Original Article

Prevalence and Factors Associated with Low-Birth-Weight in Kicukiro District, Rwanda

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Abstract

Background
Low birth weight (LBW) and neonatal deaths have continued to be a major global challenge. The global prevalence of LBW is 15.5 per cent, which amounts to about 30 million LBW infants born each year, 96.5 per cent of them are found in developing countries according to the World Health Organization. This study aimed to assess the prevalence and factors associated with LBW amongst children aged 0 to 15 months at immunization clinics brought by mothers at health centers in Kicukiro district, Kigali city, Rwanda.

Methods
A cross-sectional design, quantitative approach was used. Three hundred forty nine participants were chosen by a systematic sampling technique. A questionnaire using Open Data Kit (ODK) and SPSS version 21 were used for data collection and analysis respectively. Multivariable analysis was utilized to identify the factors associated with LBW for p-value <0.05.

Results
The LBW prevalence in Kicukiro District, Kigali was 23.8%. Adolescent mothers under 18 years (AOR=32.49, p=002), pre-delivery weight loss (AOR=2.18, p=018) and multiple babies (AOR=6.16, p=004) were significantly associated with LBW.

Conclusion
In conclusion, low birth weight is an important problem that needs to be addressed in Kicukiro district. Interventions would mainly focus on the key determinants of low birth weight relating to adolescent mothers under 18 years, pre-delivery weight loss and mothers with multiple babies.

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Key words: Children aged 0 to 15 months, Kicukiro District, Low birth weight, Prevalence, Rwanda

Introduction

Globally, The World Health Organization defines low birth weight (LBW) as a newborn having a weight of less than 2,500 g at birth; LBW contributes 60 per cent to 80 per cent of all neonatal deaths and infants who have low birth weight have been demonstrated to be at increased risk of neuro-developmental impairments, respiratory & gastrointestinal complications.[1] The global prevalence of LBW is 15.5 per cent, which amounts to about 30 million LBW infants born each year where 96.5 percent of them in developing countries according to the World Health Organization.[2] The majority of low-birthweight occurs in low- and middle-income countries and especially in the most vulnerable populations.[3] In sub-Saharan Africa, the prevalence of low birthweight is 13%; this is approximately, two times higher than the prevalence of LBW in the Organization for Economic Cooperation, Development (OECD) countries with about 6.6% of live births and 1.4 times higher than the prevalence of LBW in Latin America [3] which is at 9%. LBW is the result of either intrauterine growth restriction or premature birth and is documented to be the main cause of fetal/neonatal morbidity and mortality.[4]

In Ethiopia, the prevalence of LBW was 6.3% in Guinea to 16.1%.[5]. In Uganda, a country that boarders Rwanda and one of the countries of the east African Community Region, the prevalence of LBW was shown to be 4.3 % of birth cohort study in 12 districts across northern and southwestern Uganda. Factors associated with low birth weight that were found in the same study include multigravida, spacing (>24 months), food insecurity, residence (southeast), age (>20 years) and attended ≥4 antenatal care (ANC) visits.[6]

A study conducted in Gakoma District Hospital [7] has shown that prevalence of low-birthweight was12.8%, which is higher than the general prevalence in Rwanda.[8] In Rwanda, LBW is a significant public health issue and is the top leading cause of infant mortality where it was shown to be 7.3% and although variations of prevalence of LBW exist by district in Rwanda, specific district studies that focus on low birth weight in Rwanda are scarce.[8] LBW is more prevalent in mothers giving birth at the age of less 20 years and those smoking cigarette with 15.8% of LBW. [9] Previous studies in Rwanda on LBW focused only on rural districts while there were no studies found in big cities such as Kigali and specifically in Kicukiro district.

As there are limited documentations on factors contributing to low birth weight; this study assessed the prevalence and factors associated with low birthweight among children aged 0-15 months who obtained immunization services at health centers in Kicukiro district as one of Kigali city districts where low birth weight was reported high.

Methods

Study design

This was a cross sectional study design; Information were gathered on the following variables: socio-demographic characteristics of the mother; weight of the baby at birth as documented in immunization chart; responses of the mother to some selected lifestyle risk factors; obstetrics profile of the mother, and health system factors.

Study setting

The study was conducted in Kicukiro District in Kigali City, Rwanda. Kicukiro is one of the District in Kigali City. It has a total of 10 health centers. This study was conducted in all the health centers in the District.

Study Population and sample size

The target population was the 2,731 expectant mothers in the ten health centers of Kicukiro District according to its District Health Information System in 2021. To calculate the sample size, Fisher's formula (1998) was used. According to this formula, the sample size, n was obtained by:

$n=N/(1+N(e)^2)$

Where,
n = the desired sample size.
N = target population
e= margin of error
Substituting,
$n=(2,731)/(1+2,731 (e)^2)=348.89 \infty 349$

Therefore, the minimum sample size equal to 349 mothers who brought their babies for immunization services in Kicukiro district were selected to take part in the study.
The proportion and exact number to be interviewed for each of the 10 centers was obtained at using the proportional sampling; it was determined based on the number of immunization visits per health center in function of the desired sample.
Every consecutive mothers or caretakers of babies aged 0 to 15 months who were brought for immunization services at health centers of Kicukiro district during the period between March and April 2022 were selected for interviewed until the required number per health facility was arrived at.

Data collection instrument and procedure
A structured questionnaire was used to collect data. The questionnaire was divided into three sections: Socio-demographic characteristics of the mother/caretaker, obstetric factors and health system factors. The validity of questionnaire was determined by data from 20 mothers in two health centers (urban and semi-rural) – Biryogo and Jali of Nyarugenge and Gasabo Districts by calculating the Pearson's correlation coefficient. The interpretation of values was done after checking all items of the questionnaire one by one. The degree of freedom was 18 as the pilot sample was 20. The questionnaire was confirmed valid, as the obtained values in SPSS for all items of the questionnaire were greater than the critical value in Pearson r table. The critical value for N=18 was 0.444 and it was less than all values in Pearson r table. Therefore, the questionnaire was valid.

Data analysis
Data were entered into SPSS version 21. Descriptive statistics was used to determine the percentages and frequencies for socio-demographic characteristics and the prevalence of LBW. The binary analysis helped to identify the associations between independent variables and LBW through crude odds ratios and p-values <0.05. Variables with association at the binary analysis were transferred to multivariable analysis and factors were identified through adjusted odds ratios and p-values <0.05. Findings were presented as text, tables and figure in word document.

Ethical considerations
This study was reviewed and approved by Mount Kenya University Ethical Review Committee. (REF: MKU04/PGS&R/0611/2022). Kigali City provided permission to conduct this research in Kicukiro District (Ref. no18430/07.01.16/22). Informed consents were obtained from all study participants before starting interview and questionnaires were anonymous. The privacy and confidentiality for the study participants were ensured throughout and after the study. As study's benefit for participants. The questionnaires were not accessed by someone else other than researcher.

Results

Socio-demographic characteristics of respondents
A sample of 349 mothers participated in this study. The ages ranged from 17 to 45 years, with a mean age of 28(SD). Table 1 presents the socio-demographic characteristics of the participants. Majority of the women, 223(63.9%) were in the age range of 18 to 30 years. The majority 81.1%(n=283) reported that they were married; 2.6% (n=9) and 0.9%(n=3) reported that they were divorced and widow respectively. Slightly less than a half, 166(47.6%), reported that they completed primary school level of education; 162(46.4%) indicated that they have only completed secondary education.

Only 1.1 %, (n=4) reported not having any formal education. A total of with 130 (37.2%) participants reported that they were casual workers; 19.2 %(n=62) and 18.6 %(n=65) were engaged in business and agriculture respectively.

On livelihood side, only 4.9 %, (n=17) of the mothers reported that they were salaried while 20.1 %(n=70) of mothers reported not having any occupational status. The majority of mothers, (61.0%, n=213) , were in the Wealth Category 2; (26.9%,n=94) were in Category 3.

Table 1. Socio-demographic characteristics

Variables	Frequency	Percentage (%)
Age category		
<18	8	2.3
18-30	223	63.9
>30	118	33.8
Marital status		
Single	54	15.5
Married	283	81.1
Divorced	9	2.6
Widowed	3	.9
Mother's education		
No formal education	4	1.1
Primary	166	47.6
Secondary	162	46.4
Tertiary	17	4.9
Father's education		
No formal education	62	17.8
Primary	101	28.9
Secondary	149	42.7
Tertiary	37	10.6
Mother's occupation		
Salaried	17	4.9
Casual	130	37.2
Business/trading	67	19.2
Agriculture	65	18.6
No occupation	70	20.1
Father's occupation		
Salaried	76	21.8
Casual	96	27.5
Business/trading	48	13.8
Agriculture	36	10.3
No occupation	93	26.6
Ubudehe category		
Category 1	17	4.9
Category 2	213	61.0
Category 3	94	26.9
Unknown	25	7.2

The Prevalence of low birth weight among children who obtained immunization services at Kicukiro District health centers during March and April 2022.

Figure 1 presents the prevalence of low birth weight in Kicukiro District.

Of the total 349 children that were brought for immunization care, 23.8% (n=83) were found to have a weight at the time of birth which was less than 2,500g. The prevalence of low weight at birth among children aged 0 to 15 months was 23.8%.

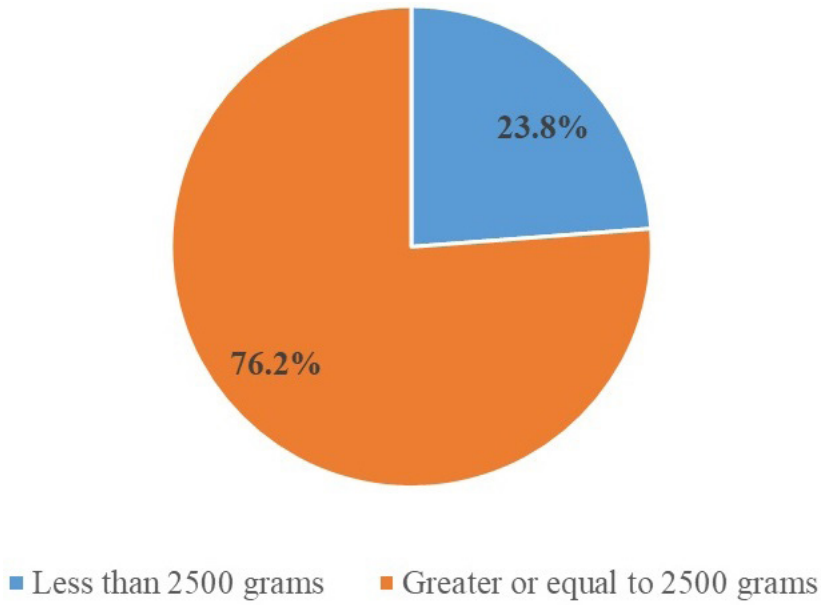

Figure 1. Prevalence of LBW among babies aged 0 to 15 months brought for Immunization care in Kicukiro District, Rwanda in 2022.

Factors Associated with low birth weight

Table 2 shows that women under 18 years old were 32.49 times more likely to deliver babies with low weight than women between 18-30 years old (AOR=32.49, 95%CI: 4.76-659.6, p=002). Low birth weight babies were 2.18 times more likely to be born to mothers who had experienced pre-delivery weight loss compared to those who did not lose weight (AOR=2.18, 95%CI: 1.14-4.17, p=018). In addition, Women who needed multiple babies were 6.16 times more likely to deliver under weight babies than those who had few babies (AOR=6.16, 95%CI: 1.79-22.02, p=004).

Table 2. Multivariable logistic regression analysis of factors associated with low birth weight in Kicukiro District of Rwanda, 2022

Variables	Low birth weight			
	Unadjusted OR(95%CI)	p value	Adjusted OR(95%CI)	p value
Age category				
<18	**19.64(2.32-166)**	**0.006**	**32.49 (4.76-659.6)**	**0.002**
>30 and above	0.709(0.420-1.19)	0.2	0.903 (0.460-1.81)	0.769
18-30	Ref		Ref	
Marital Status				
Divorced	2.400(.635-11.71)	0.224	286.. (0.000-0.000)	0.998
Married	0.740(.213-3.41)	0.66	128.. (0.000-0.000)	0.999
Single	Ref	.	Ref	.

Table2. Continued

Variables	Low birth weight			
	Unadjusted OR(95%CI)	p value	Adjusted OR(95%CI)	p value
Mather's education				
Primary	6.70(1.311-122.53)	0.069	921... (0.000-0.000)	0.998
Secondary	4.093(.790-75.15)	0.179	564... (0.000-0.000)	0.998
Tertiary	Ref		Ref	
Father's occupation				
Salaried	**0.268(.120-.560)**	**0.001**	0.339(.101-1.012)	0.062
Casual	**0.417(.216-.788)**	**0.008**	0.845(332-2.156)	0.723
Business/trading	.528(.236-1.124)	0.106	1.731 (.577-5.124)	0.321
Agriculture	**.198(.056-.551)**	**0.005**	.313 (0.077-.1.027)	0.073
Unemployment	Ref		Ref	
Customer centered care				
Good	1.77(1.010-3.24)	0.052	1.486 (.688-3. 3.25)	0.316
Poor	**32.84(8.14-222.30)**	**<0.001**	2137.. (0.000-0.000)	0.998
Very Good	Ref	.	Ref	.
Cost of service				
Yes	**2.09(1.20-3.60)**	**0.008**	.667 (0.284-1.483)	0.335
No	Ref	.	Ref	.
Client satisfaction				
Yes	**3.114(1.196-8.0)**	**0.018**	2.7 (.000-.000)	0.998
No	Ref		Ref	.
Eclampsia/Preeclampsia				
Yes	**3.234(1.35-7.68)**	**0.007**	2.546 (.896-7.070)	0.073
No	Ref		Ref	
Pre-delivery weight loss				
Yes	**2.296(2.296-3.83)**	**0.001**	**2.184 (1.14-4.17)**	**0.018**
No	Ref		Ref	
Drug/Alcohol use				
Yes	**1.750(1-3.01)**	**0.046**	1.572 (.759-3.203)	0.216
No	Ref		Ref	
Multiple babies				
Yes	3.473(1.31-9.20)	**0.011**	**6.162 (1.79-22.02)**	**0.004**
No	Ref		Ref	

Discussion

The main objective of the study was to assess the prevalence and factors associated with low birth weight amongst children aged 0-15 months who obtained immunization services at health centers in Kicukiro District, Rwanda during March, and April 2022. The findings show that the prevalence of LBW, assessed as weight at birth of less than 2,500 grams regardless of gestational age [2] amongst children aged 0-15 months who obtained immunization services at health centers in Kicukiro District, Rwanda during March, and April 2022 was 23,8%. The prevalence of 23.8% presented was about 4 times higher than that of the national prevalence which was 6%.[10]

The observed prevalence was 1.5 higher than the average global prevalence which is documented to be 15.5%.[2] Compared to other countries in Africa, this observed prevalence was comparatively high; 3.7 times higher than the prevalence of Guinea, which was 6.3%, and 1.4 times higher than the prevalence in Ethiopia, which was described to be 16.1%.[5] The findings of the prevalence of LBW in this study was also found to be 5.5 times higher than that of the findings of a study which was reported in a rural setting in Uganda which was 4.3%.[6] The prevalence of LBW found in this study (23.8%) was also higher compared to 12.8% found in Gakoma District Hospital.[7] The prevalence of LBW in Rwanda was 6%, about one-quarter of reported prevalence in Kicukiro District. LBW prevalence in Kicukiro district was surprisingly lower than the one of South Africa which is 28% and tremendously higher than the prevalence in both sub-Saharan Africa (13%) and Latin America (9%).[11]

The public health implication of this relatively high prevalence of low birth weight four times, higher than the national average, and most countries in the African region would suggest the need for further studies on the reasons of the high reference in the district. It would also suggest the need for public health efforts and aimed at addressing the root causes of low-weight some of which could be outside the realms of the medical risk factors.

The findings of this study that reveals that women aged <18 years were 32.49 times more likely to deliver a baby with low weight than women between 18-30 years old adds to the already documented association between early age of pregnancy and increased risks to the health of the baby and the mother. Strong strategies aimed at reducing early pregnancy would be important in reducing the burden and long-term effects of low birth weight. It adds this voice and provide local data that support the WHO report, which revealed that adolescent mothers (aged 10–19 years) face higher risks of low birth weight, preterm birth, and severe neonatal condition than women aged 20–24 years.

It is coherent and adds to already documented finding that babies born to mothers under age 20 are more likely to be of low birth weight than babies born to mothers age 20-34 or 35-49.[8] Although it differs from a study conducted in Ethipia which reported that babies born to mothers in the age group 35–44 years were 2.5 times more likely to counter a low-birth-weight outcome; and mothers in the age 45–54 years were significantly associated with adverse pregnancy outcome.[12] In USA, California, it was stipulated that woman 35–39 years of age were more likely, and women aged 40–54 years were twice as likely, to have an LBW baby compared with women aged 20–24 years.[13] Women aged less than 20 years and aged 40–54 years had a higher prevalence of LBW infants. The relationship between pregnancy before 18 years and LBW might be justified by the fact that low birth weight infants were the most common perinatal outcome of teenage pregnancies.[14]

The finding of this study that occupation of the mother was significantly associated with low birth weight is congruent with Desta et al who revealed mother's occupation was statistically associated with low birth weight (70.1% cases and 43.7% controls). This lack of association could be the result of the high number of Rwandans currently attending at least primary level education. As shown in this study, only 4(f=1.1%) mothers claimed not having attended school.

As for Obstetric, Medical and health system related factors, low birth weight babies were 2.18 times more likely to be born to mothers who experienced pre-delivery weight loss compared to those who did not lose weight. In addition, women who had multiple babies were 6.16 times more likely to deliver under weight babies compared to those who had few babies. The significant association between multiple babies was also found in the study conducted in South Korea on

Multiple Births and Low Birth weight. It was found out that 45.8% of the increase in LBWs over the period from 2000 to 2017 was due to the increase in multiples births. [15] The association between pre-delivery weight loss was also witnessed by the study conducted in 2 medical colleges and 1 civil hospital in India where Mumbare and his collaborates found out that maternal weight before delivery ≤ 55 kg was significantly associated with low birth weight.[16] Surprisingly, variables such as customer centered care, cost of health care services, client satisfaction to mothers were not significantly associated with low birth weight which could be due to livelihood activities in Rwandan that have been improved under government efforts. For example, among participants, only 13 % (n=17) ticked to be in Ubudehe category 1-lower level of income in Rwanda.

Limitation of the study

The findings of this study are subject to a few limitations. One, our findings were based on deliveries that were conducted in the hospital. The findings could be different from those cases of deliveries that took place outside the health facilities. Two, the socio-economic factors reported and assessed were based on self-reports from the participants. There was no way of ascertaining the extent to which they reflected really. Last, the findings of the one district (Kicukiro) cannot be generalized for the whole country as Rwanda is made of thirty districts.

Conclusion

Low birth weight is an important problem that needs to be addressed in Kicukiro district. Interventions would mainly focus on the key determinants of low birth weight including adolescents under 18 years, pre-delivery weight loss and mothers with multiple babies.

Conflict of interest

We declare that we have no conflict of interest.

Authors' contribution

JM designed the study, led the data collection, cleaned, analyzed and interpreted the data. JM and JO contributed to the conception, development of the manuscript and working on reviewers' comments until its publication.

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