Maternal and Social Factors Affecting Low Birth Weight: A Case Control Study of PHC at Kherva Village of Gujarat

Kinvanti S. Patel
Assistant Professor (Statistics)
V. M. Patel College of Management Studies, Ganpat University, Mehsana-382714, Gujarat, India.
Email: kinvanti@yahoo.com

G. C. Bhimani
Professor & Head (Statistics)
Department of Statistics, Saurashtra University, Rajkot.
Dist. Rajkot, Gujarat, India
Email: gcbhimani@yahoo.co.in

Abstract

Low Birth Weight (LBW) is a major public health problem in many developing countries and especially in India. The main objective of this paper is to identify the factors that affect birth weight of new born and to estimate the prevalence of LBW. The Case Control Study method is used to undertake the study. For this purpose the mothers giving birth to LBW neonate (<2.5 kg) are considered as cases and those whose neonates weighed ≥2.5 kg at birth are considered as controls. The present study was carried out amongst 200 pregnant women who were admitted in Primary Health Center (PHC) of Kherva village in Mehsana taluka of Gujarat state in India. The study was conducted during May 2013 to September 2013.

In present study, risk factors; Maternal Age, Nature of family, Occupation of Mother, Monthly Income, Maternal pre pregnancy Weight, Maternal Weight after pregnancy, Hemoglobin level of mother, Inter pregnancy Interval, Consumption of Tobacco, Weight of previous siblings, abortion were found to play a significant role and indicated association with the birth weight of a newborn. It suggests that interventions such as increasing marriage age of female and maternal nutrition, wider availability of contraception to delay the first pregnancy and to increase pregnancy intervals may help in identifying and ensuring adequate care for those women who are at greatest risk of LBW.

Key Words

Low Birth Weight, Maternal and Social Factors, Socio-Demographic Variables

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Introduction

The goal of reducing low birth weight(LBW) incidence by at least one third between 2000 and 2010 was one of the major goals in 'A World Fit for Children,' the Declaration and Plan of Action adopted at the United Nations General Assembly Special Session on Children in 2002. The reduction of low birth weight also forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality (UNICEF, 2004). Birth weight as a function of gestational age was introduced in the 1960s as a method to distinguish morbidity/mortality risk of low birth weight babies. Birth weight is the mass of a baby, it has direct links with gestational age at which the child was born and can be estimated (WHO, 1995). Globally, more than 20 million infants are born with low birth weight. The numbers of low birth weight babies were concentrated in two regions of the developing world: Asia and Africa. Seventy-two percent of low birth weight infants in developing countries are born in Asia (where most births also take place), and 22 per cent are born in Africa. India alone accounts for 40 per cent of low birth weight births in the developing world and more than half of those in Asia (UNICEF, 2004).

There is significant variation in prevalence of LBW across the whole India, within a country and inter country. There are wide interregional socio economic and urban versus rural differences in prevalence of LBW. Its prevalence has been reported as 8.3 – 36.60% in various studies conducted in India (Metgud, Naik & Mallapur, 2012; Nayak, Metgud, Mallapur & Naik 2013; Bisai, Sen, Mahalanabis, Datta & Bose, 2006; Choudhary, Choudhary, Tiwari & Dwivedi 2013; Biswas, Dasgupta, Sinha & Chaudhuri, 2008). About half of all deaths in prenatal period are directly or indirectly related to low birth weight and the single most important predictor of infant mortality, especially of deaths within the first month of life, is low birth weight (Gazi, Karim & Ali, 2001). Low birth weight is a major public health problem in developing countries including India. Low birth weight is defined by WHO as a birth weight less than 2500 g. (before 1976, the WHO definition was less than or equal to 2500 g.), since below this value birth-weight-specific infant mortality begins to rise rapidly (Chase, 1967). Low birth weight (LBW) has been defined as a birth weight of less than 2.5 kg regardless of gestational age (Aurora et al., 1994).
World Health Organization (WHO) estimates that globally, out of 139 million live births, more than 20 million LBW babies are born each year, consisting 15.5% of all live births, nearly 95.6% of them in developing countries (Sachdev, 2001). Infants who weigh less than 2.5 kg at birth represent about 26% of all live births in India and more than half of these are born at term. LBW infants are 40 times more likely to die within first four weeks of life than normal birth weight infants. Half of all perinatal and one third of all infant deaths occur in babies with LBW (Park, 2007). Low birth weight is associated with long term disabilities such as mental retardation, cerebral palsy, vision and hearing

impairments and other developmental disabilities. IUGR can contribute to adult short stature and infants with LBW can be at higher risk for later metabolic disorders, hypertension, cardiovascular disease and stroke. Adults who were IUGR can exhibit disparities in academic achievement and professional attainment relative to their appropriately grown counterparts (Ventura, Martin, Curtin, Menacker, & Hamilton 2001).

The maternal risk factors are biologically and socially interrelated; most are, however, modifiable. Kramer has identified 43 potential factors for low birth weight (Kramer, 1987). Not that all the factors, should be present in a given area. The factors vary from one area to another, depending upon geographic, socioeconomic and cultural factors. The mortality of low birth weight can be reduced if the maternal risk factors are detected early and managed by simple techniques. Thus it is necessary to identify factors prevailing in a particular area responsible for low birth weight.

Objective

The main objective of the present study is to identify the maternal risk factors associated with LBW and to determine prevalence of LBW.

Materials and Methods

A case-control study was conducted during May 2013 to September 2013 at Primary Health Center of village Kherva, Gujarat in West India. According to UNICEF, almost every third born (30%) in India is LBW (UNICEF, 2004). Considering the prevalence of low birth weight baby as 30% in India, 95% confidence limit and allowable error 6.5 %, got 200 sample size using the formula $n= Z^2PQ/E^2$. 200 mothers were taken with convenient sampling method. Study was carried out with 200 mothers and their newborns in the Primary Health Center of Kherva village in Mehsana taluka of Gujarat state in India.
Mehsana is a District place, which is only 8 kilometer away from this hospital so people go to Mehsana for antenatal checkup and delivery; also some patients go to big hospitals who have some complications. In this hospital only class IV people come for check up and delivery.

The study was approved by the Doctor of this Hospital and oral consent was obtained from the mothers. The data comprise questionnaire responses collected from 200 single birth mothers delivered during the study period. All babies were weighed within one hour after birth. The staff nurse collected data for this study. Through pretested questionnaire information about social and maternal characteristics were collected by staff nurse. Women were interviewed by the staff nurse in local language after delivery. As far as possible all consecutive births during the duty periods were considered for this study.

Studied variables included Maternal age (years), Education of mother, Occupation of mother, Nature of family, Monthly income of household, Maternal pre pregnancy weight (kg.), Maternal post pregnancy weight (kg.), Maternal height (cms.), Parity of mother, Sex of newborn, Gestational age at delivery, Hemoglobin level of mother (g/dl), Inter pregnancy interval, Consumption of tobacco, Weight of previous siblings, Abortion. History was asked regarding consumption of tobacco in any form regularly. History of abortion was classified as ever/never had abortion. Birth interval between the current and last pregnancy was taken as a continuous variable. Gestational age was calculated from the first day of the last menstrual period reported by the mother (Smith, Pell & Dobbie, 2003). Neonate characteristics included sex and the birth weight. The chi-square test was performed using SPSS package (version 16) to establish the association between studied variables and LBW.

Results

Among the newborns delivered to the mothers included in this study, 70 (35%) were LBW, 130 (65%) had normal birth weight. Among female newborns, 30 (32.6%) were LBW as compared to 40(37%) males. the difference was not found significantly associated with LBW.

Distribution of normal and LBW newborn in relation to different Socio-demographic variables of mothers (Table-1) like maternal age (years) (χ^2=4.448, p<0.05), occupation of mother (χ^2=4.011, p<0.05), nature of family (χ^2=4.237, p<0.05) and monthly income (χ^2=5.572, p<0.05), were found significantly associated with LBW; while education of mother (χ^2 =4.573, p>0.05) was not found significantly associated with LBW.

Table I: Distribution of Birth Weight of Newborns According to Socio-Demographic Factors for LBW

Socio-Demographic Variables		Birth weight		D.F.	χ^2 / P
	N=200	< 2.5 kg (n=70)	≥2.5 kg (n= 130)		
Maternal age(years)					
< 24	94(47) **	40 (42.6)	54 (57.4)	1	4.448/0.035*
≥24	106 (53)	30 (28.3)	76 (71.7)		
Education of Mother					
Illiterate	76(38)	32 (42.1)	44 (57.9)	2	4.573/0.102
up to 5 years	60(30)	22 (36.7)	38 (63.3)		
More than 5 years	64(32)	16 (25)	48 (75)		
Occupation of Mother					
Housewife	38(19)	8(21.1)	30 (79.8)	1	4.011/0.045*
Other than Housewife	162(81)	62(38.3)	100 (61.7)		
Nature of family					
Joint	142(71)	56(39.4)	86(60.6)	1	4.237/0.040*
Nuclear	58(29)	14(24.1)	44(75.9)		
Monthly Income					
< 5000	152(76)	60(39.5)	92(60.5)	1	5.572/0.018*
≥ 5000	48(24)	10(20.8)	38(79.2)		

*Note: * p < 0.05,** figures in parenthesis indicate percentage*

Table II: Distribution of Birth Weight of Newborns According to Maternal Variables

Biological Variables		Birth weight		D.F.	χ^2 / P
		< 2.5 kg	≥2.5 kg		
	N=200	(n=70)	(n= 130)		
Maternal Weight pre pregnancy (kg.)					
< = 40	108(54)	52(48.1)	56(51.9)	1	17.841/0.000*
> 40	92(46)	18(19.6)	74(80.4)		
Maternal Weight after pregnancy (kg.)					
< = 45	74(37)	34(45.9)	40(54.1)	2	15.075/0.001*
46 - 50	86(43)	32(37.2)	54(62.8)		
> 50	40(20)	4(10)	36(90)		
Maternal Height (cms.)					
< 145 cm	59(29.5)	26(44.1)	33(55.9)	1	3.025/0.082
≥145	141(70.5)	44(31.2)	97(68.8)		
Parity of mother					
Primipara	66(33)	26(39.4)	40(60.6)	1	0.836/0.361
Multipara	134(67)	44(32.8)	90(67.2)		
Sex of newborn					
Female	92(46)	30(32.6)	62(67.4)	1	0.428 /0.513
Male	108(54)	40(37)	68(63)		
Hemoglobin level of mother(g/dl)					
<11	120(60)	52(43.3)	68(56.7)	1	9.158/0.002*
≥11	80(40)	18(22.5)	62(77.5)		
Inter pregnancy Interval***					
Upto 2 year	38(28.4)	22(57.9)	16(42.1)	1	15.103/0.000*
More than 2 years	96(71.6)	22(22.9)	74(77.1)		
Consumption of Tobacco					
Yes	98(49)	42(42.9)	56(57.1)	1	5.214/0.022*
No	102(51)	28(27.5)	74(72.5)		
Gestational age at delivery					
< 37 week	28(14)	12(42.9)	16(57.1)	1	0.884/0.347
≥ 37 week	172(86)	58(33.7)	114(66.3)		
Weight of previous siblings					
< 2500 gm	68(34)	32(47.1)	36(52.9)	2	13.112/0.001*
≥ 2500 gm	66(33)	12(18.2)	54(81.8)		
no sibling	66(33)	26(39.4)	40(60.6)		
Abortion					
Yes	66(33)	32(48.5)	34(51.5)	1	7.874/0.005*
No	134(67)	38(28.4)	96(71.6)		

p < 0.05, * 64 mothers were primiparous*

Discussion

Different factors are associated with LBW, often termed as “risk factors”. Presences of any of these in any women increase chances of LBW babies. Birth weight of newborn is indicator of public health of any nation. Present study shows that 38% mothers are illiterate and 42.1% of them delivered LBW newborn. Education of mother is statistically insignificant with LBW; which in accordance with the previous studies (Biswas et al., 2008; Velankar, 2009). While some other studies found that this factor was significant (Kiran & Garg, 2000).

The incidence of LBW was 42.6% among mothers whose age is below 24; it is found statistically significant with LBW, Which is similar with the result of previous studies (Deshmukh, Motghare, Zodpey & Wadhva, 1998). It indicates before maturity of body if any women become mother then chances of LBW also increases. This study shows occupation of mother statistically significant with LBW, which is similar with previous findings that women who engaged with some work other than house work were at higher risk to give LBW babies (Velankar, 2009). Mothers of nuclear family had less LBW infants might be due to the income of mothers house hold are less and as number of family members are less the share of each person will increase compare to joint family. Nature of family found statistically significant with LBW. While previous study (Manna, Sarkar, Baur, Basu & Bandyopadhyay, 2013) shows this factor significant but LBW was less in joint family, It seems that they have considered all type of economic class it may be the reason of contradiction with this result. This study also shows monthly household income statistically significant with LBW; which is similar to the previous study (Wasunna & Mohammed, 2002). It means low income is responsible for malnutrition and indirectly it contributes in the prevalence of LBW. In this study maternal height is found statistically significant with LBW, which is similar with finding of previous studies (Kramer, 1987; Deshmukh et al., 1998; Trivedi, C. R. & Mavalankar, 1986). The present study shows 60% mothers having hemoglobin less than 11 gm/dl; 43.3% among them are having LBW infants. It is a risk factor and significantly associated with LBW which is similar to the findings of the previous studies (Deshmukh et al., 1998; Joshi et al., 2005, Mavalankar, Gray & Trivedi, 1992; Badshah, Linda, Kenneth, Roger & Paulo, 2008).

Pre pregnancy and post pregnancy weight were statistically significant with low birth weight. Similar results have been observed in previous studies (Deshmukh et al., 1998).

If from the early childhood of girls, care should be taken in their nutritional status throughout their life cycle, it will improve the nutritional status of women and will help to reduce the problem of LBW.

Present study shows 57.9% mothers delivered LBW, whose inter pregnancy interval is less than 2 years, it is significantly associated with LBW which is similar with previous studies (Deshmukh et al., 1998; Mavalankar et al., 1992). In this study 98(49%) mothers consume Tobacco and 42.9 % of them gave birth to LBW newborns. It is significantly associated with LBW which is consistent with the previous studies (Biswas et al., 2008; Deshmukh et al., 1998).

In this study 33% mothers were primipara. While 34% mothers previously delivered LBW, among them 47.1% mothers again delivered LBW newborns, Weight of previous siblings significantly associated with LBW which is similar to the previous studies (Joshi et al., 2005). Abortion is also significantly associated with LBW which is similar with other studies (Joshi et al., 2005; Badshah, Linda, Kenneth, Roger & Paulo, 2008). Study shows parity of mother was not found significantly associated with LBW, while other studies found this factor significantly associated with LBW (Kiran & Garg, 2000; Deshmukh, Motghare, Zodpey & Wadhva, 1998). Gestational age at delivery was found insignificant association with LBW, which is similar to previous study (Velankar, 2009).

Conclusion

Maternal age (years), occupation of mother, nature of family, monthly income, maternal height (cms.), Maternal pre pregnancy weight (kg.), Maternal post pregnancy weight (kg.), Hemoglobin level of mother (g/dl), Inter pregnancy interval, Consumption of Tobacco, Weight of previous siblings, and Abortion ; come out as major factors associated with LBW in newborns. If pregnant women are given more importance in family and care is taken for their food and routine work then the prevalence of LBW can be reduced in this rural area.

Implication

The present study suggests that improvement in nutrition of girls from the early childhood is necessary because it is one of the root causes of LBW and also care should be taken during pregnancy. Avoiding short birth interval, delay marriage age of female will automatically delay child bearing in young females (<19 years). Health education

components should be introduced in the syllabus of the whole education system. Programs should be conducted by government time by time for young male and female for health awareness. Consumption of Tobacco do not harm only mother but also harm her baby, so for awareness of it program should be conducted by government. 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 will lead to achieve a Millennium Development Goal (MDG) of reduction of child mortality.

Limitation

Still many deliveries take place at home in Rural India. As this is hospital based study, only hospital deliveries can be studied. The picture of whole area can be cleared by doing community study.

References

Aurora, S., Bhat, V. B., Habibullah, S., Srinivasan, S., Puri, R. K. & Rajaram, P. (1994) Maternal nutrition and birth weight. *Indian Maternal and Child Health Journal, 5,* 73-75.

Badshah, S., Linda, M., Kenneth, M., Roger, P. & Paulo J G, L. (2008). Risk factors for low birth weight in the public-hospitals at Peshawar, NWFP-Pakistan. *BMC Public Health*, 8, 197 doi: 10.1186/1471-2458-8-197

Biswas, R., Dasgupta, A., Sinha, R.N. & Chaudhauri, R. N. (2008). An epidemiological study of low birth weight newborns in the district of Puruliya, West Bengal. *Indian J Public Health*, *52,* 65–71.

Bisai, S., Sen, A., Mahalanabis, D., Datta, N. & Bose, K. (2006). The effect of maternal age and parity on birth weight among Bengalees of Kolkata, India. *Human Ecology, Special Issue No. 14,* 139-143.

Chase, H. C. (1967). *International comparison of perinatal and infant mortality: the United States and six west European countries.* Washington DC, U.S. Government Printing Office. (Public Health Service Series 3(6), Publication No. 1000).

Choudhary, A. K., Choudhary, A., Tiwari, S., C. & Dwivedi, R. (2013). Factors associated with low birth weight among newborns in an urban slum community in Bhopal. *Indian journal of Public Health, 57,* 20-3.

Deshmukh, J. S., Motghare, D. D., Zodpey, S. P. & Wadhva, S. K. (1998). Low birth weight and associated maternal factors in an urban area. *Indian Pediatrics, 35,* 33-36.

Gazi, R., Karim, F. & Ali, A. (2001). Low birth weight was the major predictor of infant deaths: Evidence from a prospective study in rural Bangladesh. *Brac Research Annual Report.*

Joshi, H. S., Subba, S. H., Dabral, S. B., Dwivedi, S., Kumar, D. & Singh, S. (2005). Risk factors associated with low birth weight in newborns. *Indian Journal of Community Health, 30,*142-4.

Kiran, A. & Garg, B. S. (2000). A study of factors affecting LBW. *Indian Journal of Community Medicine; 25(2)*, 57-61.

Kramer, M.S. (1987). Determinants of LBW: Methodological assessment and meta analysis. *Bulletin of the World Health Organization, 65(5),* 663-737.

Manna, N., Sarkar, J., Baur, B., Basu, G. & Bandyopadhyay, L. (2013, Jan-Feb). Socio-Biological Determinants of Low Birth Weight: A community based study from rural field practice area of Medical College, Kolkata, West Bengal (India). *Journal of Dental and Medical Sciences (IOSR-JDMS), 4(4),* 33-39.

Mavalankar, D.V., Gray, R.H. & Trivedi, C. R. (1992). Risk factors for preterm and term low birth weight in Ahmedabad, India. *International Journal of Epidemiology, 21,* 263-72.

Metgud, C.S., Naik, V.A. & Mallapur, M.D. (2012, July). Factors affecting birth weight of a newborn – a community based study in rural Karnataka, India. *PLoS ONE 7(7),* e40040. doi:10.1371/journal.pone.0040040

Nayak, R. K., Metgud, C.S., Mallapur, M.D. & Naik, V.A. (2013). Prevalence of low birth weight at primary health centre of North Karnataka. *Int. J. Pharm. Med. & Bio. Sc., 2(1),* 1-4.

Park, K. (2007). *Park's text book of preventive and social medicine. Jabalpur.* M/s. Banarsidas Bhanot Publishers 17, 426 - 428.

Sachdev, H. P. S. (2001) Low Birth Weight in South Asia. *International Journal of Diabetes in Developing Countries, 21,* 13–29.

Smith, G. C., Pell, J. P. & Dobbie, R. (2003). Caesarean section and risk of unexplained stillbirth in sub sequent pregnancy. *Lancet , 362(9398),* 1779-1784.

Trivedi, C. R. & Mavalankar, D. V. (1986) Epidemiology of low birth weight in Ahmedabad. *Indian Pediatrics; 53:* 795-800.

UNICEF & WHO. (2004). Low birth weight: country, regional and global estimates. New York. Retrieved May 5, 2013, from http://www.unicef.org/publications/files/low_ birthweight_from_EY.pdf

Velankar, D. H. (2009). Maternal factors contributing to low birth weight babies in an urban slum community of greater Mumbai. *Bombay Hospital Journal, 51,* 26-35.

Ventura, S. J., Martin, J. A., Curtin, S. C., Menacker, F.& Hamilton, B. E.(2001) Births: Final data for 1999. *National vital statistics reports 49.* Hyattsville, Maryland: National Center for Health statistics.

Wasunna, A. & Mohammed, K. (2002). Low birth weight babies: socio demographic and obstetric characteristics of adolescent mothers at Kenyatta National Hospital, Nairobi. *East African Medical Journal, 79,* 543-546.

WHO. (1995). Physical status, the use of interpretation of anthropometry. WHO, Geneva, 854.