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AN INVESTIGATION ON THE CAUSES OF LOW BIRTH WEIGHT IN RURAL DELTA STATE, NIGERIA.

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ABSTRACT: *Low birth weight as defined by World Health Organization is the weight of the baby at birth which is less than 2500grammes (5.5pounds). This study examines the factors associated with low birth weight in rural delta state, Nigeria with objectives of determining the variables making significant contributions to the occurrence of LBW and developing an explanatory model for predicting Birth-weight in the region. Simple descriptive analysis, correlation analysis and multiple linear regression was applied on the dataset, from which significant correlations were found to exists between birth weight and gestational period, birth weight and parity and between birth weight and mother's age {(r = .290, p-value = .044), (r = -.249, p-value = .001), (r = -.234, p-value = .045)} respectively. Also, the model, Birth Weight = -1.032 + .032 Mother's Age + .308 Gestational Period + .377 Parity, significantly predicted Birth Weight, F(5,136) = 3.482, p-value =0.005 < 0.05, $R^2_{adjusted}$= 0.589; 58.9%. with Parity making the strongest statistically unique significant contribution to explaining Birth Weight in the region(Beta = -.408)*

KEYWORDS: Low Birth Weight, Maternal Variables, Parity, Gestational Period, Rural Delta State.

INTRODUCTION

One of the salient slogan of the World Health Organization (WHO) is "Children's health is tomorrows wealth." Birth weight is the baby's weight at birth. A new born baby weighing less than 2500grammes (5.5pounds) at birth with the measurement taken within 24 hours of life, before significant weight loss has occurred, is designated as low birth weight (LBW) baby (WHO/UNICEF, 2009). Low birth weight is one of the causes of high infant mortality and morbidity rates in developing countries, it determines the neonatal and childhood survival (UNICEF, 2012). In Latin America the percentage of LBW was at 10.1%, in Africa 14% and in Kenya LBW was measured at 16% in 2010 and 11% in 2012 (world-bank 2012). At birth, fetal weight is accepted as a parameter that is directly related to the health and nutrition of the mother as well as an important determinant of the chances of the new born to survive and experience healthy growth and development (Wilcox, 1992; Kraemer et al., 1977). Low birth weight is usually caused by preterm birth (a low gestational age at birth, commonly defined as younger than 37 weeks of gestation) or the infant being small for gestational age (that is, a slow prenatal growth rate) or a combination of both. In general, risk factors in the mother that may contribute to low birth weight include, young age, multiple pregnancies, previous LBW infants, poor nutrition, heart disease or hypertension, drug addiction, alcohol abuse, and insufficient prenatal care. Environmental risk factors include smoking, lead exposure, and other types of air pollutions. Baby's loss of weight has been shown severally to be significantly associated with maternal education, family size, race, spacing of children/child in the womb, babies that sustain injury in the womb, sickness of mother during pregnancy (Bay and Cirus, 2007). In order to aid in reducing infant mortality, this paper is aimed at;

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1. Determining the variables which made significant contributions to the occurrence of low birth weight amongst women of reproductive age in rural delta state, Nigeria.
2. Developing an explanatory model of birth weight with parity, maternal age, blood pressure of the mother and gestational period as its determinant.

METHODOLOGY

To achieve the set objectives, some models were reviewed and applied which includes;

Multiple Linear Regression Model

Was used to determine how well a set of explanatory variables (birth weight, mother's age, mother's blood pressure, parity and gestational period) is able to predict the response variable (birth weight), which variable in the set of explanatory variables is the best predictor of birth weight and whether an explanatory variable is still able to predict the response variable when the effect of another explanatory variable are controlled for.

$$Y = x\beta + e_i$$

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ \ldots + e_i$$

$$where\ i = 1,2,\ \ldots,\ n$$

$$Y\ is\ the\ Outcome\ Variable$$

$$\beta_0, \beta_1, \ldots, \beta_n\ \ are\ the\ parameters\ of\ the\ model$$

$$x_1, x_2, \ldots, x_n\ are\ the\ predictors$$

Estimation of Model Parameters

$$Y = x\beta + e_i$$

$$e_i = Y - x\beta$$

$$e^i e = (Y - x\beta)^2 = (Y - x\beta)^{'}(Y - x\beta)$$

$$e^i e = Y^{'}Y - Y^{'}X\beta - X^{'}Y\beta + X^{'}X\beta^2$$

$$e^i e = Y^{'}Y - 2X^{'}Y\beta + X^{'}X\beta^2$$

$$\Sigma\,(e^i e) = \Sigma\,(Y^{'}Y - 2X^{'}Y\beta + X^{'}X\beta^2)$$

$$\Sigma\delta(e^i e) / \delta\beta = \ - 2X^{'}Y + 2X^{'}X\beta = 0$$

$$:- 2X^{'}X\beta = 2X^{'}Y$$

$$X^{'}X\beta = X^{'}Y$$

$$\beta^{\wedge} = (X^{'}X)^{-1} X^{'}Y$$

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Correlation Coefficient 'r' and Coefficient of Determination

This was used to know the strength of the relationship between the variables.

$$r = \frac{n\sum x\,y - \sum x \sum y}{\{(\sum x^2 - (\sum x)^2) - (n\sum y^2 - (\sum y)^2\}^{1/2}}$$

DATA ANALYSIS AND RESULTS

Table 1: Descriptive Statistics

	Mean	Std. Deviation	N
Birth Weight	2.996	.7318	142
Mother's Age	27.06	5.237	142
Mother's Weight	66.63	10.880	142
Mother's BP	.54	.500	142
Gestational Period	37.51	1.242	142
Parity	2.15	1.080	142

Table 2: Correlations

		Birth Weight	Mother's Age	Mother's Weight	Mother's BP	Gestational Period	Parity
Pearson Correlation	Birth Weight	1.000	-.234	-.046	-.013	.290	-.249
	Mother's Age	-.234	1.000	.177	.279	-.013	.606
	Mother's Weight	-.046	.177	1.000	.182	.285	.188
	Mother's BP	-.013	.297	.182	1.000	.091	.211
	Gestational Period	.290	-.013	.285	.091	1.000	.179
	Parity	-.249	.606	.188	.211	.179	1.000
Sig. (1 tailed)	Birth Weight		.045	.292	.439	.044	.001
	Mother's Age	.045		.018	.000	.441	.000
	Mother's Weight	.292	.018		.015	.000	.013
	Mother's BP	.439	.000	.015		.141	.006
	Gestational Period	.044	.441	.000	.141		.017
	Parity	.001	.000	.013	.006	.017	
N	Birth Weight	142	142	142	142	142	142
	Mother's Age	142	142	142	142	142	142
	Mother's Weight	142	142	142	142	142	142
	Mother's BP	142	142	142	142	142	142
	Gestational Period	142	142	142	142	142	142
	Parity	142	142	142	142	142	142

Table 2 shows the correlations between birth weight and the explanatory variables and the significance of the correlations. Significant correlations exists when p-value is less than .05. The correlation between Birth Weight and Mother's Weight was found not significant (r = -.046, p-value = .292), the correlation between Birth Weight and Mother's BP was found not

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significant (r = -.013, p-value = .439), the correlation between Birth Weight and Gestational Period was significant (r = .290, p-value = .044), implying that, as gestational period increases, birth weight increases significantly .The correlation between Birth Weight and Parity was significant (r = -.249, p-value = .001), implying that as Parity increases, Birth Weight decreases significantly, The correlation between Birth Weight and Mother's Age was significant (r = -.234, p-value = .045),), implying that as Mother's Age increases, Birth Weight decreases significantly

Table 3: Regression Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin - Watson
1	.786	.618	.589	.520	1.810

a. Predictors: (Constant), Parity, Gestational Period, Mother's BP, Mother's Weight, Mother's Age

b. Dependent Variable: Birth Weight

Table 4: ANOVA

Model		Sums of Squares	Df	Mean Squares	F	Sig.
1	Regression	8.569	5	1.714	3.482	.005
	Residual	66.948	136	.492		
	Total	75.517	141			

a. Predictors: (Constant), Parity, Gestational Period, Mother's BP, Mother's Weight, Mother's Age

b. Dependent Variable: Birth Weight

Table 5: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.032	1.905		-.542	.589
	Mother's Age	.232	.015	.226	2.139	.034
	Mother's Weight	-.004	.006	-.063	-.725	.470
	Mother's BP	.007	.125	.005	.056	.955
	Gestational Period	.308	.051	.383	2.115	.026
	Parity	.377	.071	-.408	-3.905	.000

a. Dependent Variable: Birth Weight

The analysis on Table 3, 4 and 5 shows that the five predictors (Parity, Gestational Period, Mother's BP, Mother's Weight, Mother's Age) statistically significantly predicted Birth Weight, F(5,136) = 3.482, p-value =0.005 < 0.05, $R^2_{adjusted}$= 0.589; 58.9% of the total variance in Birth Weight is explained by the model. Parity made the Strongest statistically unique significant contribution to explaining Birth Weight when the variance explained by all other variables in the model is controlled for (βeta value = 0.408, p-value = 0.000),

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Gestational Period made less of a contribution (βeta value = 0.383, p-value = 0.026), Mother's Age made a lesser contribution (βeta value = 0.226, p-value = 0.034), while Mother's Weight, Mother's BP did not make a significant unique contribution to the prediction of Birth Weight (βeta value = 0.026, -.063, .005 with p-values = .434, .470, .955) respectively when the variance explained by all other variables in the model is controlled for. The Regression model can be written as;

Birth Weight = -1.032 + .032 Mother's Age + .308 Gestational Period + .377 Parity

This implies that a unit increase in Mother's Age will lead to .032 increase in Birth Weight, a unit increase in Mother's Weight will lead to .004 decrease in Birth Weight, also, a unit increase in Mother's BP will lead to .007 increase in Birth Weight, a unit increase in Gestational Period will lead to .308 increase in Birth Weight and a unit increase in Parity will lead to .377 increase in Birth Weight.

CONCLUSION

Based on findings from this study, we hereby conclude that Maternal Age, Parity and Gestational Period are good predictors of birth weight in rural delta state and can be recommended and can be recommended for use among peripheral health workers for detection of mother's at risk of delivering big or low birth weight babies. We hereby recommend a strengthening of the universal basic education Programme to help increase girl child education and hence maternal education in rural communities of delta state, with the aim of reducing the prevalence of LBW. Our study has some limitations, since the study sample was carried out in a hospital settings, generalization of the findings to the entire region may be limited. Community-based study are advocated and may overcome this limitation.

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