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Neonatal Morbidity and Mortality in Nigeria

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Abstract : A retrospective analysis of neonatal morbidity and mortality was conducted over a ten-year period (1981-1990) at a tertiary hospital in Ilesa, Nigeria, to determine the trends in neonatal morbidity and mortality in relation to places of delivery. 7,225 babies were admitted into the neonatal unit during the period wherein 3,232 (44.7%) were inborns and 3,993 (55.3%) outborns.

Places of delivery of outborn babies were government hospitals/maternity centres (44.1%), home (28.5%), private hospitals/clinics (18.8%), and mission houses (8.7%). Major indications for admission among inborns were neonatal jaundice (45.6%), low birthweight (18.6%), birth asphyxia (14.2%), and neonatal infections (9.3%), while those for outborns were neonatal jaundice (39.5%), low birthweight (23.2%), neonatal infections (18.0%), neonatal tetanus (5.7%), birth asphyxia (4.8%). Overall mortality rate was 13.0%. It was higher in outborns than inborns ($p < 0.001$). Mortality was lowest in 1983 and peaked in 1987 and 1988. It was higher in outborns than inborns during the period ($p < 0.001$). Major causes of death were low birth weight (42.8%), neonatal jaundice (14.1%), neonatal tetanus (12.8%), infections (12.4%), and birth asphyxia (11.6%). In almost all cases, case fatality rates were higher among the outborns ($p < 0.001$). Similarly, mortality was higher in outborns than inborns in almost all the weight range. Among the outborns, mortality was highest in babies delivered at home and private hospitals. Improved access to neonatal medical and antenatal care will significantly reduce neonatal morbidity and mortality in Nigeria. **(Indian J Pediatr 1998; 65 : 441-449)**

Key words : *Trends; Neonatal Morbidity; Nortality; Nigeria.*

Neonatal mortality is an important component of infant mortality in Nigeria and other third world countries.[1-10] It may account for up to half of the deaths in the first year of life,[2-5] Neonatal mortality rate (NNMR) and day-one mortality rate are directly related to health service activity.[11] Neonatology is a neglected aspect of Paediatrics in many of the developing countries.[6] With the meagre resources, priorities are often given to other less expensive but easily applied preventive measures. With the present emphasis on primary health care (PHC) activities and prevention of many of the vaccine preventable diseases, however, it is conceivable that neonatology will be given its right place. It is important, therefore, that we continue to report on trends in neonatal morbidity and NNMR against which future performance can be judged. This may help to identify deficiencies and assist health workers and planners. Since community-based data are difficult and expensive to collect in the face of diminishing resources (in real value), many poor third

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world countries will continue to rely on hospital-based data for sometime to come for health planning. Moreover, changes in hospital-based data are likely to reflect changes in the community as a whole. A better neonatal outcome will follow improved maternal and chiild health (MCH) services in the community.[12,13]

The Neonatal Care Unit (NCU) at the Wesley Guild Hospital (WGH), Ilesa, is a tertiary unit that admits high-risk neonates in Nigeria. In addition to the high-risk babies delivered in the hospital maternity unit (inborns), the unit also looks after many ill neonates delivered at home and other units (outborns). The organization of the unit has been previously described.[1]

The present review covers a ten-year experience in the unit with emphasis on the trends and patterns in neonatal morbidity (NNM) and NNMR in relation to places of delivery of the babies.

MATERIALS AND METHODS

The NNU at WGH provides all neonatal medical care services except mechanical ventilation. It has eight cubicles and each cubicle has capacity for four babies. Six of the eight cubicles are for preterm (including those admitted from outside within 48 hours of birth), and babies born in WGH. One of the remaining two cubicles is for babies with obvious infection (ophthalmia neonatorum, *staphylococcal* skin infection, gastroenteritis etc.) and the eighth cubicle is reserved for cases of neonatal tetanus (NNT). Resting spaces are provided for the mothers by the side of each cubicle[1,2] to enable them to provide expressed breast milk 24 hours a day.

We analyzed the admission and discharge registers for 1981-1990. In cases where the registered information was inadequate, we also reviewed the case files. The following data was obtained from the records : postnatal age, weight at birth or admission, sex, places of delivery and the main indications for admission or discharge diagnosis. For example, if we admitted a preterm baby with LBW, the main diagnosis would be preterm and LBW, though he might develop jaundice while on admission. On the other hand, if we admitted a 2000 gm baby on the third day for jaundice, the main diagnosis will be neonatal jaundice (NNJ).

Cases that we diagnosed as NNJ were admitted and treated primarily for jaundice. In normal weight (birthweight > 2.499 kg) babies the serum bilirubin concentrations were usually over 12-15 mg/dl depending on the postnatal age. We sometimes based the diagnosis of neonatal sepsis (NNS) on clinical features only since blood culture bottles were not always available. These were cases in which the consultant in charge agreed with the presumptive diagnosis of NNS and treated for sepsis. In babies born in WGH, we diagnosed birth asphyxia (BA) if the APGAR score was seven or below. Nearly all the babies admitted from WGH for BA had an APGAR score of five or below. For outborn babies we diagnosed BA on the basis of the referral letter, history and the clinical findings and the APGAR score was not always known.

We admitted babies (in born and outborn) under 30 days old into the unit. We included babies born in the hospital and discharged home before admission into the unit under the inborn group.

The other places of delivery were the government hospitals/maternity centres/health centres (HOS/HC), home; private hospitals/clinics (PRIV), and churches/mission houses (MH). In each group, the

TABLE 1. Comparison of Weight Distribution of the Inborns and Outborns

Weight range (grams)	Total	Inborn Total	Inborn % of total	Outborn Total	Outborn % of total	P value
< 999	125	28	0.9	97	2.4	< 0.001
1000-1499	613	157	4.9	456	11.4	< 0.001
1500-1999	846	345	10.7	501	12.5	< 0.050
2000-2499	1135	548	17.0	587	14.7	< 0.050
2500-2999	1782	814	25.2	968	24.2	NS
> 3000	2724	1340	41.5	1384	34.7	< 0.001
Total	7225	3232	100.0	3993	100.0	

NS = p > 0.05 (not statistically significan); VLBW = 738 (10.2%) of total admissions.; LBW = 2719 (37.6%) of total admissions

standards available varied greatly (see under discussion). We stratified the babies into weight range groups and used Chi-square test for statistical analysis, using Statigraphics Plus for Windows (Manugstics, Inc. USA). We took p value of 0.05 or less as being statistically significant.

RESULTS

A total of 7,225 babies, were admitted into the NNU during the period. These consisted of 4,189 males and 3,036 females giving a male : female ratio of 1.38 : 1. Places of delivery of the babies were WGH, HOS/HC, PRIV, home and MH in 44.7%, 24.3%, 10.4%, 15.7% and 4.8% respectively. Proportion of babies being admitted from home and MH increased slowly over the period. On the average, the outborns were admitted at older age than the inborns. As the total number of deliveries in WGH decreased, the number from other government HOS/HC also decreased (r = 0.58) but total outborns increased (r = -0.42). The proportions of the live births in WGH admitted increased from 21.6% (lowest) in 1983 to 37.6% (highest) in 1987 (p < 0.001).

Table 1 shows the weight distribution of the babies. We grouped all the babies admitted from outside together for ease of comparison and compared them with babies born in WGH. Out of 7,225 admissions, 2,719 (37.6%) were LBW (weighing < 2,499 gm), comprising 1,078 (33.4%) of the 3,232 inborns and 1,641 (41.1%) of the 3,993 outborns (p < 0.001). Also, 185 (5.7%) of the inborns and 563 (13.9%) of the outborns were of very low birthweight [(VLBW) < 1.499 kg], p < 0.001. Table 2 shows the distribution of the major admission diagnoses in relation to places of delivery. The babies from the other units are also grouped as outborns. About 61% of the NNT cases were from about 16% of the babies who were born at home. Other indications for admission were equally represented in outside units. The miscellaneous conditions included : anaemia, vomiting, burns, seizures, bleeding disorder, poisoning, failure to thrive, hypothermia and admissions for observation.

Tables 3, 4 and 5 present the mortality data. During the period we recorded 12,348

TABLE 2. Places of Delivery and Admission Diagnosis

Diagnoses	Inborn (WGH) number	Outborn number	Total
NNJ	1474	1579	3,053
LBW	602	923	1,525
NNS	300	583	883
NNT	4	226	230
BA	459	156	615
Ophthalmia	70	109	179
Cong. malformation	42	87	129
Gastroenteritis	35	91	126
Broncho	36	76	112
Birth trauma	45	37	82
Resp distr	50	31	81
Miscella.	115	95	210
Total	3,232 *(44.7)	3,993 (55.3)	7,225 (100)

* Figures in parenthesis is percentage of total admission.

NNJ = Neonatal jaundice; LBW = Low birthweight; NNS = Neonatal sepsis; NNT = Neonatal tetanus; BA = Birth asphyxia; Ophthalmia = Ophthalmia neonatorum; Cong malf. = Congenital malformation; Gastro. = Gastroenteritis; Broncho. = Bronchopneumonia; Resp dist. = Respiratory distress; Miscella. = Miscellaneous.

live births in WGH, and 212 (1.72%) of these died (giving mean NNMR of 17.2/1000 live births in the hospital). We recorded the highest NNMR of 35.2/1000 and 30.2/1000 in the hospital in 1987 and 1988 respectively (fig. 1). These were the years with the lowest numbers of deliverries in the hospital. Mortality rate among the 3,232 babies admitted from WGH was 212 (6.6%) and was lower than 726 (18.2%) for the 3,993 outborns ($p < 0.001$). Highest mortality rate occurred among LBW infants, followed by NNT, NNS, NNJ and BA which together accounted for 892 (95.1%) of the 938 deaths. In almost all the birth weight range and clinical conditions, mortality rate was significantly higher in outborns than inborns.

DISCUSSION

The WGH NNU covers a large area of the former Western Region of Nigeria. It, therefore, has a sizeable record of neonatal problems in Nigeria. The present data have some similarities to the data of Oydeji *et al.*[2] For example, the M : F ratio was about 1.38 : 1 in both cases and the overall indications for admission were very similar. It appears

TABLE 3. Mortality Rates According to Places of Delivery

Place of delivery	Total admissions	Number of deaths	Mortality rates percents
Wesley guild hospital	3,232	212	6.6
Government hospital/Health centres	1,759	285	16.2
Home	1,137	234	20.6
Private clinics/hospitals	750	156	20.8
Mission houses	347	51	14.7
Total	7,225	938	13.0

$X^2 = 203.3$; $p < 0.001$

TABLE 4. Weight Specific Mortality Rates among Inborns and Outborns

Weight range (gms)	Inborns		Outborns		P values*
	Total	Deaths	Total	Deaths	
< 999	28	28 (100)	97	83 (85.1)	NS
1000-1499	157	49 (31.2)	456	174 (38.1)	NS
1500-1999	345	33 (9.6)	501	95 (19.0)	< 0.001
2000-2499	548	30 (5.5)	587	93 (15.8)	< 0.001
2500-2999	814	24 (2.9)	968	143 (14.7)	< 0.001
> 3000	1340	48 (3.6)	1348	138 (10.1)	< 0.001
Total	3232	212	3993	726	< 0.001
Case fatality rate		(6.6)		(18.2)	

Figures in parenthesis are percentages of total in each row.
*Comparing row data.

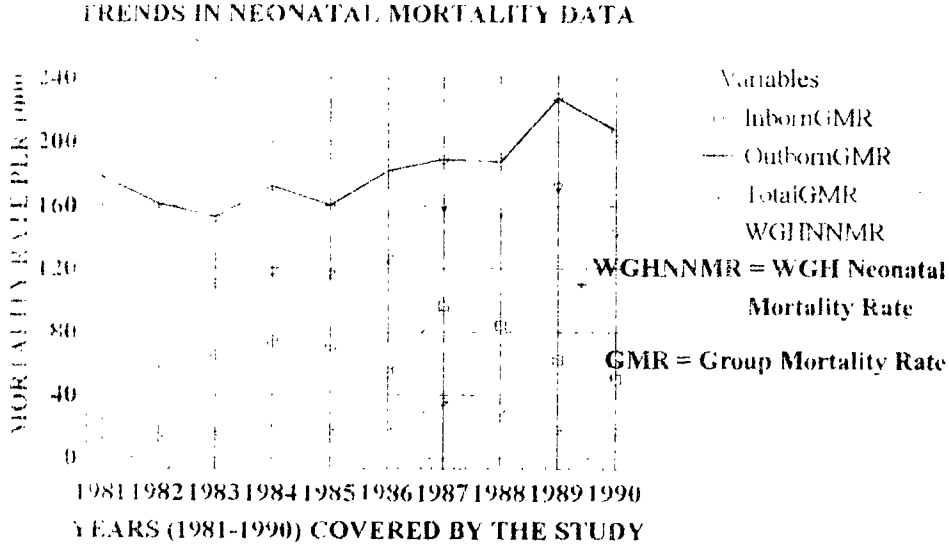
TABLE 5. Case Fatality Rates Among Nine Major Causes of Deaths

Causes	Inborns			Outborns			P value
	Total No.	No. of deaths	Case fatality rates	Total No.	No of deaths	Case Fatality rate	
LBW	602	115	19.1	923	288	31.2	< 0.001
NNJ	1474	13	0.9	1579	119	7.5	< 0.0001
NNT	42	2	50.0	226	118	51.3	NS
NNS	300	9	3.0	583	106	18.2	< 0.001
BA	459	61	13.2	156	51	32.7	< 0.001
Cong mal	42	7	16.7	87	10	11.5	NS
Bronchop	36	2	5.6	76	12	15.8	NS
Gastroent	35	–	–	91	9	9.9	–
Res distr	50	3	6.0	31	4	22.6	NS
Others	115	–	–	95	9	9.5	–
Total	212	6.6	726	18.2			

NO = Number; TD = Total deaths; LBW = low birthweight; NNJ = Neonatal jaundice; BA = Birth asphyxia; NNS = Neonatal sepsis; NNT = Neonatal tetanus; Cong mal = Congenital malformation; Bronchop = Bronchopneumonia; Res distr = Respiratory distress; Gastroent = Gastroenterits.

however, that more high-risk neonates such as LBW infants are now being admitted from outside.

In each of the other places of delivery the standards of practice vary greatly. In government HOS, mothers are delivered by doctors and nurses while in HC and MC they are delivered mainly by nurses. Some of the PRIV are under the supervision of specialist doctors with very high standards of practice, some are supervised by nurses/mid wives while others are under un-



Data for Figure 1 : Trends in Neonatal Mortality Rate

Year	Inborn		Outborn		Inborn and Outborn per 1000	Yearly NNMR in WGH/ 1000 Live births
	Total	Rate/ 1000	Total	Rate/ 1000		
1981	412	60.7	321	177.6	111.9	14.4
1982	420	59.5	422	161.1	110.5	13.2
1983	431	65.0	452	152.7	109.9	14.1
1984	418	74.2	330	172.7	117.6	17.4
1985	324	71.0	362	160.2	115.1	17.7
1986	318	53.5	402	181.6	125.0	17.5
1987	187	96.3	413	188.9	159.5	35.9
1988	214	84.1	476	187.0	155.1	30.2
1989	209	62.2	409	227.4	171.5	17.5
1990	279	50.2	406	206.9	143.1	17.0
Total	3232	65.5	3393	181.8	129.8	17.2

trained people who parade themselves as doctors and nurses with standards that are worse than those at Home and MH.

The present data cover a ten-year period, long enough to perceive trends in NNM and NNMR patterns. Among the live births in WGH the mean NNMR was 17.2/1000. This was significantly higher than the figures of 6.5/1000 for the USA[14] and 4.3/1000 from a centre in the UK.[15] This figure is unlikely to represent the true figure for Nigeria since WGH looks after high-risk pregnancies. While NNMR figures in the developed countries show consistent downward trends[14,15] the present data showed a definite increase to a maximum level in 1987 and 1988. Multiple factors may be responsible for this. A major factor may be the decline in socio-economic status of the people.[16,17] For example, introduction of charges late in 1984 led to decline in ANC cases in WGH.[16,17] Therefore, smaller proportion of high-risk mothers delivered in WHG after severe complications had set in. With greater proportion of high-risk mothers delivering at home and peripheral units, more critically ill neonates were being admitted from outside. This might contribute to the high NNMR in the hospital between 1987 and 1988.

The overall NNMR of 13.0% in the unit was significantly lower than the 23.4% and 16.5% reported by Twaites *et al*[1] and Oyedeji *et al*[2] in 1973 and 1983 respectively. Although most of the babies born in WGH were delivered by high-risk pregnant women, the mortality rate of 6.6% was much less than 18.2% among outborn babies. Proportions of VLBW and LBW neonates were higher among outborn than inborn babies. This may contribute to the higher NNMR among outborns than inborns. This is not likely to be the only reason. For example, weight specific NNMR shows that mortality rate was higher among outborns than inborns in almost all the weight groups except in the VLBW in which it was almost equal. Low birthweight was a major cause of death. Most of the LBW infants who died, died within the first two days of respiratory failure.

Neonatal intensive care would save many of these infants. Many of the LBW infants who were brought from outside got to us in very poor conditions of severe hypothermia and NNS. It is possible that many other LBW infants died at home and the others outside units. A critically ill, VLBW infant with moderate to severe respiratory distress syndrome needs neonatal intensive care facilities like ventilator support.

Bias in case selection also may be a factor. Outborn babies were generally older than inborn babies on admission. Birth asphyxia among outborn babies probably represented more severe form of the condition. Some of the babies were only referred after they had developed complications like convulsions. This suggests that if adequate obstetrics and immediate neonatal care were available to this other group, a drastic reduction in NNMR could be expected in this group. This can be inferred from the analysis of the major causes of death like NNT, NNS, NNJ, LBW and BA that are either preventable or treatable conditions. The high incidence of NNS and NNT in these babies is due to inadequate ANC and unhygienic care of delivery and umbilical stump.[16] Kernicterus and death due to NNJ is now rare in term infants delivered in WGH due to early intervention.[19] Death due to LBW and BA can be reduced with proper ANC and the use of Neonatal Intensive Care.[14,15]

Over 61% of cases of NNT were delivered at home and significant proportion came from the PRIV. Under the unfavourable conditions and even with the emphasis on preventive measures at the PHC the number of NNT cases remained high. This is because many poor mothers could not afford proper ANC and many babies are still being born in the dirty and infected environments of Home and MH. In the present series, four (0.3/1000) cases of NNT were recorded in the 12,348 babies born in WGH. All the babies had been discharged for home before the onset of illness. The way the cords were treated at home may be more important than the actual places of delivery. However, NNT in such babies poses a great challenge to the objective of eliminating NNT.[18] This situation may not be peculiar to Nigeria. It may be true of many developing countries. For example, a recent report from Bangladesh shows that NNT remains the leading cause of neonatal death.[20]

All the outside units, including the government HOS/HC do not have adequate facilities to look after or transport ill newborn babies. Because delivery at home or MH is almost free, services are obtained faster in PRIV than in the HOS/HC and transport remains a major problem in many of the towns, especially at night and in rural areas. Patients, therefore, find it easier and cheaper to remain at home or go to the MH that are often nearer to them, at the cost of their health. The other places of delivery will therefore continue to play an increasing role in the delivery of babies as long as the adverse socio-economic conditions persist. This will be particularly true of delivery at home, and MH.

Improvement in NNMR in advanced countries has been attributed to many factors that include[21] better and more extensive access to ANC, improvement in standard of living, better nutrition, better obstetric and neonatal care and greater access to high quality medical neonatal care.[14-21] Improvement in NNMR is anticipated when facilities for neonatal intensive care are available. Facilitated access to perinatal care and improvement in neonatal care facilities would reverse the current unfavourable neonatal morbidity and mortality data in Nigeria.

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