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Research article

ACCURACY OF LOW BIRTH WEIGHT AS PERCEIVED BY MOTHERS AND FACTORS INFLUENCING IT: A FACILITY BASED STUDY IN NEPAL

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ABSTRACT

Introduction: Birth weight is a key predictor for risk of childhood illnesses and chances of survival; however in developing countries less than half of newborns are weighed at birth. In Nepal, only 36% of children born were weighed at birth. Nearly two thirds (63%) of deliveries take place at home and birth weight may not be known for many babies, the mother's estimate of the baby's size at birth could be used as an alternative. **Aim and Objective:** This study assessed the accuracy of low birth weight as perceived by mothers and factors influencing whether their perceptions were accurate. **Methods:** The study was a facility based descriptive study carried out in four hospitals with sample size of 1533. Hospital nurses interviewed mothers using a pre-tested tool. Data was entered into EpiData 3.1 and analyzed using SPSS version 17 software package. **Results:** A total of 1533 mothers were interviewed of which 75 did not respond. An overall 75% mothers accurately identified actual low birth weight; and 25% mother perceived normal for actual low birth weight. Less percent of mothers <20years (sensitivity=0.74), illiterate (sensitivity=0.74), and primigravida (sensitivity=0.74) identified actual low birth weight than mothers ≥20years (sensitivity=0.75), literate (sensitivity=0.75) and multigravida (sensitivity=0.77). **Conclusion:** The study concluded that 75% mothers recognized actual low birth weight of newborn, and 25% mother's perceived normal for actually low birth weight. The percentage of women accurately identifying actual low birth weight was slightly lower among mothers <20years, illiterate and primigravida as compared to mothers ≥20years, literate and multigravida.

Keywords: Lowbirth weight, Mother's perception, Facility based study, Nepal

INTRODUCTION

Birth weight indicates the health status of both newborn and mother. Low Birth Weight (LBW), less than 2.5 kg^[1]. is the consequence of small maternal size at conception; low gestational weight gain; premature delivery; and pregnancy among younger women²; and can have consequences on increasing newborn morbidity and mortality^[2]. Additionally, knowing the birth weight can help providers and family to take care of newborn at right time.

Globally, 15.5% of all births are born with LBW. Among them 95.6% are in developing countries^[3]. About 80% intrauterine growth retarded (IUGR) newborns who are LBW and full term are born in Asia^[3]. Nepal has an overall 21% LBW² and little variation in different studies, 12.76%^[5], 21.6%^[6], 11.9%^[7]; similar to prevalence of LBW in India 23%^[7], 21.5%^[9], 12.8%^[7], and 17.3%^[10]. More than half of infants in the developing world are not weighed after birth^[1] as

they born at home^[1,11,12] and thus will not have a recorded birth weight. In the past, most estimates of LBW for developing countries were based on data compiled from health facilities, these estimates did not cover the weight of newborns who were born out of a health facility^[1]. Since birth weight may not be known for many babies, the mother's estimate of the baby's size at birth was also obtained^[13].

Nepal has taken the percentage of newborns with LBW as one of the indicators to demonstrate achievement of nutritional wellbeing, maintenance of a healthy life and socioeconomic development of the nation. Many nutritional policies; principles; and strategies are based on this indicator, such as, increased nutrition monitoring and counseling services at antenatal checkup to reduce LBW^[2]. Hence, it is important to take birth weight of newborn and, where formal measurements are unavailable, validate the accuracy of mothers' perception of birth weight as a possible alternative source of data. However, studies on validation on perceived birth weight is not available for Nepal in our knowledge, and mother's perception about the size of baby has not been properly verified as a reliable estimate of birth weight. We questioned that is mother's perception on weight of newborn is correct? Is her perception on weight of newborn is affected by her socio-demographic background? This study aimed to assess accuracy of birth weight perceived by mothers against actual birth weight recorded in hospital; and to find out any associated determinants.

MATERIAL AND METHODS

The study was approved by Institutional Review Board of Institute of Medicine, Maharajgunj Medical College. We also received approval from each hospital board; and consent from each mother before data collection. Hospital nurses interviewed mothers once they were comfortable following delivery. After interviewing, nurses gave information to mothers on breast feeding; keeping newborn warm, special care for infants who were LBW using Kangaroo mother care, family planning, and baby immunization. This was a hospital based descriptive study, carried from August 2012 to February 2013. We chose hospitals for this study as hospitals routinely record weight of newborn and therefore provided a comparison against which the accuracy of mothers' perception on LBW could be assessed. We carried out this study in 4

hospitals: Tribhuvan University Teaching Hospital (TUTH), and Paropakar Maternity and Women's Hospital located in central Kathmandu; Seti Zonal Hospital in Kailali district, far western region of Nepal, 723 km away from Kathmandu city; and Dhulikhel Hospital in Kavre district, 30 km away from Kathmandu city. We chose these hospitals purposively to represent geographical scope from far western plain area to central hill areas.

Women within the reproductive age of 15-45 years were the target population for this study. The sampling unit was mothers who were recently delivered, had completed 37 weeks of gestation, single not multiple births and having a live birth. The dependent variable for this study was perceived birth weight, and independent variables were mothers' age, education, and gravida.

Sample size, data collection, management and analysis: The sample size was calculated using statistical formula^{14, 15}, at 95 percent confidence level; 25% of LBW based on birth weight by birth size¹¹, and 2% confidence interval. Hence, sample size calculated using this formulae, $SS = 1800$ For sample size – finite population, where, population = 10350 (total average deliveries in 4 hospitals); $SS = \text{sample size} = 1800$; the sample size calculated were 1533. The tool was a structured questionnaire with open and close ended questions. We asked to mothers on how she felt the weight of her baby; what her estimation was for NBW measurement in her idea; and what causes small baby if she felt her baby was small. Prior to collecting data, we did pre-test of questionnaire in TUTH hospital and made corrections as required from pre-test. Hospital nurses who worked in maternity ward were trained in the study tool and data collection techniques. Trained hospital nurses briefed mothers of the objective of study; then interviewed mothers who met selection criteria using the pre-tested tool before they were told birth weight of their newborn baby in their respective duty shift from August 2012 to September 2013. The actual birth weight of the newborn was taken from the hospital maternity register.

Data entry program was developed in EpiData 3.1 and checked for any inconsistencies; analyzed using the SPSS version 17 computer software package through running simple frequency, descriptive cross tabulations. Sensitivity and specificity was calculated. The sensitivity is the proportion of actual LBW in the

selected sample who are accurately identified as LBW by the mothers; and the specificity is the proportion of actual normal birth weight (NBW) of newborn who are so identified by the mothers^[14,16,17,18].

RESULTS

We interviewed 1533 mothers regarding their perception on birth weight of newborn, 75 mothers did not response.

Maternal age and perceived LBW: Referring to table 2, out of 1458 mothers, 205 (14.1%) mothers were age <20 years and 1253 (85.9%) were age 20years. Among the mothers who were <20 years (205), 84 (41%) mothers delivered LBW babies. Among them (84), 62 (73.8%) mothers accurately perceived weight of their newborn baby as low for actual LBW. Of the remaining 121 women <20 years who delivered NBW babies, 9 (7.4%) mothers perceived weight of their newborn baby as low, for actual NBW. Similarly, among mothers age of 20 years, 404 (32.2%) delivered LBW baby, 849 (67.8%) delivered NBW baby. Among 404, 302 (74.8%) mothers perceived weight of their newborn baby was low for actual LBW baby. Out of 849, 64 (7.5%) mothers perceived weight of their newborn baby as low for actual NBW. Mothers were better at estimating NBW rather than LBW.

Maternal education and perceived LBW: Out of 1458, total of 142 (9.7%) mothers were illiterate, 1316 (90.3%) mothers were literate. Among the illiterate mothers, 57 (40.1%) delivered LBW babies and 85 (59.9%) had NBW babies. Out of 57, 42 (73.7%) mothers perceived weight of their newborn baby as low for actual LBW. Out of 85, 9 (10.6%) mothers perceived weight of their newborn baby as low for actual NBW. Among literate mothers, 431 (32.8%) delivered LBW babies and 885 (67.3%) delivered NBW babies. Out of 431, 322 (83.4%) mothers perceived weight of their newborn baby as low for actual LBW. Out of 885, 64 (16.6%) mothers perceived weight of their newborn baby as low for actual NBW. So, illiterate women were less likely to be accurate in identifying LBW than literate women (83.4% vs. 73.7%).

Gravida and perceived LBW: Out of 1458, 956 (65.6%) were primigravid mothers and 502 (34.4%) were multigravid mothers. Out of 956 primigravid mothers, 347 (36.3%) delivered LBW babies and 609

(63.7%) had NBW babies. Out of 347, 256 (87.7%) mothers perceived weight of their newborn baby as low as for actual LBW. Out of 609, 36 (12.3%) mothers perceived weight of their newborn baby as low for actual NBW. Among 502 multigravid mothers, 141 (28.1%) delivered LBW babies and 361 (71.9%) delivered NBW babies. Out of 141, 108 (74.5%) mothers perceived weight of their newborn as low for actual LBW. Out of 361; 37 (25.2%) mothers perceived weight of their newborn baby as low for actual NBW.

Overall diagnostic indicators of LBW: As an overall (table number 1), out of 1458, 488 mothers gave LBW babies, 970 mothers gave NBW babies. Out of 488 mothers, 364 (74.6%) accurately diagnosed baby as LBW and 124 (25.4%) diagnosed as normal for actual LBW. Out of 970, 73 (7.5%) mothers diagnosed birth weight as low, and 897 (92.5%) diagnosed as normal for actual NBW babies. We found that 75% mothers identified actual LBW babies (sensitivity=0.75), 93% mothers identified actual NBW babies (specificity=0.93). Twenty five percent mothers perceived NBW for actual LBW; whereas, 8% mothers perceived LBW for actual NBW babies.

Table 1: Concordance between low birth weight and perceived birth weight in two categories

Perceived birthweight	Actual LBW (%)	Actual NBW (%)	Total (%)
Low	364 (74.6)*	73 (7.5)	437 (30)
Normal	124 (25.4)	897 (92.5)**	1021 (70)
Total	488	970	1458

*sensitivity at 95% CI (0.71-0.78), ** specificity at 95% CI (0.91-0.94)

Maternal profile and diagnostic indicators of LBW: We found (table #2) there were no remarkable differences in relation to maternal age and education with diagnostic indicators on LBW (sensitivity and specificity). Seventy four percent mothers age <20 years (sensitivity=0.74 @ 95% CI: 0.64-0.82); and 75% mothers age 20 identified actual LBW babies (sensitivity=0.75 @95% CI: 0.70-0.78). Seventy four percent illiterate mothers (sensitivity=0.74 @ 95% CI: 0.61-0.83) identified actual LBW and for literate mothers were 0.75 (at 95% CI: 0.70-0.79), and 0.93 (at 95% CI: 0.91-0.94) respectively.

Our study revealed that diagnostic indicators were varied slightly as differences in number of gravida. Seventy four percent primigravid mothers

(sensitivity=0.74 @ 95% CI: 0.69-0.78), and 77% (0.69-0.83) identified actual LBW. multigravida mothers (sensitivity=0.77 @95% CI:

Table 2: Number of mothers with their profile, perceived low birth weight, and diagnostic indicators

Maternal Factors	Perception of mother on birth weight	Actual LBW (%)	Actual NBW (%)	Total (N=1458)(%)	Diagnostic Indicators	
					Sensitivity*	Specificity*
Age <20 years	Low	62 (73.8)	9 (7.4)	71 (34.6)	0.74	0.93
	Normal	22 (26.2)	112 (92.6)	134 (65.4)	(0.64-0.82)	(0.86-0.96)
	Total	84 (41.0)	121 (59.0)	205 (14.1)		
Age ≥ 20 years	Low	302 (74.8)	64 (7.5)	366 (29.2)	0.75	0.92
	Normal	102 (25.3)	785 (92.5)	887 (70.8)	(0.70-0.78)	(0.90-0.94)
	Total	404 (32.2)	849 (67.8)	1253 (85.9)		
Illiterate	Low	42 (73.7)	9 (10.6)	51 (35.9)	0.74	0.89
	Normal	15 (73.7)	76 (89.4)	91 (64.1)	(0.61-0.83)	(0.81-0.94)
	Total	57 (40.1)	85 (59.9)	142 (9.7)		
Literate	Low	322 (83.4)	64 (16.6)	386 (29.3)	0.75	0.93
	Normal	109 (11.7)	821 (88.3)	930 (70.7)	(0.70-0.79)	(0.91-0.94)
	Total	431 (32.8)	885 (67.3)	1316 (90.3)		
Primigravida	Low	256 (87.7)	36 (12.3)	292 (30.5)	0.74	0.94
	Normal	91 (13.7)	573 (86.3)	664 (69.5)	(0.69-0.78)	(0.92-0.96)
	Total	347 (36.3)	609 (63.7)	956 (65.6)		
Multigravida	Low	108 (74.5)	37 (25.5)	145 (28.9)	0.77	0.90
	Normal	33 (9.2)	324 (90.8)	357 (71.1)	(0.69-0.83)	(0.86-0.92)
	Total	141 (28.1)	361 (71.9)	502 (34.4)		

*calculated at 95% CI

DISCUSSION

This study assessed and analyzed perceived LBW and the maternal factors that influence on her perception on LBW. We asked mothers on her perception on birth weight before she was told weight of her newborn. We did not cover home based deliveries because the birth weight was not recorded in home delivery and thus cannot validate the perception of mother on LBW. We also did not include multiple births, preterm and still birth. Next, we are not aware of this kind of study conducted in Nepal before. It could be a unique study for Nepal. Though Nepal Demographic health Survey (NDHS) uses mother's perception to identify low or normal birth weight, but to date there has been no study to determine whether this is an accurate proxy indicator. This study fills that gap.

A study conducted in Korea to identify factors affecting the validity of self-reported data on health services from community health survey; and in some other countries have done similar studies using diagnostic indicators^[11, 12, 19, 20]; UNICEF and WHO

did LBW country, regional and global estimates in 2004^[11]; and an evaluation of international estimates and updated estimation procedure¹¹ were resources for this study.

However, whilst it is important to know an accurate birth weight; data on it is often difficult to obtain in those countries where most babies are born at home, similarly in Nepal^[13,21]. Many infants are never weighed at birth. Eighty-eight percent of newborns in Pakistan, and 70% in India in central and other Asia^[11] were not weighed, while those weighed at birth are often not recorded. Nepal has been also facing a similar problem to assess an accuracy of birth weight as it is not recorded in home deliveries. It is difficult to evaluate the accuracy of birth weight data because there are hardly any comparable registration data available^[12]. In Nepal, those available data showed that only 4% children are reported to be very small at birth, 12% were reported to be smaller than average, and 84% were reported to be average or larger in size on verbal autopsy^[13]. Our study revealed that 75% mothers identified actual

LBW (sensitivity=0.75). In other words, 91% mothers recognized actual NBW (specificity=0.91). Hence, it showed that fewer mothers could recognize actual LBW in compare to actual NBW. We would like to suggest here that the next study could be “why more mothers could identify NBW rather than LBW?” We also found that 25% mothers perceived normal for actual LBW babies which is crucial from a programmatic viewpoint.

In Nepal, birth weight is still not given a priority by family. An awareness on LBW among women who delivered during last year in Nepal was only 12.4%^[22]. A similar kind of study conducted in Cameroon found that specificity for LBW (92.9%) was much higher than sensitivity (59.9%) and the negative predictive value (96.1%) was much higher than the positive predictive value (44.4%)^[23]. Further analysis of data from DHS India showed that among babies who were reported as weighing <2500 grams, 53% were perceived by mothers as less than average size at birth and among babies who were reported as weighing ≥ 2500 grams, 91% babies were perceived by mothers as average or more than average size at birth. These numbers suggest that mother’s perception about size at birth was reasonably reliable^[24].

Accuracy of perception of mothers on birth weight is influenced by her education, number of gravida, and her age. Maternal age, educational level correctly predicted just over 35% of LBW^[20]. Blanc and Wardlaw examined these assumptions and documented that the characteristics of infants with numerical birth weights were not representative of all births^[11]. Births that were weighed were more likely to involve mothers who were better educated and resided in urban areas. They were also more likely to be in a medical facility and with assistance from skilled health personnel. These characteristics are generally associated with higher birth weights and, therefore, the resulting estimates were still likely to underestimate the level of LBW^[11]. We found that younger mothers age <20 years had difficulty in identifying LBW (sensitivity=0.74) as compared to older mothers age ≥ 20 years (sensitivity=0.74). The study conducted in Nepal showed 85% mother’s age between 20-34 estimated their child’s birth weight was average or normal^[13]; maternal age was significantly related to the incidence of LBW^[8].

Our study revealed that 75% literate mothers recognized actual LBW, which was slightly higher than 74% illiterate mothers recognized actual LBW. In other words, 93% literate mothers identified NBW against 89% illiterate mothers who recognized NBW. Studies in Nepal showed that awareness on LBW among women who completed secondary education; and who completed higher than it, was 15.0% and 18.8% respectively in Nepal^[22]; 86% mother’s having School Leaving Certificate and above estimated their child’s birth weight was average or normal^[13]. Literate mothers can read health messages and understand easily the advice given by health providers. The report shown that literate mothers visited health provider more for ANC check-ups as well¹³. The occurrence of LBW decreased with rising education level of the mother^[8,25]. So, the accuracy of perception of mothers is more among literate mothers than illiterate mothers. A study conducted in Cameroon found that concordant descriptions were associated with higher education ($P = 0.008$) and delivery in a health unit ($P = 0.025$)^[23]. Analysis of population-based data from 10 centers in Burma, Thailand, China and Vietnam, have also shown a strong associations with LBW were found with maternal education^[26].

The knowledge of mother on health increase as she delivers more. The study found that frequency of LBW infant is high at birth order 1 and 2⁹. Our study revealed that recognition of actual LBW was higher among multigravida mothers (sensitivity=0.77) than in primigravida mothers (sensitivity= 0.74).

Mother’s perception of birth weight as a proxy indicator: There is a strong debate on the use of mothers’ estimate of birth weight in developing countries where there is low formal measurement data. A possible solution to it is to use a proxy variable¹³; putting question on size of the infant at birth (i.e. low, normal or high). This approach is being used in DHS and Multiple Indicator Cluster Surveys. In these surveys, mothers are asked to classify the size of their newborn^[12].

In many countries, birth weight information is collected through applying retrospective surveys^[27] especially in DHS. Cambodia, Kazakhstan and Malawi the responses to this question using DHS surveys, were assessed to indicate the relationship between birth weight and mother’s perception¹². The

results indicated that mother's perception on size of newborn is a good proxy for birth weight¹². Other surveys such as Multiple Indicator Cluster Surveys, Pan Arab Project for Child Development and Reproductive Health Surveys, a question is asked to the mother regarding the size of her child at birth, which has been considered as a proxy indicator for birth weight¹¹. Further analysis of data from DHS India suggest that mother's perception about size at birth was reasonably reliable^[24].

As in other developing countries, still two-thirds of births (63%) take place at home in Nepal^[25]. Only 36% of children were weighed at birth as the majority of births do not take place in a health facility in Nepal¹³. Nepal DHS has been using verbal autopsy from mothers on their newborn baby's size; and birth weight was recorded in the questionnaire if available from either a written record or the mother's recall. Since birth weight may not be known for many babies, the mother's estimate of the baby's size at birth was also obtained and useful proxy for the weight of the child^[26].

Based on our study, 93% mothers recognized actual normal birth weight, and 75% mothers recognized actual LBW, and still 25 percent mothers could not recognize actual LBW. Hence, perceived birth weight could be used as proxy indicator when birth weight data are not available. We noticed that proxy indicator could be more reliable if mother were literate, aged 20 years. A study conducted in Cameroon indicated that recall of size, in Cameroonian women and in other low resource settings, should be used only in the absence of other sources of data^[27]. A further similar study among mothers who delivered in home with an intervention of birth measurement is recommended to cover broader area and to ensure accuracy of perceived birth weight.

CONCLUSION

An overall, 75% mothers recognized actual LBW, and still 25% mothers perceived normal were actual LBW babies, which is crucial from programmatic view. A percent of identifying actual LBW was slightly lower among mothers <20 years, illiterate and primigravid as compared to mothers 20 years, literate and multigravida. Mothers' perception on birth weight can be considered as proxy indicator for

birth weight of newborn as and when birth weight is not available.

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Conflict of Interest: Nil

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