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Study of morbidity, mortality and survival of low birth weight babies born in a tertiary care hospital Vadodara Gujarat

Maharshi Vinod Patel

Associate Professor, Department of Community Medicine, S.B.K.S.M.I.R.C. Sumandeep Vidyapeeth Deemed to be University Piparia, Vadodara, Gujarat, India

*Corresponding author email: maharshivp84@yahoo.co.in

Piyushkumar C. Parmar

Associate Professor, Department of Community Medicine, S.B.K.S.M.I.R.C. Sumandeep Vidyapeeth Deemed to be University Piparia, Vadodara, Gujarat, India

Abhishek Somani

Assistant Professor, Department of Community Medicine, S.B.K.S.M.I.R.C. Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Bhavsar Bharat S.

Retired Professor and Head, Department of Community Medicine, S.B.K.S.M.I.R.C. Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India

Abstract--Introduction: The birth weight of an infant is strongly conditioned by health and nutritional status of mother and is an important determinant of survival, healthy growth and development of the newborn. Low Birth Weight has been defined by World Health Organization as weight at birth of less than 2500 grams. Materials and Methods: 252 babies having birth weight between 2.0 Kg to 2.5 Kg born during August 2012 to January 2013 in Jamnabai Hospital of Vadodara city were included in this prospective study of six month for assessing Survival rate and morbidity among them. Results: All 249 babies (3 drop out), who were followed up 6 months survived. Prevalence rate (sick babies) varied from 17.27 % to 41.2 %, Prevalence rate (Morbidity) varied from 18.07 % to 42.4%. Common morbidities were fever, cough, cold, diarrhea, vomiting, rash. Babies who were fully immunized had lesser morbidity compared to babies who were not fully immunized. Conclusion: The 6 months prospective

study which was carried out on small sample of specific group of babies in Urban area has value that it reflects the situation of babies in middle and lower middle class families.

Keywords---low birth weight, survival, morbidity.

Introduction

The birth weight of an infant, is strongly conditioned by the health and nutritional status of the mother and is an important determinant of the survival, healthy growth and development of the newborn. It is a reliable and sensitive indicator of the health status of population groups.¹ Low Birth Weight has been defined by World Health Organization (WHO) as weight at birth of less than 2500 grams(g) (5.5 pounds)². This practical cut-off for international comparison is based on epidemiological observations that infants weighing less than 2500g are approximately more likely to die than heavier babies³. According to birth weight babies are classified as follows: low birth weight(LBW) less than 2500 g, very low birth weight(VLBW) less than 1500g, extremely low birth weight(ELBW) less than 1000 g.⁴ More common in developing than in developed countries, a birth weight below 2500g contributes to a range of poor health outcomes. The goal of reducing low birth weight 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. Activities towards the achievement of the MDGs 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 child birth safely. Low birth weight is therefore an important indicator for monitoring progress towards these internationally agreed-upon goals. WHO and United Nation International Children Emergency Fund(UNICEF) published the first global, regional and country estimates of low birth weight rates in 1992⁵. At that time, the low birth weight rate for industrialized countries was around 7 per cent, and in less developed countries it ranged between 5 and 33 per cent, with an average of 17 per cent. Around the year 2000, UNICEF and WHO accelerated efforts to estimate global and country rates. The process of monitoring progress towards international goals on low birth weight reduction led to a greater recognition of the limitations of the available data, in particular the relatively small proportion of infants weighed at birth. In response, UNICEF proposed using household survey data adjusted for underreporting of low birth weight, a procedure originally developed by Boerma et al⁶.

Materials and Methods

The study was carried out in Jamnabai General Hospital located in Mandvi area of Vadodara city which is one of the oldest and busiest areas of Vadodara and is

inhabited by middle and lower middle class people. It comes under the Ward No.1. of Vadodara Municipal Corporation.

Study Type

Prospective Study

Study Participants

Mothers of the babies weighing between 2.0 to 2.5 Kg were taken as study participants for studying their profile and 252 babies having birth weight between 2.0 to 2.5 Kg were followed up for six months.

Inclusion Criteria

Babies born of women living in Vadodara city were taken into the study.

Exclusion Criteria

Babies, whose birth weight was ≥ 2500 grams and babies who were weighing between 2.0 Kg and 2.5 Kg but living out of Vadodara city were excluded from the study.

Sample Size

As per available hospital data, considering monthly average of 40 babies with low birth weight, the study was planned to cover 240 babies born in 6 months (from August 2012 to January 2013) for monthly follow up till 6 months.

Sampling Technique

From the total number of deliveries taking place every month in the hospital mothers of babies weighing between 2.0 Kg and 2.5 Kg were taken into the study and their babies were followed up for the period of 6 months.

Procedure

Study was carried out in two phases.

- Hospital Phase
- Community Phase
- Before conducting the study informed consent was taken from the mothers of the babies weighing between 2.0 Kg and 2.5 Kg.

Hospital Phase

During the hospital phase (first visit), the relevant information of the babies was recorded on a pretested Performa. In the ward, neonates were weighed after their birth and weights were recorded. Information of mother and baby was recorded on a pretested Proforma by interviewing the mother, examining the baby and

utilizing hospital records. Mother's complete residential address with her / husband's cell phone number was recorded for follow up visits.

Community Phase

During the second phase of follow up study the registered babies were followed up every month for 6 consecutive months to study morbidity, mortality and survival of the baby. In case of death, the cause of death was assessed by verbal inquiry method. In case of family migration, an attempt was made to contact family by given cell phone number and the child was considered "lost to follow up" if family could not be traced by phone and necessary entry was made in the Performa. Data thus, collected during the study was analyzed and presented. For socio economic classification Modified Prasad's classification was adopted. Consumer Price Index of June 2013 was applied.

Statistical Analysis

Data was cleaned, validated and analyzed and appropriate and suitable statistical test was applied. Microsoft Excel 2010, Epi Info 7 and SPSS version 20 were used for data analysis. Chi-square was used for qualitative data analysis and correlation coefficient was used for quantitative data analysis.

Results

Present study was carried out in Vadodara city of Gujarat. The hospital component of the study was carried out in 250 bedded Jamnabai General Hospital located in Mandvi area of Vadodara city which is one of the oldest and busiest areas (Ward No: 1) of Vadodara and is inhabited by the middle class and lower middle class families. It has average daily OPD of 700 patients (all specialties). The number of deliveries, still births and birth weight of babies born during August 2012 to January 2013 is shown in Table No: 1.

Table 1
Number of Deliveries, Stillbirths and Birth Weight of Babies (August 2012 to Jan 2013)

Month and Year	Number of Deliveries	Number of Live births	Number of Still born babies	Total number of low Birth weight babies	Number of Newborn Babies with birth weight between 2 to 2.5kgs (%)	Number of Newborn Babies with birth weight less than 2kgs (%)
August 2012	161	160	1	60 (37.51)	43 (26.88)	17 (10.63)
September 2012	163	163	0	58 (35.58)	40 (24.54)	18 (11.04)
October 2012	169	169	0	63 (37.28)	42 (24.85)	21 (12.43)
November 2012	157	155	2	65 (41.94)	42 (27.10)	23 (14.84)
December 2012	200	199	1	64 (32.16)	45 (22.61)	19 (09.55)

January 2013	205	203	2	64 (31.52)	40 (19.70)	24 (11.82)
Total	1055	1049	6	374 (35.65)	252 (24.02)	122 (11.63)

The above table shows that during the period between August 2012 to January 2013, 1055 deliveries were conducted by the hospital and babies with birth weight between 2 to 2.5kgs were 252 (24.02%) and there were 112 (11.63%) babies during the same period whose birth weight was less than 2kgs. During above period 35.65 % babies had birth weight less than 2.5 Kg (31.52 to 41.94%). The survival of 112 babies whose birth weight was less than 2 Kg. and were transferred to Vadodara Medical College (Government of Gujarat) attached Shri Sayaji Rao General Hospital for better medical care (intensive neo natal care) could not be ascertained. During the above period 6 still births were reported giving Still Birth rate of 5.7 per 1000 births. Out of 374 low birth weight babies, 252 (67.3%) babies having birth weight more than 2.0 Kg had fare chance of survival.

252 babies born in 6 months (from August 2012 to January 2013) with birth weight between 2.0 Kg to 2.5 Kg were included in the study for monthly follow up till 6 months. The attempts were made to contact the families who could not be accessible personally by cell phone to prevent drop out. There were three (3) families who could not be traced out, contributed to drop out of 3 babies during follow up ($3 / 252 = 1.19\%$). Therefore, the follow up analysis includes 249 babies.

Table 2
Profile of Babies

		Number babies (n=252)	of Percent
Gestational age of babies (weeks)	< 37	034	13.5
	37-42	218	86.5
Birth Order of babies	1	116	46.0
	2	102	40.5
	3	034	13.5
Sex	Male	150	59.5
	Female	102	40.5
Birth weight (Kg)	2.00-2.099	102	40.5
	2.10-2.199	034	13.5
	2.20-2.299	025	09.9
	2.30-2.399	034	13.5
	2.40-2.499	057	22.6
Head circumference (Cm)	30.00-30.40	034	13.5
	30.50-30.90	000	00.0
	31.00-31.40	102	40.5
	31.50-31.90	034	13.5
	32.00-32.20	082	32.5
Chest circumference (Cm)	28.00-28.40	34	13.5

	28.50-28.90	00	00
	29.00-29.40	102	40.5
	29.50-29.90	34	13.5
	30.00-30.40	82	32.5
Mid arm circumference (Cm)	9.0-9.2	102	40.5
	9.3-9.5	000	00.0
	9.6-9.8	068	27.0
	9.9-10.2	082	32.5

Out of 252 babies; 34(13.5%) babies born pre-term (< 37 weeks of gestation) while rest (218, 86.5%) of them completed full term of pregnancy (37-42 weeks of gestation). The mean and SD of gestational age were 37.54 weeks and 1.56 weeks respectively. It was observed that 116(46%) babies were the first child of their parents while 102(40.5%) newborn babies were the second child and rest of the babies 34(13.5%) was third child. (Fig: 1) Since all babies were born in hospital, all babies were breast fed within 2 hours after their birth and no prelacteal feeds were given. Out of 252 babies under study; 150(59.5%) were male while rest of them 102(40.5%) were females (Fig: 2). The study covered babies with birth weight less than 2.5 kg. The distribution of babies according to their birth weight is shown in table No: 2. 102 (40.5%) babies had birth weight between 2.00-2.099 kgs, Equal number of babies (i.e.34) had birth weight between 2.10-2.199 kgs and 2.30-2.399 kgs, 25 (9.9%) had birth weight between 2.20-2.299 kgs and 57 (22.6%) had birth weight between 2.4-2.499 kgs. The mean and SD of birth weight were 2.16 kg and 0.16 kg respectively.

The head circumference of all babies was measured during the first visit in hospital. The distribution of babies according to the head circumference is shown in Table 2 which shows that maximum 102 (40.5%) babies had head circumference between 31.00-31.40cms, 82 (32.5%) babies had head circumference between 32.00-32.20cms and equal number of babies (i.e. 34) babies had head circumference between 30.00-30.40cms and between 31.50-31.90cms. The mean and SD of head circumference were 31.31 cm and 0.66 cm respectively. The distribution of babies according to their chest circumference measurement at birth is shown in table No: 2. It was observed that that maximum 102 (40.5%) newborn babies had chest circumference between 29.00-29.40cms, 82 (32.5%) babies had chest circumference between 30.00-30.40cms and equal number of babies (34, 27%) babies had chest circumference between 28.00-28.40cms and between 29.50-29.90cms. The mean and SD of chest measurement were 29.29 cm and 0.66 cm respectively. The measurement of mid arm circumference of babies at birth is shown in Table 2. It was observed that maximum of 102 (40.5%) newborn babies had mid arm circumference between 9.0-9.20cms, 82 (32.5%) of babies had mid arm circumference between 9.90-10.20cms while rest 68 (27%) of the babies had mid arm circumference between 9.60-9.80cms. The mean and SD of mid arm circumference were 9.55 cm and 0.42 cm respectively.

Table 3
Morbidity among Babies

	Follow up months						
	First Month	Second	Third	Fourth	Fifth	Sixth	Total
Number of babies (n)	252	252	250	249	249	249	1501
Lost to follow up	-----	-----	2	1	-----	-----	-----
Babies with some health complaints	57	78	103	62	54	43	407
Prevalence rate (Person) (%)	22.62	30.95	41.2	24.90	21.69	17.27	27.12
Morbidity (number)	57	81	106	71	59	45	419
Prevalence rate (%) morbidity	22.62	32.14	42.4	28.51	23.69	18.07	27.91
Average morbidity / sick child	1.44	1.49	1.18	1.47	1.43	1.65	1.03
Total Sickness duration (Days)	82	116	122	91	77	71	559
Average duration of morbidity / sick child	1.44	1.49	1.18	1.47	1.43	1.65	1.37

Calculated child month follow up = 1501
Follow up observation: (Table No: 3)

A total of 252 babies born in hospital were followed up for 6 months. Month wise babies followed up, sample loss, sick babies, morbidity and duration of morbidity is shown in table No: 10. 3 babies could not be traced during the follow up. All 249 babies, who were followed up from birth to 6month of age, survived giving the survival rate of 100 %. Prevalence rate (sick babies) varied from 17.27 % to 41.2 %, being highest (41.2 %) in third moth and lowest (17.27%) in sixth month. Prevalence rate (Morbidity) varied from 18.07 % to 42.4%, being highest (42.4 %) in third month and lowest (18.08%) in sixth month. The average morbidity per sick child was 1.03. On an average a sick child remained sick for 1.37 days. Prevalence rate of Sick child = $27.11 / 100$ child month. Prevalence rate of morbidity = $27.91 / 100$ child month. Duration of sickness = 37.24 Days / 100 child month.

Table 4
Proportional Distribution of Morbidity

Morbidity	First	Second	Third	Fourth	Fifth	Sixth	Total
Fever	18(31.5)	13(16)	16(15.1)	14(19.7)	8(13.2)	14(31.2)	83
Fever and vomiting	8(14)	10(12.3)	9(8.4)	4(5.6)	6(10.3)	-	37
Fever and cough & cold	3(5.3)	16(19.7)	11(10.4)	3(4.2)	7(11.8)	6(13.3)	46
Fever and breathlessness	3(5.3)	2(2.5)	-	1(1.4)	3(5.1)	-	9
Cough cold	8(14)	12(14.8)	23(21.6)	13(18.4)	8(13.7)	14(31.2)	78
Diarrhea	5(8.8)	14(17.3)	18(17)	7(9.9)	9(15.3)	4(8.9)	57
Diarrhea and vomiting	3(5.3)	5(6.2)	6(5.7)	6(8.5)	2(3.4)	3(6.6)	25
Vomiting	7(12.3)	3(3.7)	15(14.2)	11(15.5)	9(15.3)	2(4.4)	47

Cough & cold anddiarrhoea	-	1(1.3)	2(1.9)	6(8.4)	1(1.7)	1(2.2)	11
Diarrhoea and fever	-	2(2.5)	4(3.8)	4(5.6)	2(3.4)	-	12
Vomiting and cough cold	-	-	-	-	3(5.1)	1(2.2)	4
Rash	2(3.5)	3(3.7)	2(1.9)	2(2.8)	1(1.7)	-	10
Total	57(100)	81(100)	106(100)	71(100)	59(100)	45(100)	419

Note: The figures in the parenthesis show percentage.

The month wise proportional distribution of morbidity observed among the babies is shown in Table No: 4. The common morbidities recorded were fever, cough & cold, diarrhea, vomiting and rash. No life threatening morbidity was recorded.

Table 5
Weight of Babies and Morbidity During Follow up

	Weight (Kg)	Morbidity		Total (%)	X2 values
		Yes (%)	Nil (%)		
End of 1 st Month	2.3-2.599	57(39.6)	87(60.4)	144(100)	(X ² = 53.01, d. f. = 1, p < 0.0001)
	2.6-3.099	0(0)	108(100)	108(100)	
End of second month	2.8-3.199	75(52.1)	69(47.9)	144(100)	(X ² = 67.91, d. f. = 1, p < 0.0001)
	3.2-3.599	3(2.8)	105(97.2)	108(100)	
End of Third month	3.2-3.599	102(57.3)	76(42.7)	178(100)	(X ² = 63.87, d. f. = 1, p < 0.0001)
	3.6-3.999	1(1.4)	71(98.6)	72(100)	
End of Fourth month	3.6-3.999	60(42.6)	81(57.4)	141(100)	(X ² = 54.12, d. f. = 1, p < 0.0001)
	4.0-4.399	2(1.9)	106(98.1)	108(100)	
End of Fifth month	4.0-4.399	50(35.5)	91(64.5)	141(100)	(X ² = 34.47, d. f. = 1, p < 0.0001)
	4.4-4.799	4(3.7)	104(96.3)	108(100)	
End of Sixth Month	4.5-4.899	42(29.80)	99(70.2)	141(100)	(X ² = 35.66, d. f. = 1, p < 0.0001)
	4.9-5.399	1(0.9)	107(99.1)	108(100)	

It was observed from above table (No: 5) that the greater the weight of babies lesser was the risk for morbidity. The association was significant.

Table 6
Vaccination status against Morbidity during the 4thMonth

Vaccination Status	Health complains of babies during 4 th Month		Total(%)
	Nil (%)	Yes (%)	
Incompletely Immunized	21(60.0)	14(40.0)	35(100)
Completely Immunized	166(77.6)	48(22.4)	214(100)
Total	187	62	249

The proportion of babies falling sick was 40.0% among the incompletely immunized babies as compared to 22.4 % among the completely immunized babies. Babies who were fully immunized (Up to 6 months) had lesser morbidity as compared to the babies who were not fully immunized. There has been significant association found between the vaccination status and morbidity of the babies. ($X^2 = 4.07$, d.f. = 1, $p < 0.04$) (Table No : 6).

Discussion

Child birth is viewed as an important life event. It is a natural physiological phenomena and one of the life events which introduces new experience in a woman's reproductive life

Between August 2012 and January 2013, out of 1049 live births 374 (35.65%) newborn babies were reported to be low birth weight (< 2.5 kgs). Out of 374 newborn babies 252 (24.02%) were between 2.5kgs to 2kgs of weight and 122 (11.63%) were < 2 kgs of weight. Newborn babies (122, 11.63%) which were < 2 kgs of weight were referred to higher center for better medical care as facility for managing newborn babies of weighing < 2 kgs was not adequate at Jamnabai Hospital. The incidence of low birth weight babies in India is 27.6%⁷ which is less as compared to the present study. It can be explained from the fact that people who utilize the facility of Jamnabai Hospital belonged to middle and lower middle class. Out of 252 babies in the present study 34(13.5%) babies born pre-term (< 37 weeks of gestation) while the rest (218, 86.5%) of them completed full term of pregnancy (37-42 weeks of gestation). The mean and standard deviation of gestational age were 37.54 weeks and 1.56 weeks respectively. A study of 959 live births in a tertiary level hospital in Bangalore over a period of one year had 119 preterm (< 37 weeks) of which 82(68.91%) were in low birth weight category and 840 term(>37 weeks) deliveries of which 167(19.64%) were in normal birth weight category respectively.⁷

It was observed in the present study that 116(46%) babies were the first child of their parents while 102(40.5%) newborn babies were the second child and rest of the babies 34(13.5%) was third child. A longitudinal study carried out at Rural Health Training Centre (RHTC), the field practice area of the department of Community Medicine and the Obstetrics and Gynecology wards of the Himalayan Institute of Medical Sciences, Dehradun during the period from March 2003 to February 2004 involving 172 mothers showed that the LBW rate was high for parity one 38.6% when compared to parity two (16.4%) and parity three and above (10.6%). The association was found to be highly significant ($p < 0.01$). The odds ratio for parity one and two was 3.21, which indicates that parity one has three times the risk of delivering LBW babies compared with mothers with parity two or more.⁸ Since all babies (252) included in the present study were born in hospital, all received BCG, OPV₀ and Hep B₀ vaccines as per schedule.

During the monthly visit information was collected about the happenings during the last month. At the of six months of follow up it was observed that 214 babies (86.0 %) babies were completely immunized as per schedule up to age of six months. 34 (13.6 %) babies missed one dose of all three vaccines while 1 (0.4 %) baby missed two doses of all three vaccines. This immunization schedule followed

in the present study in Jamnabai Hospital is as National Immunization Schedule recommended by Government of India.⁹ A prospective cohort study on children of under five years in a hospital in rural Western India showed that a non-immunized or incompletely immunized child has a more than 10 times higher risk of dying before 5 years age as compared to a child who has received his primary immunization. So it appears that 214 (86%) babies included in this study who were completely immunized as per follow up visits has a fair chance of survival in their life.¹⁰

The association between complete immunization and lesser morbidity was significant. It appears that the immunization enhances general immunity to protect the baby from morbid conditions other than the vaccine preventable diseases also. Low birth weight babies are more prone to infection so “right vaccine, right dose at right time” would protect babies from infections. Mothers had knowledge about the vaccines but for one or the other family problems / social reasons the child could not receive vaccines as per schedule. Neonatal mortality accounts for about 1/3 of deaths < 5 years of age and VLBW mortality for approximately 1/3 of neonatal mortality¹¹. Gujarat being welfare state, the Health Department has initiated many welfare schemes and properly implemented National Health Programmes to increase the survival of babies. Few to name are; Child Survival and safe Motherhood (1997)¹², Integrated Child Development Scheme (1975)¹³, Integrated Management of Neonatal and Childhood illnesses (2005)¹⁴, Reproductive and Child Health (1997)¹⁵, JananiSurakshaYojna (2005)¹⁵, ChiranjeeviYojna (2005)¹⁶.

Conclusion

The study showed that as the weight of baby increased the chance for his/her survival increased and the risk of morbidity decreased. Babies with birth weight 2.0 Kg to 2.5 kg have fair chance of survival. Also fully immunized babies had lesser morbidity as compared to the babies who were incompletely immunized. The 6 months prospective study which was carried out on the small sample of specific group of babies (252 hospital born babies with birth weight between 2.0 Kg to 2.5 Kg) in Urban area has value that it reflects the situation of babies in middle and lower middle class families. The institutional delivery and the child survival activities under various programmes provide hope to such families that their children would survive and it may encourage adopting small family norms.

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