

Comparison of Low Birth Weight Babies in Mothers Seeking Antenatal Care Services at a Tertiary Care Hospital and at Other Healthcare Facilities: A Cross-sectional Study

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ABSTRACT

Introduction: The high prevalence of Low Birth Weight (LBW) due to Preterm Birth (PTB) and Intrauterine Growth Restriction (IGUR) still persists a challenge in India. This happens due to poor and infrequent utilisation of Antenatal Care (ANC) service.

Aim: To assess the difference of PTB and LBW newborns in mothers, who availed ANC at a tertiary care hospital against those who availed ANC at other healthcare facility.

Materials and Methods: This cross-sectional study was conducted at Gynaecology Department in Sir Sundarlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India and 1858 mothers and their newborn were analysed. The data was obtained from the delivery register maintained at the Labour Room of the Department. The age of the mother, place where ANC services availed, birth weight of the newborn and the gestational age were recorded on a master chart. The newborn were considered LBW, if birth weight was <2500 gm, PTB if birth occurred <37 completed weeks of gestation and Intrauterine Growth Restriction (IUGR), if birth weight was below the expected weight at birth for the gestational age. The prevalence of PTB, LBW and mean with SD of LBW were obtained. The association of PTB and LBW with place of ANC services availed was judged using

Chi-square test. The 95% confidence interval of the prevalence was obtained by using logit transformation.

Results: Out of total 2420 deliveries, 1858 mothers and their newborn were analysed. The mean age of mothers was 26.4±4.3 years. Half (50.1%) of the mothers had taken ANC at SS Hospital and the rest at other healthcare facilities. The prevalence of LBW and PTB babies were 29.2% (95% CI: 27.1-31.3) and 28.8% (95% CI: 26.7-30.9), respectively. Overall, both PTB and LBW were found to be significantly associated with the place of ANC services. Prevalence of LBW born in mothers who received ANC at tertiary care hospital was 19.4%; while it was 39.0% in those receiving at other healthcare facilities. The prevalence of PTB and LBW was more than 1.6 times and twice in those taken ANC at other healthcare facilities than those at TCH irrespective of gestational age. Among the PTB, the LBW were 42.2% in mothers receiving ANC at the Tertiary Care Centre (TCH) against 65.6% in those receiving at other healthcare facilities. Among the full-term deliveries also, the LBW born were 13.1% in mothers receiving ANC at tertiary care as against 24.3% in those receiving at other healthcare facilities.

Conclusion: The mothers seeking ANC services at other healthcare facilities need education about the advantage of ANC by the service providers, for timely and better adherence to ANC.

Keywords: Gestational age, Preterm birth, Prevalence, Underweight

INTRODUCTION

The birth weight of a new born below 2500 gm is called Low Birth Weight (LBW) baby irrespective of gestational age [1]. Low birth weight is the result of either PTB or Intrauterine Growth Restriction (IUGR). A study cited that the LBW born neonates are at 20 times higher risk of death than those with normal birth weight [2]. These LBW children, in the long term suffer due from neurologic disabilities, impaired language development, and have increased risk of chronic diseases including cardiovascular disease and diabetes [3-7].

Globally, LBW is one of the leading causes of all the deaths under five years and considered as the valuable public health indicator of maternal health, nutrition, healthcare delivery, and poverty [8-10]. It is demonstrated that reducing the burden of LBW is of much importance to save the cost on healthcare system and the household as well [11]. Across the world, each year estimated preterm deliveries are 15 million and India with 3.5 million preterm babies is on the top [12,13]. In India, way back in 1999, nearly 30% (7.5 million) born were LBW that accounted for more than two-fifth (42%) of the global burden of which 60% were term but with growth restriction and 40% were preterm [13,14]. India, in 2013, reported nearly 0.75 million neonatal deaths and among these about half were either LBW or premature birth [15].

Thus, reduction in incidence of PTB and LBW is important to reduce its consequential effect of higher risk of childhood death, especially during neonatal period and poor physical and mental growth and the risk of chronic disease like diabetes and cardiovascular disease as well. Many analytical studies had identified socio-demographic, maternal, obstetrics and disease related conditions being the associated factors of PTB and LBW. Within the existing socio-economic condition and health infrastructure, the role of ANC services is well documented in reducing the overall prevalence of LBW babies [16-19].

The quality ANC services with continuous monitoring by health professional are an important issue to bring maximal reduction in PTB, and IGUR and consequently LBW. The aim of the present study was to compare the extent of preterm and underweight born babies to mothers availing ANC services at a Tertiary Care Hospital (TCH) and at other healthcare facility and further, to compare the trend of LBW babies with the gestational age between these two group of mothers.

MATERIALS AND METHODS

This cross-sectional study was conducted on newborn from January 2018 to December 2018, in the Gynaecology Department of Sir Sundarlal Hospital, Institute of Medical Sciences, Banaras Hindu University (BHU), Varanasi, Uttar Pradesh, India. The study

was approved by the Ethical Committee of the Institute of Medical Sciences, BHU, Varanasi (Letter number: No. Dean/2019/EC/1519 Dated 25.09.2019). The data was obtained from the delivery register maintained at the Labour Room of the Department on born to mothers during January 2018 to December 2018. The data on age of the mother, the place of ANC services availed birth weight of babies and the gestational age were recorded.

Inclusion criteria: The mothers giving singleton birth on or after 28 weeks to 41 weeks of gestation were included in the study.

Exclusion criteria: Mothers giving birth to twin babies, births before 28 weeks and after 41 weeks of gestation and extremely LBW i.e., <1000 gm irrespective of gestational age were excluded. Also, mothers missing for the records for either age, birth weight or gestational age or the place of ANC services were also excluded.

Sample size estimation: The sample size for the estimation of prevalence was decided using the prevalence rate of LBW as 26% from a randomly selected one month birth weight recorded data January 2018 to December 2018. The sample size was determined using the following formula:

$$n = \frac{Z_{\alpha/2}^2 pq}{d^2}$$

Where, 'p' is the prevalence rate of LBW=26%; 'q' is the prevalence rate of normal birth weight i.e., (100-p)=74%, d is the anticipated difference in the estimate=2% and $Z_{\alpha/2}$ =1.96 is the two tailed abscissa of normal distribution at 5%. Thus, the minimum sample size computed was 1848 mothers and their newborn. Following the inclusion and exclusion criteria, since the eligible mothers were 1858; hence all of them were considered in the study.

Out of 2420 deliveries, 1858 mothers and their newborn were eligible (after excluding 95 twin babies, 46 born before 28 weeks and after 41 weeks, five extremely LBW i.e., <1000 gm irrespective of gestational and 416 incomplete records).

Before performing the analysis, the weight and gestational age were categorised as LBW and PTB born babies following the World Health Organisation (WHO) recommendation [1].

- The newborn were LBW, if birth weight was <2500 gm and normal, if birth weight was ≥2500 gm.
- The PTB, if delivered at <37 completed weeks of gestation and full term, if delivered at ≥37 completed weeks of gestation.

STATISTICAL ANALYSIS

The prevalence of PTB and LBW along with their 95% Confidence Intervals (CIs) was computed using the logit transformation [15] and presented in percentage. The association of prevalence of PTB with place of ANC services as well as prevalence of LBW with place of ANC services separately for pre-term and preterm deliveries were judged using χ^2 test. Further, the mean birth weight and prevalence of LBW along with 95% CIs at various gestational ages were also

computed to assess the trend in birth weight and prevalence of LBW. The statistical computation was performed using Statistical Package for the Social Sciences (SPSS) version 19.0 [20] and statistical significance was judged at $\alpha=0.05$.

RESULTS

Out of total 2420 deliveries, 1858 mothers and their newborn were analysed. The mean age of mothers was 26.4±4.3 years and mean parity was 1.8±0.9. The mean gestational age and birth weight of the new born were 37.2±2.6 weeks and 2681.4±589.9 gm, respectively. As indicated in [Table/Fig-1], the prevalence of preterm deliveries was significantly associated with the place of ANC services availed. It was much lower among mothers who received ANC services at TCH (21.9%; 95% CI: 16.8-28.1) compared to those who received at other healthcare facilities (35.7%; 95% CI: 30.7-41.0). The prevalence of LBW and PTB babies were 29.2% (95% CI: 27.1-31.3) and 28.8% (95% CI: 26.7-30.9), respectively.

Gestational age	At Tertiary Care Hospital (TCH)		At any other healthcare facilities	
	n	%	n	%
Preterm	204	21.9 (16.8- 28.1)	331	35.7 (30.7-41.0)
Full-term	727	78.1(74.9-81.0)	596	64.3 (60.4 -68.0)
Chi-square, Degree of freedom, p-value	43.11, 1, p-value <0.001			

[Table/Fig-1]: Prevalence of preterm born babies according to place of ANC services availed. Figures in parenthesis are 95% CI

Among the preterm deliveries, the prevalence of LBW babies was 42.2% in mothers who received ANC services at the TCH [Table/Fig-2]; while it was 65.6% in mothers who received ANC services at other healthcare facilities. Among the full-term deliveries also, the LBW babies were 13.1% in mothers who received ANC services at TCH, against 24.3% in those who received at other healthcare facilities.

Gestational age	At Tertiary Care Hospital (TCH)		At any other healthcare facilities		p-value
	n	% LBW	n	% LBW	
Preterm	204	42.2 (35.6-49.1)	331	65.6 (60.3-70.5)	<0.001
Full-term	727	13.1 (10.8-15.7)	596	24.3 (21.0-27.9)	<0.001
Total	931	19.4 (17.0-22.1)	927	39.0 (36.0-42.3)	<0.001

[Table/Fig-2]: Prevalence of LBW born babies in preterm and full-term deliveries of the mothers by their place of ANC services. Figures in parenthesis are 95% CI

The birth weight at any gestational age was always higher in mothers who had received ANC services at TCH [Table/Fig-3]. The difference of mean birth weight at each age of gestation except at or after 40 weeks was significant (p-value <0.05). The mean birth weight exceeding 2500 gm was at 35 weeks of gestation among the mothers who had received ANC services at TCH, while it was at

Gestational age (weeks)	At Tertiary Care Hospital (TCH)		At any other healthcare facilities		Difference of mean birth weight (gm)	t-value	p-value
	Number of born babies	Birth Weight Mean±SD (gm)	Number of born babies	Birth weight Mean±SD (gm)			
≤33	37	2135.5±952.5	138	1855.5±690.8	280.0	2.01	0.046
34	23	2395.4±380.4	47	2133.1±483.8	262.3	2.28	0.026
35	61	2543.3±542.8	64	2346.3±434.5	197.0	2.05	0.043
36	103	2657.2±374.2	82	2493.6±526.9	163.6	2.47	0.015
37	172	2733.5±418.8	173	2576.7±485.2	156.8	3.21	0.001
38	218	2891.9±442.6	138	2729.6±478.8	162.3	3.33	0.001
39	200	3005.1±450.2	131	2830.4±460.8	174.6	3.42	0.001
40	96	3023.2±424.6	94	2924.9±472.7	98.4	1.51	0.133
≥41	21	2967.9±443.7	60	2980.4±556.5	-12.6	0.09	0.926

[Table/Fig-3]: Trend of birth weight of born babies by gestational age and place of ANC services availed.

37 weeks in the other group. In the early age of gestation, the difference of mean birth of babies between the mothers who received ANC services at TCH and those received at other healthcare facilities was wider than those delivering at latter ages of gestation.

[Table/Fig-4] compares the proportion of LBW babies born beyond a specific gestational age between the two groups of mothers. Among those born at >33 weeks of gestation, the proportion of LBW was 17.3% in mothers who received ANC services at TCH, while it was 31.9% for the other. In both the groups, the proportion of LBW decreased as the gestational age increased, but the proportion of LBW was more than half among the mothers who had received ANC services at TCH.

Gestational age (Weeks)	At Tertiary Care Hospital (TCH)		At any other healthcare facilities	
	No. of births	LBW prevalence, (95% CI)	No. of births	LBW prevalence, (95% CI)
>33	894	17.3 (15.0-19.9)	789	31.9 (28.7-35.2)
>34	871	16.3 (14.0-18.9)	742	29.8 (26.6-33.2)
>35	810	15.2 (12.9-17.8)	678	27.1 (23.9-30.6)
>36	707	13.1 (10.8-15.8)	596	24.3 (21.0-27.9)
>37	535	10.3 (8.0-13.1)	423	18.4 (15.0-22.4)
>38	317	8.8 (6.1-12.5)	285	15.8 (12.0-20.5)
>39	117	6.0 (2.9-12.0)	154	16.2 (11.2-22.9)
>40	21	9.5 (2.4-31.1)	60	18.3 (10.4-30.1)

[Table/Fig-4]: Trend of prevalence of LBW born babies by the gestational age and place of ANC services availed. Figures in parenthesis are 95% CI

DISCUSSION

Birth weight is a valuable public health indicator of maternal health, nutrition, healthcare delivery, and poverty [8-10]. As reported in 2013, LBW babies at higher risk of death during neonate period [15]. India with its infrastructural network of subcenters, primary healthcare centres, community healthcare centres, district hospitals, state medical college hospitals, and other hospitals in the public and private sectors has observed commendable reduction in the prevalence of LBW born babies i.e., from 30% in 1999 [13] to 17.5% in 2015 [21]. Still ANC services are not up to the level of satisfaction. The proportion of women who had four or more ANC visits increased from 37% in 2006 to only 51% in 2016 [21]. Many Indian women do not go for early registration and do not complete the recommended four or more ANC visits which was higher in rural mothers than the urban or rural [22]. In fact, mothers lack the knowledge regarding the importance of early registration. Delayed registration may be due to a younger age of pregnancy, poor education, poor adherence to peripheral staff advices and may be distance from nearest healthcare facilities [23]. Under such conditions, reducing the prevalence of LBW is a challenging task indicating the need of focussed effort to reduce the burden of LBW and its consequential effects.

The peripheral health workers e.g., Accredited Social Health Activist (ASHA) and Angan Wadi Workers (AWW) are putting efforts on rural mothers to minimum of four antenatal check-up which include check-up of weight and blood pressure, abdominal examination, immunisation against tetanus, and iron and folic acid prophylaxis, as well as anaemia management [22]. Most of these mothers seek the ANC by the general physicians; while at TCH by the experts in the field of Gynaecology. Moreover, TCH have equipment and facilities for routine ANC check-ups. Usually, TCH are present in the city areas where mothers are literate and educated resulting to more attention towards the advices by the gynaecologists, while it is less among the mothers availing the services from other healthcare facilities.

Under the existing socio-demographic, maternal, obstetrics and disease related conditions; adequate and quality ANC services is the

best option in reducing the incidence of LBW babies [16-19]. Studies of Haryana and Karnataka had reported the beneficial effect of ANC check-up and consumption of iron tablets on birth weight [17,19]. The present analysis compared the prevalence of PTB and LBW between mothers who took ANC service at the TCH and those at other healthcare facilities under the assumption that TCH is expected to provide better ANC services and mothers adhere to the advices.

The overall prevalence of LBW was 29.2% which is almost similar to the reported prevalence 29.53% and 27%, respectively by the study conducted at tertiary care teaching hospital, Maharashtra [24] and rural PHC, Karnataka [25]. In others studies at tertiary care hospitals, large variation in prevalence of LBW between south and north had been reported (13.7% in south and 32.30% in north) [26,27]. In the present study, though the prevalence of LBW is in between other studies at tertiary care hospitals, but towards higher side and much higher than the prevalence at national figure in mothers who were able to recall the birth weight (18%) [21]. The present study indicated that prevalence of LBW was almost twice (39.0%) among mothers who had received ANC services at other healthcare facility compared to those who availed ANC at TCH (19.4%). This discrepancy in LBW is contributed by the high prevalence of PTB (35.7%) in mothers who had received ANC services at other healthcare facility and poor intrauterine growth even if had full-term delivery. A hospital-based study had also indicated preterm deliveries to contribute the highest to LBW compared to full-term deliveries [24]. This discrepancy in LBW is also substantiated as the mean birth weight of those born at each age of gestation was always higher in mothers who availed ANC services at TCH. The gap in birth weight between the two groups of mothers was although found to decrease with increased gestation age but prevalence of LBW always remained almost double irrespective of gestational age. In babies born at >33 weeks of gestation, the proportion of LBW was 17.3% in mothers who availed ANC services at TCH, while it was 31.9% in the other. While babies born at >39 weeks of gestation, the proportion of LBW was much less, only 6.0% in mothers who availed ANC services at TCH that was more than twice (16.2%) in those who availed ANC services at other healthcare facilities, infact majority of the mothers who availed ANC services at other healthcare facilities are rural and lack in availing recommended ANC services. This fact is evidenced in one of the studies on newborn babies at a tertiary care hospital in north-east that showed a significant association of LBW with ANC visit and with 26% overall prevalence of LBW and about 80% mothers were of rural areas [28].

Limitation(s)

In the present study, authors provided results for the other healthcare facilities on the data extracted from the delivery register which was maintained in the labour room of the Department of Obstetrics and Gynaecology. Since the data of other healthcare facilities includes few referred cases; so, there is possibility of presence of referral bias. Detailed clinical and socio-demographic variables were not available of the mothers. Thus, it was difficult to compare socio-economic and demographic characteristics and the underlying medical conditions that are likely to influence the LBW of babies.

CONCLUSION(S)

The present study indicated 1.6 times higher prevalence of PTB among mothers who availed ANC services at other healthcare facilities than those at TCH that resulted to a higher prevalence of LBW. Prevalence of LBW, even in full-term deliveries, in mothers seeking ANC services at other healthcare facilities was much higher. This reveals that mothers who availed ANC services at other healthcare facilities either adhere poorly or missed with quality ANC services. This may happen when mothers lack the knowledge of importance of ANC care. Hence, mothers need to be educated about the advantage of ANC by the healthcare professionals providing ANC service.

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