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Socio-Demographic Determinants of Birth Weight Status of Babies Born at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kenya

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ABSTRACT

Background: Low birth weight (LBW) is a serious public health problem, especially in developing countries. Globally, 15.5% of all births are born LBW and 95.6% of them in developing countries. In Kenya, 8% of babies are born LBW and at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) it is 11.1%. Despite several efforts such as antenatal care services put in place to improve the quality of maternal and child health, the rates of LBW are still high. LBW is a major cause of mortality and morbidity in infants.
Objective: The objective of this study was to assess socio-demographic determinants of birth weight status of babies born at JOOTRH, Kenya.
Materials and Methods: This was a cross-sectional study with a sample size of 131 babies plus their mothers, from a total population of 538 deliveries during the study period. Systematic random sampling was used to select the respondents. Data was collected using questionnaire and anthropometric assessment form. Data analysis was done using descriptive statistics and inferential statistics specifically logistic regression.
Result: The study results showed that prevalence of LBW was 13.7%. LBW was strongly associated with mothers employment status (AOR=4.769) and residence (COR=3.502). Mother's age, level of education, marital status, and average family monthly income had no association with LBW.
Conclusion: The prevalence of LBW 13.7%, higher than national rates 8% and statistically significant with a Z score of 2.398, p=0.016. Mothers employment status and residence influenced occurrence of LBW. Improving employment status and public education targeting mothers living in rural is important in reducing LBW. Cost-effective interventions and programes may help improve maternal and child health and also reduce economic cost related to management of morbidities associated with LBW.
KEY WORDS: Baby, Birth weight, Low birth weight, Prevalence, Socio-demographic

INTRODUCTION

Birth weight is classified as the first weight of the newborn obtained after birth and it should be measured within the first hour after delivery of a newborn at least before significant weight loss has occurred. World Health Organization (WHO) has defined low birth weight (LBW) as the weight of a newborn at birth less than 2,500 grams or (2.5kg) regardless of gestational age [1]. This is based on epidemiological observations by the United Nations Children's Fund (UNICEF)/WHO that infants weighing less than 2,500 g are at greater risk of dying than babies born with normal birth weight [2]. LBW can further be subdivided into very low birth weight {< 1,500 g} and extremely low birth weight {< 1,000 g} [2].
A variety of factors influence intrauterine fetal growth and they can be grouped into several categories which include factors originating from the fetus itself, maternal factors and placental factors or can also be due to the interaction of all these factors [3]. LBW results from either preterm birth that is birth before 37 weeks of gestation or intrauterine growth restriction [4] which mostly occurs due to interference with placental circulation resulting to alteration of the mother-placenta-fetus interchange and therefore causing intrauterine malnutrition [3]. Socio-demographic factors like age at pregnancy is significantly associated with LBW [5].
Birth weight is an important indicator of a child's growth, vulnerability to illnesses and chances for survival, thus children born with LBW have an impaired growth resulting to increased morbidity and higher mortality rate [6]. Those who survive are faced with the challenge of inhibited growth, cognitive development, and chronic diseases later in life [7]. Babies born with LBW are at a higher risk of developing diseases such as cerebral palsy, visual problems, learning disabilities and respiratory problems [8]. Such babies remain a burden on government economy in developed countries and a permanent problem for their families in developing countries [9]. Neonatal intensive care after delivery, long-term health complications and lost economic productivity later in life lead to increased economic costs associated with preterm birth [10]. Most of the babies born with LBW die during their first year of life [11]. A systematic analysis done in 2008 by Black *et al.,* found that neonatal mortality accounts for 41% of all deaths among children less than five years [12]. About 50% of all neonatal deaths occur due to LBW. It is estimated that 4 million babies die every year in the first 4 weeks of life [4]. Three-quarters of these neonatal deaths happen in the first week and the highest risk of death is on the first day of life [13]. According to 2014

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Kenya Demographic and Health Survey (KDHS), the data for mortality estimation showed that the national under-five mortality was 52 deaths per 1,000 live births while Nyanza it was 72 deaths per 1,000 live births thus a child born in the Nyanza Region was at greater risk of dying before age five. The neonatal mortality rate was 22 deaths per 1,000 live births [14]. Globally more than 20 million infants are born with LBW, representing 15.5% of all births and 95.6% of them in developing countries, out of which 22% in developing countries are born in Africa. The estimation further indicated that in sub-Saharan Africa, around 15% of babies are born LBW [13]. According to Kenya Demographic and Health Survey 2014, 8% of babies are born low birth weight in Kenya while in Nyanza Region the prevalence of LBW is 4% [14]. The current data at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) show that 11.1% of babies are born with LBW [15]. This prevalence rate of LBW at JOOTRH which a referral hospital in the Western Kenya Region is higher than the national rate, but there is limited data available on the factors influencing LBW. Therefore, this study assessed the Socio-demographic determinants of birth weight status of babies born at JOOTRH).

MATERIALS AND METHODS

Study design

This cross-sectional study was conducted at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH), the major referral hospital in Western Kenya Region. It is located in Kisumu City, Kenya between Kondele and Kibuye along Kisumu-Kakamega highway. The coordinates for the hospital are 0°15'08.0"N-34°45'01.0"E.

Study population

The study population comprised babies delivered at the JOOTRH plus their mothers.

Inclusion Criteria and Exclusion Criteria

All mothers who had live birth at JOOTRH and were willing to consent were included in the study. Mothers who delivered babies with a congenital abnormality were excluded.

Sample Size Determination

The appropriate sample size was determined using the formula recommended Fisher *et al.* (1991), 11.1% prevalence of LBW babies at JOOTRH [15], correction for finite population was done and added 10% non-response rate giving a total sample size of 131.

Sampling Procedure

538 deliveries were conducted at JOOTRH during the study period and systematic random sampling was used to select the study respondents. The mother who had first live delivery on 7th November 2018 was the first respondent in the study, every 4th live delivery after the first delivery that occurred at JOOTRH during the period from 7th November – 6th December 2018 was included in the study until the desired sample size of 131 was achieved.

Data Collection Instruments

A Questionnaire and anthropometric measurement form were used to collect data. The questionnaire was prepared and pretested among ten conveniently selected mothers who delivered at JOOTRH to check for relevancy and detect any errors before being used in the main study.

The baby's weight was measured within one hour upon delivery using a digital beam balance (SECA Model 354). A sterile light paper was placed on the weighing scale to prevent baby's skin contact with the weighing scale then zeroing was done and a baby was placed on the weighing scale naked. Weight was recorded to the nearest 100g, a baby weighing less than 2500 grams was considered a low birth weight. To minimize errors in measurements, standardization of weighing scale was done by measuring a standard weight (1 kg) twice a day in the morning and in the evening and was zeroed before weighing.

Data on socio-demographic characteristics was collected by interviewing the mothers within 24 hours after delivery on a one-on-one basis.

Ethical approval was sought from Maseno University Ethics Review Committee (Ref No.-MSU/DRPI/MUERC/00569/18) and National Commission for Science, Technology, and Innovation (Ref No - NACOSTI/P/18/11529/26439).

Study variables

Socio-demographics comprised data and information on the age of the mother, marital status, education level, occupation, income, and residence. Age of the mother was defined as the number of completed years since birth and was determined using reported age, marital status as the mother's marriage status that is if in marriage or not, education level as highest-level assessment, occupation as nature of income generation, whether formal or informal, income as the total amount of money earned by the family per\ month and residence as a place where

the family lives either urban or rural. The information solicited was used to facilitate assessment of the characteristics of the mother that influenced knowledge and attitude during pregnancy thus influencing birth outcome.

Dependent variable comprised information on the birth outcome either normal birth weight or low birth weight. Normal birth weight was defined as birth weight ≥2500 g or (2.5kg) and low birth weight as birth weight <2500 g or (2.5kg). The information collected was used to determine birth weight status of babies born at JOOTRH.

Data analysis

Data analysis was done using descriptive statistics such as frequencies, mean and measures of dispersion were computed. Inferential statistics specifically binary logistic regression was done to determine if there was a significant association between LBW and socio-demographic characteristics of the mothers delivering at JOOTRH. Both the crude and adjusted odds ratio were computed based on the 95% level of significance, p-value equal to or less than 0.05 was considered significant. A Z score test was further conducted based on a 95% level of significance to determine whether the prevalence of the study sample differed significantly with the expected prevalence.

RESULTS

538 deliveries were conducted during the study period, a total of 131 babies plus their mothers were included in the study. The mean birth weight was 3111.8g (SD 56.7) with the lowest birth weight was 1085.00 g and highest 4800.00g. The results showed that 86.3% (113) of the babies were born with normal weight while 13.7% (18) were born LBW. The distribution of birth weight status is represented in Figure 1.

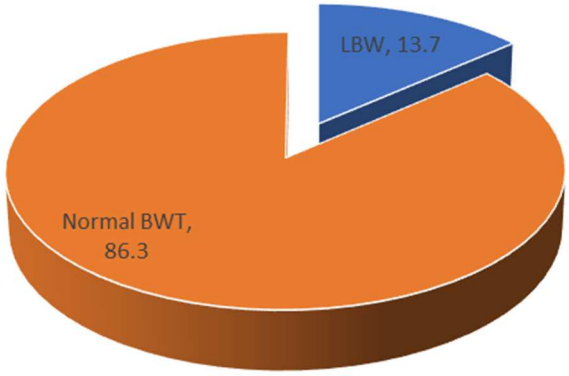

Figure 1: Distribution of Babies by Birth Weight

Further analysis using a Z score test was done to determine whether the prevalence of 13.7% differed significantly with the expected prevalence 8% national rate. The results showed that the prevalence was statistically significant with a Z score of 2.398, p=0.016 ($p \leq 0.05$).

The mean age of the respondents was 25.1 years (standard deviation {SD} 5.6), the youngest mother was 14 years and the oldest 38 years with 81.7% (107) of the mothers being aged between 20-34 years. Among the mothers 80.9% (106) were married, 48.9% (64) of the mothers had completed primary education, 25.2% (33) had completed secondary education and 23.7% (31) were of tertiary education. For those who were married, 35.8% (38) of the spouses had completed primary education, 34.9% (37) were of tertiary education while 29.3% (31) had secondary education. Among the mothers 45.8% (60) were unemployed. For the married mothers, 50% (53) of their spouses were employed. Among the single, unemployed mothers, 78.9% (15) depended on their parents. The mean average family income was 28,919.8 Kenya Shilling (SD 37840.6) and 34.4% (45) had a family income of >20,000 Kenya Shilling. Among the mothers, 64.9% (85) lived in the urban while 35.1% (36) lived in a rural setting. Birth weight status according to socio-demographic and economic characteristics of the mother is represented in Table 1.

Table 1: Distribution of Birth Weight Status by Socio-demographic Characteristics

Characteristic	Birth weight				Total	
	LBW (<2500g)		Normal Birth Weight (≥2500g)			
	n	%	n	%	n	%
Mother's age						
< 20	5	(3.8)	13	(9.9)	18	(13.7)
20-34	12	(9.2)	95	(72.5)	107	(81.7)
≥35	1	(0.8)	5	(3.8)	6	(4.6)
Marital status						
Single	6	(4.6)	17	(13.0)	23	(17.6)
Married	12	(9.2)	94	(71.8)	106	(80.9)
Widowed	0	(0)	2	(1.5)	2	(1.5)
Respondent level education						
No formal education	1	(0.8)	2	(1.5)	3	(2.3)
Primary education	10	(7.6)	54	(41.2)	64	(48.8)
Secondary education	4	(3.1)	29	(22.1)	33	(25.2)
Tertiary education	3	(2.3)	28	(21.4)	31	(23.7)
Spouse level education						
Primary education	7	(6.6)	31	(29.2)	38	(35.8)
Secondary education	3	(2.9)	28	(26.4)	31	(29.3)
Tertiary education	2	(1.9)	35	(33.0)	37	(34.9)
Respondent employment status						
Employed	3	(2.30)	22	(16.8)	25	(19.1)
Unemployed	14	(10.7)	46	(35.1)	60	(45.8)
Self-employed	1	(0.8)	44	(33.5)	45	(34.3)
Casual laborer	0	(0)	1	(0.8)	1	(0.8)
Spouse employment status						
Employed	8	(7.5)	45	(42.5)	53	(50)
Self-employed	3	(2.8)	40	(37.7)	43	(40.6)
Casual laborer	1	(0.9)	9	(8.5)	10	(9.4)
Unmarried, unemployed income source						
Parents	5	(26.3)	10	(52.6)	15	(78.9)
Others*	0	(0)	4	(21.1)	4	(21.1)
Family monthly income						
0-5000	3	(2.3)	8	(6.1)	11	(8.4)
5001-10000	6	(4.6)	23	(17.6)	29	(22.1)
10001-15000	3	(2.3)	21	(16.0)	24	(18.3)
15001-20000	2	(1.5)	20	(15.3)	22	(16.8)
> 20000	4	(3.1)	41	(31.3)	45	(34.4)
Residence						
Urban	7	(5.3)	78	(59.5)	85	(64.9)
Rural	11	(8.4)	35	(26.7)	46	(35.1)

Birth weight was dichotomized into normal birth weight (≥ 2500 g) and LBW (<2500 g). Binary logistic regression was done to determine the association between LBW and socio-demographic characteristics of the respondents. Crude odds ratio (COR) and adjusted odds ratio (AOR) were computed in binary logistic regression based on 95% level of significance to test for the strength of the association between socio-demographic determinants and low birth weight babies born at JOOTRH. Mothers employment status was significantly associated with LBW both in crude odds ratio and adjusted odds ratio (AOR 4.769) with Confidence Interval (C.I) of (1.163-19.564), this indicates that others who were unemployed had 4.769 times higher likely to deliver LBW compared to mothers who were employed $P<0.05$.The residence was significantly associated with LBW, this was only observed in crude odds ratio, (COR 3.502, C.I 1.253-9.791), this implies that mothers living in a rural setting were 3.502 times higher likely to get LBW compared to those living in urban areas $p< 0.05$. Other socio-demographic characteristics such as the age of the mother, mother's level of education, marital status, and average family monthly income had no significant association with LBW $p > 0.05$ as shown in Table 2.

Table 2: Maternal Socio-demographic and Economic Characteristics Associated with Low Birth Weight

Characteristic	Crude OR	(95% C.I)	Adjusted OR	(95% C.I)
Age of the mother				
< 20 years	3.045	(0.923-10.043)	1.270	(0.243-6.655)
20-34 years (ref)				
≥ 35 years	1.583	(0.17-10.043)	2.365	(0.17-32.862)
Marital status				
Married (ref)				
Single	2.765	(0.913-8.371)	1.194	(0.283-5.028)
Widowed	0.00		0.00	
Mothers level education				
No formal education	4.667	(0.32-68.032)	4.131	(0.099-172.423)
Primary education	1.728	(0.44-6.792)	1.194	(0.143-9.945)
Secondary education	1.287	(0.264-6.278)	1.032	(0.118-9.059)
Tertiary education (ref)				
Mothers employment status				
Employed (ref)				
Unemployed	5.098*	(1.578-16.472)	4.769*	(1.163-19.564)
Family monthly income				
0-5000	3.750	(0.7-20.089)	0.838	(0.96-7.288)
5001-10000	2.609	(0.666-10.217)	1.384	(0.239-8.016)
10001-15000	1.429	(0.292-6.987)	1.616	(0.22-11.888)
15001-20000	0.952	(0.161-5.634)	1.024	(0.136-7.714)
> 20000 (ref)				
Residence				
Urban (ref)				
Rural	3.502*	(1.253-9.791)	2.421	(0.769-7.615)

Key: OR – Odds Ratio, C.I – Confidence Interval, ref- reference category, *- *P* value ≤0.05

DISCUSSION

The results of this study showed that 86.3% of the babies were born with normal birth weight. The prevalence of low birth weight (LBW) was 13.7%. This finding of LBW prevalence 13.7% was higher than national prevalence 8% and thrice regional 4%, according to the Kenya Demographic Health Survey (KDHS) report of 2014 [15]. Further analysis using Z core test indicated that the prevalence 13.7% differed significantly with the expected prevalence 8% national rate by KDHS 2014, with a p=0.016 (P≤0.05). The variation may be due to the difference of sample sizes and also, the national and regional prevalence estimates are pooled while the study findings 13.7% was from a sample selected from a population of mothers delivering at JOOTRH. The finding almost agrees with the prevalence found in a cross-sectional analytic study conducted at the Olkalou Hospital in Kenya 12.3% and another study carried out in Tigray, Northern Ethiopia 14.6% [16-17]. The findings were slightly higher than the current data from the District Health Information System (DHIS) at JOOTRH 11.1% [15]. The reason for this variation may be due to the study findings being from a selected sample of mothers while data from DHIS was from monthly statistics of the whole population of mothers delivering at JOOTRH. The study results showed that mothers employment status was significantly associated with LBW both in crude odds ratio (COR) and adjusted odds ratio (AOR). Mothers who were unemployed were 4.769 times higher likely to deliver LBW compared to mothers who were employed. This was in agreement other studies conducted in a tertiary-care hospital, Shimoga, Karnataka and in six maternity main hospitals in Lithuania [11, 18]. The reason for this might be, a mother who is unemployed has more problems related to economic deprivation and social insecurity while employed mothers have higher income and they can feed themselves with good nutritional food to meet the increased nutritional needs during pregnancy [19,18]. The study showed that residence was significantly associated with LBW, although this association was only observed in the crude odds ratio. Mothers living in a rural setting were 3.502 times higher likely to deliver LBW compared to those living in urban areas. This finding agrees with a study done in Tigray, Northern Ethiopia and in Lithuania in six main maternity hospitals [17,18]. The reason for this might be due to inadequate access to health care services, health information and nutritional awareness for mothers living in rural areas as compared to urban areas. Another reason might be mothers in rural are faced with hardship due to low infrastructures, few job opportunities, and hard physical work. Mothers living in rural areas have deprived economic conditions, are likely to have inadequate nutrition and poor health over a long period of time and underpinned by poverty [2]. Some studies have indicated maternal age below 20 and in mothers above 35 years of age to be significantly associated with LBW [9,18]. but this study did not find maternal age to be significantly associated with LBW. The difference might have been due to the large sample size used in those studies. This study finding is consistent with similar studies conducted in Olkalou hospital in Kenya and in an urban slum community in Bhopal [16,20]. This study found that mothers < 20 years were 3.045 times more while those above >35 years were 1.583 more likely

to have LBW compared to mothers between age 20-34 years. The odds ratio changed after adjustment with mothers < 20 years were 1.270 times more while those above >35 years were 2.365 higher. This reason for this may be, a teenage mother is still growing thus they compete with growing fetus for nutrients thus leading to restricted fetal growth and as women advance in age they are associated with decreased potential for fetal growth due to biological aging of maternal tissues and increased risk of chronic diseases [21,22]. This study did not find significant association between mother's marital status and LBW, though single mothers were 1.194 times higher likely to get LBW compared to married mothers. This was contrary to a study done in Lithuania in six main maternity hospitals [18] that found single mothers significantly associated with LBW due to risk of depression, difficult life events during pregnancy and reduced economic support [23]. Mother's level of education was not found to be significantly associated with LBW, this agrees with a study conducted in Malawi [24]. Although mother's education level was not associated with LBW, the study findings showed that mothers who had no formal education were 4.131 times higher, primary education 1.194 times higher and secondary education 1.032 times higher to deliver LBW adjusted odds ratio compared to mothers who had tertiary education. Mothers with low education level are likely to live in poorer neighborhoods due to low income thus more vulnerable to adverse birth outcomes [25]. Education level influences mother's perception and thinking about different activities including health activities, maternal feeding practices during pregnancy and health care service seeking behaviors [7]. Family income was not significantly associated with LBW this was contrary to a study conducted in Lithuania in six main maternity hospitals that found low family income to be significantly associated with LBW [18]. This study showed that as the income decreased the chances of getting LBW increased. Compared to mothers who had income of > 20,000, mothers who had income of < 5,000 were 3.750 times higher, (5,001-10,000) 2.609 times higher and 10,001-15,000 were 1.429 times higher to have LBW (COR). Mothers with low income are likely to be shorter and thinner, consume fewer calories and other nutrients during pregnancy due to the decreased purchasing power of food [26].

CONCLUSION

This study explored socio-demographic determinants that influence birth weight status of babies born at JOOTRH, Kenya. Study showed that 86.3% of the babies at JOOTRH were born with normal birth weight. The prevalence of LBW was 13.7%, this was higher than the national 8% and regional 4% rate. Mothers employment status was significantly associated with LBW both in crude odds ratio and adjusted odds ratio. The residence was significantly associated with LBW in crude odds ratio, but the association did not hold in adjusted odds ratio. Other socio-demographic characteristics such as the age of the mother, mother's level of education, marital status, and average family monthly income had no significant association with LBW.

Focused antenatal care offered as a package of interventions could substantially reduce the incidence and complications related to LBW. A Multi-prong approach which include public education on awareness about how to carry a healthy pregnancy, improving the health of the mother before and during pregnancy targeting mothers living in rural areas who are faced with more challenges. Also, educate the mothers on how to start income generating activities to improve employment status.

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