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Neonatal Mortality and Perinatal Risk Factors in Rural Southwestern Nigeria: A Community-Based Prospective Study

La Mortalité Néo-natale et les Facteurs de Risque Périnataux dans le Nigeria Sud-ouest Rural : une Étude Potentielle à base de Communauté

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ABSTRACT

BACKGROUND: **Reliable data on births and deaths particularly at the community level are scarce yet they are urgently needed to inform policy and assess the improvements which may have occurred with recent interventions.**

OBJECTIVE: **To determine neonatal mortality rate and identify perinatal risk factors associated with neonatal deaths.**

METHODS: **In a community-based prospective study, baseline data on births and deaths were collected as they occurred in a rural community of Southwest Nigeria from 1993 to 1998. Data on births and deaths were collected for the period.**

RESULTS: **There were 972 live births and 64 infant deaths giving an infant mortality rate of 65.8 per 1000. Neonatal deaths accounted for a half of all infant deaths (N=32) giving a neonatal mortality rate of 32.9 per 1000. Twelve (37.5%) of neonatal deaths occurred on the first day of life; half of all neonatal deaths occurred within two days of birth, 21(65.6%) occurred during the first seven days of life and only 11 (34.4%) occurred over the last three weeks of the first month. The commonest known cause of death was associated with low birth weight (LBW) which was responsible for eight (25%) of deaths, while sepsis/fever and maternal deaths/failure to thrive were responsible for four (12.5%) and three (9.4%) deaths respectively. Asphyxia accounted for 3(9.4%) deaths; neonatal tetanus, congenital abnormality and diarrhoea were responsible for one (3.1%) death each. Cause of death was unclassified in many early neonatal deaths particularly those which occurred at home. Predictors of neonatal death included LBW {RR=4.7 (1.7-13.1) p=0.03}, delivery outside a health facility {RR=3.6 (1.001-13.2) p=0.05}, lack of attendant at delivery {RR=5.01 (1.3–19.1) p=0.018} and Traditional Birth Attendant (TBA) delivering the baby {RR=2.7 (1.1–6.4) p=0.03). Effect of sex of the neonate, mother and fathers' ages were not significant at the 5% level in the model.**

CONCLUSION: **Neonatal deaths contribute significantly to the high infant mortality in this rural community. Services provided by TBAs are not optimal but appear to be better than having no one in attendance at delivery. TBAs therefore need to be trained to identify at risk neonates and refer. Obstetric and public health services have to be available and made more accessible at the grass root level. WAJM 2010; 29(1): 19–23.**

Keywords: **Neonatal mortality; traditional birth attendants; low birth weight; perinatal risk factors; Nigeria, Southwest, rural.**

RÉSUMÉ

CONTEXTE: *les données sûres sur les naissances et les morts particulièrement au niveau de communauté sont rares encore ils sont d'urgence nécessaires pour informer la politique et évaluer les améliorations qui peuvent s'être produites avec les interventions récentes.*

OBJECTIF : *déterminer la mortalité néo-natale et identifier des facteurs de risque périnataux associés aux morts néo-natales.*

MÉTHODES : *Dans une étude potentielle à base de communauté, les données de ligne des bases sur les naissances et les morts ont été recueillies comme ils se sont produits dans une communauté rurale du Nigeria du Sud-ouest à partir de 1993 à 1998. Les données sur les naissances et les morts ont été recueillies pour la période.*

RÉSULTATS : *Il y avait 972 naissances vivantes et 64 morts de bébé donnant une mortalité de bébé de 65.8 par 1000. Les morts néo-natales ont représenté une moitié de toutes les morts de bébé (N=32) donnant une mortalité néo-natale de 32.9 par 1000. Douze (37.5 %) de morts néo-natales s'est produit le premier jour de vie; la moitié de toutes les morts néo-natales s'est produite au cours de deux jours de naissance, 21 (65.6 %) s'est produit pendant les sept premiers jours de vie et seulement 11 (34.4 %) s'est produit pendant les trois semaines dernières du premier mois. La cause de mort connue du commonest a été associée au poids de naissance bas (LBW) qui était responsable de huit (25 %) de morts, pendant que la septicité/fièvre et les morts/échec maternelles pour se développer étaient responsables de quatre (12.5 %) et trois morts (de 9.4 %) respectivement. L'asphyxie a représenté 3 morts (de 9.4 %); le tétanos néo-natal, l'anomalie congénitale et la diarrhée étaient responsables d'une mort (de 3.1 %) chacun. La cause de mort était non classifiée dans beaucoup de premières morts néo-natales particulièrement ceux qui se sont produits à la maison. Les prophètes de mort néo-natale ont inclus LBW {RR=4.7 (1.7-13.1) p=0.03}, la livraison à l'extérieur d'une facilité de santé {RR=3.6 (1.001-13.2) p=0.05}, le manque de gardien à la livraison {RR=5.01 (1.3–19.1) p=0.018} et le Gardien de Naissance Traditionnel (TBA) la livraison du bébé {RR=2.7 (1.1–6.4) p=0.03). L'effet de sexe du neonate, la mère et les âges de pères n'était pas significatif au niveau de 5 % dans le modèle.*

CONCLUSION : *les morts néo-natales contribuent de façon significative à la haute mortalité de bébé dans cette communauté rurale. Les services fournis par TBAs ne sont pas optimaux, mais ont l'air de n'être mieux que le fait d'avoir personne de service à la livraison. On doit entraîner que TBAs donc s'identifie en danger neonates et fasse allusion. Les services de santé publique et obstétricale doivent être disponibles et fait plus accessible au niveau de racine d'herbe.* ***WAJM 2010; 29 (1) : 19–23.***

Mots clé : *mortalité néo-natale; gardiens de naissance traditionnels; poids de naissance bas; facteurs de risque périnataux; le Nigeria, le Sud-ouest, rural.*

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Abbreviations: LBW, Low Birth Weight; **TBA,** Traditional Birth Attendant.

INTRODUCTION

Eleven million children under the age of five years die globally every year from mostly preventable diseases. Millennium goals were set to reduce 1990 infant mortality rates by two thirds by the year 2015.[1] There is growing evidence to show that infant and under-five mortality rates have dropped in the last few years but because neonatal mortality has essentially remained unchanged, especially in low and middle income countries, it is now accounting for an increasing proportion of all childhood deaths.[2-4] Preventing deaths in newborn babies has not been a focus of child survival or safe motherhood programmes and interventions to reduce neonatal mortality are largely unaddressed even though the size of the problem, different cost-effective interventions, as well as health system constraints are already known.[4-6]

Nigeria with an under-five mortality rate of 198 ranks among the worse 13 in the world and child survival is still very poor in Nigeria.[7,8] Neonatal mortality contributes between 40 and 70% of infant deaths in Nigeria.[7] Reliable data on births and deaths particularly at the community level and on neonates are however scarce in Nigeria yet they are urgently needed to inform policy and assess the improvements which may have occurred with recent interventions. This prospective community-based study was designed to provide baseline data on births and identify perinatal factors associated with neonatal mortality in a rural community in South-Western Nigeria.

SUBJECTS, MATERIALS, AND METHODS

The study was carried out from 1st January 1993 to December 31st 1998 in Lagun, a small typical Yoruba village in South-western Nigeria with a mid year population of 3013 at the beginning of the study and a growth rate of 3.0%.[9] There is a primary health care clinic in the village. To facilitate data collection, the village was divided into seven zones, two Voluntary Health workers (VHW) per zone who also lived within these zones were recruited and trained for this demographic exercise. Data on all births and deaths were collected prospectively throughout the study period as they occurred. A pre-study demographic census was carried out and subsequently, house to house surveys were done by trained interviewers to verify information submitted by the VHW's. Health records were also used to verify diagnosis for the few who attended the facility. Where the neonate was not seen in the clinic or neighboring hospitals in the last illness, presumptive cause of death was recorded as unknown. Neonatal deaths were defined as deaths which occurred within the first 28 days of life.[10] A skilled attendant is an accredited health professional such as a midwife, doctor or nurse, who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period and in the identification, management and referral of complications in women and newborns.[14]

Surviving infants (infants who did not die as neonates) served as unmatched controls for analysis.

Statistical Analysis

Data were entered into the computer using EPI Info version 6.04 for univariate and bivariate analysis,[11] and exported into SYSTAT for multiple logistic regression analysis.[12] Cases were compared with the control in relation to the risk exposure under investigation. The Relative Risk (RR) was generated to establish the exposures as risk factors for death. All associations significant at the 5% level were significant. For multivariate logistic regression analysis, covariates were analyzed simultaneously to remove the effect of confounders.[13] The dependent variable was neonatal death: present or absent as a dichotomous variable. Variables that had at least borderline significance or were known to be associated with neonatal death were also entered into the regression model as independent variables. Due to small numbers in cells, some of the groups in the variable were collapsed to form a larger group for the purpose of analysis.

Permission to carry out the study was obtained at the beginning of the study from the Department of Preventive and Social Medicine, from the Village paramount head as well as from members of the Village Community Health Committee and the Village Community Development Committee.

RESULTS

In the study period from 1993–1998, there were 972 live births (including 23 sets of twins) in Lagun village. There were 64 infant deaths giving an infant mortality rate of 65.8 per 1000. Neonatal deaths accounted for a half of all infant deaths (N=32) giving a neonatal mortality rate of 32.9 per 1000.

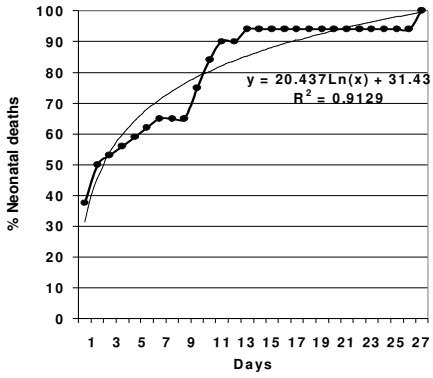

Fig. 1: Cumulative proportion of Neonatal Deaths by Age at Death and Trend Line

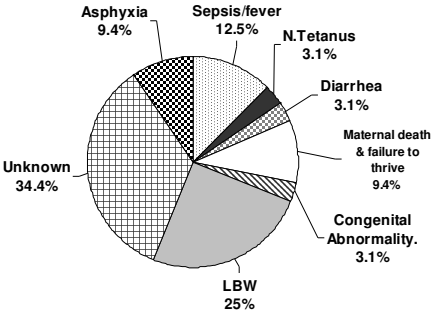

Fig. 2: Cause of Neonatal Deaths in Lagun, S.W Nigeria 1993–1998

Timing of Neonatal deaths

Twelve (37.5%) neonatal deaths occurred on the first day of life; 16 (50%) of all neonatal deaths occurred on the second day, 21(65.6%) of all neonatal deaths occurred during the first seven days of life while only 11(34.4%) occurred over the last three weeks of the first month of life. Figure 1 shows the cumulative number of deaths by age at death.

Causes of Neonatal Deaths

Overall, the commonest known cause of death was associated with low birth weight and responsible for eight (25%) of deaths, while infections (sepsis or malaria) and maternal deaths and failure to thrive were responsible for four (12.5%) and three (9.4%) deaths respectively. Birth asphyxia was responsible for three (9.4%) deaths while neonatal tetanus, congenital abnormality and diarrhoea were responsible for one (3.1%) death each (Figure 2). Cause of most deaths (66.7%) which occurred on the first day was reported as unknown, 11(52.4%) of deaths which occurred in the first week were also reported as unknown. Cause of all neonatal deaths was unknown in 11(34.4%). The earlier the neonatal deaths, the more likely they were to be reported as unknown. Cause of most deaths [eight (61.5%)] which occurred at home or at the TBA's were classified as unknown.

Place of Birth and Neonatal Deaths

Nineteen (59.4%) of all neonatal deaths were in infants born at home. Six (75%) out of the eight LBW babies who died were born at home; five (62.5%) of these LBW babies had mothers with no attendant at delivery, while one (12.5%) had a TBA in attendance. The babies who died of failure to thrive/and or following maternal deaths were all born at home.

Perinatal Risk Factors associated with Neonatal Deaths

In the bivariate analysis, Low birth weight {Relative Risk RR=4.4, (95% Confidence Interval 2.4–8.3)}; First birth order {RR=3.9, (1.93–7.88), delivery during the wet rainy season {RR = 2.5 (1.05–6.4)} and traditional birth attendant (TBA) assisting at the delivery {RR=1.5, (0.9–2.5)} were associated with an increased risk of neonatal deaths. Delivery in a health facility {RR=0.3, (0.2–0.7)} and delivery during the daytime as opposed to night time {RR=0.4, (0.3–0.6)} were associated with reduced risk. Sex of the neonate, ages of mother and fathers were not significant at the 5% level (Table 1). When the rates were adjusted and covariates analysed simultaneously, only LBW {RR=4.7 (1.7–

Table 1: Bivariate Analysis showing Socio-demographic and Perinatal Factors associated with Neonatal deaths in Lagun, 1993–1998

Characteristic	Live Births N (%)	Neonatal Deaths N (%)	RR (95% Confidence interval)
Maternal Age (years)			
15–24	492 (50.6)	15 (3.0)	0.7 (0.2–2.5)
25–34	411 (42.3)	14 (3.4)	0.88 (0.5–1.7)
35+	69 (7.1)	3 (4.3)	1.0
Total	**972 (100.0)**[§]	**32 (3.3)**	
Attendant at Delivery			
Nil	369 (38.0)	13 (3.5)	1.4 (0.6 – 3.08)
TBA	104 (10.7)	6 (5.8)	1.5 (0.99 – 2.5)
Skilled worker*	437 (45.0)	12 (2.7)	1.0
Missing[†]	26 (2.7)	1 (3.8)	n/a
Total	**972 (100.0)**	**32 (3.3)**	
Sex of Baby			
Male	436 (44.9)	11 (2.5)	1.03 (0.7 – 1.5)
Female	532 (53.8)	21 (3.9)	1.0
Missing[†]	13 (1.3)	0 (0)	n/a
Total	**972 (100.0)**	**32 (3.3)**	
Birth weight[‡]			
Normal	399 (41.0)	6 (1.5)	1.0
Low	127 (13.1)	8 (6.3)	4.4 (2.4 – 8.3)
Missing[†]	446 (45.9)	18 (4.0)	n/a
Total	**972 (100.0)**	**32 (3.3)**	
Place of Delivery			
Home	472 (48.6)	18 (3.8)	0.6 (0.3 – 1.2)
Health Facility[¶]	463 (47.6)	12 (2.6)	0.3 (0.2 – 0.7)
Mission house/TBA's	11 (1.1)	1 (9.1)	1.0
Missing[†]	26 (2.7)	1 (3.8)	n/a
Total	**972 (100.0)**	**32 (3.3)**	
Season of delivery			
Dry	356 (36.6)	6 (1.7)	1.0
Wet	589 (60.6)	25 (4.2)	2.5 (1.05 – 6.4)
Missing[†]	27 (2.8)	1 (3.7)	n/a
Total	**972 (100.0)**	**32 (3.3)**	
Fathers Age (Years)			
18 – 24	178 (18.3)	8 (4.5)	1.14 (0.5 – 2.8)
25 – 34	465 (47.8)	11 (2.4)	0.7 (0.5 – 1.2)
35+	329 (33.9)	13 (4.0)	1.0
Total	**972**[§] **(100.0)**	**32 (3.3)**	
Position of Child			
First born	115 (11.8)	11 (9.6)	3.9 (1.93 – 7.9)
Other	857 (88.2)	21 (2.5)	1.0
Total	**972 (100.0)**	**32 (3.3)**	
Time of delivery			
Daytime	453 (46.6)	12 (2.6)	0.4 (0.3 – 0.6)
Night time	493 (50.7)	19 (3.9)	1.0
Missing[†]	26 (2.7)	1 (3.8)	n/a
Total	**972 (100.0)**	**32 (3.3)**	

** Doctor, midwife, community health officer; [†]missing data excluded from analysis [‡]Birth weight not measured till 1996, [§]includes 23 sets of twins. [¶]At the time of the study, obstetric care was not available in the village and women had to go to neighboring maternity centers and private hospitals.*

Table 2: Predictors of Neonatal Deaths in Lagun :1993–1998

Risk factor	Relative Risk*	95% Confidence interval	P value
Birth Weight			
Low	4.7	1.7 – 13.1	0.003
Normal	1.0		
Fathers Age (years)			
18-24	1.032	0.1 – 9.7	0.978
25- 34	0.6	0.24 – 1.6	0.332
35+	1.0		
Mothers Age (years)			
15-24	0.4	0.04 – 3.3	0.366
25-34	0.6	0.3 – 1.6	0.338
35+	1.0		
Birth Season			
Wet	1.8	0.5 – 7.0	0.361
Dry	1.0		
Time of Birth			
Night time	2.4	0.6 – 9.7	0.220
Day time	1.0		
Sex of child			
Male	1.0		
Female	1.03	0.8 – 1.4	0.833
Place of delivery			
Outside health facility‡	3.63	1.001 – 13.2	0.050
Health facility	1.0		
Birth Order			
First	1.0		
Not first	0.5	0.1 – 2.4	0.394
Attendant at delivery			
Nil	5.01	1.3 – 19.1	0.018
TBA	2.7	1.1 – 6.4	0.030
Skilled†	1.0		

**Quasi maximum-likelihood adjusted; †doctor, nurse/midwife, community health officer. ‡At home or at the TBA's*

13.1) p=0.03}, delivery outside the health facility {RR=3.6 (1.001–13.2) p=0.05}, No attendant at delivery {RR=5.01 (1.3–19.1) p=0.018} and TBA assisting in the delivery {RR=2.7 (1.1–6.4) p=0.03) were significant at the 5% level. (Table 2).

DISCUSSION

Neonatal mortality rate in this rural Lagun community of Southwestern Nigeria is high, contributing a half of all infant deaths. Most of the neonatal deaths occurred within the first few days of life. The study's neonatal mortality rate of 32.9 per 1000 compares favourably with the regional rate of 39 per 1000 and is lower than the national rate of 48 per 1000.[8] It is difficult to generalize on facility and community based rates as neonatal mortality in facility deliveries as low as 16.4 per 1000 live births and as high as 51 per 1000 live births were obtained in similar Nigerian communities at the time of the study.[15,16] What may explain the relatively lower rates obtained in this study could be the presence of the Department of Community Medicine, Public Health Clinic which provided preventive education and care to the community for many years (excluding obstetric care). The verification exercise done after the reported vital event gives one the assurance that very few births and deaths were missed.

Low birth weight was a major risk factor in the data presented and has been a consistent finding in other neonatal studies.[2,16-19] It is important that these babies are identified at birth particularly those who are delivered at home and appropriate care given to them. Furthermore effort must be made to reduce maternal malnutrition in pregnancy and identify and reduce promoters of preterm delivery in this community.

Day time delivery was associated with a lower death rate though this effect was attenuated when the data were adjusted. However, neonatal mortality has been shown to be higher in babies born at night[20] and attempts should be made to identify why more deaths occurred in the community at this time. Neonatal tetanus can be effectively prevented through immunization and clean delivery and cord care practices, yet deaths due to this disease were seen in the study period indicating inadequate preventive care of women of child bearing age and care of pregnant women.

Many rural dwellers are poor and cannot afford to pay for private, secondary or tertiary care where they are likely to be referred when a problem is identified. The bureaucracy, the paper work, the travel time and the time wasted at some facilities also deter a lot of rural people from accessing the available skilled manpower.[20–22] This may explain why many deliveries in this rural community were unattended or attended by TBAs. From the data presented, delivery by TBAs was not optimal, but it was better than having no one take the delivery. TBAs need to be trained to identify at-risk neonates and refer them to the health facility early.

Mothers need to be discouraged from delivering at home and to use a health care facility where standard obstetric care is made available by the state and local government. The facility must be affordable and accessible and perceived as useful. Mothers and the whole community must be educated repeatedly on the need to use health facilities for antenatal/delivery as well as preventive and curative care of their babies. A whole new culture of facility care must be imbibed by the community as a solution to this important issue. Lack of an attendant at delivery, TBAs

taking the delivery, babies born with low birth weight and outside the health facility were significantly associated with neonatal deaths in the model following adjustment of rates. Some of these risk factors are documented for maternal deaths and hardly need any elaboration but have not been widely documented for neonatal deaths. This shows that some of the factors that put mothers at risk also put their infants at risk. In order to see a lasting reduction in the high neonatal deaths rates, more needs to be done to integrate neonatal survival with maternal survival strategies and this should be done at the primary care level. One limitation of the study is the inherent difficulty in confirming cause of death particularly in deliveries which occurred outside the health facility. Also because of the lack of facility care for antenatal and delivery, birth weight was not generally measured in the village. To overcome this problem, a device was developed which is able to fairly accurately identify babies who have low birth weight (birth weight <2.5 kg) and those who do not.[23]

There is a need to engage health workers, the state and local government and the community in dialogue on the way forward. Continued operations research effort would also be necessary in this rural community so that perinatal factors which contribute to neonatal deaths are addressed systematically.

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