

Research Article

Perinatal mortality and morbidity among low birth weight babies

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Received: 14 December 2014

Accepted: 10 January 2015

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ABSTRACT

Background: This study was conducted to assess the perinatal mortality and morbidity among Low Birth Babies (LBW) and to determine the associated maternal health and sociodemographic factors.

Methods: This was a hospital based cross sectional observational study conducted over a period of three years. All the babies (1002) with birth weight <2500 gm but >1000 gm born during this period and their mothers were included in the study. Babies were followed up for one week after birth and perinatal mortality and morbidity were assessed.

Results: The perinatal mortality rate among LBW babies was 124.7/1000 babies. Very low birth weight babies (<1500 g) had 10 times mortality rates than babies with birth weight between 1.5-2.5 kg. Preterm and growth restricted babies had the worst perinatal outcomes. The most common perinatal complication was hyperbilirubinemia (16.77%) followed by hypoglycemia (14.99%) and Hyaline membrane disease (14.86%). Preterm babies had higher rates of birth asphyxia, hypoglycemia, hyperbilirubinemia and neonatal ICU admissions ($P < 0.001$). Intrauterine growth restricted babies had better perinatal outcomes than preterm babies. Majority of the mothers (96.87%) belonged to low socio-economic status. The most common maternal complications associated with LBW were anemia (43.36%) and hypertensive disorders of pregnancy (17.6%).

Conclusions: Low birth weight babies had higher perinatal mortality and morbidity rates. To decrease the incidence of low birth weight, measures to improve the general health and nutrition of mothers should be employed. Appropriate referral of high risk pregnancies and delivery in centres with good neonatal facilities should be engaged.

Keywords: Low birthweight, Perinatal mortality, Morbidity, Preterm

INTRODUCTION

Low birthweight (LBW) is defined by the World Health Organization as birth weight of less than 2500 grams.¹ This is based on epidemiological observations that neonatal mortality in infants weighing less than 2500 g was 20 times more than in heavier babies. The goal of reducing low birth weight incidence by at least one third between 2000 and 2010 is one of the major goals in 'A world fit for children', the declaration and plan of action adopted by the United Nations General Assembly special session on children in 2002.²

Perinatal mortality and morbidity is highest among LBW babies and babies who have survived are at increased risk of long term physical and intellectual impairment.³

It was estimated that 20 million infants worldwide (15.5%) were LBW and 95.6% of these infants were born in developing countries.⁴ In developed countries, the incidence is 4-8% and in developing countries it is about 6-30%.³ In Asia, the incidence is high (19.7%), almost three times that of Europe (6.5%) or USA (7%).⁵

In India, LBW constitutes about 30% of all live births, i.e., nearly 3 million LBW babies are born per year in India. According to WHO, 33% of infant mortality in

India is associated with LBW.⁴ A similar observation is found by a recent survey in India. National Family Health Survey (NFHS) 1998-99 in which among children for whom birth weights were reported, 23% weighed <2.5 kg.⁶ Percentage of LBW babies was higher in rural areas (24.5%) than in urban areas (21%).

Various maternal, fetal and uteroplacental factors may have an etiological role in low birth weight. Factors during gestation and delivery as well as during postnatal period have a major impact on the morbidity and mortality among LBW babies.⁷ LBW babies may have intrauterine growth restriction (IUGR) or prematurity.

The present study deals with the problems of LBW babies and the various sociodemographic and health factors associated with LBW.

METHODS

This was a cross sectional study conducted in KMCT medical college, Kerala including all babies with birth weight <2500 gm but >1000 gm, born between January 2010 and December 2012. Their mothers were also included in the study. The perinatal mortality and morbidity among the study group was assessed. The death of the babies, occurring after 28 weeks gestation or within first week of life was taken as perinatal death. Any illness occurring in the baby during the first seven days of life was taken as perinatal morbidity.

Maternal health, socio-economic and demographic factors associated with low birth weight were also studied.

The statistical analysis was performed using SPSS and Epiinfo softwares. Pearson's Chi-square test was used for analysis. Statistical significance was assumed at a P value of <0.05.

RESULTS

A total of 1002 low birth weight babies and 982 mothers were included in the study (There were 20 pairs of twins). Out of this, 76 were still births (7.58%). Among the 926 live LBW babies, there were 49 neonatal deaths accounting to 5.29% of live babies (Figure 1).

The perinatal mortality rate among LBW babies was 124.7/1000 LBW babies (Table 1).

Classification of low birth weight babies according to birth weight

It is seen that very low birth weight babies (<1500 g) had almost 10 times more mortality rates when compared to babies with birth weight between 1.5-2.5 kg (Table 2). Thus it can be seen that birth weight is a powerful indicator of perinatal mortality.

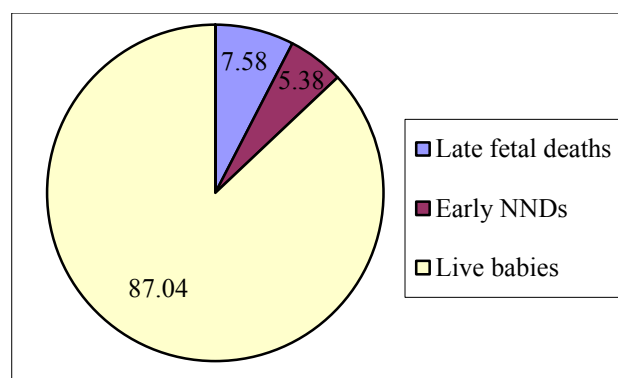


Figure 1: Low birth weight babies (%).

Table 1: Perinatal mortality rate among LBW babies (PNMR).

No. of LBW babies	No. of perinatal deaths	PNMR/1000 LBW babies
1002	125	124.7/1000 LBW babies

Table 2: Classification of low birth weight babies according to birth weight.

Birth weight	1-1.49 kg	1.5-2.5 kg
Number of babies	110	810
Number of deaths (%)	28 (25.45%)	21 (2.59%)

Analysis of still births

Table 3 shows that that majority of the stillbirths (60.5%) were among Very Low Birth Weight (VLBW) babies (birth weight <1500 gm).

The most common maternal factor associated with stillbirth was anemia. Inadequate dietary supplementation and malnutrition was associated with 47.36% of stillbirths (Table 4).

Table 5 shows that the major proportion of stillbirths was associated with preeclampsia and its complications (36.84%). Placental abruption also contributed to 11 still births (14.47%).

This highlights the importance of early detection and effective management of hypertensive disorders of pregnancy.

Table 3: Classification of still births according to baby weight.

Birth weight	No. of still births	% of still birth
1-1.49	46	60.5
1.5-2.5	30	39.47

Table 4: Maternal factors associated with stillbirths.

Maternal illness	No. of stillbirths
Anemia	32
Infections	3
DM	1
Hypothyroidism	1
Epilepsy	1

Table 5: Pregnancy complications associated with stillbirths.

Pregnancy complications	No. of still births
Preeclampsia	22
Eclampsia	4
HELLP	2
Abruption	11
PPROM	1
Oligamnios	1
Polyhydramnios	1
Cord complications	3
Meconium stained amniotic fluid	2

Classification of live low birth weight babies

Among the 926 live babies, 6 had major congenital malformations incompatible with life. These were excluded and the remaining 920 babies were classified into IUGR, preterm, constitutionally small or preterm with IUGR for assessing perinatal morbidity (Table 6).

Table 6: Classification of live low birth weight babies.

Classification	No. of babies	% of live LBW babies
IUGR (birth weight <10 th centile)	423	45.97
Preterm (gestational age <38 weeks)	364	39.56
Constitutionally small (birth weight <10 th centile, but healthy)	105	11.4
Preterm with IUGR	28	3.04

Preterm and growth restricted babies

Among the 28 babies in this group, 8 babies were <1.5 kg and 20 babies between 1.5 to 2.5kg. All the babies were admitted in neonatal ICU and there were 5 neonatal deaths among this group - 2 due to hyaline membrane disease, 2 due to birth asphyxia and 1 due to sepsis. Perinatal morbidity was also high among this group (Table 7). Hypoglycemia, hyperbilirubinemia and hyaline membrane disease were the major morbidities (Figure 2).

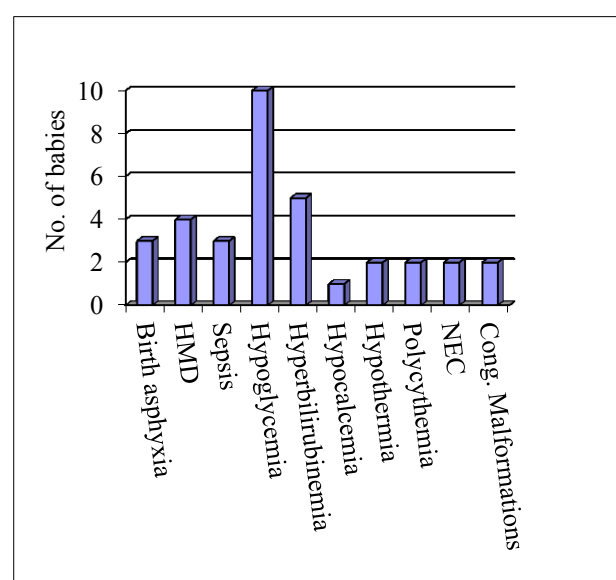
All mothers among this group belonged to low socioeconomic status. Preeclampsia or its complications were associated with 18 mothers. Twenty mothers had

inadequate nutritional intake. Early neonatal mortality rate among this group was found to be 17.8%.

These findings suggest that the group which comprised of both preterm and growth restricted babies had very high mortality and morbidity rates.

Table 7: Perinatal morbidity among preterm and growth restricted babies.

Perinatal morbidity	No. of babies
Birth asphyxia	3
HMD	4
Sepsis	3
Hypoglycemia	10
Hyperbilirubinemia	5
Hypocalcemia	1
Hypothermia	2
Polycythemia	2
NEC	2
Congenital malformations	2

**Figure 2: Perinatal morbidity in preterm and growth restricted babies.****Constitutionally small babies**

This group comprises 11.4% of the live low birth weight babies. Among 105 babies in this group, all weighed between 2 to 2.5 kg. All were healthy babies and there were no neonatal deaths in this group.

Perinatal morbidity in preterm babies and IUGR babies

The most common perinatal complication was hyperbilirubinemia (16.77%) followed by hypoglycemia (14.99%) and Hyaline Membrane Disease (HMD-

14.86%). Birth asphyxia (9.02%) and sepsis (5.46%) were the other major morbidities (Table 8) (Figure 3).

Preterm babies had higher rates of birth asphyxia, hypoglycemia, hyperbilirubinemia and neonatal ICU admissions (All significant with P value <0.001). HMD was exclusively a disease of preterm due to lung immaturity (Table 9). Preterm babies are more prone to hypoglycemia because of decreased liver glycogen stores. Hyperbilirubinemia is also more in preterm babies as the immature liver is incapable to conjugate more bilirubin

Thus it can be seen from Table 8 that IUGR babies have better perinatal outcomes than preterm babies.

Table 8: Perinatal morbidity in preterm babies and IUGR babies.

Perinatal morbidity	Total	% of LBW babies	IUGR	Preterm
Birth asphyxia	71	9.02	27	44
Hyaline membrane disease (HMD)	117	14.86	0	117
Hypoglycemia	118	14.99	40	78
Hyperbilirubinemia	132	16.77	43	89
Sepsis	43	5.46	23	20
Meconium aspiration syndrome (MAS)	4	0.50	4	0
Hypothermia	12	1.5	4	8
Polycythemia	5	0.63	2	3
Hypocalcemia	3	0.38	0	3
Necrotising enterocolitis (NEC)	3	0.38	0	3
Disseminated intravascular coagulation (DIC)	1	0.13	1	0
Transient tachypnoea of newborn (TTNB)	14	1.78	6	8
Structural anomalies	33	4.19	20	13

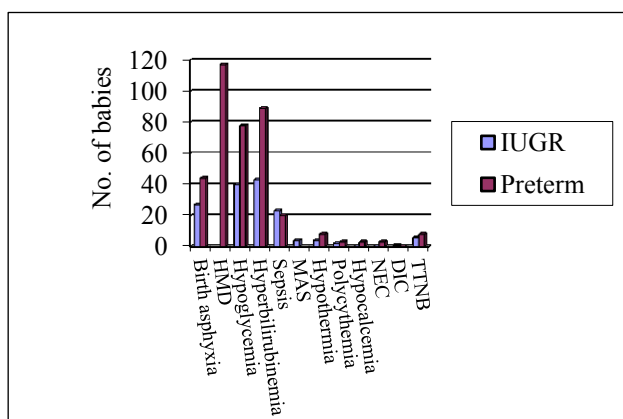


Figure 3: Perinatal morbidity in live LBW babies.

Table 9: Comparison between IUGR and Preterm babies.

Morbidity	IUGR babies		Preterm babies		P value
	No.	%	No.	%	
Neonatal ICU admission	130	30.73	239	65.66	<0.001
HMD	-	-	117	32.14	
Birth asphyxia	27	6.38	44	12.08	<0.001
Hypoglycemia	40	9.4	78	21.4	<0.001
Hyperbilirubinemia	43	10.17	89	24.4	<0.001

Neonatal mortality

There were 49 early neonatal deaths accounting to 5.29% of live babies. The major causes of neonatal death were hyaline membrane disease (3.56%) and birth asphyxia (1.11%) (Table 10). All the deaths due to HMD were among the preterm group (Figure 4).

Table 10: Neonatal mortality.

Cause of neonatal death	No. of deaths	% of babies	IUGR	Preterm
HMD	26	3.56	0	26
Birth asphyxia	9	1.11	4	5
Congenital anomalies	6	0.65	4	2
Sepsis	4	0.51	2	2
MAS	2	0.22	2	0
Intrauterine infection	1	0.1	1	0
Aspiration of feeds	1	0.1	1	0

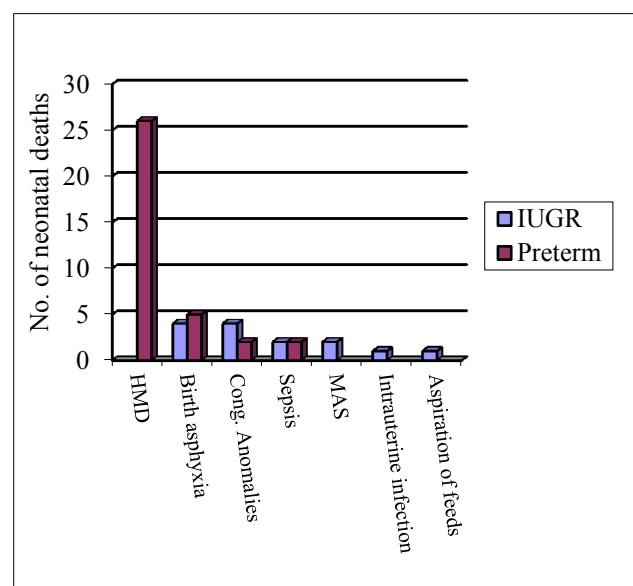


Figure 4: Neonatal mortality in live LBW babies.

Maternal health and socio-demographic factors affecting low birth weight

More than 95% of LBW babies belonged to low socioeconomic status (Table 11). This reflects the effect of inadequate nutrition and subnormal perinatal services available to this group. The most common maternal illness associated was anemia (43.36%) (Table 12). Most common pregnancy complications associated with LBW were hypertensive disorders and preterm labour (Table 13). In majority of the hypertensive disorders, pregnancy was terminated remote from term, leading to increased number of preterm babies (Figure 5).

Table 11: Maternal health and socio-demographic factors affecting low birth weight.

Maternal factors	Number of babies	Percentage
Age <20 or >30 years	240	23.95
Primipara	590	58.88
Previous history of preterm labour	45	4.49
Regular antenatal care	763	76.14
Low socioeconomic status	897	89.52
Inadequate dietary intake	356	35.52
smoking	80	7.98

Table 12: Maternal illness and low birth weight.

	No. of babies	Percentage
Anemia	399	43.36
Heart disease	10	1.08
Maternal illness	7	0.76
Chronic hypertension	4	0.43
Overt DM	4	0.43
Hypothyroidism	2	0.21
SLE	3	0.33
Epilepsy	1	0.1

Table 13: Pregnancy complications and low birth weight.

Pregnancy complications	No. of babies	Percentage
Preeclampsia	162	17.6
Eclampsia	23	2.5
HELLP	20	2.2
Gestational hypertension	7	0.76
GDM	21	2.28
PPROM	39	4.24
Preterm labour	181	19.67
Abruption	36	3.91
Placenta previa	13	1.41
Polyhydramnios	4	0.43
Oligamnios	28	3.04

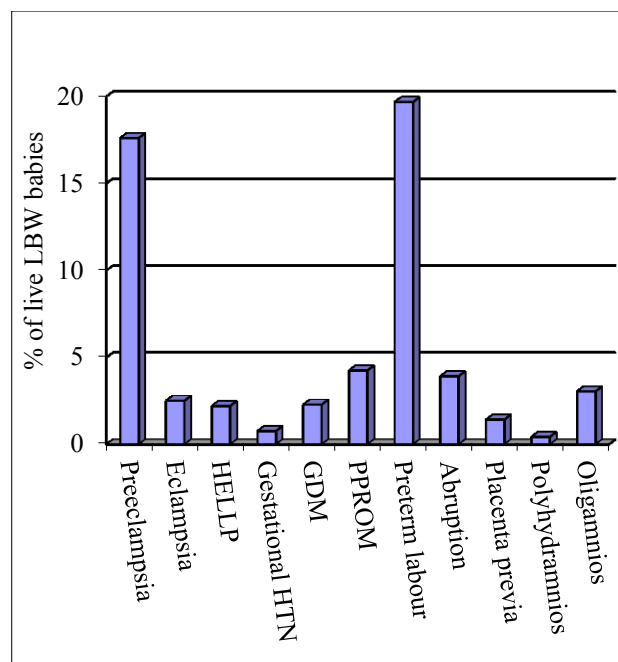


Figure 5: Pregnancy complications and LBW.

Sex of the baby & NICU admission

It was seen that female babies had less NICU admissions (35.82% in females versus 43.52% in males) and less neonatal deaths (3.07% in females versus 7.21% in males). This difference was statistically significant (P value <0.01). Thus it can be seen that female babies had better perinatal outcomes (Table 14).

Table 14: Sex of the baby & NICU admission.

Sex	NICU admission	% of NICU admission	Neonatal deaths	% of neonatal deaths
Male	205	43.52	34	7.21
Female	163	35.82	14	3.07

Table 15: Perinatal mortality: a comparison between different subgroups.

Sub group	No. of babies	No. of NNDs	Percentage
Preterm	364	33	9.06
IUGR	423	10	2.36
Preterm & IUGR	28	5	17.8
Constitutionally small	105	0	0

DISCUSSION

Perinatal mortality rate among low birth weight babies in KMCT medical college was found to be 124.7/1000 babies. Chandran Savita et al.⁸ in 2003 reported the perinatal mortality rate among low birth babies to be 135/1000. Salam et al. in 1996 reported a higher perinatal mortality rate of 223/1000 low birth weight babies.⁹ Thus

it can be seen that there is a slight decrease in the perinatal mortality rates among low birth weight babies over the years.

In India, the perinatal mortality rate is 28/1000 births.¹⁰ Thus it can be seen that the perinatal mortality among low birth weight babies is very high.

According to this study, perinatal mortality rate among very low birth weight babies (1-1.5 kg) was almost 10 times that of babies with birth weight >1.5 kg (Table 2). Stephen J. Bacek et al.,¹¹ 2004 and Fanaroff AA et al.,¹² 2007 also found similar observations that perinatal mortality was highest among low birth weight groups and youngest gestational age.

The group which consisted of both preterm and growth restricted fetuses had the highest mortality and morbidity rates (Table 15). Comparing the preterm and IUGR babies, IUGR babies had a better chance of survival than preterm babies.

IUGR babies have a stressful intrauterine environment and they are able to adapt to the external environment better than the preterm infants. Preterm infants are insufficiently equipped for extrauterine survival, due to immaturity of the organ systems.¹³

Studies by Pravati, 2014¹⁵ showed that prematurity accounted for majority of perinatal deaths. In the study by Chandran Savita et al., 2003,⁸ IUGR babies showed better survival rates than preterm babies.

There were no perinatal deaths among constitutionally small babies. This shows that although they are low birth weight, they are healthy babies, comparable to normal babies. These babies have excellent prognosis.

The major cause of perinatal mortality was hyaline membrane disease (3.56%) (Table 10). The other causes were birth asphyxia (1.11%), congenital anomalies (0.65%), sepsis (0.51%), meconium aspiration syndrome (0.22%), intrauterine infection (0.1%) and aspiration of feeds (0.1%). HMD was the leading cause of death in preterm babies and birth asphyxia was the leading cause in IUGR babies.

Among preterm babies, 65.66% and among IUGR babies, 30.73% had neonatal ICU admissions (Table 9). This shows that premature babies were more prone for perinatal complications than IUGR babies. Hyperbilirubinemia (16.77%), hypoglycemia (14.99%) and hyaline membrane disease (14.86%) were the leading perinatal morbidities. Similar observations were made by Chandran Savita⁸ et al and Pravati.¹⁵ Most of the babies were preterm because of early termination of pregnancy due to complications like hypertensive disorders of pregnancy.

Majority of the mothers in this study belonged to low socio-economic status (96.87%). Low financial status leads to inadequate dietary intake, increased physical activity and increased infectious morbidity, all of which are indirect causes of low birth weight.¹⁶ A community based study by Idris et al., 2000 had shown that mothers of low birth weight babies had inadequate dietary intake and also had moderate to severe physical activity during pregnancy.¹⁴ In this study, 36.3% of mothers had inadequate nutrition during pregnancy and 8.04% of mothers were exposed to passive smoking, both of which were associated with low birth weight¹⁷ (Table 11).

The highest incidence of low birth weight babies was found among primiparas (Table 11). Similar finding was noted by Jurjus, 1995.¹⁸ It is believed that the uterus becomes more vascularized with pregnancy. A uterus is better vascularized with the second pregnancy than with the first, which facilitates the passage of more nutrients through the placenta. However with more numerous pregnancies the situation might not be the same.

In this study 15.23% of mothers had previous history of abortion, 5.49% of mothers had previous history of preterm labour and 3.67% of mothers had reduced spacing between pregnancies. Studies by P. K. Bhatnagar, 2000 have shown that previous bad obstetric history had significant impact on birth weight.⁷

Male babies had increased incidence of NICU admission and worse perinatal outcomes than female babies. Neonatal mortality rates were also high among males (Table 14). Similar observations were made by Chandrasekharan et al, 1998.¹⁹ But the reason for this disparity is poorly understood.

The most common pregnancy complication associated with low birth weight was hypertensive disorders of pregnancy, including preeclampsia, eclampsia, HELLP and gestational hypertension making upto 17.6% (table 13). Premature termination of pregnancy had to be done in most of the cases resulting in more preterm babies. Similar findings were noted by Xu Xiong et al, 2002.²⁰ This indicates the importance of early detection and appropriate management of hypertensive disorders so as to decrease the perinatal mortality and morbidity rates.

Preterm prelabour rupture of membranes (4.24%), abruption (3.91%) and gestational diabetes (3.04%) also contributed to low birth weight⁷ (Table 13).

There were 43.36% mothers with anemia. Studies by Levy, 2005 have shown maternal anemia to be an independent risk factor for lowbirth weight and preterm delivery.²¹ Other maternal illnesses associated with low birth weight were heart disease (1.08%), infections (0.76%), chronic hypertension (0.43%), overt diabetes (0.43%) (Table 12).

The early detection and effective management of maternal illness and pregnancy complications may help to decrease the incidence of low birth weight babies and improve the perinatal outcome.

CONCLUSIONS

The perinatal mortality rate among LBW babies in KMCT medical college is 124.7/1000. Perinatal mortality was found to be highest among very low birth weight babies (1000-1500 gm). Constitutionally small babies have excellent prognosis while babies with prematurity and growth restriction had the worst prognosis.

Comparing IUGR and preterm babies, IUGR babies have a better perinatal outcome and lower mortality rates. The most common cause of death among preterm babies was hyaline membrane disease and IUGR babies were birth asphyxia.

The most common perinatal morbidity among low birth weight babies was hyperbilirubinemia (16.77%), followed by hypoglycemia (14.99%), and hyaline membrane disease (14.86%). Birth asphyxia (9.02%) and sepsis (5.46%) were also common.

Mothers belonging to lower socioeconomic status have higher risk of delivering LBW babies. Primiparas were more prone to have LBW babies. Maternal anemia and malnutrition significantly contributed to LBW.

The most common pregnancy complication associated with LBW was hypertensive disorders of pregnancy (17.6%).

It is seen that birth weight plays a major role in determining perinatal outcome of babies. To decrease the incidence of low birth weight, measures to improve the general health and nutrition of mothers should be employed. All mothers should have proper antenatal care. Anemia should be corrected at the earliest. Early identification of pregnancy complications and appropriate referral to higher centres should be done. LBW babies should be delivered in centres with good neonatal ICU. Proper neonatal care should be given to prevent both short term and long term complications.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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DOI: 10.5455/2394-6040.ijcmph20150211

Cite this article as: Sangamam R. Perinatal mortality and morbidity among low birth weight babies. *Int J Community Med Public Health* 2015;2:51-8.