ORIGINAL ARTICLE

Incidence of Low Birth Weight and Its Associated Factors in Jimma University Specialized Hospital

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ABSTRACT

Background: *Weight at birth is a good indicator of the newborn's chance for survival, growth and development, as well as long term health and psychosocial development. Low birth weight newborns are at a significantly higher risk of morbidity and mortality contributing a lot to the higher perinatal, neonatal, infant and childhood morbidity and mortality rates specially in the developing countries like Ethiopia. They are also at a higher risk of adulthood illnesses once they survive the early complications. Even if many studies have been done on low birth weight, its associated factors and the short as well as long term outcomes of low birth weight infants in the developed world, little has been done in developing countries like Ethiopia where the burden of the problem is huge. In Ethiopia, few studies have been done on the incidence of low birth weight and associated factors but most of these studies didn't consider many of the factors thought to be associated with low birth weight.*

Objectives: *To determine the incidence of low birth weight and its associated factors in Jimma University Specialized Hospital.*

Methods and materials: *A cross sectional study was conducted on 931 newborns who were born in Jimma University Specialized Hospital from March 1 to May 30, 2014 GC. Data were collected by using structured questionnaire. Maternal and neonatal anthropometric measurements were done by using standard beam balance, tape meter and measuring board. Consecutive sampling technique was used to include all eligible newborns and their mothers until the required sample size is obtained. p value of <0.05 was used to consider significance.*

Results: *The mean (± SD) of birth weights were 3017 ± 612gm. The incidence of low birth weight (birth weight <2500) was 24.4%. The factors found to be associated with low birth weight in this study are female gender, maternal urinary tract infections, preterm delivery, maternal antepartal hemorrhage, and multiple gestations.*

Conclusion and recommendations: *The incidence of low birth weight is found to be high in this study. An attempt to increase the rate of ANC attendance and identifying the medical illnesses as well as obstetric complications and addressing them timely is recommended so that the rate and complications of low birth weight could be minimized.*

Key words: *Birth weight, low birth weight, intrauterine growth restriction*

INTRODUCTION

Birth weight is an important determinant of prenatal, neonatal as well as post neonatal outcomes as poor intrauterine growth increases the risk of prenatal, neonatal, infant and childhood morbidity and mortality as well as long term morbidity during adulthood(1). Low birth weight refers to a newborn with birth weight of less than 2500gm and it includes those who are born premature as well as those who are born fully mature but with intrauterine growth restriction.

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Multiple factors play a role in determining the birth weight of a newborn which could relate to the mother; such as mother's own fetal growth, her diet from birth through pregnancy, her body composition at conception, illnesses which may be infectious or non-infectious, her life-styles like consumption of alcohol, cigarette smoking and physically demanding activities. The fetal factors include gender, genetic makeup, and the number of fetuses. Environmental factors (like altitude, toxin exposure, air pollutants, and war) also contribute in determining birth weight of a newborn(1,2).

Low birth weight is associated with multiple acute and long term complications which contribute a lot for neonatal, infant and childhood morbidity and mortality as well as adulthood chronic illnesses. Among the acute complications of LBW which could occur in the neonatal period are respiratory distress syndrome, intra-ventricular hemorrhages, necrotizing enter colitis, neonatal infections, patent dactus arteriosus and metabolic complications like hypothermia and hypoglycemia, thus directly or indirectly increasing the neonatal morbidity and mortality(1,6,7).

Majority of the newborns who survive these acute complications are again at higher risk of additional complications during their childhood and adulthood life. Some of these complications are neurologic and developmental abnormalities (like cognitive dysfunction, poor school performance, cerebral palsy, hydrocephalous, hearing and visual impairments), chronic obstructive lung diseases, renal damage and chronic kidney disease, cardiovascular disorders (like stroke, hypertension, coronary heart disease), metabolic abnormalities (like diabetes mellitus, hypercholesterolemia, and metabolic syndrome)(2,3,4,6).

All the above mentioned complications will add up and increase the health cost of the LBW infant both at an individual household level and at the national level. For all these reasons, LBW has been a good public health indicator and target has been made by the WHO, UNICEF, and the global countries to reduce the prevalence and associated complications(1,2,8).

The incidence of LBW in Sub-Saharan sub-region is estimated at around 10-20% which is higher than most other sub regions of the world, presenting a major challenge in the sub-region (1,7).Ethiopia, being one of the countries with higher neonatal and infant mortality rates in the world, has a limited data on LBW since most of the deliveries occur at home and the birth weight is not measured. According to a data obtained from Ethiopian Demographic and Health Survey_(EDHS) 2011, which didn't use objective measurement of birth weight, rather used maternal estimate of birth weight as giving birth to very small baby, over a period of the preceding five years, the incidence of LBW is found to be among the highest in the world (9). In an institutional based study done in a referral hospital in North Western Ethiopia, the incidence was found to be 17.1% which is highly significant (10). In a study done in South West Ethiopia in 2002/03 in four health centers and JUSH, the prevalence of LBW was found to be 22.5% which is again higher (11). These all indicate that LBW is highly prevalent in the country. Thus an attempt to make an accurate measurement of birth weight and estimating the incidence is necessary at all health institutes as much as possible and identifying the factors which play a role locally is very vital. The objective of this study was to determine the incidence of low birth weight and associated factors in JUSH, Jimma, Ethiopia

METHODS

Study design and setting

A cross sectional study was conducted on newborns born in JUSH. The study was conducted on newborns born in JUSH, Jimma Zone, Jimma town, Oromia Region, South West Ethiopia which is located about 350Km from Addis Ababa, the capital of the country. The study period was from March 1 to May 30, 2014 GC. The hospital is the only referral hospital for over 15million people in the Southwest Ethiopia (JUSH archive, 2000). At the same time it is a teaching hospital with various other public health services.

The labor ward is one of the busiest wards of the hospital where both normal & complicated cases are served. Laboring mothers could come having follow up in the hospital or being referred from the nearby health centers as well as hospitals. There are six first stage and three second stage beds in the labor ward of the hospital. There is also one functional operating room adjacent to the

labor ward where laboring mothers in need of operative deliveries are operated. The neonatal ward of the hospital is in close proximity to the labor ward so newborns that need further care and treatment will be referred to the ward. More than 3,830 mothers deliver in the ward per year.

Study population and Sampling: All newborns who were born in JUSH over a period of three months (i.e. from March 1 to May 30, 2014 G.C) were enrolled in to the study. A consecutive sampling technique - including all eligible participants was used until the required sample size was obtained (after checking willingness of the mother or care takers).

The estimated number of deliveries in the labor ward of JUSH hospital was around 320 per month. The study was conducted over a period of three months. So the total population for this study was 960.

The minimum sample size needed for the study was calculated by using the single population proportion formula of calculating the minimum sample size. 95% confidence interval assumption was also used. So according to this formula:-

Data sources

Data on maternal socio-demographic characters, maternal medical conditions, and maternal obstetric factors, were obtained by interviewing the mother as well as revising her medical record. The data on maternal behavioral factors were obtained by interviewing the mother. The data on maternal and neonatal anthropometric characters was obtained by measuring the anthropometric parameter (by using standard beam balance for maternal and neonatal weight, measuring board for maternal height and measuring tape for maternal MUAC, neonatal length and head circumference). Maternal and neonatal anthropometric characters were measured only once.

RESULTS

There were a total of 938 mothers who gave birth in the hospital during the study period and of these 910 of the mothers were willing to participate in the study making a response rate of 97%. The total number of newborns included in the study were 931 (19 of the mothers had twin deliveries and one of the mothers had triplets).

Majority of the mothers(95.5%) were aged between 18-35years. The predominant religion of the mothers was Muslim accounting for about 63.2% of the cases. More than two third (76.3%) of the mothers were Oromo and 35.6% of the mothers didn't have any education. Most (72.8%) of the mothers were housewives. More than half of the mothers(57.3%) reside in the rural area. Among the mothers included in the study, 97.5% were married. (Table 1).

Maternal obstetric factors

Half of the mothers were Para II to V whereas 46.04% and 3.96% of the mothers were Para I and Para VI and above respectively. Of the multiparous mothers, the birth interval was >2years in majority of the cases (74.7%), 1-2 years in 24.8% and <1year in 0.5% of the cases. Majority of the pregnancies (90%) were planned.

With regard to gestational age, in 41.8% of the mothers the gestational age could not be obtained whereas 7.1%, 49.8% and 1.3 % of the cases were preterm, term and post term deliveries respectively. APH was identified in 30 of the mothers , of which 23 had placenta previa and 7 had placental abruption. Of all the mothers included in the study, 77 of the mothers had pregnancy induced hypertension, of which 13 had ecclampsia and 64 had preeclampsia. With regard to ANC attendance, 3.8% of the mothers had no ANC follow up at all, whereas 42.6% had less than 4 visits and 53.6% had 4 or more visits.

Table 1: socio-demographic characteristics of the mothers involved in the study.

Variable (n=910)		Frequency	Percent (%)
Age(Years)	<18	8	0.9
	18-35	869	95.5
	>35	33	3.6
Religion	Protestant	120	13.2
	Orthodox	212	23.6
	Muslim	578	63.2
Ethnicity	Oromo	694	76.3
	Amhara	136	14.9
	Kefa	28	3.0
	Gurage	26	2.9
	Others*	26	2.9
Marital status	Single	6	0.6
	Divorced	8	0.8
	Widowed	10	1.1
	Married	886	97.5
Education	No education	324	35.6
	Primary	308	33.8
	Secondary	158	17.4
	College & above	120	13.2
Occupation	Student	25	2.7
	Daily labor	90	9.9
	Employed	133	14.6
	House wife	662	72.8
Residence	Rural	521	57.3
	Urban	389	42.7

*=Tigre, Dawuro, Yem, Wolaita, Siltie

Maternal medical disorders

With regard to maternal medical conditions, anemia is the most common identified medical illness whereas hypertension and renal diseases were the second and third frequent illnesses identified(see table 3). Only less than half of all the mothers (45.4%) were screened for syphilis and none of them had a positive test result. Almost one third of the mothers (32.1%) were not tested for HIV.

Table 2: Maternal medical disorders identified during the study

Medical disorder	Frequency	Percent(%)	P value (for association with LBW)
Asthma	5	0.5	1.00
Cardiac diseases	7	0.8	.06
Diabetes Mellitus	8	0.9	.21
UTIs	13	1.4	.02
HIV/AIDS	14	1.5	.76
Malaria	36	3.9	.14
Hypertension	52	5.7	.000
Renal diseases	55	6.0	.36
Anemia	249	27.4	.01

Incidence of LBW

The incidence of LBW in this study was 24.4%. Majority (58.3%) of the newborns were males and 41.7% were females. Out of the 931 newborns included in this study, 24.4% had LBW, whereas 70.6% and 5% of the newborns had normal birth weight and macrosomia respectively. From the 24.4% LBW newborns, 0.8% were VLBW, whereas 23.6% were just LBW; there is no newborn found to be ELBW. From the newborns with LBW, 17.5% had symmetric IUGR and 78% had asymmetric IUGR. The rest 9 newborns didn't have IUGR.

Of all the 931 newborns included in the study, 99% were live births and 1% were still births. Majority (77.8%) of the still births had LBW whereas the rest 22.2% had NBW. The mean ± SD of birth weights were 3017 ± 612gm.

Factors associated with low birth weight

On the binary logistic regression, factors found to have statistically significant association with low birth weight are rural residence (COR=1.56,95%CI 1.14,2.13), maternal hypertension (COR=2.88 95%CI 1.65,5.03), UTIs(COR=3.70 95%CI 1.23, 11.13), hemoglobin of less than 11gm/dl(COR=1.56 95%CI 1.12, 2.17), MUAC of less than 23cm(COR=2.09,95%CI 1.46,3.00), prematurity(COR=22.96 95%CI 11.74, 44.92), maternal APH (COR=3.74 95%CI 1.79, 7.78), maternal pregnancy induced hypertension(COR=3.09 95%CI 1.94, 4.92), lack of ANC followup or infrequent (<4) visits (COR=1.74 95%CI 1.29, 2.36), female sex(COR=1.62 95%CI .46, .83) and multiple gestation(COR=4.78, 95%CI 2.52, 9.07).

On the multiple logistic regression analysis, all the variables having p value <.25 on binary logistic regression analysis were considered for analysis. The variables found to have statistically significant associations with LBW include maternal UTIs(AOR=9.13 95%CI 1.26, 66.46),prematurity (AOR=16.03 95%CI 7.60, 33.83), maternal APH (AOR=4.74, 95%CI 1.49, 15.07), female sex (AOR=2.02 95%CI 1.22,3.36), and multiple gestation (AOR=8.6 95%CI 1.88, 34.16). All the other factors have no statistically significant associations.

Table 3: Comparison of the mean birth weights of the different categories of the newborns.

Variable		Mean	SD	P	95%CI of the difference lower	upper
Gender	M	3.073	.5947	.001	.0542	.2146
	F	2.939	.6382			
No. of fetus	singleton	3.038	.6121	.000	.3378	.6067
	Multiple	2.566	.4078			
Parity	Multipara	3.090	.6438	.000	.0795	.2346
	Primipara	2.933	.5620			
Gestational age	>37weeks	3.099	.5499	.000	.7332	1.0189
	<37weeks	2.223	.5465			
Residence	Urban	3.084	.5807	.004	.0373	.1941
	Rural	2.968	.6033			

To the contrary, statistically significant difference was not seen in the mean birth weight of newborns with regard to maternal age, religions, ethnicities, marital status, educational status and occupation when analyzed by one way Annova.

DISCUSSION

The incidence of LBW in this study is 24.4% which is one of the highest figures in the world, and is consistent with different studies done in different parts of the world. In India, K.S Negi did a longitudinal study, which showed incidence of 23.8%(12). In a cross sectional descriptive study done in Jimma zone (in one hospital & four health centers),22.5% of the births were LBW(11). It is also comparable with the EDHS-2011 report of LBW rate of 21% which was based on maternal report of giving birth to a small or very small baby.

But the 24.4% incidence of LBW found in this study is lower than some community based

studies. For example, in a community based study done in India by J.S. Deshmukh, 30.3% of the deliveries were found to have LBW(13). In Kersa , Eastern part of Ethiopia, a community based observational cohort study was done, and the incidence of LBW was 28.3% (21). This difference may be explained by the fact that these two studies were done in the community which might be the real reflection of the problem whereas our study was a hospital based study.

When compared with other studies , the incidence of LBW found in this study is much higher than the previous ones. Some of these studies are prospective cross sectional study done in Turkey, Istanbul which showed incidence of 9.1%(16), a cross sectional study done in Yazd, Iran, where the incidence of LBW was 8.8%(17), a study conducted in Zahdan Hospital in Iran, where the incidence was 11.8%(18), a study done in Tanzania, which showed 13.6 of the births to be LBW(7), a cross sectional study done on 305 newborns in Gondar University Hospital, North West Ethiopia, with the overall incidence of LBW of 17.1%(10). The difference in the socio-demographic background of the participant mothers and also the time at which these studies were conducted may explain this difference in the incidence of LBW between these studies and our study.

Maternal residence in a rural area was found to have statistically significant association with low birth weight which is similar with study done in Peshawar, Pakistan in public hospitals, which has demonstrated area of residence (i.e. rural) to have a negative association with birth weight(15). It is also consistent with the EDHS-2011 report which showed place of residence as one of the factors associated with LBW(9). But in a study done in Gondar University, maternal residence in rural area was not found to be associated with LBW(10), the reason behind may be the difference in the distribution of the mothers in the two studies (75% of the mothers in the Gondar University study were urban dwellers whereas only 42.7% of the mothers were urban dwellers in our study).

Maternal MUAC of less than 23 was found to be associated with LBW, a finding similar to a study done in Eastern Ethiopia(11).

Female sex, multiple gestations, prematurity, maternal UTIs and APH are the factors found to have statistically significant association with LBW on the multiple logistic regression analysis during this study. This is also consistent with some of the studies done so far like a study done in Istanbul, Turkey which has demonstrated multiple gestation and prematurity to be associated with LBW(16), in Iranian study which also showed prematurity & multiple gestations to be associated with LBW(17), the study done in Gondar (female sex), and the Jimma study which has also shown preterm and multiple gestations to be associated with LBW(10,11). Some other studies didn't find significant association between sex of the newborn and LBW(16,17) which might be explained by the difference in sex distribution seen during those studies.

Maternal demographic factors like age, religion, ethnicity, marital status, and educational status were not found to have statistically significant associations with LBW which was also demonstrated on other similar studies done in the other parts of the country as well as the study done in Jimma zone in 2002-2003(10,11,21). The reason for this might be because of similar nature of the mothers in the study, majority being in a similar age group, not educated, married , and belonging to one religion or ethnic group.

Many of the maternal medical illnesses were not found to have a significant association with LBW like other studies done in the past (10,21) and in contrary to other studies done elsewhere (7,17,18). The possible explanation for this might be the fact that the number of mothers identified to have these medical disorders in the current study was minimal (which was actually the case in the previous studies done in Ethiopia as well). The other reason may be the fact that significant number of the mothers were not tested for some of the medical illnesses (54.6%, 32.1% and 9.1% of the mothers were not screened for Syphilis, HIV, and anemia respectively) during the current study.

Inconclusion, the incidence of LBW found in this study is higher than many of the hospital based studies done so far and also the national estimate of LBW. It is even higher than the regional average estimate for the Sub-Saharan African sub-region. The factors found to be associated with LBW in this study are rural residence, female gender, UTIs, hypertension, anemia, maternal MUAC of less than 23cm, preterm delivery, lack

of or infrequent ANC follow up, pregnancy induced hypertension and APH.

An attempt to increase the rate of ANC attendance as part of the zonal and regional program should be strengthened. In those having ANC follow up health workers providing these services should try to identify the medical illnesses as well as obstetric complications and address them timely so that the rate and complications of LBW could be minimized. Additionally, routine screening of some of the medical illnesses such as HIV and Syphilis at ANC visits should be strengthened.

Further study should also be carried out to address the other factors associated with LBW and also to determine the outcomes of these LBW infants using follow up study.

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