American Journal of Public Health Research, 2015, Vol. 3, No. 4A, 19-26
Available online at http://pubs.sciepub.com/ajphr/3/4A/4

DOI:10.12691/ajphr-3-4A-4

Surviving the First Day in Nigeria: Risk Factors and Protectors

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Received April 08, 2015; Revised April 29, 2015; Accepted June 26, 2015

Abstract **Background:** Deaths occurring within the first twenty-four hours of life constitutes a large proportion of child mortality; about 36% of all neonatal deaths took place within the first twenty-fours of delivery globally. Nigeria contributes around 9% of the global first-day mortality. **Objectives:** To determine the levels and determinants of first-day mortality using the 2013 Nigeria DHS data. **Methods:** This study utilized the 2013 Nigeria DHS which is a cross-sectional involving a nationally representative sample of 38, 948 women aged 15-49 years. First-day mortality rates were estimated for all births within the past five year prior to the survey and disaggregated by background characteristics and Cox proportional hazard models were generated to assess the relationship between some background characteristics and first-day mortality. Analysis was conducted using Stata v13. **Results:** The first-day mortality rate was found to be 19 per 1000 live births which was found to be higher among younger aged women, overweight women, babies in Southern part of Nigeria, rural residents, male babies and those babies delivered in health facilities among others. Factors that significantly predict first-day mortality are maternal age of more than 35 years (HR=1.12, 95%CI: 1.01-1.24), residing in Northern Nigeria (HR=1.18, 95%CI: 1.10-1.26), living in rural areas (HR=1.30, 95%CI: 1.22-1.40) and increasing maternal education (HR=1.20, 95%CI: 1.10-1.32). Utilization of at least four ANC visits (HR=0.87, 95%CI: 0.80-0.93) and having postnatal care within 24 hours (HR=094, 95%CI: 0.89-0.99) are all associated with decreased hazard of first-day mortality. **Conclusion:** First-day mortality rate in Nigeria is high; provision and expansion of both antenatal and postnatal care services particularly in rural areas and northern part of Nigeria will potential contribute in the reduction of first-day mortality.

Keywords: *First-Day, Child, Mortality, Risk, Nigeria*

Cite This Article: Tukur Dahiru, "Surviving the First Day in Nigeria: Risk Factors and Protectors." *American Journal of Public Health Research*, vol. 3, no. 4A (2015): 19-26. doi: 10.12691/ajphr-3-4A-4.

1. Introduction

The global agenda for several decades now has been the emphasis on reducing under-five mortality and to some extent neonatal mortality ignoring the critical and crucial twenty four hours of life described as the most vulnerable period in human life [1-5]. The birth of a child is an event of celebration, but for several parents it is silent grief due to the loss of a precious life that has not been named, documented or properly celebrated. UNICEF estimates that of the 6.9 million under-five deaths in 2013, 16% or 1.05 million deaths occurred among newborn that did not live beyond their first twenty four hours of life; eighty percent of these first-day deaths occur in only two regions of the world: sub-Saharan Africa and South Asia; and that sub-Saharan Africa contributes around 397,000 first-day deaths [6]. Furthermore, four of the ten countries that shoulder 64% (673,200) of the global first-day mortality are in sub-Saharan Africa: Nigeria, DR Congo, Ethiopia and Tanzania, in that order; and among the top twenty countries with the highest first-day mortality rate only Pakistan and Afghanistan are outside of sub-Saharan Africa [6]. Worldwide, two factors are responsible for the largest portion of first-day mortality: complications arising from prematurity and birth complications; these two factors constituting 58% of first-day deaths [7]. However, in sub-Saharan Africa the factors are multitudes ranging from maternal undernutrition, early child marriage, shorter birth interval from low contraceptive use to increase birth intervals, poor skilled attendance at delivery and shortage of skilled health workforce to deliver essential health care [8-20].

In the Nigerian context the situation of child mortality continues to be public health challenge despite great effort to reduce child mortality under the global effort of Millennium Development Goals (MDGs). Efforts under the MDGs in reducing child mortality in Nigeria showed a negligible impact with an annual average reduction of 1.4%, which is not enough to achieve MDG 4 by the deadline [7]. In terms of first-day mortality, the situation is equally gloomy where Nigeria is ranked as the 11th in terms of first-day mortality rate of 14 per 1000 live births and contributing about 90,000 first-day deaths or 9% of global first-day deaths, second only to India [7]. With huge coverage gaps in the essential maternal, newborn and child health packages with respect to ANC, skilled birth attendance and postnatal care the unacceptable high first-day mortality rate for Nigeria does not come as a surprise.

Recent figures indicates that only about half (or 51%) of pregnant women had at least four or more ANC visits, only 38% of women were delivered by skilled professional health worker, 63% of births took place at home and nearly one-in-five deliveries happened with no one present [21]. There is scanty literature on first-day mortality until the Save the Children's analysis of the situation with its first-ever publication of Birth Day Risk Index that compares first-day death rates for babies in 186 countries to identify the safest and most dangerous places to be born. In this publication, Nigeria's newborns are safer than those countries that are either politically unstable or experiencing civil war or have just emerged from civil conflicts or political impasse: Guinea-Bissau, Mali, Somalia, Cote d'Ivoire, Chad, DR Congo, CAR, Sierra Leone, Angola and Burundi [7]. This publication has underscored the urgent need to investigate factors associated with first-day mortality in Nigeria with the overall aim of providing evidence for programming and policy development as we prepare for post-2015 agenda.

2. Methods

2.1. Data

The data for this investigation comes from the most recent Nigeria DHS, the 2013 Nigeria DHS. The 2013 Nigeria DHS was a cross-sectional, descriptive design collecting information from eligible men and women. The 2013 Nigeria DHS is the fifth in the series of nation-wide organized data collection project supported by USAID and implemented by the National Population Commission with technical assistance from ICF Macro International [21]. The 2013 survey consists of nationally representative sample of 38,948 women aged 15-49 years and 17,359 men aged 15-59 years living in 38,904 households. The purpose of the survey is to provide policy makers and researchers with "updated estimates of basic demographic and health indicators" for planning, policy-making and programming. Therefore, it collected information on various demographic and health issues and indicators such fertility levels, trends and preferences, nuptiality, sexual activity, awareness and use of contraception, child nutrition and feeding practices including nutritional statuses, child morbidity and mortality, health seeking behaviors among mothers. The instruments used to collect the data for the 2013 NDHS consisted of six questionnaires; for the purpose of this research birth recode (NGBR6AFL) was utilized for the analysis

2.2. First-day Deaths

For the purpose of this study, the study population composed of all births within the 5-year period preceding the survey in 2013 (119, 148) and all the first-day deaths within the 5-year period prior the survey in 2013 (2215). In calculating first-day mortality, the DHS age-at-death data was analysed (variable b6). To avoid calendar bias in estimating first-day deaths ("day-0"), age-at-death 100 and 101 were merged to avoid this calendar bias.

2.3. Variables

The variables of interest in this study are broadly classified into dependent (or outcome) and independent (or explanatory) variable. The primary outcome variable is death within 24 hours of birth and the explanatory variables include those acting distally or the socio-economic factors such as mother's, household wealth index, religion, rural/urban location, region of residence and household structure (sex of the household head); and those acting proximally such as maternal age and body mass index (BMI), parity, birth weight, sex of baby, and ANC-related factors such utilization and number of ANC visits, number of tetanus toxoid injections received, BP measurement, urine test, blood test, information about complication); delivery-related factors (place of delivery). Table 1 below gives a summary of these variables. An index of ANC adequacy was created to using six elements/components of ANC services. These elements are having blood pressure measurement, having at least two doses of tetanus toxoid vaccination, consuming iron tablets supplements, taking two doses of Fansidar tablets to prevent malaria and having done urine and blood tests. This index is dichotomous, that is either a pregnant woman received all of these elements or not receiving any at all. This index is constructed in this way to optimize the benefit of ANC since all the elements are important components of the ANC service; receiving one less means not having the optimum benefit and can lead to adverse pregnancy outcome.

2.4. Data Analysis

The first step in the data analysis was recoding of some relevant variables into appropriate categories such as age of mother, region of residence, household headships (male versus female), educational attainment of the mother, wealth index, first-day death, birth weight, use ANC, blood pressure (BP) measurement, urine test, blood test, tetanus toxoid injections and index of ANC adequacy. Then descriptive statistics were generated in terms of first-day mortality across background characteristics and first-day mortality rates were subsequently generated from first-day deaths and live births.

Bivariate analyses were generated to establish any statistical association between the outcome variable and the explanatory variables as listed in Table 1. The bivariate analyses are the unadjusted regression models; they provided the crude hazard ratios. Multivariate analysis was also conducted using stepwise backward elimination method to identify those factors that were significantly associated with first-day mortality. The statistical model for investigating the factors influencing first-day mortality is the Cox proportional hazards regression model [22]. The Cox was chosen for this analysis since it represents the typical "time-to-event" data we are dealing with. First-day death is a form of failure data in which we are trying to estimate the risk or probability of first-day death from birth. Thus, Cox model provides the most appropriate analytical model for analyzing the effect of various factors on first-day death. In this model, it is proposed that the hazard or risk or probability for a subject j in the data experiencing the event is given by the semi-parametric relationship:

$$h\left(t \mid x_j\right) = h_0\left(t\right).\exp\left(x_j \beta_x\right);$$

the h_0 component represents the survival or the hazard function while the β component stand for the multivariate component or the regressions coefficients to be estimated from the data and the x's multiplied by β are the explanatory variables i=1, 2, 3, …….n; n denotes the number of the explanatory variables in the model. The h_0 represents that baseline hazard function when all the explanatory variables are zero. A model with one explanatory (independent) variable looks like this:

$$h_j\left(t \mid x_j\right) = h_0\left(t\right).\exp\left(x_1\beta_{1j}\right);$$

and if the individual (live birth in this case) is exposed to any of the factors under investigation, the model is of the form: (i.e. x=1)

$$h_j\left(t \mid x_j = 1\right) = h_0\left(t\right).\exp\left(\beta_1 * 1\right) = h_0\left(t\right).\exp\left(\beta_1\right).$$

However if the individual is not exposed, then the model takes the form of: (i.e. x=0)

$$h_j\left(t \mid x_j = 0\right) = h_0\left(t\right).\exp\left(\beta_1 * 0\right) = h_0\left(t\right).$$

In this model the risk or probability of first-day death was measured in terms hazard ratio; representing increased (or decreased) risk of first-day death. Hazard ratio of more than one indicates increased risk of first-day death while hazard ratio of less than one indicates reduced risk of first-day death; hazard ratio of one means the exposure/characteristic/factor has no effect on early neonatal death. The Cox model is implemented in Stata v13 [23] using the Stata's *stcox* command that fits the Cox proportional hazard models. However, the data was first *stset* that is 'telling' the Stata to treat the data as a form of 'time-to-event' or survival analysis. Further, because the data for the analysis was collected using complex three-stage cluster sampling design, the analyses were conducted incorporating this sampling design and also applying the sampling weight (wgt) generated by dividing v005 by 1,000,000. The Stata survey command *svy* was utilized to 'inform' Stata about the nature of the data in terms sampling design and by so doing, Stata handles the data appropriately. The sampling weight was also *stset*, as usual to 'tell' Stata to handle this weight as survival data. The Cox model was finally fitted to assess the effect of each factor on first-day death. All output were generated incorporating the *svy* command to adjust for the complex sampling design.

Table 1. List of variables, variable definition and variable coding

Variable	Variable definition	Coding
First-day death	Death of a live birth within 24 hours of delivery	Died (0); survived (1)
ANC visit/attendance	Attending antenatal care while pregnant in the last pregnancy	<4(0); 4+ (1)
Timing of ANC visit	Number of months pregnant at time of first ANC visit	First trimester (1); Second Trimester (2); Third Trimester (3)
TT injections	Two doses of TT injections received in last pregnancy	<2 (0); 2+(1)
Blood pressure	Blood pressure measured	None(0); Yes (1)
Urinalysis	Test of urine (Urinalysis) done	None(0); Yes (1)
Blood test	Blood test done	None(0); Yes (1)
Antimalarial	Took antimalarial drug (Fansidar)	None(0); Yes (1)
Iron/Folic acid	Took iron and folic acid supplements	None(0); Yes (1)
Complications	Informed of pregnancy complications	None(0); Yes (1)
ANC Adequacy	Receiving all the six components of antenatal care	Received all (1); received none (0)
Maternal age	Maternal age at birth of last child	Numerical values in years
Maternal education	Highest level of formal education attained by mother	None (0); primary (1); secondary (2); tertiary (3)
Household structure	Sex of Household	Male(1); female(2)
Place of residence	Place of residence either rural or urban	Urban(1); rural(2)
Household Wealth Index	Measure of household wealth in quintiles	Poor (1); Middle (2): Rich (3)
Religion	Religious affiliation of mother	Christianity(1); Islam (2) Traditional/Others (3)
Regional of residence	Geopolitical zone of residence	South (1);North (2)
Parity	Total children ever born by mother	One(1); 2-4(2); 5+(3)
Birth size	Perceived size of baby at birth by mother without birth weight recording	Small/very small (1); smaller than average (2); average/large (3)
Birth weight	Accurate size of baby at birth in kilograms (facility deliveries)	<2.5Kg (1); 2.5-4.5Kg (2);>4.5 (3)
Place of delivery	Place where delivery took place	Home (0); Health facility (1)

3. Results

Table 2. Live births, first day mortality and first day mortality rates, Nigeria DHS 2013

Covariate	Live births	24-hour mortality	24-hour mortality rate
Age of mother			
15-24	9553	212	21.7
25-34	39377	705	17.6
35+	67881	1297	18.8
BMI			
Underweight	9133	165	17.6
Normal	70567	1350	18.8
Overweight	24564	525	20.9
Obese	12570	274	21.3
Geopolitical zone			
North	79958	1447	17.8
South	36853	766	20.4
Place of residence			
Urban	37985	723	18.7

Rural	78849	1591	19.8
Mother's level of education			
No formal education	62543	1112	17.5
Primary	25612	498	19.1
Secondary+	28656	603	20.6
Mother working			
Yes	27588	559	19.9
No	88850	1753	19.4
Wealth index			
Poor	55939	1066	18.7
Middle	22631	431	18.7
Rich	38240	716	18.4
Religion			
Christianity	42829	902	20.6
Islam	71844	1272	17.4
Traditional/other	1563	33	20.7
Parity			
One	4303	85	19.4
2-4	34307	562	16.1
5+	78201	1566	19.6
Type of marriage			
Monogamy	66127	1206	17.9
Polygyny	42886	854	19.5
Sex of child			
Male	59742	1309	21.4
Female	57068	905	15.6
Pregnancy desire			
Then	28163	485	16.9
Later	2039	38	18.5
No more	478	14	29.3
Skilled ANC visits			
None	104786	2042	19.1
At least one	12025	171	14.0
Blood pressure			
Yes	11852	17	14.3
No	1173	172	14.2
Urinalysis			
No	2330	39	16.7
Yes	10688	149	13.8
Blood test			
No	2303	39	16.7
Yes	10712	150	13.8
Complications			
No	4126	62	14.8
Yes	8905	127	14.1
Iron tablets			
Less than 180 days	10879	159	14.4
Greater than 180 days	795	12	15.1
Took Fansidar			
No	14331	201	13.8
Yes	5188	58	11.0
TT injection (2 doses)			
No	10157	125	12.1
Yes	9614	135	13.9
ANC Index			
Not adequate	103031	2013	19.2
Adequate	13780	201	14.3
Place of delivery			
Home	19605	293	14.6
Facility	11105	241	21.1
Mode of delivery (CS)			
Yes	29732	544	47.1
No	627	31	17.9
Birth weight			
Small	688	9	13.3
Normal	4218	28	6.6
Large	26104	524	19.7
Size of baby			
Large	13301	187	13.8
Average	12570	194	15.2
Small	4589	135	28.6
Postnatal care			
Within 24 hours	2338	17	7.2
After 24 hours	3272	4	1.2
Birth order			
First	26927	657	23.8
Second	22829	327	14.1
Third	18772	270	14.2
Fourth+	48282	960	19.5
Total	116811	2215	18.6

Table 3. Unadjusted and adjusted hazard ratios (95% confidence interval [CI]) for variables associated with first day mortality

Variables	Unadjusted HR	Unadjusted 95% CI	Unadjusted P	Adjusted HR	Adjusted 95% CI	Adjusted P
Age of mother						
15-24	1.00			1.00		
25-34	1.02	[1.00-1.05]	0.05	1.04	[0.96-1.13]	0.298
35+	1.08	[1.06-1.10]	<0.001	1.12	[1.01-1.24]	0.025
Geopolitical zone						
South	1.00			1.00		
North	0.88	[0.87-0.89]	<0.001	1.18	[1.10-1.26]	<0.001
Place of residence						
Urban	1.00			1.00		
Rural	1.17	[1.16-1.19]	<0.001	1.30	[1.22-1.40]	<0.001
Mother's level of education						
No formal education	1.00			1.00		
Primary	1.16	[1.15-1.18]	<0.001	1.20	[1.10-1.32]	<0.001
Secondary+	1.12	[1.11-1.14]	<0.001	1.17	[1.07-1.29]	0.001
Mother working						
No	1.00			1.00		
Yes	1.06	[1.05-1.08]	<0.001	0.98	[0.92-1.04]	0.509
Wealth index						
Poor	1.00			1.00		
Middle	1.10	[1.09-1.12]	<0.000	1.15	[1.06-1.26]	0.001
Rich	0.99	[0.98-1.00]	0.132	1.06	[0.97-1.17]	0.216
Religion						
Christianity	1.00			1.00		
Islam	0.79	[0.78-0.80]	<0.001	0.90	[0.84-0.96]	0.001
Traditional/other	0.92	[0.87-0.96]	<0.001	0.89	[0.62-1.29]	0.545
Parity						
One	1.00					
2-4	0.97	[0.94-1.00]	0.030			
5+	1.04	[1.01-1.07]	0.021			
Type of marriage						
Monogamy	1.00					
Polygyny	1.05	[1.03-1.06]	<0.001			
BMI						
Underweight	1.09	[1.07-1.12]	<0.001	1.02	[0.92-1.14]	0.687
Normal	1.00			1.00		
Overweight	1.03	[1.02-1.05]	<0.001	0.97	[0.91-1.04]	0.403
Obese	1.02	[1.00-1.04]	0.021	1.01	[0.93-1.10]	0.784
Sex of child						
Male	1.00					
Female	1.00	[0.99-1.01]	0.633			
Sex of household head						
Male	1.00					
Female	1.15	[1.13-1.17]	<0.001			
Pregnancy desire						
Then	1.00					
Later	1.13	[1.08-1.18]	<0.001			
No more	1.19	[1.09-1.29]	<0.001			
Focused ANC visits						
Less than four	1.00			1.00		
Four visits	0.98	[0.96-1.00]	0.015	0.87	[0.80-0.93]	<0.001
Complications						
No	1.00					
Yes	1.07	[1.04-1.11]	<0.001			
Place of delivery						
Home	1.00					
Facility	1.04	[1.01-1.06]	0.001			
Mode of delivery						
Normal	1.00					
Caesarean	1.03	[0.96-1.12]	0.410			
Birth weight						
Normal	1.00			1.00		
Small	0.88	[0.81-0.95]	0.002	0.75	[0.65-0.85]	<0.001
large	1.00	[0.97-1.03]	0.908	1.05	[0.98-1.12]	0.144
Postnatal care						
After 24hours	1.00			1.00		
Within 24hours	0.88	[0.83-0.93]	<0.001	0.94	[0.89-0.99]	0.024
Birth order						
First	1.00	[0.98-1.02]	0.986	1.07	[0.98-1.16]	0.134
Second	1.00			1.00		
Third	1.01	[0.99-1.03]	0.390	1.02	[0.93-1.11]	0.649
Fourth+	1.03	[1.02-1.05]	<0.001	1.01	[0.93-1.10]	0.748

The results are displayed in Table 2 and Table 3. Table 2 provides number of live births, first-day mortality and first-day mortality rates disaggregated by background characteristics. It also show that the average first day mortality rate is 19 per 1000 live births. Background characteristics with above average first-day mortality include being a young mother, overweight and obese, residing in Southern part of Nigeria, living in rural areas, having secondary school education or more, being a working mother, being either a Christian or traditionalist,

being either of parity one or five, being a male newborn, pregnancy that was not wanted any more, facility delivery, Caesarean delivery, being a large baby or small sized-baby and the newborn being either the first or the fourth. These descriptive statistics gives an idea on the direction of the relationship between the background characteristics and risk of first-day mortality. Table 3 presents the crude and adjusted hazard ratio of first-day mortality and some selected background characteristics. All the background characteristics are significantly influencing first-day mortality except those newborns born to women in the rich wealth index, female newborns, those delivered via a Caesarean operation, large babies and babies that are either first or third born. Increased hazard of first-day mortality are associated with factors such as age above 25 years, rural residence (HR=1.17, 95%CI: 1.16-1.19), having at least primary education or more, having a mother that is working (HR=1.06, 95%CI: 1.05-1.08), being born into a polygynous family (HR=1.05, 95%CI: 1.03-1.06), either being an underweight mother (HR=1.09, 95%CI: 1.07-1.12) or overweight (HR=1.03, 95%CI: 1.02-1.05) or obese mother (HR=1.02, 95%CI: 1.00-1.04). An unexpected finding is that of increased hazard of first-day mortality among female compared to male newborns (HR=1.15, 95%CI: 1.13-1.17).

The last three columns of Table 3 presents the adjusted regression model where increasing age of the mother (35 years+) (aHR=1.12, 95%CI: 1.01-1.24), rural location (aHR=1.30, 95%CI: 1.22-1.40), living anywhere in Northern part of Nigeria (aHR=1.18, 95%CI: 1.10-1.26) and having formal education (secondary and more) (aHR=1.17, 95%CI: 1.07-1.29). Only three factors appear to significantly reduce the risk of first-day mortality: Islamic religion (aHR=0.90, 95%CI: 0.84-0.94), utilization of focused ANC (aHR=0.87, 95%CI: 080-0.93) and utilization of postnatal care within 24 hours of delivery (aHR=0.94, 95%CI: 0.89-0.99).

4. Discussion

The hours surrounding labour and delivery has been described as the most risky period for the survival of mankind and provision of skilled medical intervention during this period can significantly reduce threat to life of newborn and mankind in general. Analysis of trend of child mortality has indicated a new paradigm shift where more deaths are clustering around the time of time implying that interventions targeted around this time can substantially reduce the burden of child mortality [24].

We assessed factors potentially associated with first-day mortality using the most recent DHS data for Nigeria. Geographical zone (North versus South) of residence and rural residence appear in our model to significantly influence first-day mortality. Expectedly, newborn in the North have increased hazard of first-day mortality compared to their counterparts in the South. The North-South differential in first-day mortality could be a reflection of overall socio-economic disadvantage of the North compared to that in the South. Large proportion of women in the North have lower educational attainment than that of the South, implying that health knowledge, attitudes and practices regarding pregnancy and prenatal care, skilled delivery attendance and child care particularly postnatal care are significantly low compared to their counterparts in the South. On poverty index, more states in the North are in the poorest poverty index than in the South; more people in the North fall within the poverty line than in South. Geographically, more of the North is described as being rural than the South. This has the implication that access to quality health care is restricted in rural areas and since majority of people live in rural areas in the North they are obvious disenfranchised in access and utilization of medical care. Overall, the combinations of poverty, poor state of health facilities and poorly equipped and staffed health facilities, poor access and utilization of health services, low levels education among the women makes the North have the poor health outcomes compared to the South [25,26].

Our findings indicates that having at least four ANC visits during pregnancy reduces the risk of first-day mortality. Antenatal care started in Europe in early 19th century and it was provided routinely to all pregnant women without recourse to numbers and elements of care until WHO conducted a trial about the numbers of visit and content of care in 2001 and recommended a new model of care called focused antenatal care [27]. This new method was rapidly adopted in many countries including Nigeria. Our findings confirms some of the previous results supporting the protective effect of ANC on child outcome; that having four ANC visits decreases the chance of first-day mortality. The study by Singh [28] pooling DHS data from Africa, Latin America/Caribbean and Asia revealed that having at least four ANC visits was associated with reduced odds of first-day mortality or a reduction of about 29%-35% few neonatal deaths. Antenatal care exerts this mortality-decreasing effect via four possible mechanisms: early detection of adverse condition that can risk the survival of the newborn; allows timely intervention in situation where adverse conditions have been detected; transmission of health knowledge to the pregnant women and re-enforcement of healthy behaviors and practices [29,30]. Additional advantage is derived when women who attended ANC are more likely to deliver in presence of skilled personnel thereby increasing the survival chances of the mother-baby pair [31,32].

According to the 2013 Nigeria DHS, postnatal care (among the newborn) happens to be most poorly utilized newborn care in the continuum of maternal and child health care; only 14% of newborn received postnatal care within the first two days of delivery, 12% of postnatal care was from skilled professionals and that up to 36% of newborn something else was placed on the umbilical stump after cutting [21]. Postnatal care is a recommended strategy aimed at reducing both maternal and child health that contributes to achievement of MDGs 4 and 5. Our study indicates that utilizing postnatal care within the first two days reduces the hazard of first-day mortality. This is not surprising since provision of some proven interventions at around delivery and immediately after delivery has been shown to improve maternal and health and consequently reduce maternal and child mortality [33,34]. However, our findings contradicts the findings of Singh (to some extent) when they reported that postnatal care utilization is within 24 hours is not associated with neonatal mortality in India [35].

Notable factors appear not to influence first-day mortality in contradiction to some previously reported literatures. Of particular importance is the sex of child and place of delivery. Studies consistently indicates the mortality advantage of female babies over that of male babies. These include those reported from Indonesia, Nepal and Nigeria [36,37,38]. Our results indicates that sex of the baby is not a significant predictor of first-day neonatal mortality both in bivariate and multivariate models. It is possible that whatever factor that is responsible for this survival advantage of females over males is yet to express itself within the first 24 hours of delivery that is as the newborns become older sex differentials become more pronounced for some unknown reasons. However, closely related our result is the study by Wu in which they reported survival advantage of male babies over female ones [39]. We are cautious in this comparison since these studies cited hear refer to either neonatal mortality [36,37,38] or early neonatal mortality [40]. Also, the role of place of delivery and neonatal mortality is inconclusive. Oti [43] have reported that place of delivery does not influence neonatal mortality while a meta-analysis indicates that place of delivery reduces risk of neonatal mortality by as much as 29% [41]. As earlier mentioned, cautioned needs to be exercised in making these comparison with previous reports as almost all of them referred to either neonatal or early neonatal mortality. This, in our opinion indicates paucity of research in this field.

5. Conclusion

This paper explored the factors associated with first-day mortality. Two factors significantly determine first-day mortality in Nigeria: advanced maternal age, residing in northern and rural Nigeria and advanced maternal education. Utilizing focused ANC and postnatal care reduced the hazard of first-day mortality.

Acknowledgements

The acknowledged the useful comments of Dr. Latifat Ibisomi of Witwatersrand School of Public Health, Johannesburg. Also we are grateful to MEASURE DHS for permission to use the data set in this study.

Competing Interest

Author declared no conflict of interest. Source of funding: this study was independently conducted by the author without financial support from any agency or organization both within and outside Nigeria.

References

[1] UNICEF. (2009). State of the world's children 2010. New York, USA: United Nations Children's Fund.

[2] United Nations. (2009). The millennium development goals report 2009. New York: United Nations.

[3] WHO. (2009). World health statistics 2009. Geneva: World Health Organization.

[4] Cabral, S. A., & de Moura, A. T. S. Overview of the global health issues facing children. Pediatrics 2012; 129 (1), 1-3.

[5] Rajaratnam, J. K., Marcus, J. R., Flaxman, A. D., Wang, H., Levin-Rector, A., et al. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970-2010: a systematic analysis of progress towards Millennium Development Goal 4. Lancet 2010; 375: 1988-2008.

[6] Save the Children. State of the World's Mothers 2013. Save the Children, May 2013.

[7] Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, et al. for the Child Health Epidemiology Reference Group of WHO and UNICEF.. Global, Regional and National Causes of Child Mortality: An Updated Systematic Analysis for 2010 with Time Trends since 2000. Lancet 2012; 379: 2151-2161.

[8] Kathryn D and Begum K. Long-Term Consequences of Stunting in Early Life. Maternal & Child Nutrition 2011; 7: S3, October 2011. p. 8.

[9] UNICEF Global Databases (Accessed March 11, 2013).

[10] Pathfinder International. Creating Partnerships to Prevent Early Marriage in the Amhara Region. 2006.

[11] UNICEF. Child Protection from Violence, Exploitation and Abuse: A Statistical Snapshot. (New York: 2011) p. 3.

[12] UNICEF. The State of the World's Children 2012. Table 111.

[13] Joy L, Kinney M, Black R, Pitt C, Cousens S, Kerber K, Corbett E, Moran A, Morrissey C and Oestergaard M. Newborn Survival: A Multi-country Analysis of a Decade of Change. Health Policy and Planning: A Decade of Change for Newborn Survival (2000-2010): A Multi-Country Evaluation of Progress towards Scale. Health Policy and Planning 2012; 27, Suppl 3: 6-28.

[14] United Nations Population Division. *World Contraceptive Use 2011*. *un.org/esa/population/publications/contraceptive2011/contraceptive2011.htm.*

[15] United Nations, Department of Economic and Social Affairs, Population Division. *World Contraceptive Use 2012* (POP/DB/CP/Rev2012).

[16] UNFPA. *State of World Population 2012*. (New York: 2012) pp. 112-114.

[17] UNICEF Global Databases (Accessed March 11, 2013).

[18] UNICEF Global Databases (Accessed March 11, 2013).

[19] UNICEF. *The State of the World's Children 2012*. Table 8, p. 116.

[20] MEASURE DHS's STATcompiler (Accessed on March 11 2013).

[21] National Population Commission (NPC) [Nigeria] and ICF International. 2014. *Nigeria Demographic and Health Survey 2013*. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.

[22] Cox DR. Regression models and life tables. J Roy Statist Soc B 1972; 34: 187-220.

[23] StataCorp. Stata statistical software: Release 13. College Station: StataCorp LP. 2014.

[24] Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE, et al. Global, regional, and national causes of child mortality in 2000-13, with projections to inform post-2015 priorities: an updated systematic analysis. Published Online October 1, 2014. Accessed on April 20, 2015

[25] Adejuwon J.2008. Vulnerability in Nigeria: A national-level assessment. In N Leary, C Conde, A Nyong, and J Pulhin (Eds.), Climate Change and Vulnerability (198-217). London: Earthscan.

[26] Agunwamba A, Bloom D, Friedman A, et al. 2009. Nigeria: The Next Generation-Literature Review. British Council 2009.

[27] Villar J, Ba'aqeel H, Piaggio G, et al. WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. Lancet 2001; 357: 1551-64.

[28] Singh K, Prodish P, Suchindra C. A regional multilevel analysis: can skilled birth attendant uniformly decrease neonatal mortality? Maternal Child Health Journal 2014; 18: 242-49.

[29] Di Mario S et al. 2005. What is the effectiveness of antenatal care? (Supplement) Copenhagen, WHO Regional Office for Europe (Health Evidence Network report; http://www.euro.who.int/Document/E87997.pdf, accessed 28 December 2014).

[30] Ram F and Singh A. Is antenatal care effective in improving maternal health in rural Uttar Pradesh? Evidence from a district level household survey. Journal of Biosocial Science 2006; 38(4): 433-448.

[31] de Allegri M., Ridde V, Louis V R., et al. Determinants of utilisation of maternal care services after the reduction of user fees:

a case study from rural Burkina Faso. Health Policy 2011; 99: 210-218.

[32] Guliani H, Sepehri A, & Serieux J. What impact does contact with the prenatal care system have on women's use of facility delivery? Evidence from low-income countries. Social Science & Medicine 2012; 74: 1882-1890.

[33] Darmstadt GL, Bhutta ZA, Cousens S, et al., for the Lancet Neonatal Survival Steering Team. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; 365: 977-88.

[34] Bhutta ZA, Das JK, Bahl R, et al. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? *Lancet* 2014; 384: 347-70.

[35] Singh A, Yadav Aand Singh A. Utilization of postnatal care for newborns and its association with neonatal mortality in India: An analytical appraisal. BMC Pregnancy and Childbirth 2012 12: 33.

[36] Titaley CR, Dibley MJ, Roberts CL. Type of delivery attendant, place of delivery and risk of early neonatal mortality: analyses of the 1994-2007 Indonesia Demographic and Health Surveys. Health Policy and Planning 2011; 27: 405-416.

[37] Shakya K, McMurray C. Neonatal mortality and maternal health care in Nepal: searching for patterns of association. Journal of Biosocial Science 2002; 33: 87-105.

[38] Ezeh OK, Agho KE, Dibley MJ, et al. Determinants of neonatal mortality in Nigeria: evidence from the 2008 demographic and health survey. *BMC Public Health* 2014, 14: 521.

[39] Wu Z, Viisainen K, Wang Y, et al. Perinatal mortality in rural China: retrospective cohort study. Brit Med J 2003; 327 6 December.

[40] Oti S, Odimegwu C. 2011. Perinatal mortality in Nigeria: Do place of delivery and delivery assistants matter? *The Open Demography Journal* 4: 1-10.

[41] Tura G., Fantahun M, Worku A. 2013. The effect of health facility delivery on neonatal mortality: systematic review and meta-analysis. *BMC Pregnancy and Childbirth* 13: 18.