American Journal of Pediatrics
2022; 8(2): 63-69
http://www.sciencepublishinggroup.com/j/ajp
doi: 10.11648/j.ajp.20220802.13
ISSN: 2472-0887 (Print); ISSN: 2472-0909 (Online)

Determinants of Low Birth Weight at the University Hospital Center of Brazzaville (Republic of Congo)

Buambo Gauthier Regis Jostin[1, 3, *], Ngakengni Nelie Yvette[2, 3], Eckoba Oba Jean Baptiste[1], Potokoue Mpia Sekangue Samantha Nuelly[1, 3], Mokoko Jules Cesar[1, 3], Itoua Clautaire[1, 3], Iloki Leon Herve[1, 3]

[1]Obstetrics Gynecology Department, University Hospital Center of Brazzaville, Brazzaville, Congo

[2]Neonatology Department, University Hospital Center of Brazzaville, Brazzaville, Congo

[3]Faculty of Health Sciences, Marien Ngouabi University, Brazzaville, Congo

Email address:

buambogauthier@yahoo.fr (B. G. R. Jostin), yngakengni@gmail.com (N. N. Yvette), jb.eckoba.oba@gmail.com (E. O. J. Baptiste), samanthasekangue@gmail.com (P. M. S. S. Nuelly), jlsmokoko@gmail.com (M. J. Cesar), clautairei@yahoo.com (I. Clautaire), herviloki@yahoo.fr (I. L. Herve)

[*]Corresponding author

To cite this article:

Buambo Gauthier Regis Jostin, Ngakengni Nelie Yvette, Eckoba Oba Jean Baptiste, Potokoue Mpia Sekangue Samantha Nuelly, Mokoko Jules Cesar, Itoua Clautaire, Iloki Leon Herve. Determinants of Low Birth Weight at the University Hospital Center of Brazzaville (Republic of Congo). *American Journal of Pediatrics*. Vol. 8, No. 2, 2022, pp. 63-69. doi: 10.11648/j.ajp.20220802.13

Received: March 13, 2022; **Accepted**: March 30, 2022; **Published**: April 14, 2022

Abstract: *Objective:* Analyze the determinants of low birth weight at the Center Hospitalier Universitaire de Brazzaville. *Methods:* Case-control study, conducted from January 01 to June 30, 2020, in the Gynecology-Obstetrics department of the Brazzaville University Hospital, comparing 200 mother and newborn couples with a birth weight < 2500g (Cases) and 200 other mother and newborn couples -born with birth weight ≥ 2500g (Controls). The variables studied were pre, per and post partal. The p-value of the probability was considered significant for a value less than 0.05. *Results:* The mothers were different in age (age < 20 years: ORa = 6.0 [2.6-13.7]; p < 0.05 and age > 35 years ORa = 2.6 [1.1-6.0]; p < 0.05) mostly single (OR = 1.6 [1.3-3.9]; p < 0.05) with a history of low birth weight (ORa = 6.1 [1.2- 13.5]; p < 0.05) and lean (ORa = 8.4 [4.7-15.0]; p < 0.05). Pregnancies were associated with malaria (ORa = 3.0 [1.7-5.4]; p < 0.05) and arterial hypertension (ORa = 8.3 [3.1-22.3]; p<0.05). Most of them gave birth vaginally (OR= 1.8 [1.1-3.0]; p < 0.05), before term [(90.0% vs 8.5%); p<0.05)]. *Conclusion:* Low birth weight is of multifactorial origin. Its prevention requires management of the risk factors associated with it.

Keywords: Low Birth Weight, Determinants, Childbirth, Brazzaville

1. Introduction

Low birth weight (LBW) is defined by the World Health Organization (WHO) as any birth weight below 2500g regardless of gestational age [1]. It is a global public health problem in both developed and developing countries [2]. According to WHO data, approximately 20.5 million children are affected by this morbid condition, or 14.6% of all live births. Responsible for 80% of neonatal deaths each year worldwide, it is particularly prevalent in Asia and Africa where the prevalence is 17.3% and 13.7% respectively [2]. As a result, low birth weight is an issue and a concern both for the obstetrician who must ensure its prevention, and for the pediatrician responsible for neonatal growth. Several risk factors for LBW both related to the mother and to the pregnancy have been reported by many authors [3, 4]. More than a decade after Mabiala Babela's study in the same center, we set ourselves the objective of analyzing the determinants of low birth weight at the University Hospital Center (UHC) of Brazzaville.

2. Methods

This was a case-control study, conducted from January 01 to June 30, 2020, in the Gynecology-Obstetrics department of the Brazzaville University Hospital, comparing 200 mother

and newborn couples with a birth weight < 2500g (Case) and 200 other mother and newborn pairs with a birth weight ≥ 2500g (Controls). Were included for both groups, couples whose newborns were hospitalized at the University Hospital of Brazzaville, of chronological age between 22 and 41 weeks of amenorrhea (WA) according to the date of the last menstrual period or early ultrasound (< 16 WA). Were not retained for the two groups, the couples of which:

1) the mothers presented serious obstetric morbidity or a state of neurological deficiency that did not allow for proper questioning or those who died during childbirth;
2) the newborns had a birth weight < 500 g or > 90th percentile according to the Audipog reference curves [5], and those malformed or dead-on admission to Neonatology.

Based on the classification of Sherry and Mei validated by the WHO in 2004 [6], low birth weights were distinguished into extremely low weight [500 – 999 g], very low weight [1000 – 1499 g] and low weight [1500 – 2499 g].

The variables studied were:

1) socio-demographic (age, gainful activity, level of education, marital status), reproductive (gestation, history of abortion, parity, history of LBW);
2) related to pregnancy monitoring: body mass index (BMI) in the first trimester of pregnancy, number of prenatal contacts, supplementation with medicinal products based on iron and folic acid, and existence of comorbidities;
3) related to the delivery methods (term, temperature, state of the membranes, aspect of the amniotic fluid, delivery route).

3. Results

Low birth weight accounted for 45.6% (220/482) of neonatology hospitalizations.

The mothers were different in age and mostly single in case of LBW (table 1).

Table 1. *Socio-demographic characteristics.*

	Case (N=200)		**Control (N=200)**		**p**
	n	**%**	**n**	**%**	
Age (years)					0.001
[14-20]	50	25.0	13	6.5	0.001
[20-35]	122	61.0	166	83.0	
[35-43]	28	14.0	21	10.5	0.01
Rural area	89	44.5	95	47.5	0.5
Gainful activity	8	4.0	7	3.5	0.7
Educational level					0.4
Any	26	13.0	19	9.5	0.3
Primary	46	23.0	57	28.5	0.6
Secondary	101	50.5	95	47.5	0.6
*Superior**	27	13.5	29	14.5	
Single	138	69.0	114	57.0	0.01
Socio-economic level					0.1
Low	143	71.5	125	62.5	0.2
Average	46	23.0	59	29.5	0.7
*Pupil**	11	5.5	16	8.0	
Pregnancy					0.1
Median (q1-q3)	2 (1 - 4)		2 (1 - 3)		
History of abortion	74	37.0	90	45.2	0.09
Parity					0.08
Median (q1-q3)	2 (1 - 5)		3 (2 - 5)		
Primiparity (1 delivery)	67	33.5	58	29.0	0.2
Pauciparity (2 to 3 deliveries)*	103	51.5	117	58.5	-
Multiparity (≥ 4 deliveries)	30	15.0	25	12.5	0.3

*Reference

LBW was significantly associated with a BMI < 18.5 kg/m² in the first trimester, the number of fetuses and the existence of obstetric comorbidity (Table 2).

Table 2. *Characteristics related to pregnancy follow-up.*

	Case (N=200)		**Control (N=200)**		**p**
	n	**%**	**N**	**%**	
Number of prenatal contacts					0.1
Median (q1-q3)	3 (0 - 4)		4 (0 - 5)		
BMI [(1)] (Kg/m²)					0.001
Thinness (< 18.5)	124	62.0	29	14.5	0.001
*Normal (18.5-24.9) **	74	37.0	165	82.5	
Overweight/Obesity (>24.9)	2	1.0	6	3.0	1
Fetus					0.001

	Case (N=200)		Control (N=200)		p
	n	%	N	%	
Unique	144	72.0	193	96.5	
Multiple (≥2)	56	28.0	7	3.5	
Iron and folic acid drugs	113	56.5	116	58.0	0.7
Comorbidities					
Malaria	102	51.0	46	23.1	0.001
Urogenital infection	91	45.5	87	43.5	0.6
Hypertensive pathology	26	13.0	8	4.0	0.001
Diabetes	3	1.5	3	1.5	1.0
Sickle cell disease	4	2.0	1	0.5	0.2
HIV [2]	6	3.0	2	1.0	0.1
Congenital malformation	20	10.1	17	8.5	0.6

*Reference
[1] Body Mass Index
[2] Human Immunodeficiency Virus

After logistic regression, by integrating the clinically relevant variables with a p-value of less than 20%, the risk factors for LBW were as much related to maternal characteristics, to pathologies associated with pregnancy as to the fetus (Table 3).

Table 3. *Logistic regression.*

	Logistic regression			
	Simple		Multivariate	
	OR [CI (95%)]	p	OR ajusted [CI (95%)]	p
Age (years) < 20	5.2[2.7-10.0]	0.001	6.0 [2.6 – 13.7]	0.001
Age (years) ≥ 35	1.8[1.2-7.6]	0.01	2.6 [1.7 – 6.0]	0.01
Single	1.6[1.3-3.9]	0.01	-	0.3
Low socio-economic status*	-	0.2	-	0.2
History of abortion *	-	0.2	-	0.05
History of LBW [1]	3.7[1.5-9.6]	0.001	6.1 [1.2 – 13.5]	0.02
BMI [2] < 18.5 kg/m²	9.5[5.8-15.5]	0.001	8.4 [4.7 – 15.0]	0.001
Malaria	3.4[2.2-5.3]	0.001	3.0 [1.7 – 5.4]	0.001
Hypertensive pathology	3.5[1.5-8.1]	0.001	8.4 [4.7 – 22.3]	0.001
Sickle cell disease*	-	0.2	-	0.5
Multiple pregnancies	10.7[4.3-24.2]	0.001	8.4 [3.2 – 21.7]	0.001

* Clinically relevant variables
[1] Low Birth Weight
[2] Body Mass Index

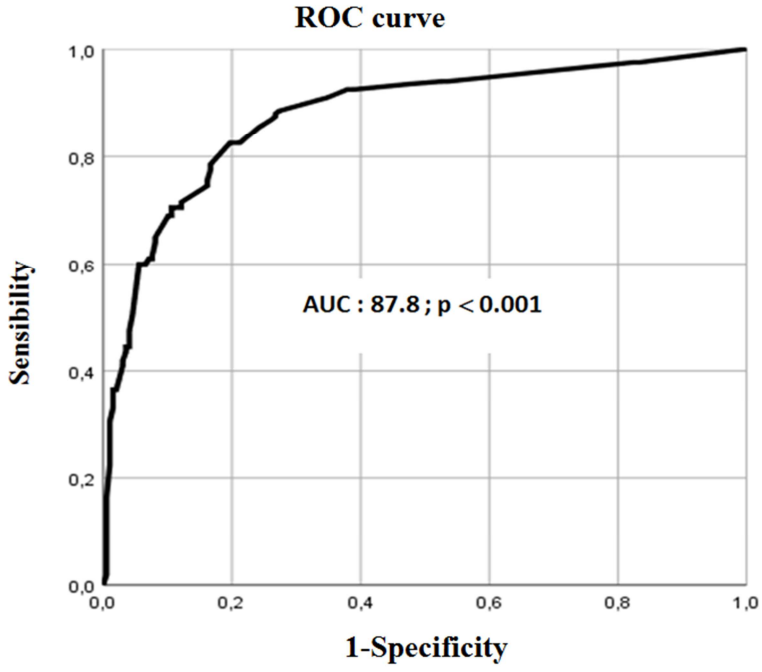

Figure 1. *Logistic Regression Model ROC Curve.*

The probability of Hosmer and Lemeshow being less than 0.05 (Ho hypothesis accepted), our model was judged to be good and consolidated by the ROC curve whose value of the area under the ROC curve (figure 1) was estimated at 87.8 (excellent discrimination).

Mothers of low birth weight newborns gave birth twice as often vaginally as by caesarean section and prematurely in 90% of cases (table 4).

Table 4. *Delivery modalities.*

	Case (N=200)		Control (N=200)		OR [CI (95%)]	p
	n	%	n	%		
Gestational age (WA) [(1)]						0.001
[22-28]	3	1.5	1	0.5	27.4[2.7-276.4]	0.001
[28-32]	103	51.5	1	0.5	942.4[124.6-7124.8]	0.001
[32-37]	74	37.0	15	7.5	45.1[21.9-92.9]	0.001
*[37-41] **	20	10.0	183	91.5	-	
Maternal fever	27	13.5	16	8.0	-	0.07
Meconium amniotic fluid	25	12.5	7	3.5	3.9[2.0-7.1]	0.001
Delivery route						0.02
Vaginal	170	85.0	151	75.5	1.8[1.1-3.0]	
Caesarean section	30	15.0	49	24.5	-	

*Reference
[(1)] Weeks of Amenorrhea

Very low weight and extreme low weight were noted respectively in 25.5% and 8.5% of cases. Distinguishing them according to term and growth like the WHO, there were three times more premature babies (30%) than hypotrophic ones (10%), although in 60% of cases, the two groups were associated.

4. Discussion

Low birth weight remains a public health problem in both developed and developing countries [2], despite multiple awareness campaigns on maternal and child health and improved prenatal care services. Its prevalence is 15.5% worldwide, i.e. around 20 million LBW newborns per year, of which 96.5% are born in developing countries [7]. In developed countries, the noted average of 7% represents about half of that reported by demographic health surveys (DHS) in developing countries, i.e. 19% [7, 8], contrasting with the higher frequencies of hospital series, i.e. 20.7% in Cameroon [9], 24.9% in Burkina Faso [10], 52.6% in the Central African Republic [11] and 45.6% in our series. However, these are far superior to the 10.6% in the Senegalese series [12], which was only interested in hypotrophic full-term newborns, excluding premature babies. LBW is believed to result from either preterm birth or intrauterine growth restriction (IUGR) [13, 14]. If in countries with low prevalence, the first cause turns out to be prematurity, in those with high prevalence, there is a predominance of IUGR whose clinical expression is hypotrophy [15]. Indeed, in developed countries, an upsurge in the prevalence of prematurity has been noted over the past two decades, reaching 12% [16-19]. Several factors are evoked to explain this evolution: the increase in the percentage of multiple pregnancies by the improvement of medically assisted procreation techniques, the rise in the average maternal age, the selective increase in the therapeutic indications for caesareans and the progress of medicine allowing more and more the birth and the survival of very preterm newborns [16-21]. As a result, it is clear that the increase in the prevalence of prematurity in direct relation to the technological advances set out for industrialized countries plays a lesser role in developing countries where far fewer very premature babies survive. Prematurity and hypotrophy represented respectively 30% and 10% of LBW in our series. The frequency of hypotrophic newborns is far lower than that observed in the African literature, about 25% [9, 22-28]. This difference could be explained by the improvement of professional collaboration between the various actors in charge of prenatal follow-up and the contribution of ultrasound in monitoring fetal growth. Despite the mechanism of occurrence of LBW, several factors associated with LBW are classically reported, both prior to pregnancy (related to maternal characteristics) and antenatal (occurring during pregnancy).

The pre-pregnancy factors identified after multivariate analysis in our series were maternal age < 20 years and ≥ 35 years, history of LBW, body mass index in the first trimester <18 kg/m^2. The influence of maternal age on the weight of the newborn at birth has been mentioned by several authors but remains a subject of controversy. Some report the impact of adolescence on the onset of LBW, due partly to insufficient nutritional intake (the adolescent girl being in competition with the fetus for growth) and the low efficiency of placental functions [9, 22, 25]. On the other hand, psycho-emotional aspects are mentioned, pregnancy being most often unwanted and unplanned [9, 25, 28]. Conversely, other authors suggest that factors such as socio-economic differences, level of education and marital status can weaken the effect of maternal age [28]. Thus, the literature reports the influence of the level of education of mothers on birth weight, the LBW being inversely proportional to the level of maternal education [9, 29]. The likely hypothesis would be difficulties in understanding that poorly educated mothers might have when transmitting messages about maternal and

child health. Similarly, single status and low socio-economic level, generally observed in this category of the population, have been associated with LBW [3, 4, 24, 29].

In univariate analysis, single mothers were twice as likely to give birth to a low-weight newborn compared to those in a couple. Moreover, objective weight loss at the start of pregnancy was eight times more associated with the risk of LBW, just as the history of LBW multiplied the risk by a factor of 6. Primigestity and primiparity have been reported as risk factors of FPN by several authors [3, 9, 22, 24, 29, 30]. However, other authors note the impact of multiparity in the occurrence of LBW [3, 22]. In the United States, in a study looking for the influence of parity on LBW carried out on 36,056 New York singleton newborns, it was found that birth weight is proportional to parity when the latter is between one and three but decreases markedly in higher parity groups [31]. In North Carolina, Swamy concludes that parity exerts a greater influence on birth weight than does maternal age, with significantly different effects across racial subgroups [32]. The risk among multiparas would be justified by the fact that women in sub-Saharan Africa spend the majority of their lifespan, i.e. 35 to 50% of the reproductive years, meeting the obligations of pregnancy, childbirth and breastfeeding [28] responsible for maternal exhaustion. It has been observed that the energy costs of pregnancy and even more of lactation, particularly in the context of close reproductive cycles, result in a cumulative effect, a deterioration in maternal nutritional status, which can thus lead to LBW [30, 33]. Body mass index <18 kg/m^2 was associated with an eight times higher risk of LBW in our series. Considering low anthropometric status and short stature below 155 cm as variables assessing nutritional deficit, some authors have reported the influence of maternal nutritional status on fetal growth [24]. Moreover, constitutionally short women are considered at risk of LBW without there being a direct underlying pathological mechanism [24]. The possibility of a nutritional deficit before the first gestation has been mentioned, causing a chain of events that contribute to the intergenerational transmission of malnutrition [24].

During pregnancy, the literature reports high frequencies of IUGR and prematurity in regions with high malaria endemicity [9, 22-25]. Malaria infection in the first or second trimester of pregnancy commonly results in IUGR, while late infection causes more prematurity due to early delivery during or after the malaria attack. Placental parasitaemia causing an accumulation of red blood cells in the placenta acting as a filter of the maternal circulation, leads to placental insufficiency with disruption of exchanges between the mother and the fetus. The result, depending on the extent of the histological alterations and the term of the pregnancy, is hypoxia and a drop in the supply of nutrients to the fetus, which can lead to IUGR, prematurity or even fetal death [24]. Furthermore, arterial hypertension through uteroplacental ischemia multiplied the risk of LBW by 8, as reported by other authors [9, 22, 24, 25]. Indeed, vascular-renal syndromes lead to the disturbance of maternal-fetal exchanges responsible for IUGR and severe complications requiring the termination of pregnancy before term. Prematurity, when it is not induced by obstetric morbidity, may be the consequence of cervical changes secondary to uterine overdistension as observed in twin pregnancy. The average term of childbirth in the case of twinning is only 37 WA, this occurring nearly half the time before 37 WA [34]. According to the perinatal survey carried out in 1995 in France [34], prematurity before 34 WA affects 10% of twin pregnancies compared with 1.5% of single pregnancies. Before 32 WA, 7% of patients are concerned, against 1% for single pregnancies. The occurrence of preterm delivery in the case of a twin pregnancy is essentially influenced by the monozygotic nature of the pregnancy, in the case of monochorionic placentation and the existence of malformation or the death of one of the twins [34]. In our series, as in that of Tshinzobe Kaka in the Democratic Republic of Congo [35], the risk of LBW was multiplied by 8 in the event of a twin pregnancy.

Despite the small size of the sample and the possible recall biases, in relation to the methodology of our study, the risk factors for LBW found remain almost the same as those observed more than ten years ago [3]. Although considerable efforts have been made in reproductive health, more reinforcing measures must be taken in order to improve fetal growth and the pregnancy experience. These measures could be applied as part of a three-party strategy involving the pregnant woman and the community, health workers in charge of reproductive health and state health authorities. An effort should first be made to sensitize women and the community on the seriousness of this phenomenon and therefore the usefulness of quality prenatal care. Then, educational and promotional measures on contraception, birth control and limitation should be applied to fight against early and closely spaced pregnancies. Health professionals should pay more attention to the quality of prenatal contacts by identifying risks, screening and treating pathologies associated with pregnancy.

5. Conclusion

The delivery of low birth weight newborns remains frequent at the University Hospital Center of Brazzaville. It is associated with maternal age, marital status, socioeconomic level and nutritional status. The occurrence of malaria and arterial hypertension during pregnancy is harmful to fetal growth and responsible for the most often induced prematurity. The prenatal management of maternal factors and the improvement of the quality of prenatal contacts would contribute to the reduction of this phenomenon.

Recommendations for Follow-up or Future Work

Future studies on LBW should focus on the study of severe morbidity, the identification of determinants of newborn

survival and the assessment of the impact of LBW on growth and psychomotor development in the infant.

Conflicts of Interest

All the authors do not have any possible conflicts of interest.

References

[1] World Health Organization [Online]. Care of the Preterm and/or Low Birth Weight Newborn, Department of Maternal, Newborn, Child and Adolescent Health, 2019 [cited 2020 Jan 02]. Available: https://www.who.int/maternal_child_adolescent/topics/newborn/care_of_preterm/fr/. Google Scholar.

[2] World Health Organization [Online]. Too many babies are too small at birth, 2019 [cited 02 Jan 2020]. Available: https://news.un.org/en/story/2019/05/1043611. Google Scholar.

[3] Mabiala Babela JR, Matingou V, Senga P. Risk Factors for Low Birth Weight in Brazzaville, Congo. J Gynecol Obstr Biol Reprod 2007; 36: 795-8.

[4] Diongue M, Mangane A, Bassoum O and al. Study of the risk factors of low birth weight in the health district of kolda in 2018 (Senegal). RAMReS Sciences de la Sante 2020; 1 (3): 180-90.

[5] Mamelle N, Munoz F, Grandjean H. Fetal Growth from the AUDIPOG study. I. Establishment of Reference Curves. J Gynecol Obstet Biol Reprod 1996; 25: 61–70.

[6] Sherry B, Mei Z, Grummer-Strawn L, Dietz HW. "Evaluation of and Recommendations for Growth References for very Low Birth Weight (< or =1500 grams) Infants in the United States." Pediatrics 2003; 111 (4): 750-8.

[7] United Nations Children's Fund and World Health Organization [Online]. Low Birthweight: Country, regional and global estimates. UNICEF: New York, 2004 [cited 2014 Oct 02]. Available: http://www.unicef.org/publications/index_24840.html.

[8] United Nations Children's Fund [Online]. Progress for children. UNICEF: New York. 2006 Apr [cited 2014 Oct 02]. Available: http://www.unicef.org/french/media/files/Progres_pour_les_enfants-No.4.pdf.

[9] Chiabi A, Miaffoc L, Mah E and al. Risk Factors and Hospital Prognosis of Low Birth Weight Newborns (birth weight less than 2500 grams) at the Gyneco-obstetric and Pediatric Hospital of Yaoundé, Cameroon. J Pediatric Pueric 2011; 24: 125-32.

[10] Nagalo K, Kaboret S, Toguyeni L and al. Low birth weight newborns in hospitals in Burkina Faso. J Rech Sci Univ 2021; 23 (2): 223-39.

[11] Bobossi SG, Diermer H, Naji-Adim F, Siopathis RM. Low Birth Weight Newborns in the Neonatology Unit of the Bangui Pediatric Complex (RCA): Immediate Outcome and Prognosis. Med Afr Noire 2000; 47: 192-5.

[12] Camara B. Low Birth Weight: Frequency and Risk Factors in the District of Guediawaye (Suburb of Dakar — Senegal). Med Afr Noire 1996; 43: 260-5.

[13] March of dimes [Online]. Medical Reference: Low Birth Weight. 2004 [cited 2011 Sep 12]. Available: http://www.marchofdimes.com/printableArticles/681_1153.asp?printable=true.

[14] Rambaud P [Online]. Prematurity and Hypotrophy at Birth: Epidemiology, Causes and Prevention. Chu Grenoble, Neonatal Medicine and Infant Resuscitation Service 2000 [cited 2011 Dec 22]. Available: http://www.sante.ujfgrenoble.fr/SANTE/neonat/PREHYPNNE/pr ehypnntext.htm.

[15] ACC/SCN. Low Birth Weight (Nutrition Policy Paper 18). Geneva: ACC/SCN. 2000. Google Scholar.

[16] Blencowe H, Cousens S, Oestergaard MZ et al. "National, Regional, and Worldwide Estimates of Preterm Birth Rates in the year 2010 with time trends since 1990 for selected countries: a Systematic Analysis and Implications." Lancet 2012; 379 (9832): 2162-72.

[17] Haas DM. "Pretermbirth." Clin Evid 2006; 15: 1966-85.

[18] Lumley J. "Defining the Problem: the Epidemiology of Preterm Birth." BJOG 2003; 110 (20): 3-7.

[19] Tucker J, McGuire W. "Epidemiology of preterm birth." Br Med J 2004; 329 (7467): 675-8.

[20] Stanton C, Pelouse JE, Rahman H, Wilczynska-Ketende K, Hill K. "Stillbirth Rates: Delivering Estimates in 190 countries." Lancet 2006; 367 (9521): 1487-94.

[21] Vohr BR, Tyson JE, Wright LL and al. "Maternal Age, Multiple Birth, and Extremely Low Birth Weight Infants." J Pediatr 2009; 154 (4): 498-503. e492.

[22] Telly N, Touré O, Kayentao K and al. Risk Factors for Low Birth Weight in Douentza, Mopti Region. Mali public health 2019, 9: 39-45.

[23] Padonou G, Le Port A, Cottrell G and al. Prematurity, Intrauterine Growth Retardation and Low Birth Weight: Risk Factors in a Malaria-endemic Area in Southern Benin. Trans R Soc Too Med Hyg 2014; 108 (2): 77-83. Doi: 10.1093/trstmh/trt099.

[24] Padonou G, Le Port A, Cottrell G and al. Factors Associated with Growth Patterns from Birth to 18 months in a Beninese Cohort of Children. Acta Too 2014; 135: 1-9. Doi: 10.1016/j.actatropica.2014.03.005.

[25] Ilunga PM, Muluku O, Mawaw PM, Mutombo AM. Frequency and Early Neonatal Prognosis of Low Birth Weight in Lubumbashi, Democratic Republic of Congo. Pan Afr Med J 2016; 23: 232.

[26] Ngolomba J, Ngolomba EA, Widobana DM, Pasi PN, Mbilisi A. Low Birth Weight at the Jason Sendwe Provincial General Reference Hospital in Lubumbashi: DRC from January to December 2019. Int J Innov Appl Stud 2020; 29 (4): 1052-63.

[27] Faye PM, Diagne-Gueye NR, Paraiso L and al. Postnatal Weight Growth of Low Birth Weight Newborns in the Neonatology Department of the Albert Royer National Children's Hospital Center: Incidence of Extra-uterine Growth Retardation. J Pedriat Pueric 2016; 29 (1): 20-7. Doi: 10.1016/j.jpp.2015.11.002.

[28] Kakudji LP, Muluku O, Kalenga MP. Study of Low Birth Weight Associated with Maternal Age and Parity in a Mother-Child Couple Population Followed in Lubumbashi. Pan Afr Med J 2015; 20: 246. Doi: 10.11604/pamj.2015.20.246.5169.

[29] Siza I. Risk Factors Associated with Low Weight of Neonates among Pregnant Women Attending a Referral Hospital in Northern Tanzania. Tanzan J Health Res 2008; 1: 1-8.

[30] Kangulu IB, Ngoy EK, Nzaji MK, Kalenga Mwenze P. Risk Factors for Low Birth Weight in Semi-Rural Areas of Kamina, Democratic Republic of Congo. Pan Afr Med J 2014; 17: 1-5.

[31] MacLeod S, Kiely JL. The Effects of Maternal Age and Parity on Birthweight: a Population-based Study in New York City. Int J Gynaecol Obstet 1988; 26 (1): 11-9. PubMed | Google Scholar.

[32] Swamy GK, Edwards S, Gelfand A, James SA, Miranda ML. Maternal Age, Birth Order, and Race: Differential Effects on Birth Weight. J Epidemiol Community Health. 2012; 66 (2): 136 - 42. PubMed | Google Scholar.

[33] Vaast P, Lucot JP, Chauvet MP and Puech F. Multiple Pregnancies. Anatomoclinical Study and Management. Encycl Med Chir (Scientific and Medical Editions Elsevier SAS, Paris, all rights reserved), Gynecology/Obstetrics, 5-030-A-10, 2000, 20 p.

[34] Blondel B, Du Mazaubrun C, Breart G. National Perinatal Survey. Unit for Epidemiological Research on the Health of Women and Children. INSERM, 1995: U149.

[35] Tshinzobe Kaka JC, Ngaya Kwango D. Case-control study of factors associated with low birth weight at the Center Hospitalier de Kingasani, Kinshasa (Democratic Republic of Congo). Pan Afr Med J 2021; 38: 94. Doi: 10.11604/pamj.2021.38.94.16099.