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F.N. Were, MBChB, MMed, FNIC, Lecturer, B.O. Mukhwana, MBChB, Senior House Officer and R.N. Musoke, MBChB, MMed, Associate Professor, Department of Paediatrics and Child Health, College of Health Sciences, University of Nairobi, P.O. Box 19676, Nairobi.

Request for reprints to: Dr. F. N. Were, P.O. Box, 20956, Nairobi.

NEONATAL SURVIVAL OF INFANTS LESS THAN 2000 GRAMS BORN AT KENYATTA NATIONAL HOSPITAL

F.N. WERE, B.O. MUKHWANA and R.N. MUSOKE

ABSTRACT

Background: **Survival of patients is regularly used as a measure of the level and appropriateness of medical care provided by institutions. Newborn services have been evaluated in this manner since the 1960s. Though Kenyatta National Hospital has provided neonatal services for over 25 years, no survival data for the low birth weight infants has been published since 1978.**

Objective: **To determine the birthweight specific neonatal survival of infants born weighing less than 2000 grams at Kenyatta National Hospital.**

Design: **A cross sectional survey.**

Setting: **Newborn Unit, Kenyatta National Hospital, Nairobi.**

Main outcome measures: **The proportion of infants surviving the first 28 days of life grouped in the following birthweight categories; below 1000 grams (extremely low birthweight), 1000 - 1499 grams (very low birthweight) and 1500 - 1999 grams (low birthweight).**

Results: **The overall neonatal survival of 163 infants born below 2000 grams was 62.6%. None of the 23 infants born less than 1000 grams survived the neonatal period. Bigger infants fared much better with 68% (n=73) of the 1000 - 1499 and 78% (n=67) of the 1500-1999 gram groups surviving. Survival based on gestational age was also determined. Sixty nine per cent of infants born between 32 and 35 weeks survived while only 27% and 9% of the 28 - 31 weeks and those less than 28 weeks survived respectively. When the patients were analysed for age at death, it was found that over 28% of the deaths occurred within the first day and by the seventh day, more than 70% had died. Less than 30% of the deaths occurred after the first week. The commonest clinical syndromes seen were infection (41%) and respiratory distress (43%).**

Conclusion: **Neonatal survival rates of low birthweight infants are still much lower than those observed in developed countries as far back as the early 1970's. The big proportion of deaths occurring during the first week, and in particular the first day, is due to lack of neonatal intensive care facilities and inadequate obstetric services.**

INTRODUCTION

Neonatal survival rate as a measure of outcome is regularly used for medical audit purposes(1,2). Though considered crude its strength improves significantly when evaluating situations with low survival and high mortality rates(3). More predictive outcome evaluations of high-risk newborns presently involve measures such as subsequent morbidity, handicap rates and quality of life computation(4). These require up to five or more years of follow up and are both more difficult and expensive to undertake.

In Kenya, neonatal survival rate is still useful as an audit tool since the projected mortality rates are probably still very high. Its knowledge will help determine the broad developmental strategies to adopt for improving the provision of medical care. In particular the categories of babies most likely to benefit from the available resources will be identified by such information.

The effect of improved neonatal services on survival has been extensively reported from Western European, North American and Australian centres and most of this information is now in standard textbooks of neonatology. We deliberately looked for reports from developing countries. We found three papers of particular interest from Nigeria, Thailand and Kenya.

A comparison of neonatal mortality between 1976 and 1980 in Nigeria demonstrated nearly 50% reduction among babies born weighing 2500 grams or more but failed to show any appreciable reduction for the low birth weight infants(5). This was despite the improvement in the care of the illnesses found to have been most contributory to the neonatal mortality in 1976. The Nigerian workers concluded that in the absence of advanced neonatal intensive care, efforts should probably be better concentrated on decreasing the incidence of low birth weight deliveries. In Thailand where technological advances in neonatal care were made between 1986 and

1996, a decrease in neonatal mortality was demonstrated in all birth weight categories(6). Most of the advances in the Thailand study were in the development of simple strategies for the management of the high risk newborn. The only published neonatal mortality from this centre way back in 1978, reported 51% overall survival of infants weighing less than 2000 grams at birth. More sub classified birth weight specific survival at that time was: 14% ; 36% and 62% for the under 1000, 1000 - 1499 and 1500 - 1499 grams infants respectively(7). At the same time the Nigeria study mentioned above reported 18%, 75% and 91% respectively for the same birth weight stratification as in the Kenyan review. There is hence need to review the current local position in view of the evidence that as far back as 1975 this centre was behind its contemporaries.

MATERIALS AND METHODS

Clinical records of all infants admitted to the newborn unit between the months of April and August 1996 with birth weights less than 2000 grams were analysed. This was done, during the course of the infants stay at the unit (prospectively). The exact entry point into the study was on completion of 28 days of age, the time of death and at discharge for the bigger infants who were well enough before the 28th day of life. The study assumed that those discharged before 28 days of life survived the neonatal period. This was a possible source of error. The birth weight was recorded for each individual to the nearest gram. Electronic scales with this level of accuracy are routinely used at the unit. The gestation was calculated from menstrual dates and confirmed by clinical assessment using the Jean Ballard's method(8). The clinical diagnoses made by the primary physicians were also recorded. Analysis involved computing frequency distributions and comparison made with a similar study performed in this centre in 1975 and a selection of studies reported from other centres.

RESULTS

Birth weight specific neonatal survival rates: Survival by 28 days was computed for a total of 163 infants. The results are summarised in Table 1. The results of the 1975 survey are appended for comparison.

Table 1

Birth weight specific neonatal mortality

Birth weight (grams)	No. admitted	Survivors at 28 days	Survival rates %	Survival rates at this unit in 1975 (%)
Less than 1000	23	0	0	14.7
1000- 1499	73	50	68.5	36.2
1500- 1999	67	52	77.6	66.7
Total	163	102	62.6	51.2

The overall survival was 62.6% marginally better than 1975. The extremely low birth weight infants (<1000 grams) had no neonatal survivors this time while 15% survived in earlier series. Two thirds and three fourth of the 1000 - 1499 and the 1500 to 1999 categories survived respectively. Neonatal survival has marginally improved since 1975. Deterioration was, however, noted among the extreme low birth weight infants.

The computed survival rates were then compared with similar observations from another developing country (Nigeria) in 1976(5) and pooled data from centres in Israel and America collected 1975 and 1988 (Table 2).

Table 2

Comparison of survival rates with those from other centres

Birth weight (Grams)	KNH survival in 1996 (%)	The Nigerian series(%)	*1975 pooled data(%)	*1988 pooled) data(%
Less than 1000	0	18	24	59
1000- 1499	68.5	75	78.9	91.8
1500- 1999	77.6	91	88.6	98.5

KNH = Kenyatta National Hospital
*Joint programme for centres in Israel and America.

The neonatal survival was lower at this centre in all weight categories than the Nigerian series of 1976 and the results from the technologically advanced countries, 21 years ago.

Gestational age and neonatal mortality: The maturity of infants has a profound influence on their morbidity and mortality correspondingly influencing their survival. Table 3 summarises the results of the 101 infants for whom information on gestational age was available. Some of the infants had no maternal menstrual history and died before gestation age assessment.

Table 3

Gestation and neonatal mortality rates

Gestational age (weeks)	Total number	Number of survivors	Survival %.
Less than 28	22	2	9.01
28 - 31	33	9	27.27
32 - 35	46	32	69.56
Overall	101	43	42.57

Table 3 shows a predictable inverse relationship between gestation and neonatal survival.

Age at death: The age at which the infants died was determined. It is important to classify infants in this manner since the time of death distinguishes different broad aetiological entities. Table 4 summarises the findings. The 1975 Kenyan survey is again appended for comparison.

Table 4

Age at death

Day of life	No.	% of total	% in the 1978 survey
Before day 1	55	28.35	62.4
1 - 6	82	42.27	34.1
7 - 27	57	29.38	3.5
Total	194	100.00	100.0

Twenty eight per cent of infants died within 24 hours of life. More than 70% died within the first week (early neonatal deaths). This is better than the 96% observed in 1975. The high proportion of early neonatal deaths seen in the present survey signifies major contribution of obstetric factors and probably inadequate neonatal intensive care facilities.

Disease pattern: The various clinical diagnoses made by the primary physicians on the low birth weight infants during their duration of stay were also evaluated. Some of the individuals had multiple diagnoses at the same or different times during their total follow up period.

Table 5

Distribution of clinical syndromes

Disease entity	Proportion (%)
Respiratory distress syndrome	43.04
Neonatal sepsis	41.42
Birth asphyxia	6.80
Others	8.74
	100.00

Over 80 % of the diagnoses were evenly distributed between respiratory distress syndrome and infection. The other diagnoses referred to in Table 5 included anaemia, pathological jaundice and small for gestational age.

DISCUSSION

Neonatal survival of low birth weight infants is evidently still poor in this centre compared to results from elsewhere. This is not withstanding the minor improvements observed since 1975. All birth weight categories still have survival rates worse than those observed in developed countries in the early 1970s(9,10) at which time most of these centres were also functioning at levels comparable to this unit today (without intensive life support facilities). Considerably less was known then about the importance of other contributory factors like appropriate nutritional strategies, meticulous management of fluid and electrolyte balance and control of infections in the care of low birth weight infants. These factors now clearly understood should be an integral part of the standard practice in each unit. The neonatal survival in this centre is actually still lower than the situation in Nigeria in 1976(4), a country whose level of development is considered equal to that of Kenya. There is need to identify and prioritise the strategies for improving neonatal survival in low birth weight infants at this unit and indeed the whole country.

Evidence that adherence to relatively simple organisational strategies will improve the survival of even the smallest infants even if not to the same extent as does neonatal intensive care was established by workers in Bangkok, Thailand(5). In that centre, improvement of basic neonatal care led to significant increases in neonatal survival across the birth weight spectra over a 10 year period(5). It should be possible for this centre, the national referral and teaching hospital, to emulate the Bangkok achievements by employing the same measures.

Conceptually the factors that determine neonatal survival are, the quality of the infant at birth, which depends on obstetric factors (good versus bad babies) and the level of neonatal care available (good versus bad care)(11). Improving neonatal survival involves addressing these two concepts. However controlling the quality of infants born is more cost effective than improving neonatal intensive care in situations where high neonatal mortality is still prevalent. The most important strategies will be those that reduce premature deliveries best achieved by improving the socio-economic status of the people and prevent respiratory distress syndrome by reducing prematurity rates and antenatal lung maturation with corticosteroids whenever preterm delivery is expected. Routine lung maturation is the most immediately affordable strategy for Kenya.

Over 80% of the clinical entities identified in this group were either respiratory distress syndrome or sepsis. The improvement of neonatal care should be focussed on the cost effective measures for treating these two illnesses. The first step towards this goal is to establish locally appropriate and affordable treatment protocols for these two illnesses. The high proportion (70%) of infants dying during the first week of life further strengthens the hypothesis that less than optimum obstetric care (bad babies) and inadequate neonatal care (bad care) prevail in this unit. There is however an improvement from the situation in 1975 at the same unit when this was 96%.

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REFERENCES

1. Rothstein P. and Johnson P. Paediatric intensive care: factors that influence outcome. *Crit. Care Med.* 1982; **10**:34 - 37.
2. Schroeder S.A. Outcome assessment, 70 years later: are we ready? *N. Engl. J. Med.* 1987; **316**:160-166.
3. Pollack M.M., Puttimann V.E. and Geston P.R. Accurate prediction of the outcome of paediatric intensive care. A new quantitative method. *N. Engl. J. Med.* 1987; **316**:134 -139.
4. Pharaoh P.O.D., Stevenson R.C., Cooke R.W.I. and Sandu B. Costs and benefits of neonatal intensive care. *Arch. Dis. Child.* 1988; **63**:725 - 728.
5. Adekunle H.D. and Effiong C.E. Neonatal mortality: effects of selective paediatric interventions. *Paediatrics:* 1985; **75**:51- 57.
6. Ratrisawadi V. and Horpoapan S. Perinatal-neonatal and weight specific neonatal mortality in Thailand in 1996 and a comparison with 1976 and 1986. *J. Med. Ass. Thai:* 1998; **81**:506 - 511.
7. Meme J.S. A prospective study of neonatal deaths in Nairobi, Kenya. *East Afr. Med. J.* 1978; **55**:262-267.
8. Ballard J., Kazman C. and Driver M. A simplified score for assessment of foetal maturity of newborn infants. *J. Paediat.* 1979; **95**: 769 - 774.
9. Ghai V. Follow up of low birth weight infants. *In: Clinical Perinatology.* 1988; 15:123-128.
10. Wilson A.L. Survival of low birth weight infants. *Paediat.* 1982; **70**:587-592.
11. David J.R. and Siegel E. Decline in neonatal mortality, 1968 to 1977: Better Babies or Better Care? *Paediat.* 1983; **71**:531 - 540.