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FACTORS INFLUENCING EXCLUSIVE BREASTFEEDING PRACTICES IN NIGERIA: LOGISTIC REGRESSION MODEL APPROACH

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Abstract: Logistic regression has been used to model exclusive breastfeeding (EBF) as a response variable conditioning on some predictors. To determine the factors influencing the practice of EBF, various maternal and infant characteristics were compared between exclusively breastfed infants and their counterparts. Descriptive analysis was performed to determine the differentials of EBF by explanatory variables and to provide insight into the structure of data. A stepwise backward logistic regression model was applied to test significant variables. A *p*-value of less than 0.05 denoted significance of the factors, and was retained in the final model. Our results show that being married is inversely associated with EBF {less common among married women}. This inverse relationship appeared to be due to 2 selection factors in the sample and possibly due to the fact that most unmarried women were the teen ages {very few} who are under the care of their families. The results further show that richer women are more likely to practice EBF. That is the wealth index directly affects EBF prevalence. Classification table was used to examine the consistency of the model in classifying the observed and predicted values of EBF and its overall percentage of correct classification was 60.4%.

Keywords and phrases: logistic regression, exclusive breastfeeding, infants, odds ratio.

Introduction

In the early 1970s the prevalence of breastfeeding declined in the world. After 1990, the breastfeeding initiation rates have increased, while exclusive

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breastfeeding (EBF) rates have shown little or no increase. In 2001, the World Health Organization suggested that exclusive breastfeeding should continue until six months of life in both developing and developed countries. It seems that the major challenge in breastfeeding is the duration of breastfeeding rather than its initiation [1].

Exclusive breastfeeding (EBF) has been defined by World Health Organization (WHO) as the situation where the infant has received only breast milk and no other liquid or solid with the exception of drops or syrups consisting of vitamins, minerals supplements or medicines [2]. It is adequate in quality and quantity in terms of energy, protein, nutrients, water, etc. [3]. World Health Organization (WHO) and United Nations Children's Emergency Fund (UNICEF) recommend that all mothers should breastfeed their children exclusively for six months and thereafter continue to breastfeed for as long as the mother and the child wish and both appropriate and sufficient wean food should be added after six months of life [4]. It has been described as one of the cardinal components of the baby friendly hospital initiative (BFHI) that aimed at protecting, promoting and supporting breastfeeding for optimal maternal and child health and it is part of 1990 innocenti declaration which states that all governments should create an environment enhancing women to practice EBF for the first six months of life and to continue breastfeeding with adequate complementary foods for up to 2 years [5].

In Africa, Nigerian integrated child health cluster survey 2003 indicated that a major area of need in infant breastfeeding was early initiation. Newborns are expected to put to breast within one hour of delivery. The survey indicated decline from 56% in 2000 to 34% in 2002. In a study by [5] smaller family size had a positive effect on exclusive breastfeeding among women with ≤ 4 children per family, who achieved higher EBF rates than those with ≥ 5 $(P < 0.001)$. It is self-evident that mothers can cope better with the demand of EBF when they have fewer babies who are well spaced out. Her study also found out that higher maternal educational level favours EBF. A study by scientists at the Africa Centre for Health and Population

Studies, South Africa (2007) has shown that exclusive breastfeeding can significantly reduce the risk of HIV transmission from mother to child in infants aged under six months when compared to those also given solid foods or replacement feed. Studies reveal that women whose babies are born through caesarean surgery are just as successful at breastfeeding as mothers who deliver virginally, as long as their commitment to breastfeeding remains high [6]. After a caesarean section, the first breastfeeding may occur immediately at the operation room with baby passed under the sterile drapes while the mother is being stitched up. When this is not possible, it will commonly occur in the recovery room as soon as possible after delivery. That many women have successfully breastfed twins and triplets, some for over two years, shows that EBF is possible even with multiple births. Research suggested that when breastfeeding twins, one baby should not be exclusively assigned to a breast because they may be uneven suckers and very shortly the mother will have lopsided shapes due to their uneven sucking patterns.

The superiority of breast milk over any other milk nourishment of the human newborn and infants can hardly be challenged and over the years, it has become more and more apparent that it is the most ideal, safe and complete food that a mother can provide for her newborn, so a more detailed understanding of the factors associated with EBF in Nigeria is needed to develop effective intervention to improve the roles of EBF and thus reduce infant mortality. There are two main uses of logistic regression. The first is the prediction of group membership. Since logistic regression calculates the probability of success over the probability of failure, the results of the analysis are in the form of an odds ratio.

This study is aimed at fitting an adequate, parsimonious model that measure the exclusive breastfeeding chance of infants less than six months of age. Also to identify and examine the extent of influence of the identified factors on the prevalence of exclusive breastfeeding using an existing representative survey datasets collected for the Nigeria Demographic and Health Survey conducted by the National Population Commission, while controlling for maternal and infant characteristics [7].

Materials and Methods

Logistic regression

Modelling the relationship between explanatory and response variables is a fundamental activity encountered in statistics. Simple linear regression is often used to investigate the relationship between a single explanatory (predictor) variable and a single response variable. When there are several explanatory variables, multiple regressions is used. However, often the response is not a numerical value. Instead, the response is simply a designation of one of two possible outcomes (a binary response) e.g. alive or dead [9].

In logistic regression, the goal is the same as in Ordinary Least Square (OLS) regression where we model a dependent variable in terms of one or more independent variables [9]. The OLS method which is commonly used to predict dependent variables based on knowledge of one or more independent variables is useful only for continuous dependent variables. We would not use multiple regressions here because, the response variable in this case is binary rather than continuous. Assuming the usual regression model for the probability of EBF practice could lead to predicted values of the probability outside the interval $(0, 1)$. Secondly multiple regression models assume that given the values of the explanatory variables, the response variable has a normal distribution with constant variance. Clearly this assumption is not acceptable for a survey response. Binary logistic regression does not make any assumption of normality, linearity and homogeneity of variance for the independent variable. The logistic transformation will expand the range from $(0, 1)$ to $(-\infty, \infty)$ [10]. Let P (predicted probability of a child having EBF) be a function of the explanatory variables: $0 \leq P \leq 1$ and $P \sim B(p, npq)$, using logit transformation of P, i.e. in $(P/\ln(P/1 - P))$. This leads to logistic regression model of the form

$$In\left(\frac{P}{1 - P}\right) = \beta_0 + \beta_1 X_1 + \cdots + \beta_q X_q. \tag{1}$$

The binary nature of the response also creates difficulties in how we view the variability of individual values around the mean, i.e.

$$E(Y_i \mid X_i) = \beta_0 + \beta_1 X_i = \pi_i.$$

The variance of a binary response is a function of the probability, πi. Explicitly

$$Var(Y_i) = \pi_i(1 - \pi_i),$$

πi is a function of X_i and so the variance of Y_i is also a function of π_i, that is, an assumption of constant variance σ^2 is violated. Additionally, since binary responses can take on only two values, 0 and 1, it is obvious that binary responses cannot vary about the mean according to a normal distribution. One should remember at this point that the error structure, our assumptions on how individuals vary about the mean, is necessary for the proper application and interpretation of the formal statistical inferences made for simple linear regression. In other words, we need these assumptions, construct confidence intervals and test for significance of the linear relationship.

The log-odd is modelled as a linear function of the explanatory variables.

In terms of P, the logistic regression model can be written as

$$P(y = 1) = \frac{\exp f(x)}{1 + \exp f(x)}, \tag{2}$$

where $f(x) = (\beta_0 + \beta_0 X_1 + \cdots + \beta_p X_p)$.

Extend this technique of multiple logistic regression analysis to research situation where the outcome variable is categorical by modelling the survival of infants [11]. Competing models in multiple logistic regressions can be formally compared by a likelihood ratio (LR) test, a score test or by Wald test. The three are asymptotically equivalent but differ in finite samples. The score test is better than the Wald test but the likelihood ratio method is best because it uses the difference between the probability of obtaining the observed results under the logistic model and the probability of obtaining the observed results in a model with no relationship between the independent and dependent variables [12].

Let n be an independent observations of a pair of response variable y_i and vectors of independent observation $x = (x_1, x_2, ..., x_p)$, where y is coded as 0 and 1. If

$$y_i = \pi(x) + \varepsilon, \tag{3}$$

where ε is the error and assume two values, when $y = 1$, then, $\varepsilon = 1 - \pi(x)$ with probability $\pi(x)$, and when $y = 0$, $\varepsilon = -\pi(x)$, with probability $1 - \pi(x)$, thus ε has a distribution with mean zero and variance equal to $\pi(x)[1 - \pi(x)]$, i.e. the conditional distribution of the response variable follows a binomial distribution. The likelihood function of the pair of vectors x and y is given as

$$l(\beta) = \Pi\pi(xi)yi[1 - \pi(xi)](1 - yi) \tag{4}$$

and

$$L(\beta) = \ln[l(\beta)] = \Sigma\{yi \ln[\pi(xi)] + (1 - yi)\ln[1 - \pi(xi)]\}. \tag{5}$$

Maximizing (5) gives two nonlinear equations of the form

$$\Sigma[yi - \pi(xi)] = 0,$$

$$\Sigma(xi)[yi - \pi(xi)] = 0 \tag{6}$$

which are nonlinear in β and thus require special methods for the solution which are iterative in nature and are solved with computer program. The special form of logistic regression model is of the form of 1 and a transformation of that is the logit transformation. This is defined in terms of $\pi(x)$, i.e.

$$f(x) = \ln\{\pi(x)/[1 - \pi(xi)]\}, \tag{7}$$

$$f(x) = \beta_0 + \beta 1X1 + \cdots + \beta pXp. \tag{8}$$

We can compare the observed to predicted value using the (3), i.e. deviance test is

$$D = -2\Sigma\{yi \ln[\pi i/yi] + (1 - yi)\ln[1 - \pi i/(1 - yi)]\}, \quad (9)$$

where $\pi i = \pi(xi)$ and D is called *deviance test*. Other methods apart from the above method are non-iterative weighted least squares and discriminant function analysis.

Model Selection Methods

Stepwise regression is used in the exploratory phase of research but it is not recommended for theory testing [13]. Theory testing is the testing of a priori theories or hypotheses of the relationships between variables. Exploratory testing makes no a priori assumptions regarding the relationships between the variables, thus the goal is to discover relationships. Any stepwise procedure for selection or deletion of variables from a model is based on a statistical algorithm that checks for the importance of the variables, and either includes or excludes them on the basis of a fixed decision rule. The importance is defined in terms of a measure of statistical significance of the coefficient for the variable. This depends on the assumptions of the model. Here we use likelihood ratio chi-square test since the errors are assumed to be binomially distributed.

Backward stepwise regression appears to be the preferred method of exploratory analyses, where the analysis begins with a full or saturated model and variables are eliminated from the model in an iterative process. The fit of the model is tested after the elimination of each variable to ensure that the model still adequately fits the data. The process stops when any further deletion leads to a significantly poorer fit.

Application

The 2008 NDHS sample was selected using stratified two-stage clusters design consisting of 888 clusters, 286 in the urban and 602 in the rural areas. A representative sample of 36,800 households was selected for the data (in the first stage). In the second stage, an average of 41 households was selected in each cluster by equal probability systematic sampling.

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We prepare our variables as follows: Marital status was 6 categories – never married, married, living together, widowed, divorced, and not living together. The categories, living together, widowed, divorced, not living together were merged into category – marital status 2 and those who are married are in marital status 1 and never married is our reference category. Wealth index is in five categories classified using methods recommended by world bank poverty network and united nations children's fund namely poorest, poorer, middle, richer and richest. Poorest is our reference category. Sex of the baby is in two categories – male or female, we select female as our reference category. Age of the baby (in months) was a continuous variable ranging from 0-59 months. We categorized into 0-1 month, 2-3 months, 4-6 months, above six months; this is based on WHO recommendation (WHO [7]). The category above 6 months was removed because it is not relevant to the study being carried out. 0-1 is our reference category.

Highest education level is in 4 categories – no education, primary education, secondary education, tertiary education where no education is our reference category. Place of residence is in two categories – urban and rural residence with rural residence being our reference category.

Work status – is in 2 categories – currently not working and currently working, with not working as our reference category. Mother age was a continuous variable ranging from 15 year to 49 year. We categorized it into < 20 years, 20-35 years, and 36-49 years with < 20 years as our reference category. Exclusive breastfeeding: the response variable exists in two categories with yes for practicing EBF and no for not practicing EBF.

Results

The number of respondents was initially 28647, but after necessary data sorting, it was reduced to 26422 respondents. Table 1 below shows the background characteristics of infants and other predictors associated with exclusive breastfeeding. We noticed from Table 2 that the conditional probability of the poorest practicing EBF is 0.63 {which we note that when multiplied by 100 is equal to the row percentage in the table given the way the table is organized}. The conditional probability of the poorer practicing EBF is 0.59, that of the middle class 0.56, the richer 0.52, the richest 0.46. The odds of poorest practicing EBF is 1.7, 1.5 for the poorer, 1.3 for those in the middle class category, 1.1 for the richer and 0.9 for the richest. The table reveals that the wealthier a woman, the more likely she practice EBF. Table 3 reports those with no education practicing EBF, the conditional probability is 0.61, for those who had primary education it is 0.56, 0.51 for those who had secondary education and 0.41 for those who had higher education. The odds of those with no education to practice EBF is 1.5, for those who had primary education it is 1.3, for those who had secondary education it is 1.1 and for those who had higher education it is 0.7. The table reveals that education is inversely associated with EBF. The more educated a woman is the less likely she is to practice EBF. Table 4 shows that the conditional probability of urban dwellers to practice EBF is 0.53 while that of rural dwellers is 0.58. Their odds of practicing EBF are 1.1 and 1.4, respectively. This reveals that rural dwellers are more likely to practice EBF better than urban dwellers.

Table 5 shows the conditional probability of male infants being exclusively breastfed to be 0.56 while that of female infants is 0.57. Their odds of being exclusively breastfed are 1.27 and 1.34, respectively. Female infants have higher chance of being exclusively breastfed than their male counterparts. Table 6 reveals the conditional probability working class women to practice EBF to be 0.55 while it is 0.60 for those not working. Their odds of practicing EBF are 1.2 and 1.5, respectively. We see that those not working are having higher chance of practicing EBF. Table 7 reports that the conditional probability of mothers is 0.59 between ages 15-19 to practice

EBF, 0.57 for those between ages of 20-35, and 0.53 for those between the ages of 36-49. Their odds of practicing EBF are 1.43, 1.34 and 1.14, respectively. This means that increasing age of mother affects EBF practice adversely.

In Table 8, the conditional probability for those never married to practice EBF is 0.5, 0.57 for married women, 0.56 for those living together, 0.33 for those widowed, 0.43 for those divorced and 0.27 for those not living together. Their odds of practicing EBF are 1.0, 1.34, 1.29, 0.48, 0.76 and 0.36, respectively. This shows that married women practice EBF better than others.

Table 9 shows the conditional probability of 0-1 month old infants being exclusively breastfed to be 59.2%, it is approximately 60%, for those between the ages of 2-3 months and 57.4% for those between the ages of 4-6 months. Their odds of being exclusively breastfed are 1.45, 1.49 and 1.35, respectively.

In Table 10, we discuss the results of the logistic regression estimates and at iterative ten, six variables are finally selected urban, marital status 1, work status, wealth index 2, wealth index 3, and wealth index 4. Looking at the significance level of urban and working status $(P > 0.05)$ they were removed from the model, so that the final model in term of probability becomes what we have in Table 11,

$$P = \frac{1}{1 + \exp^{-(-1.257+0.436X_1+\cdots-0.799X4)}}.$$

In terms of odds, the model in Table 10 is given as:

$$\text{Odd}(p) = \exp(-1.257 + 0.436U + 0.457W_2 + 0.843W_3 + 0.211W_4 + 0.133M - 0.799W).$$

In terms of logit, (log-odd), the model is:

$$\text{logit}(p) = -1.257 + 0.436U + 0.457W_2 + 0.843W_3 + 0.211W_4 + 0.133M - 0.799W.$$

In terms of odds, a woman who is married has a reduced chance of 48% of practicing EBF when compared to those that are single. Those in the middle category of wealth index have 40% increased chance of practicing EBF than those who are poorest. Those who are richer have 41% increased chance of practicing EBF than those who are poorest. Women who are richest have 81% increased chance of practicing EBF than the poorest. If the values of the prognostic variables in the model are set at zero for an individual the EBF for an individual will be

$$P(EBF/0) = 1/(1 + \exp - (-1.257)) = 0.22.$$

This means that out of every 100 of such individual, 22 will exclusively breastfed.

In terms of odds of EBF, we have

$$\text{Odd}(P) = \text{Exp}(-1.257) = 0.258.$$

On the other hand, if the prognostic values are set at one, for the same individual above, the chance of EBF will be 0.42. This means that out of every 100 of such individuals 42 will be exclusively breastfed.

$$\text{Odd} = e^{(-1.257+0.436+0.457-0.843+0.799)} = 1.377.$$

This represents 137.7% increase in the odds of EBF of such individual. The model interpretation in terms of what each variable contributed into the model in terms of odd and probability is given in Table 11.

For instance the contribution of marital status is estimated in terms of probability as

$$p(EBF/work\ status) = 1/1 + \exp(-(-1.257 - 0.799)) = 0.133.$$

We compute its ratio to the probability when the values of all variables are zero 0.516, which means the marital status reduces the chance of EBF by 48%.

Discussion

In the hierarchical analysis of the final model, Married, and Middle, Richer, Richest categories of wealth index were retained as the predictors of EBF. Contrary to our expectation, being married was found to be inversely associated with EBF {less common among married women}. This inverse relationship appeared to be due to selection factors in the sample and possibly due to the fact that most unmarried women were the teen ages {very few} who are under the care of their parents, but this corroborates with earlier reported research work in Ethiopia by [3]. Our results further show that the richer a woman, the more likely she is to practice EBF hence, wealth index directly affects EBF prevalence in Nigeria. This is because of her feeding habits which is sure to improve if she has more income. EBF rates in Nigeria are amongst the lowest in the world and even compare poorly with other neighbouring countries in the region. Nigeria lags behind Ghana, Republic of Benin and Cameroon in the practice of EBF for the first six months of life.

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Table 1. Background characteristics of infants and other predictor variables

		Number	Percentage
Exclusive breastfeeding	No	12358	43.4%
	Yes	16095	56.6%
Current marital status	Never married	499	1.8%
	Married	26750	94.0%
	Living together	447	1.6%
	Widowed	315	1.1%
	Divorced	215	.8%
	Not living together	227	.8%
Highest educational level	No education	14310	50.3%
	Primary	6518	22.9%
	Secondary	6291	22.1%
	Higher	1334	4.7%
Type of place of residence	Urban	7553	26.5%
	Rural	20900	73.5%
Sex of child	Male	14496	50.9%
	Female	13957	49.1%
Wealth index	Poorest	7560	26.6%
	Poorer	6826	24.0%
	Middle	5562	19.5%
	Richer	4720	16.6%
	Richest	3785	13.3%
Respondent currently working	No	10110	35.5%
	Yes	18343	64.5%
Mother's age	15-19	1571	5.5%
	20-35	21572	75.8%
	36-49	5308	18.7%
Baby's age		25550	89.8%
	0-1	771	2.7%
	2-3	1023	3.6%
	4-6	1109	3.9%

Tables 2-8 show various tables of cross-tabulations of exclusive breastfeeding and predictor variables.

Table 2. Wealth index vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Wealth index	Poorest	Count	2820	4784	7604
		% within Wealth index	37.1%	62.9%	100.0%
		% within Exclusive breastfeeding	22.7%	29.5%	26.5%
	Poorer	Count	2802	4069	6871
		% within Wealth index	40.8%	59.2%	100.0%
		% within Exclusive breastfeeding	22.5%	25.1%	24.0%
	Middle	Count	2486	3123	5609
		% within Wealth index	44.3%	55.7%	100.0%
		% within Exclusive breastfeeding	20.0%	19.3%	19.6%
	Richer	Count	2281	2474	4755
		% within Wealth index	48.0%	52.0%	100.0%
		% within Exclusive breastfeeding	18.3%	15.3%	16.6%
	Richest	Count	2048	1760	3808
		% within Wealth index	53.8%	46.2%	100.0%
		% within Exclusive breastfeeding	16.5%	10.9%	13.3%

Table 3. Highest educational level vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Highest educational level	No education	Count	5675	8743	14418
		% within highest educational level	39.4%	60.6%	100.0%
		% within exclusive breastfeeding	45.6%	53.9%	50.3%
	Primary	Count	2882	3670	6552
		% within highest educational level	44.0%	56.0%	100.0%
		% within exclusive breastfeeding	23.2%	22.6%	22.9%
	Secondary	Count	3094	3244	6338
		% within highest educational level	48.8%	51.2%	100.0%
		% within exclusive breastfeeding	24.9%	20.0%	22.1%
	Higher	Count	786	553	1339
		% within highest educational level	58.7%	41.3%	100.0%
		% within exclusive breastfeeding	6.3%	3.4%	4.7%

Table 4. Type of place of residence vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		
			No	Yes	Total
Type of place of residence	Urban	Count	3614	3999	7613
		% within type of place of residence	47.5%	52.5%	100.0%
		% within exclusive breastfeeding	29.1%	24.7%	26.6%
	Rural	Count	8823	12211	21034
		% within type of place of residence	41.9%	58.1%	100.0%
		% within exclusive breastfeeding	70.9%	75.3%	73.4%

Table 5. Sex of child vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Sex of child	Male	Count	6445	8159	14604
		% within sex of child	44.1%	55.9%	100.0%
		% within exclusive breastfeeding	51.8%	50.3%	51.0%
	Female	Count	5992	8051	14043
		% within sex of child	42.7%	57.3%	100.0%
		% within exclusive breastfeeding	48.2%	49.7%	49.0%
Total		Count	12437	16210	28647
		% within sex of child	43.4%	56.6%	100.0%
		% within exclusive breastfeeding	100.0%	100.0%	100.0%

Table 6. Respondent currently working vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Respondent currently working	No	Count	4055	6055	10110
		% within respondent currently working	40.1%	59.9%	100.0%
		% within exclusive breastfeeding	32.8%	37.6%	35.5%
	Yes	Count	8303	10041	18344
		% within respondent currently working	45.3%	54.7%	100.0%
		% within exclusive breastfeeding	67.2%	62.4%	64.5%

Table 7. Mother's age vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Mother's age	2	Count	1	0	1
		% within mother's age	100.0%	.0%	100.0%
		% within exclusive breastfeeding	.0%	.0%	.0%
		Count	1	0	1
		% within mother's age	100.0%	.0%	100.0%
		% within exclusive breastfeeding	.0%	.0%	.0%
	15-19	Count	652	932	1584
		% within mother's age	41.2%	58.8%	100.0%
		% within exclusive breastfeeding	5.2%	5.7%	5.5%
	20-35	Count	9285	12435	21720
		% within mother's age	42.7%	57.3%	100.0%
		% within exclusive breastfeeding	74.7%	76.7%	75.8%
	36-49	Count	2498	2843	5341
		% within mother's age	46.8%	53.2%	100.0%
		% within exclusive breastfeeding	20.1%	17.5%	18.6%

Table 8. Current marital status vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Current marital status	Never married	Count	252	254	506
		% within current marital status	49.8%	50.2%	100.0%
		% within exclusive breastfeeding	2.0%	1.6%	1.8%
	Married	Count	11482	15441	26923
		% within current marital status	42.6%	57.4%	100.0%
		% within exclusive breastfeeding	92.3%	95.3%	94.0%
	Living together	Count	199	256	455
		% within current marital status	43.7%	56.3%	100.0%
		% within exclusive breastfeeding	1.6%	1.6%	1.6%
	Widowed	Count	213	103	316
		% within current marital status	67.4%	32.6%	100.0%
		% within exclusive breastfeeding	1.7%	.6%	1.1%
	Divorced	Count	123	94	217
		% within current marital status	56.7%	43.3%	100.0%
		% within exclusive breastfeeding	1.0%	.6%	.8%
	Not living together	Count	168	61	229
		% within current marital status	73.4%	26.6%	100.0%
		% within exclusive breastfeeding	1.4%	.4%	.8%

Table 9. Baby's age vs exclusive breastfeeding cross-tabulation

			Exclusive breastfeeding		Total
			No	Yes	
Baby's age	0-1	Count	317	460	777
		% within baby's age	40.8%	59.2%	100.0%
		% within exclusive breastfeeding	26.3%	26.8%	26.6%
	2-3	Count	413	616	1029
		% within baby's age	40.1%	59.9%	100.0%
		% within exclusive breastfeeding	34.2%	35.9%	35.2%
	4-6	Count	476	642	1118
		% within baby's age	42.6%	57.4%	100.0%
		% within exclusive breastfeeding	39.5%	37.4%	38.2%
		Total	1206	1718	2924
		% within baby's age	41.2%	58.8%	100.0%
		% within exclusive breastfeeding	100.0%	100.0%	100.0%

Table 10. The regression estimates, *p*-values, standard error and confidence interval of exclusive breastfeeding on covariates

Covariates	*B*	S.E.	df	Sig.	*Exp*(*B*)	95.0% C.I. for *Exp*(*B*)	
						Lower	Upper
Urban	0.211	.112	1	.060	1.235	.992	1.539
Wealth index 2	0.436	.101	1	.000	1.546	1.268	1.886
Wealth index 3	0.457	.131	1	.001	1.579	1.221	2.042
Wealth index 4	0.843	.214	1	.000	2.323	1.528	3.532
Marital status 1	–0.799	.181	1	.000	.450	.316	.641
Working	0.133	.079	1	.091	1.142	.979	1.333
Constant	–1.257	.303	1	.000	.284		

Table 11. Summary of results in the final model

Variable	*B*	Odds	% contribution to odds	*P*(1)	*P*(1/*X* = 1)	% contribution to probability
Wealth index 2	0.436	1.546	55	0.42	0.308	40
Wealth index 3	0.457	1.579	58	0.42	0.31	41
Wealth index 4	0.843	2.353	135	0.42	0.398	81
Marital status 1	–0.799	0.45	–55	0.42	0.113	–48
Constant	–1.257	0.284	–72	0.42		

References

[1] A. Koosha, R. Hashemifesharaki and N. Mousavinasab, Breastfeeding patterns and factors determining exclusive breastfeeding, Singapore Medical J. 49(12) (2008), 1002-1006.

[2] WHO, Indicators for assessing breastfeeding practices, Report of an informal meeting, Geneva, Switzerland, 11-12 June, 1991.

[3] T. Alemayehu, J. Haidar and D. Habte, Determinants of exclusive breastfeeding practices in Ethiopia, Ethiop. J. Health Development 23(1) (2009), 2-5.

[4] L. L. Foo, S. J. S. Quek, S. A. Ng, M. T. Lim and M. Deurenberg-Yap, Breastfeeding prevalence and practices among Singaporean Chinese, Malay, and Indian mothers, Health Promotion International 20(3) (2005), 229-237.

[5] U. O. Uchendu, A. N. Ikefuna and I. J. Emodi, Factors associated with exclusive breastfeeding among mothers seen at university of Nigeria teaching hospital Enugu, South African J. Child Health (SAJCH) 3(1) (2009), 13-19.

[6] World Health Organization, The Global Strategy for Infant and Young Child Feeding, WHO, Geneva, 2003.

[7] World Health Organization, Indicators for Assessing Infant and Young Child Feeding Practices, WHO, Washington D.C., USA, 2008.

[8] National Population Commission (Nigeria) and IRD/Macro International Inc., Nigeria Demographic and Health Survey 2008, Federal Office of Statistics and IRD/Macro International Inc., Columbia, Maryland, 2010.

[9] K. A. Adeleke and A. A. Adepoju, Ordinal logistic regression. An application to pregnancy outcomes, J. Math. Stat. 6(3) (2010), 279-285.

[10] S. H. Walker and D. B. Duncan, Estimation of the probability of an event as a function of several independent variables. Bio variables, Biometrika 54 (1967), 167-179.

[11] C. D. Mitchell, Logistic Regression Analysis, University of Maryland, 1992.

[12] D. W. Hosmer and S. Lemeshow, Applied Logistic Regression, 2nd ed., Wiley, New York, 2000, pp. 392.

[13] A. Agresti, An Introduction to Categorical Data Analysis, 2nd ed., Wiley, New York, 2007, pp. 400.