The Influence of Urbanization and Maternal Characteristics on Birth Weight among the Neonates in Kano State, Nigeria

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Abstract

Separate studies have emphasized that significant associated risk factors for the birth weight (BW) of a newborn baby vary according to geographical location. It is shown that mothers in rural areas tend to give birth to low birth weight (LBW) babies than women who live in urban areas. In this study, attempt was made to find the influence of urbanization (location) and maternal characteristics on birth weight. A prospective, cross sectional study was conducted in six government hospitals in Kano State, Nigeria involving mother-child pair. The hospitals consist of three hospitals within Kano metropolitan and three from rural areas (one hospital from each of the senatorial district). A total of 1203 samples were taken and evaluated. Mean BW of the neonates was found to be 3079 g (approximately 3.1 kg), Urbanization was proven to be of significant effect on neonatal birth weight(P < 0.001). All the other maternal characteristics have shown no significant influence on birth weight. However, babies score in terms of: Appearance Pulse Grimace Activity and Respiration (APGAR) in the first (P < 0.001) and fifth (P < 0.001) minutes were found to have significant effects on the neonatal birth weight. Therefore, it has been concluded that there is a significant variation among the maternal characteristics in the urban and rural areas of Kano State. The study has also proven the existence of positive influence of urbanization on maternal characteristics and Apgar score among the neonates of Kano State.

Keywords: Birth Weight, Kano State, Maternal, Neonatal, Urbanization

INTRODUCTION

Birth weight (BW), is defined as the immediate body weight at birth (Blanc & Wardlaw, 2005). A weight of 2,500 to 4,000 g (2.5 to 4.0 kg) has been termed as normal birth weight (WHOSIS, 2011).Separate studies conducted by Nair et al. (2000) and Acharya et al. (2004) have emphasized that significant associated risk factors for the birth weight (BW) of a newborn, vary according to geographical location and study population. In a study conducted by

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Michael et al. (2013) it is shown that mothers in rural areas tend to give birth to low birth weight (LBW) babies than women who live in urban areas. Recently, it has been shown that the mother's residence is strongly associated with LBW, as mothers residing in rural areas are discovered to be four times more likely to have LBW babies compared to those who live in urban areas (Meresa et al., 2015).Maternal anthropometric characteristics such as maternal age, parity, family size, antenatal attendance have long been used in the indirect clinical assessment of foetal weight (Mongelli & Gardosi, 1999). Low socio-economic status is one of the underlying causes of LBW. Additional causes may include maternal malnutrition; maternal diseases like antepartum hemorrhage, anaemia, cervical incompetence; adolescent pregnancies; short birth intervals; intrauterine infections; multiple gestation; congenital malformations and placental dysfunction. In a more recently concluded work, Amosu et al. (2014) concluded that maternal age, parity, height, occupation, level of formal education and socioeconomic status are associated with birth weight. Furthermore, it has been observed that towards the last end of the pregnancy (third trimester), the foetal weight is highly influenced by some maternal factors (Adediji et al., 2015). Additionally, it has been documented that adequate maternal nutrition during pregnancy is vital for foetal growth (Nnam, 2015).

METHODOLOGY

The study was a prospective, cross sectional type conducted in six government hospitals in Kano State, Nigeria involving mother-child pair from November 2017 to May 2018. Ethical approval was given by Kano State Ministry of Health to conduct the study. Three hospitals from the urban and rural areas each were randomly selected. A sample of 1203 full term neonates and their mothers from six different government hospitals within Kano State were considered. Preterm babies or babies with congenital/physical anomalies and decline consent by the mothers were excluded from the study. A simple proforma was used as a research instrument for recording of the obtained data, and a digital weighing scale (EBSA-20, Kologn Industrial Limited) and a non elastic measuring tape (Butterfly China) were used as the research instruments. Birth weight was taken using the digital weighing scale and the readings were recorded on the proforma. The maternal characteristics include age of the mothers (recorded in years to the last birth date) together with the maternal parity, family size, maternal educational level, antenatal care attendance, domicile (location) and Apgar score were all recorded on the proforma.

Statistical Analyses

The data were expressed as Mean ± SD. General linear model was employed to determine the influence of urbanization, maternal characteristics and Apgar score (covariate) on neonatal birth weight (dependent variable). The analysis was carried out using IBM SPSS version 25.0 and$P< 0.05$ was set as level of significance.

RESULTS

Table 1 highlighted the descriptive statistics of the quantitative measured variables. The average BW among the neonates in Kano State is found to be 3079.30 g (approximately 3.1 kg). The mean maternal age was 28 years with a minimum value of 13 years and a maximum value of 18 years. The Table also shows the mean family size in Kano State to be 7, with minimum and maximum values of 2 and 23 respectively.

Table 1: The Descriptive Statistics of the Maternal Characteristics among the Mother-child Pair

Variable	N	Mean ± SD	Minimum	Maximum
Birth weight (g)	1203	3079.30± 491.77	1800.00	4600.00
Age (years)	1203	27.86± 6.78	13.00	48.00
Family size	1203	6.61± 4.17	2.00	23.00
Apgar score (1 min.)	1203	8.19 ± 1.27	4.00	10.00
(5 min.)	1203	9.68 ± 0.64	7.00	10.00

Table 2 makes obvious the influence of urbanization, maternal factors and Apgar score on birth weight among the neonates in Kano State. Urbanization is proven to be of significant effect on neonatal birth weight (P< 0.001). All the other maternal characteristics have shown no significant influence on birth weight. However, Apgar score in the first (P< 0.001) and fifth (P< 0.001) minutes were found to have significant effects on the neonatal birth weight.

Table 2: The Influence of urbanization, Maternal Characteristics and Apgar score on   Neonatal Birth Weight in Kano State

Variable	Type III Sum of Squares	Mean Square	F	P-value
Age (years)	812356.64	812356.64	3.37	0.067
MP	301755.42	301755.42	1.25	0.264
FS	271734.30	271734.30	1.12	0.289
MEL	612082.78	612082.78	2.53	0.112
ANC	270081.70	270081.70	1.12	0.291
Domicile	16123836.74	16123836.74	70.53	< 0.001
Apg sco.(1minute)	6905872.88	6905872.88	29.23	< 0.001
(5 minutes)	3636122.54	3636122.54	15.21	< 0.001

MP; Maternal Parity, FS; Family Size, MEL; Maternal Educational Level, ANC; Antenatal Care, Apg sco; Apgar score

Table 3 shows a sex specific influence of urbanization, maternal characteristics and Apgar score on birth weight among the neonates in Kano State. In both sexes, it is discovered that urbanization and maternal educational level have a significant influence on neonatal birth weight; whereas Apgar score (at the fifth minute) shows a significant influence on birth weight among the female neonates.

Table 3: The Gender Specific Influence of Urbanization, Maternal Characteristics and Apgar score on Birth Weight in Kano State

Gender	Variable	Type III Sum of Squares	Mean Square	F	P-value
Male	Age (years)	230580.40	230580.40	0.99	0.321
	MP	89046.93	89046.93	0.38	0.537
	FS	93326.75	93326.75	0.40	0.528
	MEL	99923.25	99923.25	0.43	0.514
	ANC	24494.13	24494.13	0.11	0.746
	Domicile	7204279.84	7204279.84	32.59	<0.001
	Apg sco (1min)	1266846.44	1266846.44	5.47	0.020
	Apg sco (5min)	684957.12	684957.12	2.94	0.087
Female	Age (years)	607542.94	607542.94	2.45	0.118
	MP	867199.96	867199.96	3.51	0.061
	FS	186012.04	186012.04	0.75	0.387
	MEL	1770286.30	1770286.30	7.21	0.007
	ANC	382599.64	382599.64	1.54	0.215
	Domicile	9130027.58	9130027.58	38.97	<0.001
	Apg sco (1 min.)	6540935.76	6540935.76	27.45	<0.001
	Apg sco (5 min.)	3082814.43	3082814.43	12.65	<0.001

MP; Maternal Parity, FS; Family Size, MEL; Maternal Educational Level, ANC; Antenatal Care, Apg sco; Apgar score

DISCUSSION

Maternal characteristics have shown a significant association with BW (Rao et al., 2007).Earlier studies conducted by Newcombe (1981), Raman (1981), Dougherty and Jones (1982) and, later, Talat et al. (1991), have all reported a positive influence of maternal factors on weight at birth. In the literature, the foetal weight, especially during the third trimester was found to be influenced by some maternal characteristics (Adediji et al., 2015). Increased maternal parity, decreased maternal educational level and decreased antenatal clinic care/visit are important factors associated with an increase in the incidence of low birth weight (Shah, 2010; Khan et al., 2013). Increased maternal parity, decreased maternal educational level and decreased antenatal clinic care/visit are important factors associated with an increase in the incidence of low birth weight (Shah, 2010; Khan et al., 2013). In the current study, BW of neonates observed in the urban centers were significantly (P< 0.001) higher than those observed from the rural areas. This implies that the urban/rural location of centres for data collection is a factor that influences neonatal birth weight. In addition, maternal characteristics such as maternal educational level are found to exert no influence on neonatal birth weight in the evaluation of the entire recruited study population. However, on evaluating the study population based on gender of neonates (male or female), it is observed in this study that for the female neonates, maternal educational level (P = 0.007) and urban site for data collection (P< 0.001) significantly affect the neonatal BW. This is in line with a study conducted by Arif et al. (1998) which proved that women with higher education level give birth to normal BW babies (2.5 kg to 4.0 kg) more than what is obtainable in women with low education level. Similarly, Khan et al. (2013) reported that the frequency of LBW decreases with an increase in MLE. Additionally, Metgud et al. (2012) revealed that maternal illiteracy form part of the risk factors that are significantly associated with the birth weight of newborn babies. Currie and Moretti (2003)

have also documented a fundamental effect of maternal education on BW which revealed that a strong relationship exists between maternal education and BW, in that the maternal education affects BW by improving the probability and/or productivity of health investment. In addition, maternal education improves the financial resources available to the child, directly and indirectly, through the choice of partner, timing of fertility, and number of offspring in developed countries (Behrman & Wolfe, 1989; World Bank, 1993).

Apgar score is a comprehensive screening tool used in the evaluation of the newborn's condition at birth. It is one of the quantitative measurements used in assessing the health of a new-born baby. The evaluation is performed within the first and fifth minutes after delivery. A score of less than five is termed as low Apgar score. The low Apgar score has also been found to be an index of placental nutrient efficiency, which may lead to adverse perinatal outcomes, such as perinatal death (Molteni, 1984; Wallace et al., 2013). In a Similar study conducted by Lao and Wong (2001), it was reported that there is an increase incidence of low Apgar score (a score of less than 7.0) among non-diabetic mothers. The mean Apgar score value in this study at the first and fifth minutes among the neonates stood at 8.19 ± 1.27 and 9.68 ± 0.64, respectively. This shows that the mean Apgar scores at first and fifth are above the risk level (i.e. above the scores of less than 7). Additionally, when urbanization was factored-in, a significant effect was observed (P< 0.001) at both the first and fifth minutes.

CONCLUSION
The study has determined the mean BW among the neonates in Kano State. It has been observed that there is a significant variation among the maternal characteristics in the urban and rural areas of Kano State. The study has also proven the existence of positive influence of urbanization on maternal characteristics and Apgar score among the neonates of Kano State.

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REFERENCES
Acharya, D., Nagraj, K., Nair, N. S. & Bhat, H. V. (2004). Maternal determinants of intrauterine growth retardation: A case control study in Udupi district, Karnataka. Indian Journal of Community Medicine,29(4): 4.

Adediji, J. A., Ehi-Omosun, M. B. & Ehimigbai, A. R. O. (2015). Maternal factors affecting birth weight newborn babies in Maiduguri. Journal of Health Medicine and Nursing, 19: 39 – 49.

Amosu, A. M., Degun, A. M. & Daniel, T. G. (2014). Maternal socio-demographic characteristics as correlates of newborn birth weight in urban Abeokuta, Nigeria. Biomedical Research,25(4): 612 – 616. Retrieved from http://www.biomedres.info

Arif, M. A., Qureshi, A., H., Jafarey, S. N., Alam, S. E. & Ariff, A., K. (1998). Maternal socio-cultural status: a novel assessment of risk for the birth of small for gestational age, low birth weight infants. Journal of Obstetrics and Gynaecology Research,24 (3): 215 – 222.

Behrman, J. R. & Wolfe, B. (1989). Does more schooling make women better nourished and healthier? Adult sibling random and fixed effects estimate for Nicaragua. Journal of Human Resources,24: 644 – 663.

Blanc, A. & Wardlaw, T. (2005). Monitoring low birth weight: an evaluation of international estimates and an updated estimation procedure. Bulletin of the World Health Organization, 83(3): 178 – 185.

Currie, J.& Moretti, E. (2003). Mother's education and the intergenerational transmission of human capital: Evidence from college openings. Quarterly Journal of Economics, 118(4): 1495 – 1532.

Dougherty, G.R.S.& Jones, A. D. (1982). The determinants of birth weight. American Journal of Obstetrics and Gynecology, 144:190 – 200.

Khan, M. H., Khalique, N., Amir, A. & Khan, R. (2013). Impact of behavior change communication among pregnant women regarding knowledge of low birth weight infants' susceptibility to certain morbidities. Annual Review and Research in Biology, 3(4): 350 – 357.

Lao, T. T. & Wong, W. M. (2001). Implications of a high placental ratio in pregnancies with appropriate-for gestational age neonates. Journal of Gynecology and Obstetrics Investigation, 52: 34 – 37.

Meresa, G., Fentie, A., Eleni, A.& Haileselassie, B. (2015). Maternal associated factors of low birth weight: a hospital based cross-sectional mixed study in Tigray north Ethiopia. BioMed Center Journal of Pregnancy and Childbirth, 15: 222. Doi: 10.1186/s12884-015-0658-1

Metgud, C. S., Naik, V. A.& Mallapur, M. D. (2012). Factors affecting birth weight of a new born – A community based study in rural Karnataka, India. PLOS, doi:10.1371/journal.pone.0040040

Michael, O. F., Louis, M.& Nsowah, N. N. (2013). Low Birth Weight and Associated Maternal Factors in Ghana. Journal of Biology, Agriculture and Healthcare, 3(7): 205 – 211.

Molteni, R. A. (1984). Placental growth and fetal/placental weight (F/P) ratios throughout gestation-their relationship to patterns of fetal growth. Journal ofSeminars in Perinatology, 8: 94 – 100.

Mongelli, M. & Gardosi, J. (1999). Symphysis-fundus height and pregnancy characteristics in ultrasound-dated pregnancies. Obstetrics & Gynecology, 94: 591 – 594.

Nair, N. S., Rao, R. S. P., Chandrashekar, S., Acharya, D.& Bhat, H. V. (2000). Socio-demographic and maternal determinants of low birth weight: A multivariate approach. Indian Journal of Pediatrics, 67(1): 9 – 14.

Newcombe, I. G. (1981). Non nutritional factors affecting fetal growth. American Journal of Clinical Nutrition,34:732.

Nnam, N. M. (2015). Improving maternal nutrition for better pregnancy outcomes. Proceeding of the Nutrition Society, 74: 454 – 459

Raman, L. (1981). Influence on maternal nutritional factors affecting birth weight. American Journal of Nutrition, 34:775.

Rao, T., Aggarwal, A. K.& Kumar, R. (2007). Dietary intake in third trimester of pregnancy and prevalence of LBW: A community-based study in a rural area of Haryana. Indian Journal of Community Medicine, 32(4): 272 – 276.

Shah, P. S. (2010). Parity and low birth weight and preterm birth: a systemic review and meta-analyses. Acta Obstetricia et Gynecologica Scandinavica, 89(7): 862 – 875.

Talat, J. H., Khushnaseeb, I. S., Ejaz, A., Masoodul, H.& Sadiqua, N. J. (1991). Maternal factors affecting birth weight of uncomplicated pregnancy. Journal of Pakistan Medical Association, 164 – 167.

Wallace, J. M., Bhattacharya, S.& Horgan, G.W. (2013). Gestational age, gender and parity specific centile charts for placental weight for singleton deliveries in Aberdeen, UK. Placenta – Journal - Elsevier, 30: 269 – 274.

WHOSIS (2011). World Health Organization Statistical Information System. Retrieved from http//www.who.int/whosis/indicators/compendium/2008/2bwn/index.html

World Bank (1993). World Development Report 1993: Investing in Health, New York: Oxford University Press.