ISSN: 2577 - 8005

Clinical Case Report

Medical & Clinical Research

Rate and risk factors of term low birth weight and small-for-gestational-age and planned behavior of breast feeding of lactating mother in rural maternity of lwiro in bukavu, eastern of the democratic republic of the congo

Kavira Malengera Celine[1,2,3], Augustin Murhabazi Bashombwa[4,5], Tsongo Kibendelwa[1], Théophile B.KABESHA[6]

[1]*Universite de Goma, Faculte de medecine et Sante Publique, Goma, DR Congo.*

[2]*Universite Evangelique en Afrique, Faculte de medecine et sante communautaire, Département de Sante Publique et family medecine, Bukavu, RD Congo.*

[3]*Departement de Nutrition, Centre de Recherches en Sciences Naturelles, Section Protection Maternelle et Infantile.*

[4]*Departement of Public Health, Faculty of Medicine and Pharmaceutical Sciences, University of Dschang, Cameroon.*

[5]*Universite de Kaziba Faculte de Medecine.*

[6]*Department of Ophthalmology, Faculty of Medicine, Universite officielle de Bukavu.*

***Corresponding Author**
Pr Théophile B.KABESHA Clinique ophtalmologique de Bukavu, Département d'ophtalmologie, Faculté de médecine, Université Officielle de Bukavu (UOB), République Démocratique du Congo. ORCID : 0003-0574-4271

Submitted:05 Nov 2022;**Accepted**: 10 Nov 2022;**Published**:14 Dec 2022

Citation: *Kavira Malengera Celine, Augustin Murhabazi Bashombwa, Tsongo Kibendelwa, Théophile B.KABESHA, (2022) Rate and risk factors of term Low Birth Weight and Small-for-Gestational-Age and Planned behavior of Breast Feeding of lactating mother in rural Maternity of Lwiro in Bukavu, Eastern of the Democratic Republic of the Congo. Medical & Clinical Research 7(12): 01-17.*

Abstract

Background: *There is paucity of information on cause of Small-for- Gestational Age (weight below the 10th percentile of a sex- and gestational age) (SGA). Beside, Low birth weight (birth weight less than 2500 g) and SGA have not been examined together in the region; while, both have a worst outcome at birth and late in life. Moreover studies regarding nutrition status of infants and mother in earlier post-partum are scarce in South-Kivu. However, the country is facing a double burden of malnutrition in both mother and infant. Furthermore, if breastfeeding initiation is well-timed, the rate of exclusive breastfeeding will increase and the mortality rate of less than five years infants may diminish.*

Methods: *We conducted a cross sectional study in rural area in Bukavu. One hundred forty three mother-infant pairs were randomly selected from February 2018 to October 2018. The data base was entered in Excel and analyzed by SPSS (Statistical Analysis Software) version 26.0. A WHO Anthropometrics measurement helped to calculate Z score. The descriptive statistic was performed to determine the prevalence of independents variables. In addition, a chi-square analysis was performed to establish the association between possible incriminate factors of LBW, SGA, and DIB (Initiation of Breastfeeding) as well, and a logistic regression was performed to determine the key factors of LBW and SGA.*

Results: *Findings showed that (8/143, 5.6%) and (7/143, 4.9%) of infant was weighted low at birth and Smaller for gestational age, respectively. Besides, almost the totality of lactating mothers (139/143, 97.2%) initiated their children in breastfeeding within the first hour of life. More than half (73.8%, 96/130) planned to exclusively breastfeed their children at 6 months. In fact, 14.3%, 20/140, of lactating mothers, planned of giving (foods or drinks or milk) besides breast milk. Of 143, 3(2.1%) mothers were malnourished in the first week after delivery. At birth and at baseline assessments, there was a mere prevalence of underweight (1/141, 2.1%; Vs 6/143, 4.2%), stunting (9/141, 6.5%; Vs 13/139, 9.5%) and wasted (12/142, 8.5%; Vs 12/140, 8.6%), as well.*

Unmarried women had a delay in initiation of breastfeeding (p=0.043). Mothers with vision problem at twilight during

pregnancy was 6.4 times more likely to deliver a LBW baby (OR: 6.400; 95% CI: 1.183-34.630; p<0.031) and mothers who ruled the HH was 20.789 times more likely to deliver a LBW baby (OR: 20.798; 95% CI: 2.144-201.741; p<0.009). Likewise, lactating mothers with vision problem at twilight during pregnancy was 5.333 times more likely to deliver a Small-for-gestational-age baby (OR: 5.333; 95% CI: 1.391-20.449; p<0.015). Also, the mother who was a head of household was 26.796 times more likely to deliver a SGA baby than the mother who was not the head (OR: 26.796; 95% CI: (2.531-283.717; p<0.006).

Conclusion: *A Vitamin A supplementation and an adequate food intake during pregnancy and in early post partum period may help to solve the matter.*

Keywords: Low Birth weight, Small-for-Gestational Age, Breastfeeding Initiation, nutrition status at birth, rural area

Introduction

It is believed that an optimal mother child health outcome constantly depends on mother health, adequate health care during pregnancy and earlier at birth [1]. Therefore, a strong focus in improving infant nutrition status within the period called window of opportunity is worthy. In addition, evidence has shown that infant growth and development depend on the intra uterine environment [2-4]. It is known that maternal underweight is associated with Small-for-Gestational-Age (SGA) [5]. It also has been documented that poor nutrient status and the style of living are strongly correlated with intrauterine growth retardation [3,4,6,7]. Besides the duration of gestation, poor nutrition status also correlates with preterm birth and therefore with low birth weight [5] and indirectly associated with infant illness and death [8].

Apart from these nutritional and health problems, the low prevalence of use of contraceptive methods among women in reproductive aged (15-49 ans) are the root of the poor nutrition of the mother and in consequence a poor development of infants. The prevalence of the contraceptive methods was 12.9% the last DHS. In addition, the use of contraceptive methods was lower in rural areas (15.4% versus 31.1%) in urban area [9].

World Health Organization (WHO) and the United Nation Children's Fund (UNICEF) defined the LBW as a weight less than 2500g at birth [10-12]. LBW includes premature baby delivered less than 37 weeks of gestation and SGA; or the outcome of both [13]. Small-for-Gestational-Age (SGA) newborns are those who are smaller in size than usual for his or her age and generally they are weighed less than 10th percentile for the gestational age [12]. New studies have demonstrated that a child SGA can reach the optimal size at thereabouts 9 months and it is estimated that around 80% of these children might reach the catch-up of growing as well [14]; they are at elevated risk of developing complications such as, hypoglycemia and asphyxia early after birth [8,15]. Infant mortality is caused by premature birth in high and middle income country [16] and according to Pusdekar et al (2020), the case is the same in the United Stated of America [17]. Infants who faced SGA age or weighted low at birth are in increase risk of brain palsy and others health related problems like deterioration of vision. It is predictable that those babies face the respiratory diseases such as asthma and chronically in the future [18]. The problem is that the figure is high in countries where the means of diagnosis are difficult due to lack of necessary instruments [17].

Worldwide, each year, approximately 20 million (around 15% of all live births) of children are born with LBW. Ninety five percent of them are found in developing countries (19). WHO estimates that 7% to 33% (17% on average) of children are LBW, respectively [20]. LBW is one of the most important incriminating factors of illness and death in infant in particular in Low-Middle Income Countries (LMICs) [13,21-23]. LBW child is twenty times likely to die than child with a weight more than normal [21]. Indeed, LBW is the world famous public health concern due to its brief- and prolonged damages (23) for instance early neonatal death [21], overweight, and chronic diseases for the rest of one's life [11,23].

After many continuous efforts done by the Republic Democratic of the Congo (DR Congo), government and international organizations, and non-governmental organizations and agencies as well, through the implementation of some programs and approaches such as the Programme National de Nutrution (PRONANUT), Reproductive Health Program and, UNICEF/WHO Program [24-26], the country adopted and implemented the safe mother-childhood strategies but did not achieve the target recommended by WHO [25]. The Demographic and Health Survey DHS conducted in 2013-2014 in the Democratic Republic of the Congo (DR Congo), revealed that the country is facing a double burden of malnutrition in both mother and infant [9]. On the other hand, the country is struggling with a double burden of both under-and overweight/ obesity in women in reproductive age [27]. On the infant's side, the government attempted to improve under-five mortality rate (U5MR) from 119 to 68 deaths per 1, 000 live births and neonatal mortality, from 42 to 28 deaths per 1,000 live births from 1990 to 2018, but the problem persists; and the country is still belonging to 5 countries that contributes to the half of the global burden of U5MR (Under Five Mortality Rate) in the world [28]. According to the United States Agency for International Development (USAID) the prevalence of LBW in DR Congo decreased by one percent (from 8% to 7%) over thereabouts 7 years (from 2007 to 2014) [29]. WHO reported a slow decline of percentage of LBW; 12.4%, 11.1% and 10.8% in 2000, 2012 and 2015 respectively, in DR Congo (30). In contrary, a decreased rate of (9.5%) was reported recently [17]. A remedy for children might be a successful breastfeeding from birth, and at further than two years as well as to initiate mothers into breastfeeding during the first hour of life as recommended by WHO and UNICEF [28,31,32]. Within that context, in order to improve mother-infant health, a research was conducted in rural area, in South-Kivu province. It was focused

on the implementation of successful breastfeeding program through the implication of the community health workers [33]. On the other hand, two other studies curried out, in rural and urban areas, focused on the relationship between LBW and malaria in pregnant women [34] and factors associated with growth failure within the 6 months of LBW infant life, respectively [35]. The authors concluded in the paucity of the information regarding SGA in the region to justify the observed worst outcome at birth. In addition, study that focused in both LBW and SGA are scarce. This study aims to establish the prevalence and the risk factors of both LBW and SGA. In addition, the determination of breastfeeding initiation rate and the knowledge of the rate of plan behaviors of breastfeeding (BF) might help for further evaluation of nutrition status of children in early and late post-partum and, might help decreasing the neonatal mortality rate, as well. This will provide a foundation for implementation of nutrition intervention in order to improve both mother and infant health.

Methodology

Study Design

This was a follow-up and an intervention study that was conducted in nine months from February 2018 to October 2018 in which at baseline; a cross-sectional study was carried out in Lwiro, in pilot Maternity of the health Zone of Miti-Murhesa, in the Eastern of the Democratic Republic of Congo in Bukavu. Lwiro is located at around 50 km from Bukavu and it is extended between 28° 45' to 28° 85' de longitude East and 2° 15' à 2° 30' South latitude with altitude varying between 1470m and 2200m above sea level (border of the Kahuzi Biega National Park) and the main activity in the region is agriculture but more than 60% of the population is landless[36].Therefore, the malnutrition of under-five year old children remains endemic in the region [37].

Sample Size

Sample calculation was based on a 95% confidence level ($\alpha<0.05$) and, a power of 90 % ($\beta=0.10$) was applied. In addition, a drop-out rate of 20% was assumed. We calculated the sample sizes by Allen Jr 2011 formula [38], with this assumption the sample size was 114 for both follw-up and intervention study. Considering 20% of non response rate, the final sample size reached 143 mothers-infant pairs in both studies. For the longitudinal study, the difference of hemoglobin (Hb) level between exclusively and non-exclusively breastfeed infants was considered as principal indicator and for the intervention study, maternal Hb level was defined as primary outcome. The follow-up and intervention results will be published later.

Sampling Method

Mothers and their children were randomly assigned by the systematic method. In the maternity register, a list of delivery mothers was built, from which were chosen every participant from birth to six days after delivery. The sampling interval was calculated by dividing the population size by the sample size. Then to get the first sampling unit and choose randomly a value in the list of 4 mothers that delivered between the 1st day and 7th days after delivery. After that the sampling interval was adding to the first sampling unit to get the second one until we got 143 mother-infant pairs, based on the inclusion criteria.

Data Collection and Procedure

First of all, we would like to emphasize that, this baseline data results from data collected in a large PhD project entitled "impact of breastfeeding practices, dietary intake, and food habit of lactating mother on the nutrition status of infant age from zero to six months in a maternity of a rural area in Bukavu, Eastern of the Democratic Republic of the Congo".

Anyhow, before collecting data, we secured the study permission through a formal contact with relevant stakeholders including the responsible persons of the head of the health division of South-Kivu and the responsible of both Miti-Murhesa Health Zone and Lwiro Health Center. Before testing the questionnaire that was conceived in English language; we translated it into French and Swahili languages as there are common languages in the study area. Swahili questionnaire was used because even uneducated women could have understood it perfectly. After that, we tested questionnaires and trained the interviewers on the data collection requirements. The baseline study respondents were made up of one hundred forty- three lactating mothers-infants pairs who delivered at the maternity of Lwiro and and surrounding villages. The pilot test of the questionnaire was performed before the beginning of the survey. Mothers aged from 18-45 years, with intention to breastfeed, and who delivered at the maternity ward full term healthy babies (37-42 weeks) as singleton child without congenital abnormality were included in the study. A part from what aforementioned, it is important to know that both gestational age and birth weight were assessed at baseline as well. However, were not included in the study, lactating mothers who delivered a premature or a stillborn baby, and those who suffered from any immunodeficiency diseases at the last stage as well as those who developed some complications during pregnancy i.e. pre-eclampsia and vaginal bleeding at delivery. In addition, mothers who were not living in the study area, even though they have attended antenatal program and have delivered in Lwiro Maternity were excluded in the study.

From birth to 7 days after delivery, at the Maternity, the respondents answered an opened and closed baseline questionnaire that was divided into topics, comprise an including general information (household and socioeconomic characteristics of the mother), Reproductive Health information (Contraceptive Methods, Family Planning and mother health). Besides, subject regarding the breastfeeding practices and the nutrient supplement were also developed. Anthropometric measurements were collected from the newborns and from the mothers. Children lengths (Lt), weights (Wt) were measured using standard methods of WHO to the nearest 0.1 cm, 0.1 kg with an electronic scale (Seca 336, Germany) and the Mid Upper Arm Circumference (MUAC) were measured to the nearest 0.1cm with a tape measure. For all measurements, the infants were wearing slight clothes and were barefoot as well as bareheaded [39]. However, the Head circumference was only measured in babies to the nearest 0.1cm and three indices (Z score

weight for Length, Z scores Weight for Age and Z score Length for Age as well) were calculated to determine the nutrition status of infants. On the other hand, mother MUAC was measured by placing the tape measure between the acromion and the olecranon. The arm perpendicular to the axis, along the humerus, the tape measure placed at a distance between those two bones aforementioned. In addition, the head circumference was measured by placing the tape at the front bone, perpendicularly to the axis of the face, on both side above the eyebrows and ears, lightly up to the bone occipital prominence on the back [40]. For all measurement, If the difference between the two measurements exceeded the maximum allowable difference of 0.2 kg or 0.2 cm, the measurement was repeated a second time and, if necessary, a third time.

Data Management and Analysis

Variables

The Birth Weight (BW), Gestational Age and Delay of Initiation of Breastfeeding (DIBF) were defined as dependent variables and independent variables were household and socioeconomic characteristics and reproductive health, however, for DIBF, we have selected some independent variables that might be connected.

Variables Transformation

The outcome variables BW and GA and, DIBF as well were dichotomized. The LBW was defined as <2.5 kg and normal birth weight (NBW) ≥2.5 kg and the SGA as less than 10th percentile while the normal height as more than 10th percentile (the value that divides the data, so 10% is below 10th percentile).

The infant weights, the length and the age were transformed into Z-score of weight/length for age and sex. Z-scores below 2 for length/height-for-age (HAZ), weight-for-length/height (WHZ), and weight-for-age (WAZ) were defined using Child Growth Standards (WHO, 2006) as stunting, wasting, and underweight, respectively [41,42]. Mother education level was transformed into binary variables, one defined as never attend school, illiterate and elementary level and, two as secondary level/professional and higher level of education/institut superieur/university .Number of pregnancy was ranged and transformed into binary variables, first pregnancy (primigravide) defined as less than two pregnancies and, the second as two and more 2 pregnancy (multigravide). The literacy level was also categorized as following: can read, can write and can both read and write (first category). Unable to write and both, Can neither read nor write stay the same but was assign in the second category. In addition, education level was categorized as following: Secondary and high school as the first category and never attend school, Illiteracy and elementary in second category. Marital status was also divided in two categories. The first group is married women; the second is the unmarried one (divorced, single and living with a partner without marriage). Spaced pregnancy was categorized in two groups. The first group is pregnancies which are less than 24 months; and the second from 24 months to more. Moreover, mother's occupation was also divided into employed (famers, small business and others jobs) and unemployed. Religion was also categorized in Christians (catholic, protestant and revival) and non Christians (others church). Ethnic community was divided into two groups. The first one is originally from South-Kivu (tribes from South-Kivu province) and originally from others provinces (tribes from others provinces). Furthermore, the head of HH was categorized in menship (Father and his both parents) and womenship (mother and her both parents). Likewise, breastfeeding initiation (breastfeed in the first hour after delivery) was divided into two groups. The fist group was early initiation of breastfeeding (AIBF) and the second, the Delay of Initiation of breastfeeding (DIBF).

Regarding the missing values, age at marriage has missing values (62/143), and was excluded from the analysis. Furthermore, monthly and weekly income was not considered because women were not able to give a reasonable income. In this study, the mother MUAC was transformed into categorical variables with the threshold value proposed by Kristen Cashin and Lesly Oot in 2018 for pregnant and postpartum women and girls in the Democratic Republic of the Congo; thus under nutrition was defined by a MUAC<22 cm based on t he following cut-off, severe malnutrition: <21 cm; moderate malnutrition: ≥ 21 cm to < 22 m and; well nourished ≥ 22 cm [12]. Therefore, the first group is <22 cm and the second group is ≥22 cm. The gestational age were categorized as following: Preterm less than 259 days (37 weeks) is early term or pre-term, from 259 days through 293 days, is term or full term and post term 294 days and beyond [43].

Data Cleaning

When cleaning the case report database, we perform outliers and realized that some outliers fell away from the mean but did not affect the analysis. Besides, after Z-score calculations, neither implausible values nor flogged values were observed within the study site's distribution [41].

Analysis

First, data were entered into the software Microsoft Excel and then the cleaning up was completed several times. Thereafter, the data were imported into SPSS 26 for analysis. A comprehensive explanation of household socioeconomic characteristics and Reproductive Health and, of the anthropometric measurements as well were performed by calculated a mean ± standard deviation for continuous variables. The frequency analysis was carried up for categorical variables and Z-score was calculated using Anthro WHO. Descriptive analysis was conducted to get the percentage. Chi-square test was used to assess the association of each independent variable with low birth weight, SGA and with; the significant level was defined as $p<0.05$. However, Fisher Exact test was using when the contingency cells have expected values less than five. A binary regression analysis was performed and the significant level was defined as $p < 0.05$. In logistic regression model, variables which were significant statistically ($p<0.05$) in descriptive analysis were put in the model backward except LBW due to the fact that it might influence in increasing or decreasing the risk (it may be the consequences or the cause of each other), then it might be a variable of confusion); therefore, we examined it alone.

Ethic Consideration

The study was approved by relevant institutional research ethic boar in Bukavu DR Congo, the commission Institutionnelle d'Ethique. Furthermore, an individual written and signed consent was obtained from mothers.

Results

Household (HH) and Socioeconomic, and Reproductive Health Characteristics at Baseline

The household and socioeconomic characteristics of lactating mothers (N=143) is summarized in Table 1 and 2. The day of the survey, (68.1%, 96/141) of the interviewers had greater than five persons with an average of 6.40±2.846 persons in the household. Moreover, the mean of children in the HH (including the children from the family members) was 4.31±2.762. The female child's sex was predominant (53.8%,77/143), with sex ratio of 0.85. The mean mother's age was 27.44±6.806. In the mean, infant participation at assessment was around 4 days old (3.93±1.166). As shown in table2, descriptive statistic depicts, the mean number of pregnancy was 4.12±3.051 children and the mean gestational age stated my mother at delivery was 275.83±4.789 days as well. Besides, the mean number of children alive the survey of the survey was 3.96 ± 2.838 children. The mean of gestational age (year) was 276.23±5.056, it was calculated based on women's menstruation period. As presented in Table 1,2 a chi-square analysis shown an association between Vision twilight with both LBW and SGA (p=0.032 and 0.021) respectively. On the other hand, it shows a statistically significance between vision problem at day time with both LB and SGA (p=0.032 and 0.026), respectively. Besides, head of household was also statistically associated with both LBW and SGA (p=0.016 and 0.012), correspondingly. In fact, of seven, six low birth children were very smaller (less than 10th percentile) than other babies. Both LBW and SGA were statistically associated (p=0.000). However, the evidence for the difference between LBW and female sex was weak (p=0.050). While, gender was not statistically associated with SGA (p=0.289). In contrary, the number of children in the HH, the number of the children (only born in the family, including the new born), the number of children the day of the survey, the parity, the mother age (asked at baseline), sickness during pregnancy, the knowledge about contraceptive method, the performance of family planning, use of mosquito net, the mode of delivery and the spaced between pregnancies, did not reach significance with both LBW and SGA, p>0.05 for all. In the same perspective, HH size, number of children in the HH, mother's age, mother's occupation, spaced pregnancy, literacy level, education level, marital status, ethic community, religion affiliation, the main sources of income (famer at own farm, income of own job, income of husband job), the main source of nutrition (own vegetable garden, own agriculture land, own livestock, local store/market) were not statistically associated to both LBW and SGA, p>0.05 for all. However, for variables, diseases during pregnancy (hemorrhage, hypertension, nausea and malaria), receive medication, diagnose of anemia in pregnancy, visit at hospital to seek for care when sick, sickness during the first, the second and the third trimester, as well; for both, LBW and SGA, chi square was not applicable and are not represented in the table 1 and 2.

Table 1: Relationship between household, socioeconomic and birth weight and gestational age.

Variables	Mean	Low Birth Weight	Normal weight	aTotal	p- value	Variables	Small for Gestational age(SGA)	Appropriate for Gestational age(AGA)	aTotal	p-value
		N=8	N=135	N=143			N=7	N=136	N=143	-
Household characteristics						Household characteristics				
Household size (N=141)	4.31(2.762)	-	-	-	-	Household size (N=141)	-		-	-
<5		4(50.0)	41(30.8)	45(31.9)	0.225⁑	<5	3(42.9)	42(31.3)	45(31.9)	0.396⁑
≥6	-	4(50.0)	92(69.2)	96(68.1)	-	≥6	4(57.1)	92(68.7)	96(68.1)	
Head of household(N=141)						Head of household (N=142)				
Menship		6(75)	132(98.5)	138(97.6)	0.016⁑	Menship	2(28.6)	2(1.5)	4(2.8)	0.012⁑
Womenship		2(25)	2(1.5)	4(2.8)		Womenship	5(71.4)	133(98.5)	138(97.2)	
Number of children in the household (N=141)	4.31(2.762)					Number of children in the household (N=140)				
<6		4(50.0)	80(60.2)	84(59.6)	0.414⁑	<6	3(42.9)	81(60.4)	84(59.6)	0.294⁑
≥6		4(50.0)	53(39.8)	57(40.4)		≥6	4(57.1)	53(39.6)	57(40.4)	
Farmer at own farm (N=135)						Farmer at own farm (N=135)				
Yes		1(14.3)	4(3.1)	5(3.7)	0.237⁑	Yes	1(16.7)	4(3.1)	5(3.7)	0.206⁑

No		6(85.7)	124(96.9)	130(96.3)		No	5(83.3)	125(92.6)	130(96.3)	
Income of own job (N=135)						Income of own job (N=135)				
Yes		2(28.6)	46(35.9)	48(35.6)	0.518‡	Yes	1(16.7)	47(36.4)	48(35.6)	0.303‡
No		5(71.4)	82(64.1)	87(64.4)		No	5(83.3)	82(63.6)	87(64.4)	
Income of husband's job (N=135)						Income of husband's job (N=135)				
Yes		5(71.4)	118(92.2)	123(91.1)	0.119‡	Yes	5(83.3)	118(91.5)	123(91.1)	0.424‡
No		2(28.6)	10(7.8)	12(8.9)		No	1(16.5)	11(8.5)	12(8.9)	
Main source of nutrition in HH						Main source of nutrition in HH				
Own vegetable garden(N=141)						Own vegetable garden (N=141)				
Yes		1(12.4)	27(20.3)	28(19.9)	0.503‡	Yes	1(14.3)	27(20.1)	28(19.9)	0.579‡
No		7(87.5)	106(79.7)	113(80.1)		No	6(85.7)	107(79.9)	113(80.1)	
Own agricultural land (N=141)						Own agricultural land (N=141)				
Yes		2(25)	22(16.5)	24(17.0)	0.409‡	Yes	2(28.6)	22(16.4)	24(17.0)	0.34‡
No		6(75)	111(83.5)	117(83.0)		No	5(71.4)	112(83.6)	117(83.0)	
Local stores/ market (N=141)						Local stores/ market (N=141)				
Yes		8(100.0)	129(97.0)	137(97.2)	0.79‡	Yes	7(100.0)	130(97.0)	137(97.2)	0.814‡
No		0(0.0)	4(3.0)	4(2.8)		No	0(0.0)	4(3.0)	4(2.8)	
Socioeconomic characteristics						Socioeconomic characteristics				
Mother age at baseline(year) N=139	27.44(6.806)					Mother age at baseline(year) N=138				
18-35 years		6(85.7)	105(79.5)	111(79.9)	0.517‡	<35	42(95.5)	68(72.3)	110(79.7)	0.001‡
35 years or more		1(14.3)	27(20.5)	28(20.1)		35 or more	2(4.5)	26(27.7)	28(20.3)	
Ethnic community N=143						Ethnics community N=143				
Originaly from South-Kivu		8(100.0)	133(98.5)	141(98.6)	0.891‡	Originaly from South-Kivu	7(100.0)	134(98.5)	141(98.6)	0.904‡
Originaly from other provinces		0(0.0)	2(1.5)	2(1.4)		Originaly from other provinces	0(0.0)	2(1.4)	2(1.4)	
Religion(N=143)						Religion(N=143)				
Christians		8(100.0)	134(99.3)	142(99.3)	0.944‡	Christians	7(100.0)	135(99.3)	142(99.3)	0.951‡
Non Christians		0(0.0)	1(0.7)	1(0.7)		Non Christians	0(0.0)	1(0.7)	1(0.7)	
Mother occupation (N=143)						Mother occupation (N=143)				
Employed		5(62.5)	62(45.9)	67(46.9)	0.292‡	Employed	4(57.1)	63(46.3)	67(56.9)	0.43‡
Unemployed		3(37.5)	73(54.1)	76(53.1)		Unemployed	3(42.9)	73(53.7)	76(53.1)	
Infant gender (N=143), odds 0.85						Infant gender (N=143)				

Male		1(12.5)	65(48.1)	66(46.2)	0.051‡	Male	2(28.6)	64(47.1)	66(46.2)	0.289‡
Female		7(87.5)	70(51.9)	77(53.8)		Female	5(71.4)	72(52.9)	77(53.8)	
Infant age(days)	3.93(6.806)					Infant age(days)				
Literacy level						Literacy level				
N=139						N=139				
Able to read, to write or both		7(100.0)	116(87.9)	123(88.5)	0.416‡	Able to read, to write or both	6(100.0)	117(88.0)	123(88.5)	0.473‡
Can neither read nor write		0(0.0)	16(12.1)	16(11.5)		Can neither read nor write	0(0.0)	16(12.0)	16(11.5)	
Education level (N=143)						Education level (N=143)				
Never attend, illiterate, elementary school		4(50.0)	76(56.3)	80(55.9)	0.502‡	Never attend, illiterate, elementary school	4(57.1)	76(55.9)	80(55.9)	0.631‡
Secondary and high school		4(50.0)	59(43.7)	63(44.1)		Secondary and high school	3(42.9)	60(44.1)	63(44.1)	
Marital status N=141						Marital status (N=141)				
Married		5(62.5)	60(45.1)	65(46.1)	0.338	Married	5(71.4(	60(44.8)	65(46.1)	0.168
Unmarried		3(37.5)	73(54.9)	65(46.1)		Unmarried	2(28.6)	74(55.2)	76(76.0)	
						Birth Weight(143)				
						LBW	6(75.0)	1(0.7)	7(4.9)	0.000‡
						NW	2(25.0)	134(99.3)	136(96.1)	

LBW (Low Birth Weight), NW (Normal weight); HH (Household), SGA(Small For gestational Age), AGA(Appropriate For Gestational Age, [a]Lack of corresponding sum of frequencies with total sample size is due to missing data; total frequencies per variable are given. Significantly different at p-value <0.05 (in bold); chi-square analysis for categorical variables. ‡ Fisher's test is computed when Chi-square test cannot be performed because cells are expected count <5.

Table 2: Association between Reproductive Health Care (RHC) and LBW and SGA in earlier post-partum.

Reproductive health/ Birth weight						**Reproductive health/ Gestational age(SGA)**				
Variables	**LBW**	**NW**	**aTOTAL**	**p-value**	**Mean**		**SGA**	**AGA**	**aTOTAL**	**p-value**
	n=8	**n=135**	**N=143**				**n= 7**	**n=136**	**N=143**	
Number of children now(+new born) (N=142)					4.21(2.721)	Number of children now(+new born) (N=142)				
<6	5(62.5)									
81(60.4)	86(60.6)	0.609‡		<6	3(42.9)	83(61.5)	86(60.6)	0.275‡		
≥6	3(37.5)	53(39.6)	56(39.4)			≥6	4(57.1)	52(38.5)	56(39.4)	
Parity (N=139)					4.12(3.051)	Parity (N=139)				
Primigravidae	3(37.5)	29(22.2)	32(23.0)	0.269‡		Primigravid	2(28.6)	30(22.7)	32(23.0)	0.508‡
Multigravidae	5(62.5)	102(77.9)	107(77.0)			Multigravid	5(71.4)	102(77.3)	107(77.0)	
Self-reported sickness during pregnancy (N=141)						Self-reported sickness during pregnancy (N=141)				
Yes	0(0.0)	18(13.5)	18(12.8)	0.325‡		Yes	0(0.0)	18(13.4)	18(12.8)	0.376‡
No	8(100.0)	115(86.5)	123(87.2)			No	7(100.0)	116(86.6)	123(87.2)	

Contraceptive method knowledge (N=140)						Contraceptive method knowledge (N=140)				
Yes	1(12.5)	42(31.5)	43(30.7)	0.233⁑		Yes	1(14.3)	42(31.6)	43(30.7)	0.308⁑
No	7(87.5)	90(68.2)	97(69.3)			No	6(85.7)	91(68.4)	37(69.3	
Self-asserted performing FP (N=141)						Self-asserted performing FP (N=141)				
Yes	1(12.5)	31(33.3)	32(22.7)	0.421		Yes	1(14.3)	31(23.1)	32(22.7)	0.5⁑
No	7(87.5)	102(76/7)	109(77.2)			No	6(85.7)	103(76.9)	109(77.3)	
Self-reported diagnosis with anemia during pregnancy (N=141)						Self-reported diagnosis with anemia during pregnancy (N=141)				
Yes	0(0.0)	2(1.5)	2(1.4)	0.889		Yes	0(0.0)	2(1.5)	2(1.4)	0.903
No	8(100.0)	131(98.5)	139(98.6)			No	7(100.0)	132(98.5)	139(98.6)	
Self-reported having vision problem at night time (twilight)during pregnancy (N=143)						Self-reported having vision problem at night time (twilight) during pregnancy (N=143)				
Yes	3(37.5)	11(8.1)	14(9.8)	0.032⁑		Yes	3(42.9)	11(8.1)	14(9.8)	0.021⁑
No	5(62.5)	124(91.9)	120(92.2)			No	4(57.1)	125(91.9)	129(90.2)	
Self-reported having vision problem at day time during pregnancy (N=142)						Self-reported having vision problem at day time during pregnancy (N=142)				
Yes	3(37.5)	12(9.0)	15(10.6)	0.039⁑		Yes	3(42.9)	12(8.9)	15(10.6)	0.026⁑
No	5(62.5)	122(91.0)	127(89.4)			No	4(57.1)	123(91.1)	127(89.4)	
Fight against malaria during pregnancy: Use of mosquito net (N= 143)						Fight against malaria during pregnancy: Use of mosquito net (N=143)				
Yes	8(100.0)	122(90.4)	130(90.9)	0.457⁑		Yes	7(100.0)	123(90.4)	130(90.9	0.505⁑
No	0(0.0)	13(9.6)	13(9.1)			No	0(0.0)	13(9.6)	13(9.1)	
Mode of delivery (N=143)						Mode of delivery (N=142)				
Vaginal	4(50.0)	100(74.1)	104(72.7)	0.141⁑		Vaginal	3(42.9)	101(74.3)	104(72.7)	0.088⁑
Cesarean	4(50.0)	35(25.9)	39(27.3)			Cesarean	4(57.1)	35(25.7)	39(27.3)	
Spaced pregnancy , Range (N=140)					3(1.17)	Spaced pregnancy, Range (N=140)				
> 2years	2(25.0)	55(41.7)	57(40.7)	0.294⁑		> 2years	1(14.3)	56(42.1)	57(40.7)	0.143⁑

≥2years	6(75.0)	77(58.3)	83(59.3)			≥2years	6(85.7)	77(57.9)	83(59.3)	
Mother MUAC ,Range(N=142)						Mother MUAC ,Range(N=142)				
>22	0(0.0)	3(2.2)	3(2.1)	0.839‡		>22	0(0.0)	3(2.2)	3(2.1)	0.858‡
≤22	8(100.0)	131(97.8)	139(97.9)			≤22	8(100.0)	132(97.8)	139(97.9)	

LBW (Low Birth Weight); SGA(Small for Gestational Age); AGA(Appropriate For Gestational Age); FP(Family planning), SGA(Small For gestational Age), AGA (Appropriate For Gestational Age; Significantly different at p-value <0.05 in bold NA; a Lack of corresponding sum of frequencies with total sample size is due to missing data; total frequencies per variable are given; Significantly different at p-value <0.05 (in bold); ‡: Fisher's test is computed when Chi-square test cannot be performed because cells are expected count <5.

Predictors of LBW and SFGA in Early Post-Partum

The result of the logistic regression is summarized in table 3, that examine the relationship between HH and socioeconomic indicators and Reproductive Health, shown that the mother with vision problem at twilight during pregnancy was 5.333 times more likely to deliver a Small-for-gestational-age baby (OR:5.333; 95% CI: 1.391-20.449 ;p<0.015). In addition, the household in which the mother or one of her parents who was a head of household was 26.796 times more likely to deliver a SGA baby than the mother who was not the chief of family (OR: 26.796; 95% CI: (2.531-283.717; p<0.006). On the other hand, mother with vision problem at twilight during pregnancy was 6.400 times more likely to deliver a LBW baby (OR: 6.400; 95% CI: 1.183-34.630; p<0.031) than women without vision twilight issue. Besides, the result showed the HH in which mothers or on of her parents were the head (women and their parents) was 20.789 times more likely to deliver a LBW baby (OR: 20.798; 95% CI: 2.144-201.741; p<0.009) than HH in which the father and his family were leading (men and their parents).

Table 3: Keys factors of both low birth weight and small for gestational Age.

Variables	**Birth Weight**				**Gestation Age**			
Vision problem at twilight time/evening (N=143)	LBW	NW	OR(95%CI)	p-value	SGA	AGA	OR(95%CI)	p-value
Yes	3(37.5)	11(8.1)	0.01		3(42.9)	11(8.1)	0.01	
No	5(62.5)	122(91.0)	6.400(1.183-34.630)	0.031	4(57.1)	125(91.9)	8.485(1.422-50.626)	0.019
Head of the HH								
Menship (women or one of his parents)	6(75.0)	132(98.5)	0.01		2(28.6)	2(1.5)	0.01	
Womenship (women or one of her parents)	2(25.0)	4(2.8)	20.798(2.144-201.741)	0.009	5(71.4)	133(98.5)	26.796(2.531-283.717)	0.006

LBW (Low Birth Weight), NW (Normal weight); HH (Household); Odds Ratio (OR) of the dependent variable (Low birth Weight vs Normal weight) are presented with 95% CI using simple logistic regression. Significantly different at p-value <0.05 in bold; OR (Odds ratio), CI(Confidence Interval) and SGA (small for gestational age), AGA (Appropriate Gestational age) ,Odds Ratio (OR) of the dependent variable (small length vs Appropriate Gestational Age) are presented with 95% CI using simple logistic regression. Significantly different at p-value <0.05 in bold OR (Odds ratio), CI (Confidence Interval).

Early Mothers Initiation of Bf And Planned For Infant And Young Child Feeding In The Future

As depicted in table 4, at baseline, (97.2%, 139/143) of mothers have breastfed their children at the first hour after birth and the totality (100%, 141/141) of lactating mothers gave colostrums to their babies. In addition, more than half (73.8%, 96/130) planned to exclusively breastfeed their children at 6months after birth and (13.8%, 18/130) scheduled to breastfed within 4-5months. Astonishing, (9.2%, 12/130) of mothers stated that they planned to exclusively breastfeed their child at 1-3 months after birth and a high proportion (14.3% 20/140) of lactating mothers planned of giving foods/drinks/milk besides breast milk. The plan of stopping breastfeeding the child was stated for the most for two reasons. The first one is when the baby will stop himself/herself to breastfeed (58.1%, 83/142) and the second is when the mother will get pregnant again (20.4%, 29/142). Astonishing to see that few mothers précised the time when they will stop to breastfeed their child from ≥24 months (9.2%, 13/142) and from 13-24months (3.5%, 5/142) correspondingly.

Table 4: Early mothers initiation of BF and planned for Infant and Young child feeding.

[b]Variables	[a]Frequency
Breastfeeding initiation and supplementary food	
Start of breastfeeding the infant(N=143)	
1st hour after birth	139(97.2)
2-6 hours after birth	2(1.4)
2-3 days after birth	2(1.4)
Donation of colostrums(N=141)	
Yes	141(100.0)
Donation of other foods/drink/milk besides BM (N=140)	
Yes	3(2.1)
No	140(97.9)
Plan duration of Exclusive breastfeeding(N=130)	
<1 Month	2(1.5)
1-3 Months	12(9.2)
4-5 Months	18(13.8)
6 Months	96(73.8)
7-9 Months	1(0.8)
>9 Months	1(1.8)
Plan to stop breastfeeding(N=142)	
6 Months	2(1.4)
7-9 Months	1(0.7)
13-24 Months	5(3.5)
>24 Months	13(9.2)
When the baby stopped himself/herself	83(58.1)
When there is another pregnancy	29(20.4)
When I deliver another time	1(0.7)
Other	1(0.7)
Do not know	7(4.9)
Plan of giving other foods/drink/milk besides BM during 6 months(N=140)	
Yes	20(14.3)
No	120(85.7)

[a]Categorical variables are expressed as n(%); bLack of corresponding sum of frequencies with total sample size is due to missing data; total frequencies per variable are given.

Relationship between Delay of Initiation And Some Hh-, Socio-Demographic-And Rh Characteristics

As presented in table 9, unmarried women had a delay in initiation of breastfeeding (p=0.043). While, a weak association was found between the delay of breastfeeding and the mode of delivery (p=0.062). However, the size of HH, the head of HH, the number of children in the HH, number of children the day of the survey, mother's occupation, religion, ethnic community, education level, infant gender, spaced pregnancy, contraceptive knowledge, performing FP and parity have not reach statistic significance, p value were less than 0.05. Logistic regression was not run because only one available was significant (p<0.05).

Table 5: Relationship between Delay of Initiation of Breastfeeding and some HH-, socio-demographic-and RH characteristics.

Variables	Early IBF	Delay IBF		p- value
	N=139	N=4	N=143	
Household characteristics				
Household size (n=141)				
<5	44(32.1)	1(25.0)	45(31.9)	0.619⁑
≥6	93(67.9)	3(75.0)	96(68.1)	
Head of household (n=141)				
Menship	4(2.9)	0(0.0)	4(2.8)	0.891⁑
Womenship	134(97.1)	4(100.0)	138(97.2)	
Number of children in the household (n=141)				
<6	82(59.9)	2(50.0)	84(59.6)	0.533⁑
≥6	55(40.1)	2(50.0)	57(40.4)	
Socioeconomic characteristics				
Mother age at baseline(year) (n=139)				
18-35 years	109(80.7)	2(50.0)	111(79.9)	0.517⁑
35 years or more	26(19.3)	2(50.0)	28(20.1)	
Ethnic community (n=143)				
Originally from South-Kivu	137(98.6)	4(100.0)	141(98.6)	0.945⁑
Originally from other provinces	2(1.4)	0(0.0)	2(1.4)	
Religion (n=143)				
Christians	138(99.3)	4(100.0)	142(99.3)	0.972⁑
Non Christians	1(0.7)	0(0.0)	1(0.7)	
Mother's occupation (n=143)				
Employed	65(46.8)	2(50.0)	67(46.9)	0.641⁑
Unemployed	74(53.2)	2(50.0)	76(53.1)	
Literacy level (n=139)				
Able to read, to write or both	120(88.9)	3(75.0)	123(88.5)	0.39⁑
Can neither read nor write	15(11.1)	1(25.0)	16(11.5)	
Education level (n=143)				
Never attend, illiterate, elementary school	77(55.4)	3(75.0)	80(55.9)	0.405⁑
Secondary and high school	62(44.6)	1(25.0)	63(44.1)	
Marital status (n=141)				
Married	61(44.5)	4(100.0)	65(46.1)	0.043⁑
No married	76(55.5)	0(0.0)	76(53.9)	
Infant gender (n=143)				
Male	64(46)	2(50.0)	66(46.2)	0.63⁑
Female	75(74.0)	2(50.0)	77(53.8)	
Reproductive health				

Mode of delivery (n=143)				
Vaginal	103(74.1)	1(25.0)	104(72.7)	0.062⁑
Cesarean	36(25.9)	3(75.0)	39(27.3)	
Range Spaced pregnancy (n=140)				
> 2years	55(40.4)	2(50.0)	57(4.7)	0.538⁑
≥2years	81(59.6)	2(50.0)	83(59.3)	
Contraceptive method knowledge (n=140)				
Yes	43(31.4)	0(0.0)	43(30.7)	0.329⁑
No	94(68.6)	3(100.0)	97(69.3	
Self-asserted performing FP (n=141)				
Yes	32(23.2)	0(0.0)	32(22.7)	0.459⁑
No	6(85.7)	3(100.0)	109(77.3)	
Number of children now(+new born) (n=142)				
<6	84(60.9)	2(50.0)	86(60.6)	0.516⁑
≥6	54(39.1)	2(50.0)	56(39.4)	
Parity (n=139)				
Primigravid	32(23.7)	0(0.0)	32(23.0)	0.347⁑
Multigravid	103(76.3)	4(100.0)	107(77.0)	

IBF (Initiation of Breastfeeding); aLack of corresponding sum of frequencies with total sample size is due to missing data; total frequencies per variable are given. Significantly different at p-value <0.05 (in bold); ⁑: Fisher's test is computed when Chi-square test cannot be performed because cells are expected count<5.

Nutrition Status of Mother-Infant Pairs

As depicted in table 10, for the infant, the proportion of children that were underweight, wasting and stunting, (defined as ≥-2 SD) is presented in table 5. The mean birth weight was 3.17±0.477 kg and the mean weight at baseline was 3.07±0.444 kg. In addition, the mean of the length was 48.93±1.982 cm, and the one of the Head was 34.65±1.099 cm, as well. Moreover, the mean of baby MUAC was 10.37±1.031 cm. The infant age was 3.930±1.166 days, with the minimum age of one day and the maximum age of seven days.

At birth, Z score calculation showed that at least (1/141, 2.1%) was moderately underweight. In addition, nearly seven percent (9/141, 6.5%) of infants is moderately stunted. Furthermore, around nine percent (12/142, 8.5%) of Babies was moderate wasted. On the other hand, at baseline, less than five percent (6/143, 4.2%) of children was moderately underweight. Besides, around 10% (13/137, 9.5%) of infant was moderately stunted. At last, around nine percent (12/140, 8.6% of kids was moderately wasted. However, nearly one percent (1/142, 0.7%) was severely wasted. According to the WHO cut-off values of public health significance [41], there were low prevalence of both underweight and stunting at both birth and at baseline assessments because the rates of WAZ (2.1 % and 4.2%) was less than 10% and the rate of LAZ (6.5% and 9.5%) was less than 20% for stunting. Regarding wasting, the situation is poor, for WLZ because these rates (8.5% and 8.6%) were included between 5-9% intervale.

For the mother, at baseline, the prevalence of underweight among lactating mothers: Of 143, 3(2.1%) mothers were malnourished. The nutrition status of lactating mother is also presented in Table 6.

Table 6: Nutrition status of mother and infant.

NUTRITION STATUS	
I. Infant	[b]Frenquency
Gender (N=143)	
Male	66(46.2)
Female	77(53.8)
Age (days), N=143	3.930±1.166
Sex ratio	0.85
MUAC (Cm) (N=143)	10.37±1.031
Head circumference at baseline(cm) (N=142)	34.65±1.099
Length at baseline (N=142)	48.93±1.982
Percentile range, Mean(SD) (N=142)	25.57±23.882
Weight at birth Kg, Mean(SD) (N=143)	3.17±0.477
Weight for Age Z score (ZWH) at birth (N=143)	
-3 to >-2	3(2.1)
≥-2	140(98.1)
Length for Age Z score (ZLA) at birth (N=139)	
-3 to >-2	9(6.5)
≥-2	130(93.5)
Weight for Length Z score(ZWH) at birth (N=141)	
<-3	1(0.7)
-3 to >-2	12(8.5)
≥-2	128(90.8)
Weight at baseline Kg, Mean(SD)(143)	3.07±0.444
Weight for Age Z score (ZWH) at baseline (N=143)	
-3 to >-2	6(4.2)
≥-2	137(95.8)
Length for Age Z score (ZWA) at baseline(N=137)	
-3 to >-2	13(9.5)
≥-2	124(90.5)
Weight for Height Z score(ZHA) at baseline (N=140)	
-3 to >-2	12(8.6)
≥-2	128(91.4)
Ii. Mother	
MUAC (cm), Mean (SD) N=143	26.86±3.186
> 22	3(2.1)
22 and more	139(97.9)

[b] Categorical variables are expressed as n(%) and continuous variables are expressed as mean ±SD. b Lack of corresponding sum of frequencies with total sample size is due to missing data; total frequencies per variable are given.

Discussion

Here we reported the result of the baseline assessment of mother-infant pairs in rural hospitals in South-Kivu. Our study reported a low prevalence of LBW (5.6%, 8/143) new babies; the reason should be because the infant from mothers who delivered at home or in health facilities were not included in the study. Indeed, to the author's information, this may be the primary report on SGA and his predictors in rural area of Bukavu. This is also the first statement that took into consideration the predictors of both LBW and SGA in rural area in South-Kivu. This low birth prevalence might also be due to the decreased rates of LBW recently observed in the country (9.5%) [44] and 11.5% [17] respectively. Our findings are in line with the one reported (6.5%) in 2018 in South-Kivu [34]; the slight difference could probably due to the lack of nutrition intervention in the region. On the other hand, the PRONANUT found out a high (21%) prevalence of LBW in rural area of South-Kivu [45]. This might be because of a high (11.3%, with 95% confidence interval from 9.1% to 13.7%) Global Acute Malnutrition (GAM) of pregnant women and lactating mothers in Kabare where the study was conducted. In contrary, the study conducted in South-Kivu, in the same region [34] found out that malaria infection at delivery was strongly associated with LBW ($p<0.001$).

This study shown women's vision problem as one of predictors of LBW (OR: 5.333; 95% CI: 1.391-20.449) and vision issue at day time ($p<0.032$) in chi-square analysis. This data depict a probable Vitamin A Deficiency (VAD) in pregnant women in the region. Indeed, it is known that the VAD can lead to poor fetus eyes issue and poor internal organ growth and inadequate fetal bones performance as well. In addition, this may lead to poor immune defense and maintenance [46] and may have adverse health consequences at birth due to respiratory infection, diarrhea. Therefore, a systematic provision of VA supplementation during Antenatal Care (ANC) is important in the region for mother-infant health promotion.

Also, it is documented that Infant Vitamin A Supplementation (VAS) my decrease mortality from infections disease such as measles and diarrhea, and the both night twilight and exophthalmia prevalence [47].Thus, the supplement with VAS in preschool care is also needed. In fact, around one century, a study carried out in the region has found a prevalence of 0.7% of ophthalmological signs of vitamin A deficiency in pre-school age children. The study has highlighted that VAD has co-existed in children malnourished and non-infected children [48]. Another study conducted in the same region at the same period has found out that there were a correlation between plasma retinol levels and low retinol binding protein plasma levels (r-0.77). This pushes them to think that severe malnourished hospitalized infants are likely to have VAD in the region [49]. Our study found out that VAD might start during pregnancy and may affect infant health late in life. It also revealed a mere prevalence of malnutrition in child at birth. Indeed, it is a public health problem in the region; a prospective study is needed to evaluate this matter in children less than five years in other to reduce both under-five morbidity and mortality, and the blindness of both mother and children.

Our findings showed that sickness during pregnancy was not a factor associated with LBW ($p=0.325$), probably because, of eighteen that developed disease during pregnancy the quasi-totality of respondent (15/18, 83.3%) sought for care. They should have been treated during their visit at the hospital see table 2. Prior studies have also demonstrated the relationship between antenatal care (ANC) and LBW [17,50]. In contrary, another study shown a decreasing odds of low birth weight at birth [51]. However, our study did not take into consideration the relationship between LBW and ANC because it was already proved in the region that mothers who attended antenatal care program 4 times during pregnancy, were 4 times more likely to have LBW babies [52].

Our study reported a low prevalence (4.9%, 7/143) of SGA babies. This result is not consistent with what was found in a very recent study conducted in DR Congo and in South Africa, which reported a prevalence of 32.8% of SGA babies in DR Congo [44].This great difference might be attributed to the differences in study population, study area and study design as well. Vision issues twilight is a factor associated with SGA in this area as well. This also confirmed that VAD is a Public Health issue in this area and this is a sign of pregnant mother's malnutrition in the region. The promotion of both mother adequate food intake during pregnancy and the optimal breastfeeding of infants during 6 months are worthy in order to improve nutrition and health status of the mother-infant couple.

Our study shows also a very high prevalence (97.2%) of early initiation of breastfeeding. This prevalence is high than the one recently found by Kambale et. al. in the same region (65.9%). It is also high to both of rural (69.7%) and urban area (61.6%) separately. This may be due to the fact that in our study we included women with a desire to breastfeeding also because of the difference between both studies design [53]. Besides, a high prevalence (70.7%) of intention to breastfeed within 4-6months was reported in our study. A similar result (82%) was reported among Rwandese pregnant women, but for them the duration of breastfeeding initiation was 6 months [54]. Our found was also highly compared to that reported throughout the DRC in national level (52.4% in rural area and 47.6% in urban area) [55]. This difference might be due to the fact that the survey was conducted seven years ago and there is possibility that the rate has increased but there were no new information. Moreover, the study population is different. A recent qualitative study from Congo's neighbor, the Republic of Rwanda, reported that a greater part of respondents were capable to give breast milk within the first hour after birth [54]. Our findings (97.2%) are in line with the aforementioned study. Indeed, It is obvious that the community strategies propose in a study carry up in that area that develop the implication of community workers to improve the EBF practice within 6 months after birth [33] have contributed to much, but, it is as if that there is still a gap to cover because 14.3% are still planning to give food or water before 3 months. In their study, they recommended that community workers may get a salary or motivation from the government. Unfortunately, to date, this is not done yet.

After bivariate analysis, only mother's marital status was the factor associated with the delay of breastfeeding in this study (p=0.04). This result is not consistent with the study conducted by Kambale et. al, which found that cesarean delivery was a predictor (AOR: 2.24 (95% CI: 1.74, 2.88) of the delay of initiation of breastfeeding. While, the association between caesarean delivery with the delay of initiation of breastfeeding in our study was weak (p=0.06). The same study, shown than education level was a determinant of the delay of initiation of BF [53]; However, our result did not find this association (p=0.405). Overall respondents (100%) in the study gave colostrums to their babies. This prevalence is markedly higher than prior reported [56]. According to Athavale AV, Athavale SA, Deshpande SG, Zodpey SP and Sangole S in 2004 cited by Kambale [53], there is an association between breastfeeding initiation within the first hour of birth and giving colostrums to the baby at birth. Even though a relationship was not searched in our study, both aforementioned rates were high (97.2% and 98.6%) respectively for both BF initiation rate and providing colostrums rate. With regard to the ten keys of clinical breastfeeding practices [26], two of them were met according to this result. In fact, (3/140, 2.1%) of mothers donated other foods or drinks besides breastfeeding at birth, this must be highlighted because it is very early and in the ten keys aforementioned, it is prohibited to give any food or fluids other than breast milk unless it is recommended by a physician. Indeed, it is deplorable because 50% of food was given by nurses; the ones who should have counseled and encouraged women in promoting Exclusive Breastfeeding Practices during Antenatal Care, but are the one who advised mothers to give. Moreover, it was not shown by women that it was for medical purpose. Therefore, the capacity building of health providers in nutrition of child is needed in the region.

To the best of our knowledge, this is also among few studies that assessed the nutrition severely wasted at birth. This issue must attract the intension of both policy makers and health providers and researchers as well. Severe Acute Malnutrion (SAM) has been diagnosed within 30 decades among hospitalized and non hospitalized children at Lwiro hospital and have attracted intention of some researchers [49,57,58]. This study showed that infant malnutrition in the region has started before birth. Therefore, it is better to focus in mother health and diet before and during pregnancy to improve both mothers and infant health.

However, there are some limitations of the study; the gestational age given by mother according to their last date of menstruation might create a bias. Women could had difficulties of recalling their last menstrual period; therefore there were a limitation in estimating the gestational age even in clarifying the full-and preterm infants. Moreover, the mother's height that should have been taken before pregnancy was asked at birth and only 10 of 143 lactating mothers could have recalled their height before pregnancy. The pregnancy weight was unknown by a great part of respondents as well, therefore, we did not search for the relationship between parental size and SGA. Furthermore, some information regarding the causes of LBW was not collected, including weight gain during pregnancy. This information should be given at antenatal care but, we started the study at birth. Although, it is documented that suboptimal increasing of weight and decreasing of weight before pregnancy are the great determinants of IUGR and LBW [59]. At last, the enrolment of the participants after delivery at the maternity may underestimate the number of newborns and consequently the ones of LBW and SGA infants.

Conclusion

This study revealed that LBW and SGA are merely prevalent in the study area and both LBW and SGA are likely to be associated to VAD of the mother. In addition, mothers that are chief of HH are more likely to deliver low birth and small for gestational age babies. Moreover, unmarried women do not introduce their babies to breastfeeding within the first hour of life and few of them have planned optimal Exclusive Breastfeeding. At last, a small number of infant are moderate underweight, stunting and wasting at birth. On the same perspective, mother malnutrition in early postpartum is infrequent in the region. Overall, this research suggests that dietary interventions that improve the nutritional status of the mother before and during pregnancy may reduce the incidence of LBW and SGA. Besides, the aforementioned intervention may improve the nutritional status of the mother-child pair. At last, to prevent or correct VAD in reproductive women is needed. As VAD is strongly associated with depressed immune system, a dose of 10000 IU (International Unit) during pregnancy may help to reduce mortality due to blindness. In additional, we encourage adequate food intake during pregnancy and at the first six month postpartum to help to solve the matter. The authors suggest an in-depth study of others causes of intrauterine growth retardation like iron and folate deficiency in pregnant and lactating women.

Acknowledgment

First of all, this article is a part of a PhD dissertation, in which the first author is the PhD candidates. The author gratitude is addressed to wish to the Bread for the World that supported the PhD field research through financial contributions. Our heart-felt gratitude is expressed to Professor Gustave Mushagalusha Nachigera, the chancellor of the Université Evangélique en Afrique (UEA), encouraging and supporting throughout the study. We acknowledge the contribution of supervisors, investigators and community workers of Lwiro and surrender village for their contribution during the field work. The authors wish to thanks the head of health South-Kivu Division, the head of Miti-Murhesa Health Zone for his cooperation during the study. His experience has been shared with us and helped us building for the achievement of our goals. Let others numbers of his committee have here the expression of our gratitude for also their support. We would also like to thank the interviewers Mr. Augustin, Mr. Bienvenu, and Mrs. Micheline Nahangi. Additional thanks goes to Dr Nkonzi Karazo Pacifique for facilitation. At last, we acknowledge the study's participants.

Conflicts of Interest

The authors assert no conflicts of interest.

Author's Contributions

Celine Kavira Malengera was involved in the conception, design, collection, cleaning data, analysis, interpretation, report

and manuscript writing. Theophile Kabesha was involved in supervision of the fieldwork and advising and reading the work. . Augustin also involved in data collection of the data. Prof and Prof….. were concerned in supervision et reading the work. All authors read and approved the final manuscript.

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