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Low Birth Weight Prevalence, Risk Factors, Outcomes in Primary Health Care Setting: A Cross-Sectional Study

Abstract

Background: Low birth weight (LBW) is defined by WHO as birth weight less than 2500 g. it is the single most important factor affecting neonatal mortality and morbidity. Furthermore, LBW babies are at an increased risk for serious health problems, ranging from neuro-developmental disabilities to respiratory disorders and cardiovascular disease at adulthood. Early comprehensive care for LBW infants in primary care setting is vital. Well-baby clinic offers a comprehensive and multidisciplinary care to children including LBW children. This study aims to determine the prevalence, risk factors and outcome of LBW infants registered in well-baby clinic at primary health care setting.

Methods: This is a Cross sectional retrospective epidemiological study has been conducted in accredited primary health care centers in Saudi Arabia. Target population is registered children in the Well-baby clinic of high risk category, born during 2014. Pre-term infants and infants with congenital anomalies were excluded. For data collection, a constructed data sheet for the variables included in the study adopted from the formal records of both: LBW infants and their mothers was used. Necessary permission to conduct the study obtained from research and ethical committee of the joint committee of family and community medicine. Confidentiality of information has been strictly adhered by assuring that no names or ID number will be recorded.

Results: Babies with birth weight less than 2500 gram were taken as cases. A total number of 124 (4.39%) were included, 55 (44.4%) of them were male babies and 69 (55.6%) were female babies. The mean maternal age was 28.82 years. 10 (8.1%) of LBW babies were delivered to mothers suffering from chronic illness (mainly diabetes and hypertension). 5 (4%) of LBW babies were born to smoker mothers. 76 (61.3%) of the LBW were born to anemic mothers. 9 (7.3%) of babies were born to mothers never had regular ANC follow-up. 28 (22.6%) of LBW babies were admitted to the NICU and 111 (89.5%) cases were improved after one-year follow-up in well-baby clinic.

Conclusion: The study findings suggest that four factors increase the incidence of LBW, namely smoking, anemia, mothers never had regular ANC and mother's chronic disease. It also leads to conclude that breast feeding and NICU admission are significant independent variables that have been assumed to affect the outcome of LBW during follow up at the well-baby clinic.

Research Article

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Introduction

"Children's health is tomorrow's wealth" is one of WHO's slogans of recent years. However, children's health is to a great extent determined by factors that operate *in utero*, well before they are born. At birth, fetal weight is accepted as a single parameter that is directly related to the health and nutrition of the mother and her newborn, and on the other hand, is an important determinant of the chances of the newborn to survive and experience healthy growth and development. This is because low birth weight has been shown to be directly related to both immediate, long-term and very long-term development and well-being [1-4].

Low birth weight (defined by WHO as birth weight less than 2500 g) is the single most important factor affecting neonatal mortality and a significant determinant of postnatal mortality [5]. Furthermore, LBW babies are at an increased risk for serious health problems, ranging from neuro-developmental disabilities such as cerebral palsy and mental retardation to respiratory disorders and cardiovascular disease at adulthood [6].

Fetal growth and birth weight are influenced by a variety of racial, social and economic factors, as well as specific medical conditions that may be present or develop during pregnancy [7]. Hence, it is not surprising that the mean birth weight shows a degree of variation from country to country and from area to area within the same country [8]. In the United States, 65% of all infant deaths result from LBW and preterm birth [5]. The importance of LBW is signified by the fact that the World Health Organization Fund has a development goal for reducing child mortality; this goal

includes developing methods to estimate the global percentage of LBW infants born per year. As expected, there is considerable variation in the percentage of infants with LBW among countries, yet there is a strong association between LBW percentages and infant mortality rates [6].

In brief, the rates of LBW incidence varies and in most Asian and African countries as high as 30%, followed by Latin America and Caribbean countries; the lowest rates of 3% in countries such as Norway and Northern Europe [9]. Early comprehensive care for LBW infants in primary care setting is vital because they have difficulty in eating, gaining weight and warding off infections. All LBW infants follow up in well baby clinic as a part of multidisciplinary care, where they and their mothers receive the appropriate support and education regarding the breast feeding, hygiene, vaccination, nutritional supplementation and other. Growth parameters and developmental milestones are monitored regularly and early referral to other subspecialists (ophthalmology, audiology, cardiac, surgery, genetics, etc.) is feasible as clinically indicated. To date, minimal research has been conducted to evaluate the prevalence and established risk factors associated with birth weight outcomes in primary health care (PHC) setting with significantly differing rates of LBW. For this reason, we searched the available literature about the prevalence and known risk factors associated with LBW in PHC of Saudi Arabia.

Risk factors associated with LBW

Smoking during pregnancy is among the leading preventable causes of adverse fetal outcomes such as LBW, small for gestational age, stillbirth, and sudden infant death syndrome [10]. Because only a minority of women of childbearing age manages to quit smoking when they become pregnant, smoking among young women is the primary determinant of the prevalence of smoking during pregnancy [11]. Anemia is a global public health problem affecting both developed and developing countries. The resulting effect of anemia on pregnancy outcomes includes increased risk of maternal mortality, infant mortality, and poor fetal growth resulting in LBW [12].

During Pregnancy Weight gain during pregnancy is a significant predictor of infant birth weight; furthermore, weight gain below recommended ranges correlates with increased infant mortality and LBW [13]. The efficacy of prenatal care to lower infant LBW and infant mortality is controversial, and some researchers believe that it is difficult to evaluate the association between quality of prenatal care and birth outcome [14]. Other factors affecting the pregnancy outcome such as the place of residence, the maternal age, parity, the education level, the socioeconomic level [15].

Rational

The researcher as a family physician appreciates the impact of low birth weight infants on the heath care facilities, and aims to focus on the prevalence and to correlate with possible risk factors. As observed the neonatal health is one of the measures of the health of a society and any decrease in the quality of their health status will lead to negative drawback on the community. The researcher hopes that utilizing the services that is offered in primary health care through the Well Baby Clinic as a tool, could improve the outcome and quality of life for these infants.

Objectives

To determine the prevalence of LBW infants seen in well-baby clinic at primary health care centers in 2014, to determine the outcome growth among this group at the age 12 months and to correlate the infant weight and possible risk factors.

Methods

This is a Cross sectional retrospective epidemiological study has been conducted in accredited primary health care centers in Saudi Arabia. Target population is registered children in the Well-baby clinic of high risk category, born during 2014. Pre-term baby and baby with congenital anomalies were excluded.

Constructed data sheet for the variables included in the study adopted from the formal records of well-baby clinic, including: infants weight, mode of delivery, type of feeding, events of neonatal period, presence or absence of co-morbid conditions, and the outcome after one year of age was used as a tool for data collection. Some additional data as: gestational age, maternal age, maternal health status, regular follow-up during pregnancy, maternal anemia and duration of pregnancy maternal smoking were extracted from mothers' medical records. Categorical data were summarized as number and percentages where continuous data were summarized as Mean, Standard deviation, median and Inter-quartile range. Comparison between groups for categorical variables were done using chi-square test or Fisher's exact test, where for continuous data student t-test or Mann Whitney u test were used. An association with P-value ≤ 0.05 was consider statistically significant. All the analysis was performed using SAS version 9.2 (SAS Institute, Inc., Cary, NC).

Necessary permission to conduct the study obtained from research and ethical committee of the joint committee of family and community medicine. Confidentiality of information has been strictly adhered by assuring that no names or ID number will be recorded. A pilot study applied on 15 files, in order to test the validity and reliability. These files have been chosen from the included primary health care centers for the study. Data has been collected from the patient's medical record.

Results

Babies with birth weight less than 2500 gram were taken as cases. A total number of 124 (4.39%) were included, 55 (44.4%) of them were male babies and 69 (55.6%) were female babies. The mean maternal age was 28.82 years. 5 (4%) of low birth weight babies were born to smoker mothers, while 119 (96%) were born to non-smoker mothers (Table 1). 4 (80%) of the LBW babies born to smoker mother had improved with well-baby care but it was statistically not significant P value is 0.478 (Table 2).

76 (61.3%) of the low birth weight babies were born to anemic mothers while 48 (38.7%) were born to mothers with normal hemoglobin values (Table 1). Among those born to anemic mothers 68 (89.47%) of LBW babies improved with well-baby care and 8(10.53%) did not improve, P value 0.985 which is not clinically significant (Table 2).

115 (92.7%) of babies were born to mothers who had regular antenatal care visits throughout the pregnancy and 9 (7.3%) of babies were born to mothers never had regular ANC follow-up

(Table 1). Among those who were born to mothers with regular ANC 105 (91.3%) were improved and 10 (8.7%) showed no improvement, P value 0.02 which is clinically significant (Table 2). 28 (22.6%) of LBW babies were admitted to the NICU, 96 (77.4%) were not admitted in NICU (Table 1). 22 (78.57%) of the admitted group showed improvement and 6 (21.43%) did not improve, P value is 0.032 which is clinically significant (Table 2).

10 (8.1%) were delivered to mothers suffering from chronic illness (mainly diabetes and hypertension) and 114 (91.9%) delivered to healthy mothers (Table 1). 7 (70%) of LBW babies who were born to mothers with chronic illness improved while 3 (30%) did not improve, P value is 0.036 which is clinically significant (Table 2).

The data shows that four factors increase the incidence of LBW, namely smoking, anemia, mothers never had regular ANC and mothers' chronic disease. Regarding the variables affect the outcome of LBW during follow up at WBC, Table 2 shows 111 (89.5%) were improved and 13 (10.5%) were not improved. Breast feeding and its influence on the main outcome of the LBW babies Table 3 shows among the improved group 78(70.27%) of them were breast fed and 33(29.73%) did not receive breast feeding. Among the non-improved group 3 (25%) were breast fed while 9 (75%) were mot breast fed. P value is 0.003 showing statistically significant difference between both groups.

For NICU admission Table 4 shows that among the improved group 22 (19.82%) were admitted in the NICU and 89 (80.18%) were not admitted to NICU. While among non-improved group, 5 (41.67%) were admitted to NICU and 7 (58.33%) were not admitted. p value is 0.04 which is clinically significant.

Table 1: Demographic characteristics and Risk factors associated with low birth weight (LBW).

Variable	Level	N = 124	%
Gender	Male baby	55	44.4
	Female baby	69	55.6
Smoking	Smoker	5	4
	Non-Smoker	119	96
Anaemia	Yes	76	61.3
	No	48	38.7
ANC	Yes	115	92.7
	No	9	7.3
NICU Admission	Yes	28	22.6
	No	96	77.4
Breast Feeding	Yes	81	65.3
	No	43	34.7
Mother have Chronic Disease	Yes	10	8.1
	No	114	91.9
Maternal Age	Mean	28.82	-
	Minimum	16	-
	Maximum	46	-

Table 2: Improvement of babies with Low birth weight.

Covariate	Statistics	Level	Main Outcome		*P*-value
			Improved N=111	Non-Improved N=13	
Gender	N (Row %)	Male baby	49 (89.09)	6 (10.91)	0.89
	N (Row %)	Female baby	62 (89.86)	7(10.13)	0.56
Smoking	N (Row %)	Smoker	4 (80)	1 (20)	0.478
Anaemia	N (Row %)	Yes	68 (89.47)	8 (10.53)	0.985
ANC	N (Row %)	Yes	105 (91.3)	10 (8.7)	0.02
NICU Admission	N (Row %)	Yes	22 (78.57)	6 (21.43)	0.032
Breast Feeding	N (Row %)	Yes	78 (96.3)	3 (3.7)	<.001
Mother have Chronic Disease	N (Row %)	Yes	7 (70)	3 (30)	0.036

Table 3: Comparison between the Main Outcome and Breast feeding.

Covariate	Statistics	Level	Breast Feeding		*P*-value
			Yes N=81	No N=43	
Main Outcome	N (Row %)	Improved	78 (70.27)	33 (29.73)	<.001
	N (Row %)	Non-Improved	3 (23.08)	10 (76.92)	

Table 4: Comparison between the Main Outcome and NICU admission.

Covariate	Statistics	Level	NICU Admission		*P*-value
			Yes N=28	No N=96	
Main Outcome	N (Row %)	Improved	22 (19.82)	89 (80.18)	0.032
	N (Row %)	Non-Improved	6 (46.15)	7 (53.85)	

Discussion

The prevalence and improvement of LBW children reflects the population health, and it is a good tool to gauge the quality of health care facilities. This study reveals that the prevalence of LBW children was 4.39% which is less than what was observed in other hospital based studies that were conducted in Saudi Arabia, developing world or the developed world. The prevalence in this study is almost half the prevalence in Taif city. This difference might be explained by the difference in the population settings. Most of the previous studies were conducted in the hospital and this study was conducted in primary health care setting (PHC) based on the medical records of the registered children. Subsequently, the number of population is dependent on registration and the preference of the patient and\ or family to follow in PHC or other health care facilities as governmental and private hospitals. Other factors leading to the difference in the prevalence could be possibly related to limited health care facilities in some other areas. Other reasons may include methodological issues (exclusion criteria: preterm and children born with congenital anomalies) in the current study.

LBW is associated with many factors such as smoking, maternal anemia and chronic diseases etc. In this study, 4% of LBW children included in this study were born to smoker mothers, and the improvement was 80% among them which was insignificant. In contrast to other studies that were conducted in Ohio, other studies in United States, Zahedan, Mahoning County and Tanzania which are strongly suggesting that smoking is a major risk factor in LBW development (up to 20% of LBW among smoker mothers) and subsequent adverse events. The difference in results between this study and other studies is explained by small number of smoker mothers included in this study and subsequently small event rate.

Considering that being born to anemic mothers is a major risk factor for LBW, this study provided the fact that 61.3% of all LBW children included were born to anemic mothers (cut off points 12 g\dl at first and third trimesters and 11 g\dl in second trimester) and the improvement among them was 89.47% which was not statistically significant. This result is in accordance to the result of Taif study that showed no significant association between LBW and maternal anemia. In contrast to other studies that were conducted in Nepal, Iran, Nigeria and Tanzania directly related maternal anemia as a major risk factor to the development of LBW, also concluded that maternal iron supplementation during ANC is a positive factor that prevents the occurrence of LBW. This difference in results is explained by that some studies related maternal anemia to increase the incidence of preterm (which is a major risk factor to LBW) and the fact that preterm children were excluded from this study. There is other possible contributing factor to this difference which is that the previous studies were conducted in poor countries where low socio-economic status and underweight is more common than in Saudi Arabia where the current study was conducted as in Lechtig A, Yarbrough C study and Santiago Chile study. At last, the presence of regular ANC visits would explain that difference as well. Giving the fact that in the current study the significant improvement rate among LBW children that were born to mothers that regularly attend ANC visits was 91.3%. This most probably assures better maternal dietary education, iron supplementation and early detection and treatment of anemia and other diseases.

One of the most important risk factors increasing the incidence and prevalence of LBW is maternal chronic illness (in this study mainly diabetes and hypertension). In this study, 10% of LBW children were born to mothers who suffered of diabetes, hypertension or both. The maternal chronic illness also affected he improvement rate which was 70%. This result was in accordance to the study results that was conducted in Tanzania but not with results of study conducted in Taif city which showed no significant association between LBW and maternal hypertension. This study also emphasized on the effect of some factors as postpartum NICU

admission and breast feeding. Regarding NICU admission, this study provided that 22.6% of LBW children were admitted in the NICU and 77.4% were not admitted to NICU, among the group that was admitted the improvement rate was 78.57% which is statistically significant. This may make us assume that improved medical care in NICU would result in good improvement to children admitted there.

There are a lot of efforts and project offered by the Saudi ministry of health and primary health care in particular to emphasize on the role and importance of breast feeding as single most important tool to improve pregnancy outcome and infant's growth and development in general and to improve the outcome state of LBW children in particular. This study is showing significant improvement among LBW children who received breast feeding over those who did not receive breast feeding, 25% of the non-improved group were breast fed while 75% were not breast fed. This result strengthens the claim of heath care professionals for exclusive breast feeding as an important positive factor for the children well-being.

This study had a number of important limitations and advantages. Of the limitations, the lack of information and association regarding other risk factors such as maternal education, maternal weigh gain and socioeconomic stat. Also small sample size may not develop a valid conclusion. Information was collected from maternal and children medical records which can help to reduce information bias.

Conclusion

The study findings suggest that four factors increase the incidence of LBW, namely smoking, anemia, mothers never had regular ANC and mother's chronic disease. It also leads to conclude that breast feeding and NICU admission are significant independent variables that have been assumed to affect the outcome of LBW during follow up at the well-baby clinic. These results provide clinicians and mothers with important information which will be considered during caring and counseling pregnant women with risk factors for LBW, also mothers with LBW infants to prevent adverse per-natal morbidity and mortality.

Recommendations

Based on the findings of this study the following recommendations are forwarded

a) Attendants of ANC should receive disease specific counselling by skilled health personnel with emphasis given to mothers with chronic medical illnesses.

b) Topics that should be focused upon are the importance of balanced diet and iron supplementations.

c) Heightened awareness and support should be created emphasizing the importance of breast feeding.

d) To conduct more comprehensive studies to assess maternal education, occupation and weight gain.

e) Strict no smoking policy and raising the population awareness against smoking.

f) Probably recommend to adjust the Well baby medical records to be more holistic and focusing on risk factors affecting the children's well-being.

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