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Neonatal Mortality at Olabisi Onabanjo University Teaching Hospital, Sagamu

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Summary

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Background: Neonatal mortality is a major reason for the persistence of high infant and childhood mortality in the developing world. Frequent determinations of the factors associated with neonatal mortality are desirable for effective planning of interventions aimed at reducing neonatal mortality rates.

Objective: To determine the trend in neonatal mortality in a teaching hospital over a ten-year period.

Methods: The records of neonates admitted into the neonatal unit of Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu between January 1996 and December 2005 were reviewed. Data extracted from the records included age, sex, weight, place of birth, major clinical diagnoses and outcome of admission.

Results: Out of a total of 2,933 neonates admitted into the unit, 773 deaths occurred (263.6/1000 admissions). These consisted of 168 (21.7 percent) in-born and 605 (78.3 percent) out-born babies. Of these 773 deaths, 559 (72.3 percent) were early neonatal deaths (END) and 74.8 percent of these occurred within the first 24 hours of admission. Low birth weight babies constituted 67.4 percent of these deaths. The mortality rate among in-born babies was significantly lower than that of out-born babies (14.8 percent vs 33.5 percent; p = 0.00000). The neonatal mortality rate (NMR) for the hospital ranged between 25.6/1000 live births and 72.4/1000 live births. The mortality rate for out-born babies was 336.5/1000 admissions. The leading clinical conditions associated with neonatal deaths were preterm births (38.7 percent), perinatal asphyxia (25.1 percent), septicaemia (10.5 percent), neonatal hyperbilirubinaemia (9.9 percent) and tetanus (7.9 percent).

Conclusion: Neonatal mortality in the hospital was high over the ten-year period studied. Facilitated access to quality obstetric and immediate post-delivery neonatal care is required to improve neonatal survival in Nigeria.

Introduction

NEONATAL mortality rate is a major determinant of infant and by extension, childhood mortality. It is an index of the quality of the antenatal, obstetric and neonatal care available in a community.[1] Hitherto, neonatal mortality rates have been alarmingly high in most parts of the developing world where the leading causes of neonatal deaths include prematurity, perinatal asphyxia, severe neonatal jaundice, and neonatal infections especially septicaemia and tetanus.[1-3] Interestingly, the role of these disorders in neonatal mortality has hardly changed over several decades in Nigeria.[2,4-6] In other parts of the developing world, improved neonatal care and decline in neonatal mortality have reportedly resulted in remarkable decline in infant mortality rates.[7]

Lack of access to quality obstetric and neonatal care as a result of intense economic depressions and poor funding of the health sector constitute barriers to the reduction in neonatal mortality in many parts of the

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developing world.[8] The Nigerian situation is not an exception because the country witnessed a prolonged course of socio-political turmoil between 1993 and 1999 with catastrophic effects on her economy and by extension, the health sector.[9] With improvement in the national economic indices from 1999 when civil rule was restored and international socioeconomic sanctions lifted, it was expected that the quality and spread of obstetric and neonatal services would improve over time and that more babies would survive.

The objective of the present study was to review the trend in neonatal mortality at Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu between January 1996 and December 2005. The hospital (formerly known as Ogun State University Teaching Hospital) provides specialist obstetric and neonatal services to communities in Ogun State and parts of Lagos, Ondo and Edo States. The neonatal unit of the hospital became operational in 1989, but it was only equipped to provide special care as there were no functional infant ventilators, monitoring devices and facilities for parenteral nutrition. A review of the neonatal morality pattern in this unit for the first two years of its existence has previously been reported.[5]

Materials and Methods

The admissions and discharges records in the neonatal unit of the hospital for the period January, 1996 to December, 2005 were reviewed. The number of live births during this period was also obtained from the delivery records in the Maternity Unit of the hospital. The records of all the babies that died within the first 28 days of life in the neonatal unit were also identified and included in the study.

The data obtained from the records included the postnatal age on admission, sex, and weight on admission, places of birth, major reasons for admission and the duration of hospitalization. Deaths which occurred within and after the first seven days of life were classified as early and late neonatal deaths (END and LND), respectively. Babies delivered in OOUTH were classified as in-born while referred babies were classified as out-born. Early neonatal mortality rate (ENMR) was defined as the number of in-born deaths during the first seven days of life per 1000 live births within the specified period while late neonatal mortality rate (LNMR) was defined as the number of in-born deaths after the first seven days of life per 1000 live births within the specified period. The major reasons for admission were recorded in the format previously described.[2] Sepsis was often diagnosed on suggestive clinical features with bacteriological confirmation when available. Unfortunately, paediatric post-mortem examinations were not routinely carried out due to socio-cultural disapproval.

The data were analyzed using the SPSS 11.0 software. The in-born and out-born babies were compared for age, weight, mortality rate and trend in mortality rates using the Chi-square and Student's 't' tests. Bivariate correlation was used to assess the relationship between trends in admission and mortality. Statistical significance was established when p values were less than 0.05 in two-tailed tests.

Results

General characteristics of the subjects

There were 2985 neonatal admissions between January 1996 and December 2005; this accounted for 37.5 percent of the total 7959 paediatric admissions in the hospital. Records of 52 (1.74 percent) babies were excluded from further analysis due to incomplete data. The remaining 2933 babies comprised 1135 (38.7 percent) in-born and 1798 (61.3 percent) out-born babies. There were 1707 (58.2 percent) males and 1226 (41.8 percent) females giving a male-to-female ratio of 1.4:1. The ages of the babies ranged from 0 to 19 days with a mean of 3.7 ± 4.3 days while the mean weight was 2.68 ± 0.9kg (range: 0.7-4.4 kg). The in-born babies were significantly younger on admission than the out-born babies {1.44 ± 2.2 days vs 3.44 ± 5.12 days; $t = 12.45$, $p = 0.00000$}. They also weighed significantly less than the out-born babies {2.75 ± 1.2 kg vs 2.97 ± 0.93 kg; $t = 5.56$, $p = 0.00000$}.

Pattern of mortality

Seven hundred and seventy three neonatal deaths were recorded. This number accounted for an overall neonatal mortality rate of 263.6/1000 admissions or 60.8 percent of the total 1271 paediatric deaths. These deaths were those of 426 (55.1 percent) males and 347 (44.9 percent) females, giving a male-to-female ratio of 1.2:1. Mortality rate among the females was significantly higher than that of the males {28.3 percent vs 24.9 percent; $X^2 = 4.119$; $p = 0.042$). Table I shows that the neonatal mortality rates for all the subjects ranged between 165.7/1000 admissions and 334.2/1000 admissions without a consistent pattern throughout the period.

The patterns of neonatal admissions and deaths between 1996 and 2005 were strongly correlated ($r = 0.953$; $p = 0.0000$). This suggested a direct relationship between the changes in the magnitude of neonatal admissions and deaths over the period studied. The admission rates and the various death rates among in-born and out-born babies were lowest in the year 1999. Further analysis showed that 168 (21.7 percent) of the 773 that died were in-born

Table I

Yearly Distribution of Neonatal Mortality Rates (1996–2005)

Year	No of Admissions	No of Deaths	NMR/1000 Admissions
1996	211	54	255.9
1997	252	54	214.3
1998	249	56	224.9
1999	169	28	165.7
2000	311	74	237.9
2001	319	72	225.7
2002	353	96	272.0
2003	371	124	334.2
2004	386	120	310.9
2005	312	95	304.5
Total	2933	773	263.6

NMR = Neonatal mortality rate

babies, and the remaining 605 (78.3 percent) were out-born. The mortality rate among the in-born babies ranged between 87/1000 admissions and 199/1000 admissions while for out-born babies, it ranged between 195/1000 admissions and 416/1000 admissions. The overall mortality rates among in-born and out-born babies were 148.0/1000 admissions and 336.5/1000 admissions, respectively. This difference between the mortality rate among in-born and out-born babies was significant ($X^2 = 133.6$; $p = 0.00000$). Table II shows that there were consistently more deaths among the out-born babies compared with the in-born babies. Although, the contribution of out-born babies to total neonatal death rates ranged between 61.1 percent and 84.2 percent, no consistent trend was shown. Four hundred and forty (56.9 percent) of the 773 deaths occurred within 24 hours of admission.

Table III shows the neonatal mortality rates (NMR) based on the number of hospital deliveries during

Table II

Yearly Distribution of Neonatal Mortality Rates according to the Places of Birth (1996-2005)

Years	In-born Babies			Out-born Babies				
	Adm*	Deaths	NMR/1000 Admissions	Adm*	Deaths	NMR/1000 Admissions	P values	Percentage Contribution**
1996	77	9	116.9	134	45	335.8	0.004	83.3
1997	120	17	141.7	129	39	302.3	0.002	69.6
1999	46	4	87.0	123	24	195.1	NS	85.7
2000	149	16	107.4	162	58	358.0	0.00000	78.4
2001	154	28	181.8	165	44	266.7	NS	61.1
2002	128	25	195.3	225	71	315.5	0.015	74.0
2003	133	25	188.0	238	99	416.0	0.00000	79.8
2004	127	19	149.6	259	101	390.0	0.00000	84.2
2005	100	16	160.0	212	79	372.6	0.00000	83.2
Total	1135	168	148.0	1798	605	336.5		

** Number of admissions* ***Percentage contribution of out-born babies to total deaths.* *NS = Not significant.*

Table III

Neonatal Mortality Rates based on Deliveries at OOUTH (1996 – 2005)

Years	*END*	*LND*	*Total Neonatal Deaths*	*Total Annual Live births*	*ENMR/ 1000 LB*	*LNMR/ 1000 LB*	*NMR/ 1000 LB*
1996	7	2	9	204	34.3	9.8	44.1
1997	9	0	9	320	28.1	0.0	28.1
1998	13	4	17	366	35.5	10.9	46.4
1999	4	0	4	156	25.6	0.0	25.6
2000	12	4	16	389	30.8	10.3	41.1
2001	20	8	28	387	51.7	20.7	72.4
2002	15	10	25	413	36.3	24.2	60.5
2003	19	6	25	475	40.0	12.6	52.6
2004	12	7	19	418	28.7	16.7	45.4
2005	7	9	16	431	16.2	20.9	37.1
Total	118	50	168	3559	33.2	14.0	47.2

END= Early neonatal deaths LND= Late neonatal deaths LB = Live births; NMR= Neonatal mortality rates
ENMR = Early neonatal mortality rates LNMR = Late neonatal mortality rates

the study period. One hundred and sixty eight babies out of the 3559 total live births recorded in the hospital, died. Thus, the overall NMR for the hospital for the period was 47.2/1000 live births; ranging from 25.6/1000 live births to 72.4/1000 live births. Overall, there were 559 (72.3 percent) early neonatal deaths (END) and 214 (27.7 percent) late neonatal deaths (LND). Four hundred and eighteen (74.8 percent) of these END occurred within the first 24 hours.

Table IV shows the distribution of the mortalities by weight and place of birth. The highest mortality rate was recorded among extremely low birth weight babies (weighing < 1.0kg), while the lowest mortality rate was recorded among normal weight babies. However, the mortality was significantly higher among out-born babies than in-born babies at all the weight range groups. Five hundred and twenty one (67.4 percent) of those that died were of low birth weight (weighing < 2.5kg).

The various clinical diagnoses associated with the deaths are shown in Table V. On the whole, preterm births, perinatal asphyxia and septicaemia were the leading conditions associated with these deaths. While preterm births and septicaemia were common to both in-born and out-born babies, tetanus was only recorded in out-born babies. Perinatal asphyxia was

Table IV

Comparative Analysis of Mortalities among Babies, distributed according to Body Weight

Weight (kg)	*In-born*		*Out-born*		*p-values*
	Total	*Deaths*	*Total*	*Deaths*	
<1	78	56 (71.8)	63	58 (92.1)	0.002
1 – 1.49	141	34 (24.1)	253	98 (38.7)	0.03
1.5 – 2.49	412	44 (10.7)	710	231 (32.5)	0.00000
2.5 – 3.99	470	31 (6.6)	740	207 (28.0)	0.00000
e"4	34	3 (8.8)	32	11 (34.4)	0.011
Total	113	168 (14.8)	1798	605 (33.6)	

Figures in parentheses are percentages of the respective totals.

Table V

Clinical Diagnoses, Mortalities and Places of Birth

Major Diagnoses	*Total*	*In-born*	*Out-born*	*p values*
Preterm births	299 (38.7)	71 (42.3)	228 (37.7)	NS
Asphyxia	194 (25.1)	60 (35.7)	134 (22.2)	0.0003
"NNS"	81 (10.5)	15 (8.9)	66 (10.9)	NS
Neonatal jaundice	77 (9.9)	7 (4.1)	70 (11.5)	0.005
Neonatal tetanus	61 (7.9)	0 (0.0)	61 (10.1)	0.00000*
Cong. malformations	21 (2.7)	4 (2.4)	17 (2.8)	NS
Respiratory diseases	17 (2.2)	7 (4.2)	10 (1.7)	NS
Bleeding disorders	12 (1.5)	1 (0.6)	11 (1.8)	NS
Severe anaemia	11 (1.4)	3 (1.8)	8 (1.3)	NS
Total	773 (100.0)	168 (100.0)	605 (100.0)	

*Figures in parentheses are percentages of the totals in the column. NS = Not significant. * Yates' correction applied.*
"NNS" = Neonatal septicaemia (including meningitis).
Respiratory diseases include aspiration pneumonitis, congenital pneumonia, bronchopneumonia and idiopathic respiratory distress syndrome.
Cong. Malformations = Congenital malformations, including omphalocoele, gastroschisis, cleft lip and palate, intestinal obstruction, Hirschprung's disease, chromosomal abnormalities and spinal dysraphism.

also commoner among in-born babies while neonatal jaundice was commoner among out-born babies.

Discussion

The prime position of neonatal mortality in infant mortality has been highlighted.[1] While NMR varies in different countries and in different parts of the same country, the leading causes of neonatal deaths have remained largely unchanged in many parts of the developing world. Prematurity, perinatal asphyxia and infections, including tetanus, as found in the present study have also been reported from different parts of Nigeria as the leading causes of neonatal deaths.[2,4-6] Similar findings have been reported from South Africa,[3] Bangladesh,[10] and Pakistan.[11] Preterm birth and septicaemia were almost equally associated with deaths among both the in-born and out-born babies. However, asphyxia was more commonly associated with deaths among in-born babies probably because most of the deliveries in this hospital were high risk unbooked pregnancies referred from other health facilities.[12] On the other hand, neonatal jaundice was more commonly associated with death among out-born babies because of late presentation in the hospital which could probably be explained by late detection of jaundice by the caregivers at home.

The NMR in the present study (47.2/1000 live births) was not significantly lower than the 50.8/1000 live births previously reported from the same centre.[5] This was expected since the facilities available for neonatal care in the hospital had not improved significantly since the previous review. The NMR of 37.1/1000 live births in the year 2005 in our hospital was marginally higher than the 31.9/1000 reported from West Bengal during the same period.[13] It is likely that the lack of intensive care facilities had contributed to the high NMR obtained in our hospital compared with other similar developing countries. Thus, it may be necessary to explore other means of improving the survival of these babies outside the health facilities. These may be community based to be most effective. Meanwhile, the quality of the existing services needs to be improved in terms of personnel and equipments, and the services should be subsidized to attract utilization by the at-risk population.[14,15]

Unlike the previous report where out-born babies contributed 69.6 percent of all deaths,[5] the contribution of the out-born babies to neonatal deaths over the years was much higher in the present study, ranging between 74.0 and 85.7 percent with the exception of the years 1997 and 2000. Such referred babies were usually more prone to early mortality than in-born babies just as babies of un-

booked mothers were more prone to early deaths than babies of booked mothers.[16,17] This might explain the fact that close to three-quarters of the deaths recorded in the present study were early neonatal deaths unlike the 27.1 percent previously reported from the same centre.[5] The proportion of total neonatal deaths formed by END in the present study was, however, similar to 70 percent recently reported from Pakistan.[11] Similarly, the proportion of END (74.8 percent) which occurred within the first 24 hours was higher in the present study than the 61 percent previously reported from the same centre.[5] The higher incidence of END in this study may suggest that over the years, more high risk babies were hospitalized in critical states soon after birth. Lack of prenatal care, unsupervised deliveries and inadequate neonatal resuscitation may jointly explain this scenario. The dearth of good quality prenatal and delivery services as well as the poor utilization of the existing facilities may have socio-economic basis.[14] Therefore, there is an urgent need to improve the funding of the health sector and encourage the utilization of quality obstetric services at low cost to the end users. In addition, there is need for a sound referral system between the different tiers of the health care delivery system to facilitate early maternal-foetal referral of high risk pregnancies to health facilities equipped for managing such patients.

There was no significant difference in the contribution of LBW babies to the overall neonatal deaths in the present study (67 percent) compared with 60 percent previously reported from the same centre[5] and 62.4 percent reported from Ilesa, Nigeria between 1981 and 1990.[2] It is worrisome that over a period of more than two decades, this situation has not changed in Nigeria. Since mortality in this group of babies, particularly the extremely low birth weight babies, has been attributed mainly to respiratory failure, poor thermo-regulation, feeding difficulties and infections,[2,18,19] it is important to state that the present neonatal care delivery system in Nigeria largely lacks the wherewithal to tackle these problems. This may further explain the huge contribution of LBW babies to high neonatal mortality in the country. It also lends credence to the calls for the provision of neonatal intensive care units where these LBW babies can be appropriately managed.[2]

A lot needs to be done in this country like most other developing nations, to reduce neonatal mortality and childhood mortality. Facilitated access to prenatal care services, skilled attendance at births and skilled emergency neonatal care which have been described as cost-effective interventions needed to improve neonatal health in the developing world,[20] may also be helpful.

References

1. Dawodu A. Neonatology in developing countries: problems, practices and prospects. *Ann Trop Paediatr* 1998;**18**:S73–9.
2. Owa JA, Osinaike AI. Neonatal morbidity and mortality in Nigeria. *Indian J Pediatr* 1998;**65**:441-9.
3. .Pattinson RC. Saving Babies: A perinatal care survey of South Africa. 2000 Executive Summary. Available at the website: http://www.scienceinafrica.co.za/2001/july/babies.htm
4. Asindi AA, Ibia EO, Udo JJ. Mortality pattern among Nigerian children in the 1980s. *J Trop Med Hyg.* 1991; **94**: 152–5.
5. Njokanma OF, Olanrewaju DM. A study of neonatal deaths at the Ogun State University Teaching Hospital, Sagamu, Nigeria. *J Trop Med Hyg* 1995;**98**:155–60.
6. Ayoola OO, Orimadegun AE, Akinsola AK, Osinusi K. A five-year review of childhood mortality at the University College Hospital, Ibadan. *West Afr J Med* 2005;**24**:175–9.
7. Swyer PR. Organisation of perinatal/neonatal care. *Acta Paediatr Suppl* 1993;**385**:1–18.
8. African Union. Health Financing in Africa. Special summit of the African Union on HIV/AIDS, Tuberculosis and Malaria, Abuja, Nigeria. May, 2006. Available at website: www.african-union.org
9. Ibe O. Child Survival in Nigeria: Situation, Response and Prospects. October, 2002. Available at the website http://www.policyproject.com/pubs/countryreports/NIG_CSrevised.
10. Chowdhury ME, Akhter HH, Chongsuvivatwong V, Geater AF. Neonatal mortality in rural Bangladesh: an exploratory study. *J Health Popul Nutr* 2005;**23**:16–24.
11. Fikree F, Azam SI, Berendes HW. Time to focus child survival programmes on the newborn: assessment of the levels and causes of infant mortality in rural Pakistan. *Bull World Health Organ* 2002; **80**:271–6.
12. Njokanma OF, Sule-Odu AO, Akesode FA. Perinatal mortality at the Ogun State University Teaching Hospital, Sagamu, Nigeria. *J Trop Paediatr* 1994;40:78–81.
13. Paul DK, Bag T. Perinatal mortality in rural medical college of West Bengal. *Indian J Public Health* 2005;**49**:240.
14. Ogunlesi TA. The pattern of utilization of prenatal and delivery services in Ilesa, Nigeria. *The Internet J Epidemiol* 2005; **2**(2).
15. Zupan J. Perinatal mortality in developing countries. *N Eng J Med* 2005;**352**:2047–48.

16. Kuti O, Orji EO, Ogunlola IO. Analysis of perinatal mortality in a Nigerian teaching hospital. *J Obstet Gynaecol* 2003;**23**:512–4.17.
Archibong EI, Sobande AA, Al-Bar HM, Asindi AA. Unattended delivery and perinatal outcome: a tertiary hospital experience. *Nig J Paediatr* 2002;**29**:66-70.
18. Njokanma OF, Fagbule D. Outcome of referred neonates weighing less than 2500g. *Trop Geogr Med* 1994;**46**:172–4.
19. Shankaran S, Fanaroff AA, Wright LL, *et al.* Risk factors for early death among extremely low-birth-weight infants. *Am J Obstet Gynecol* 2002;**186**:796–802.
20. Sule SS, Onayade AA. Community-based antenatal and perinatal interventions and newborn survival. *Niger J Med* 2006;**15**:108–14.

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