonatal mortality as well as morbidity and has a very complex aetiology.

Aims & Objective: The present study was undertaken with the objectives of ascertaining epidemiological determinants of LBW.

Materials and Methods: A facility based case-control study was carried out in all the 3 tertiary hospitals of Ahmedabad Municipal Corporation during April-2012 to September-2012. A total of 100 cases weighing < 2.5 kg and controls weighing > 2.5 kg each were selected during the study period. Crude and adjusted odd's ratio with 95% confidence interval was calculated. Multiple logistic regression was used to estimate independent effect of maternal characteristic on LBW.

Results: A significant association was observed between LBW and maternal age at consummation < 20 years, maternal education, socio-economic status, inter-pregnancy interval, antenatal visit < 3, maternal height < 145cm, pre-pregnancy maternal weight, habit of tobacco chewing, previous history of abortion and anaemia. These variables were further entered in multiple logistic regression model and factors such as maternal age at consummation < 20 years, inter-pregnancy interval, antenatal visit < 3, maternal height, pre-pregnancy maternal weight < 45 kg, habit of tobacco chewing, previous history of abortion and anaemia were found to be significant independent risk factor for LBW.

Conclusion: For reducing LBW emphasis should be given on reducing teen age pregnancy, improving nutrition during adolescence, increasing coverage of antenatal visits, encouraging wider birth interval and avoiding tobacco chewing.

Key Words: Case-Control Study; Low Birth Weight; Tobacco Chewing; Epidemiological Determinants

Introduction

Low birth weight (LBW) has been defined by the World Health Organization (WHO) as weight at birth of less than 2,500 grams. More common in developing than developed countries, a birth weight below 2,500 g contributes to a range of poor health outcomes.^[1] Each year between 15 and 30 million infants – up to 20 percent of all infants, are born with low birth weight.^[2] In India, 30-35% babies are LBW and more than half of these infants are full term babies.^[3] The period of intrauterine growth and development is one of the most vulnerable periods in the human life cycle. The weight of the infant at birth is a powerful predictor of infant growth and survival; it is dependent on maternal health and nutrition during pregnancy.^[4] A baby's low weight at birth is either the result of preterm birth (before 37 weeks of gestation) or due to restricted foetal (intrauterine) growth.^[1] In developing countries, including India, the majority of LBW infants because of intrauterine growth retardation (IUGR) are born small at term (> 37 weeks of gestation) with only 6.7 per cent born prematurely.^[4]

Low birth weight is closely associated with foetal and neonatal mortality as well as morbidity including inhibited

growth, cognitive development and chronic diseases later in life. Many factors affect the duration of gestation and foetal growth, and thus, the birth weight. They relate to the infant, the mother, or the physical environment. Birth weight is affected to a great extent by the mother's own foetal growth and her diet from birth to pregnancy, and thus, her body composition at conception. Mothers in deprived socio-economic conditions frequently have LBW infants which stems from the mother's poor nutrition and health during pregnancy, the high prevalence of specific and non-specific infections, or from pregnancy complications, underpinned by poverty. Physically demanding work during pregnancy also contributes to poor foetal growth. Hence, LBW has a very complex aetiology and therefore, a case-control study was planned with the objective of ascertaining epidemiological determinants of LBW.^[1]

Materials and Methods

A facility based case-control study was carried out in all the 3 tertiary hospitals of Ahmedabad municipal corporation namely Sheth V.S. General Hospital, Shardaben hospital and LG hospital during April-2012 to September-2012. All the three hospitals serve patients from

corporation area as well as surrounding suburbs and villages. A total of 100 cases and controls each were selected during the study period. All the mothers who gave birth to singleton babies at term were included. Those mothers who had preterm deliveries, multiple pregnancy, any medical condition and those who did not give written consent were excluded. Cases were mothers with singleton babies weighing less than 2500 grams at term and controls were mothers with singleton babies weighing more than 2500 grams at term. A semi-structured, pre-tested questionnaire was used to interview mothers which included information like their socio-demographic profile, anthropometric measurements, nutritional status, antenatal visits, inter-pregnancy interval, habits, haemoglobin status, etc.

Selection criteria: Cases were selected by simple random sampling using lottery method. After each case was selected, the next available newborn baby with birth weight more than 2500 grams was selected by the same method and included in the control group.

Ethical consideration: Written informed consent was obtained from each mother prior to their inclusion in the study. Permission from the superintendents of each hospital was obtained to carry out the study beforehand.

Statistical analysis: Data was analysed using SPSS 20.0 version. Crude and adjusted odd's ratio with 95% confidence interval was calculated. Multiple logistic regression was used to estimate independent effect of maternal characteristic on LBW.

Results

Mean age of cases was 24.79 ± 3.9 years, while that of controls was 21.63 ± 2.3 years. Proportion of illiterate was 41% among cases and 25% controls, 50 (50%) cases and controls each were educated up to primary level and the rest were educated up to secondary level and above respectively. About 86 (86%) cases and 82 (82%) controls were housewives respectively and rests were working as maid servants. Majority of cases (93%) as well as controls (91%) belonged to socio-economic class III and IV. Twenty (20%) cases and two (2%) controls had habit of chewing tobacco in the form of "guthka or tobacco dentrifice".

Pre-pregnancy maternal weight less than 45 kg was recorded in 27 (27%) cases and 8 (8%) controls respectively. Around 52 (52%) cases and 2 (2%) controls had 3 or less than 3 antenatal visits during pregnancy respectively. Interval between consecutive pregnancy less than 2 years was observed in 55 (55%) cases and 31

(31%) controls respectively. Nearly 52 (52%) cases and 22 (22%) controls age at consummation was found to be less than 20 years. Maternal height less than 145cm was observed in 18(18%) cases and 9 (9%) controls respectively. Around 4 (4%) cases had antepartum haemorrhage and 1 (1%) had pre-eclampsia while none of the controls had any complication during pregnancy. Anemia (hemoglobin less than 11 gm%) was seen in 19 (19%) cases and 4 (4%) controls respectively. Previous history of abortion was present in 12 (12%) cases and 3 (3%) controls respectively.

A significant association was observed between LBW and maternal age at consummation less than 20 years, maternal education, socio-economic status, inter-pregnancy interval, antenatal visit less than 3, maternal height, pre-pregnancy maternal weight, habit of tobacco chewing, previous history of abortion and anemia. These variables were further entered in multiple logistic regression model and factors such as maternal age at consummation less than 20 years, inter-pregnancy interval, antenatal visit less than 3, maternal height, pre-pregnancy maternal weight, habit of tobacco chewing, previous history of abortion and anemia were found to be significant independent risk factor for LBW. (Table.1)

Table-1: Epidemiological determinants of Low birth weight

Variable	Case	Control	P value	Crude OR	Adjusted OR
Age at consummation	<20 yrs	52	22	<0.0001	3.84 (2.08-7.10)
	20 yrs	48	78		
Education	Illiterate	41	25	0.0161	2.09 (1.14-3.81)
	Literate	59	75		
Socio-economic class	High	87	40	<0.0001	5.02 (2.72-9.28)
	Low	23	60		
Tobacco chewing	Yes	20	2	0.0001	12.38 (2.81-54.55)
	No	80	98		
Inter-pregnancy interval	≤2 yrs	55	31	<0.0001	5.23 (2.65-10.34)
	>2 yrs	45	69		
ANC visit	≤3	52	2	<0.0001	53.08 (12.39-227.20)
	>3	48	98		
Pre-pregnancy weight	<45 kg	27	8	0.0004	4.25 (1.82-9.92)
	>45 kg	73	92		
Anaemia	Present	19	4	0.0009	5.63 (1.84-17.22)
	Absent	81	96		
Height	<145cm	18	9	0.0620	2.22 (0.94-5.22)
	>145cm	82	91		
Abortion	Yes	12	3	0.015	4.41 (1.20-16.20)
	No	88	97		

Discussion

In both developed and developing countries, LBW has been used as an important public health indicator.^[1] In particular, considerable attention has been focused on the causal determinants of birth weight, and especially of LBW, in order to identify potentially modifiable factors.^[5] In the present study, the main epidemiological determinant for LBW were maternal age at consummation less than 20 years, habit of chewing tobacco, pre-pregnancy maternal

weight less than 45 kg, maternal height less than 145 cm, previous history of abortion, inter-pregnancy interval less than 2 years, antenatal visits less than 3 and haemoglobin level less than 11 gm%.

Pregnancy outcome are generally less favourable among adolescents as they have not completed growing, are likely to have low weight for height and may consume fewer calories and other nutrients.^[5] In the present study also maternal age at consummation less than 20 years was a significant independent risk factor for LBW clearly indicating that energy balance is an important determinant of birth outcome. Kumar et al in Karnataka (OR=3.96) and Cheryl et al (OR=1.7) in Hawaii also found maternal age as an important contributing factor for LBW.^[6,7]

Tobacco contains nicotine which causes fetal hypoxia and leads to growth retardation. In the present study mothers who had habit of chewing tobacco (OR=4.0) were more likely to have LBW babies. Similar observation was reported by Mujibul et al (OR=4.1), Sachin et al (OR=4.1), Deshmukh et al (OR=3.14) and Boratne et al (OR=1.54) in their respective studies.^[8-11] Maternal height and weight could affect intrauterine growth through either genetic or environmental mechanisms. Part of the mother's genetic potential could be passed on to the fetus and any deficit in her height and weight could impose limitations on the growth of the uterus, foetus and placenta.^[5] Maternal height (OR=2.0) and pre-pregnancy weight (OR=3.4) were independent risk factor for LBW in the present study. In the study of Kumar et al mothers with maternal weight < 45 kg (OR=6.7) and maternal height < 145 cm (OR=2.7) had more chances of LBW babies.^[5] Anand et al and Sachin et al observed that maternal weight < 45 kg (OR=7.1) and maternal height < 145 cm (OR=4.1) had a significant impact on birth weight respectively.^[9,12]

Antenatal care could have beneficial impact on intrauterine growth either by diagnosis and timely treatment of pregnancy complications or by eliminating or reducing modifiable risk factor.^[5] In this study, those mothers who had less than 3 antenatal visit (OR=40.9) were more likely to have LBW babies. Boratne et al (OR=1.45) also reported similar findings.^[10] A short birth interval might lead to poor pregnancy outcome either due to nutrition or hormonal depletion. This study also found that birth interval less than 2 years (OR=1.4) lead to poor pregnancy outcome. Deshmukh et al (OR=3.8) and Nagargoje et al (1.8) also stated that inter-pregnancy interval less than 2 years affected birth weight.^[10,11,13]

Anaemia could impair oxygen delivery to the fetus and

thus interfere with normal intrauterine growth.^[5] Haemoglobin level less than 11 gm% increased the risk of LBW occurrence (OR=2.5) in the present study. Similar finding were observed by Nagargoje et al (OR=1.5), Kumar et al (OR=4.3), Deshmukh et al (OR=4.8) and Sachin et al (OR=3.6) in their respective studies.^[6,9,11,13] Previous history of abortion also lead to increased chances of LBW (OR=1.8) in the present study. Anand et al (OR=4.2) and Negi et al (OR=7.3) also reported similar findings.^[12,14]

Conclusion

Findings of the present study confirms that for reducing LBW emphasis should be given on reducing teen age pregnancy, improving nutrition during adolescence to facilitate better weight gain as well as preventing anaemia, increasing coverage of antenatal visits, encouraging wider birth interval and avoiding tobacco chewing.

References

1. United Nations Children's Fund and World Health Organization. Low birth weight: Country, regional and global estimates. New York: UNICEF; 2004:1-3.
2. United Nations Children's Fund. Reduction of Low birth weight: A South-Asian priority. Nepal: UNICEF ; 2002:1.
3. Park JE, Park K. Textbook of Preventive and Social Medicine. 21st edition. Jabalpur:Banarsidas Bhanot Publishers. 2011.
4. S Muthayya. Maternal nutrition & low birth weight – what is really important? Indian J Med Res November 2009;130:600-08.
5. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bulletin of the World Health Organization 1987;65(5):663-737.
6. Kumar SG, Harsha Kumar HN, Jayaram S, Kotian MS. Determinants of Low Birth Weight: A Case Control Study in a District Hospital in Karnataka. Indian Journal of Pediatrics 2010;77(1):87-9.
7. Cheryl BP, Limin S, Nighat Q, Kathleen KB. The Epidemiology of Low Birth Weight and Preterm Delivery, in Hawai'i. 2000-2001. Californian Journal of Health Promotion 2003;1(sp issue):83-90.
8. Mujibul H, Ekhlasar R, Probbhat RD. Pregnancy Outcome of Mothers who Used Smokeless Tobacco for Five Years or More. Bangladesh J Child Health 2011;35(1):6-10.
9. Sachin SM, Girish M, Rajesh D, Surekha Y, Madhav KT, Kiran P. Maternal Risk Factors Associated with Term Low Birth Weight Neonates: A Matched-Pair Case control Study. Indian Pediatr 2012;49:25-8.
10. Boratne AV, Gupta SS, Datta SS, Mehendale AM, Garg BS. Determinants of low birth weight in rural Wardha. Indian Journal of Maternal And Child Health 2012;14(2):1-9.
11. Deshmukh JS, Motghare DD, Zodepy SP, Wadhwa SK. Low birth weight and associated maternal factors in an urban area. Indian Pediatr 1998;35(1):33-6.
12. Anand K, Garg BS. A Study of Factors Affecting LBW. Indian Journal of Community Medicine 2000;15(2):57-62.
13. Nagargoje MM, Deshmukh JS, Gupta SC, Misra SK. A Case Control study for risk factors of low birth weight in Nagpur city of Maharashtra. Indian Journal of Community Health 2010-11;23(2):4-7.
14. Negi KS, Kandpal SD, Kukreti M. Epidemiological Factors Affecting Low Birth weight. Indian J Community Med 2006;8(1):31-4.

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