OUTCOME OF NEONATES ADMITTED TO SPECIAL CARE NURSERY, UNIVERSITY HOSPITAL, KUALA LUMPUR: A COMPARISON OF TWO PERIODS

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SUMMARY

The overall mortality rate of babies delivered in the University Hospital, Kuala Lumpur has improved significantly from 18.5 in 1969–1971 to 9.9 per thousand live births in 1979–1981. This drop in mortality is also seen in those infants weighing 1001 – 2000 g at birth. Indian babies in the weight group 1001 – 1500 g at birth appear to have a significantly lower mortality than the other races. Babies referred from outside have a much higher mortality rate compared to babies delivered in University Hospital, Kuala Lumpur.

INTRODUCTION

Neonatal intensive care is quite a recent concept, having its origin in the 1960s. Initially it had the most impact on the survival of the low birth-weight infant especially those weighing between 1500 g to 2000 g but over the past one to two decades, declining mortality rates have been reported for the very low birth-weight infant ($\leqslant$ 1500 g),[1-6] though there are a few reports that have disputed this.[7-9] The majority of these reports are from specialist regional centres in developed countries, well equipped in terms of complex machinery and personnel and with mortality and morbidity rates generally lower than that of their national figures.

In Malaysia, only moderate advances have been made in perinatal and neonatal care over the last decade; however the perinatal and neonatal mortality rates have been steadily decreasing. In Peninsular Malaysia, the neonatal mortality rate has decreased from 22.9 in 1970 to 16.6 per thousand live births in 1979 while the perinatal mortality rate decreased from 36.9 in 1970 to 27.7 per thousand live births and still births in 1979.[10] The perinatal mortality rates for University Hospital, Kuala Lumpur has fallen from 34.6 in 1969 to 16.9 per thousand live births and still births in 1982. Whether this decline in mortality is due mainly to the better survival of the bigger babies or affects the whole range of birth-weights or due to changes in distribution of birth-weights is part of the objectives of this study. The admission characteristics of the Special Care Nursery and the mortality rates among the various races were also studied. The mortality rates of babies born outside University Hospital, Kuala Lumpur but admitted to the Special Care Nursery were also reviewed. We have also studied briefly the incidences of low birth-weight infants and small for gestational age infants in University Hospital, Kuala Lumpur.

MATERIALS AND METHODS

All babies admitted to the Special Care Nursery in University Hospital, Kuala Lumpur from 1969 to 1971 and 1979 to 1981 were studied. Data were

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extracted from the admission records, medical records department and where necessary from the patient's case notes. In the early years (1969 – 1971) all prematures, low birth-weight infants, sick neonates and high-risk infants were admitted. With the rise in number of deliveries in the later years, a more discriminative admission policy was adopted due to the limited number of beds. Apart from prematures, sick neonates and babies less than 2 kg in weight, only high-risk infants anticipated to have problems were admitted. Babies born outside University Hospital, Kualal Lumpur but admitted to the hospital were studied separately. The University Hospital serves mainly the Kuala Lumpur and Petaling Jaya region but on occasions, high-risk cases were also referred from other parts of the country. Thus, the population under study is biased as there is a higher proportion of high-risk pregnancies.

Case notes of patients $\leqslant$ 2 kg admitted in 1981 were also looked into, to see how many percent of these babies were small for gestational age. Gestational age was assessed by the Dubowitz method and all babies below the tenth percentile of the Lubchenko charts are termed small for gestational age.

RESULTS

From 1969 to 1971, a total of 2012 babies were admitted to the special care nursery (28.0% of total live births) compared to 2043 admission in 1979 - 1981 (13.2% of total live births). The distribution of patients admitted according to weight is as shown in Table I. It is obvious that the number of babies $\leqslant$ 2 kg admitted has approximately doubled over the years. This is due to an increase in total number of deliveries from 7.156 in 1969 – 1971 to 15,465 in 1979 – 1981 rather than, as shown below, to any changes in distribution of birth-weights. It is interesting to note that the percentage of babies (as a percentage of total live births) in the weight groups 501 to 1000 g, 1001 – 1500 g and 1501 – 2000g has remained the same over the years (Table II).

Tables III and IV give the survival rates according to weight and race. As can be seen, the overall survival rate of babies admitted to the Special Care Nursery has remained more or less the same (93.4% in 1969 – 1971 and 92.5% in 1979 – 1981). However if the total live births are taken into consideration, then the overall mortality rate has dropped significantly from 18.5 in 1969 – 1971 to 9.9 per thousand live births in 1979 – 1981 ($Z = 6.071$, $p < 0.05$)*. The survival rate of babies weighing between 1001 – 1500 g has improved significantly from 48.3% to 64.9% ($Z = 2.112$, $p < 0.05$); survival of babies weighing 1501 g – 2000 g has also improved significantly from 80.1% to 91.8% ($Z = 3.801$, $p < 0.05$). Although the survival of babies weighing berween 501 – 1000 g appears to have dropped from 18.8% to 13.3%, the differences is not statistically significant ($Z = 0.523$, $p > 0.05$). Similarly there is no significant differences in survival rates for those babies $\geqslant$ 2000 g admitted to the nursery for the two periods ($Z = 0.140$, $p > 0.05$).

TABLE I
ADMISSIONS TO SPECIAL CARE NURSERY (PERCENTAGE) BY BIRTH–WEIGHT FOR THE TWO PERIODS, 1969 – 1971 AND 1979 – 1981 *

Weight (g)	1969 – 1971 (%)	1979 – 1981 (%)
501 – 1000	1.1	2.2
1001 – 1500	3.0	6.2
1501 – 2000	8.5	16.1
2001 – 2500	17.6	21.5
> 2500	69.8	54.0

* as a percentage of total admissions to the nursery.

TABLE II
BIRTH–WEIGHT DISTRIBUTION (PERCENTAGE) UNIVERSITY HOSPITAL, KUALA LUMPUR *

Weight (g)	1969 – 1971 (%)	1979 – 1981 (%)
501 – 1000	0.3	0.29
1001 – 1500	0.84	0.82
1501 – 2000	2.39	2.13

* as a percentage of total live births.

* The tests of significance done is the test of hypotheses between two sample proprrtions (2 tail-test) whereby $Z \geqslant 1.96$ ($p \leqslant 0.05$) is significant.

TABLE III
SURVIVAL OF BABIES ADMITTED TO SPECIAL CARE NURSERY 1969 – 1971
BY RACE AND BY WEIGHT

Weight (g)	Malay		Chinese		Indian		Others		Total	
	Total number	% survivors	Total number	% survivors	Total number	% survivors	Total number	% survivors	Total number	% survivors
501 – 1000	4	25.0	11	27.2	7	0	0	–	22	18.2
1001 – 1500	24	41.7	26	46.2	7	85.7	3	33.3	60	48.3
1501 – 2000	41	82.9	66	78.8	58	79.3	6	83.3	171	80.1
2001 – 2500	90	91.1	129	93.0	117	95.7	15	80.0	351	92.9
> 2500	271	99.3	783	98.2	312	97.4	32	100.0	1398	98.3
Total	430	92.1	1015	94.2	501	93.4	56	89.3	2002	93.4

TABLE IV
SURVIVAL OF BABIES ADMITTED TO SPECIAL CARE NURSERY 1979 – 1981
BY RACE AND BY WEIGHT

Weight (g)	Malay		Chinese		Indian		Others		Total	
	Total number	% survivors	Total number	% survivors	Total number	% survivors	Total number	% survivors	Total number	% survivors
501 – 1000	16	12.5	11	0	17	23.5	1	0	45	13.3
1001 – 1500	55	16.8	35	51.4	37	81.1	0	–	127	64.6
1501 – 2000	135	90.3	66	92.4	125	93.6	3	66.7	329	91.8
2001 – 2500	177	96.6	91	95.6	163	96.9	8	100.0	439	96.6
> 2500	414	96.6	328	97.6	347	98.6	14	100.0	1103	97.6
Total	797	91.5	531	91.5	689	94.5	26	92.3	2043	92.5

When race is taken into consideration, Indian babies weighing 1001 – 1500 g had significantly better survival rates than the other races ($Z = 2.105$, $p < 0.05$ and $Z = 2.495$, $p < 0.05$ for 1969 – 1971 and 1979 – 1981 respectively). There did not seem to be any differences in survival rates between the various races for the other weight groups.

It is also observed that there was a large drop in number of Chinese babies admitted to the nursery. This was due to a large fall in total Chinese deliveries from 46.4% in 1969 – 1971 to 27.5% in 1979 – 1981. The percentages for Malays, Indians and the other races are 23.5%, 26.8% and 3.3% in 1969 – 1971 respectively, and 41.6%, 29.9% and 0.7% in 1979 – 1981 respectively.

Babies born outside and referred to University Hospital, Kuala Lumpur for admission have significantly higher mortality rates when compared to babies delivered in University Hospital, Kuala Lumpur (Table V), ($Z = 12.113$, $p < 0.05$ for 1969 –

TABLE V
SURVIVAL OF BABIES DELIVERED OUTSIDE UNIVERSITY HOSPITAL, KUALA LUMPUR AND ADMITTED TO SPECIAL CARE NURSERY BY WEIGHT

Weight (g)	1969 – 1971 Survivors/total	1969 – 1971 Percentage (%)	1979 – 1981 Survivors/total	1979 – 1981 Percentage (%)
501 – 1000	0 / 2	0	0 / 4	0
1001 – 1500	1 / 6	16.7	8 / 14	57.1
1501 – 2000	7 / 14	50	18 / 25	72
2001 – 2500	7 / 9	77.8	11 / 14	78.6
> 2500	11 / 12	91.7	23 / 26	88.5
Total	26 / 43	60.5	60 / 83	72.3

1971 and $Z = 5.464$, $p < 0.05$ for 1979 – 1981).

Our babies, on the average tend to be smaller than the western babies and as such the criteria used in our hospital for defining low birth babies is $\leqslant 2.25$ kg instead of $\leqslant 2.5$ kg. 8.6% of the total live births in University Hospital, Kuala Lumpur in 1969 weighed $\leqslant 2.25$ kg. For 1980, the percentage of babies weighing $\leqslant 2.25$ kg (singletons only) was7.9% while 13.3% of babies weighed $\leqslant 2.5$ kg. The percentage of small for gestational age babies (SGA) is also high. In 1981, 65.7% of all babies $\leqslant 2$ kg were small for gestational age; the breakdown of small for gestational age babies for the various races are as follows: Malays 58.7%, Chinese 63.9% and Indians 72.9%.

DISCUSSION

Thus it can be seen that there is significant improvement in survival rates especially for those weighing between 1001 – 2000 g. The figures for 1982 continue to show the trend in better survival rates; 25% for those weighing between 501 – 1000 g, 85.7% for those weighing between 1001 – 1500 g and 93.5% for those weighing 1501 – 2000 g. The overall mortality rate for babies born in University Hospital, Kuala Lumpur has also dropped from 18.45 in 1969–1971 to 9.89 per thousand live births in 1979–1981. This significant improvement in survival rates has occurred despite only very modest improvements in equipment and personnel for neonatal intensive care, though we do keep abreast of the latest trends in neonatal management.

We contend that attention to the basic needs of the neonate, good nursing care and where possible adapting latest advances in neonatal care to the local context has brought about this improvement. We do not think that better socio-economic conditions had any major impact on this improvement in survival rates. Kwang Sun-Lee[11,12] has shown that the socio-economic status of the community, together with racial and maternal factors, affects mainly the birth weight distribution of the population under study. The birth weight-specific mortality rates, on the other hand is affected principally by the quality of perinatal and neonatal care, gestational age, race and sex of the study population. [11,12] We do agree, however, that for more meaningful interpretation of the data presented, due consideration should be paid to the gestational age, sex and percentage of high risk pregnancies in the study population.

From Table II, it is evident that there has been little change in the birth weight distribution of the babies weighing $\leqslant 2$ kg at birth despite the apparent improvement in the socio-economic status of the community. The per capita gross national product (GNP) in Malaysia in 1979 was US$1,455 as compared to US$340 in 1969. One of the reasons is perhaps the change in racial distribution of the deliveries in our hospital. The incidence of low birth-weight

TABLE VI
COMPARISON OF SURVIVAL RATES OF VERY LOW BIRTH–WEIGHT INFANTS

Author	Year of birth	Place of birth	Length of survival clarify	Number	Birth-weight (g)	Survival (%)
Jones *et al.*, Hammersmith Hospital London	1961 to 1975	Inborn	28	110 247	501 – 1000 1001 – 1500	11.9 54.7
Walker *et al.*,[20]	1971 to 1973	N.E. Thames Health region, London	28	236 216	⩽1000 1001 – 1500	18.9 58.5
	1975 to 1977	N.E. Thames Health region, London	28	191 132	1000 1001 – 1500	13.2 71.6
Knobloch[19] Albany University New York	July 1975 to December 1979	Inborn	'on discharge'	118 211	⩽1000 1001 – 1500	20 71
Saigal[4] Ontario	1973 – 1978	Hamilton Wentworth region	'on discharge'	116 178	501 – 1000 1001 – 1500	31.9 82.6
Yu *et al.*,[15] Queen Victoria Medical Centre	1977 – 1978	Inborn and referred	28	55	501 – 1000	60
Stewart *et al.*,[21,22] University College Hospital, London	1966 – 1975 1974 – 1975	Inborn Inborn	28 28	148	501 – 1000 1001 – 1500	32 88
Lam[23] Alexandra Hospital Singapore	1971 – 1977	Inborn and referred	'on discharge'	23 117	⩽1000 1001 – 1500	0 54.7
Present study University Hospital Kuala Lumpur	1979 – 1981	Inborn	'on discharge'	43 126	501 – 1000 1001 – 1500	13.3 64.6

(LBW; defined as ⩽ 2.5 kg) is higher in the Malays and Indians; the figures being 14.5% for Indians, 5.6% for Chinese and 7.0% for Malays, giving an average incidence of 8.3% for babies delivered in the General Hospital, Kuala Lumpur. [13] This average incidence of 8.3% is much lower than our incidence of 13.3% (1981) and the national incidence of 10.6% (for 1978). [10] The experience in Singapore is similar, with the incidences of low birth–weight (⩽ 2.5 kg) in Chinese, Malays and Indians being 7%, 8% and 14.7% respectively. [14]

Table VI gives a comparison of the survival rates from various centres with that from University Hospital, Kuala Lumpur. Although the figures for babies weighing 1001–1500 g compares quite

favourably with that from other centres, there is considerable room for improvement especially for babies weighing 501 – 1000 g. The 60% survival rate for babies weighing 501 – 1000 g reported by Yu *et al.*,[15] is impressive and it should be interesting to see what the morbidity for this group is like on follow-up.

We have not attempted to quote morbidity figures for survivors. This is because a follow-up clinic for high risk neonates was only started in 1980 and we lack the trained personnel to fully assess these patients. Of major concern to all is whether a declining mortality rate is associated with increasing morbidity. Jones[8] in a review of babies 501–1500 g over a 15-year period found that the number of handicapped children has remained the same over the years, namely 5.3% with major handicaps and 5.6% with minor handicaps. However her series also showed no significant improvement in neonatal mortality over the 15 years period. Stewart[2] in a review of world literature of babies $\leqslant$ 1.5 kg found that the level of handicapped children has remained stable at about 6.8% but the survival rate has trebled since 1946.

As noted earlier, the emphasis is now on the very low birth-weight babies (501 – 1500 g at birth) and it is this group that now derives the most benefit from neonatal intensive care. As such, we believe that we have now reached a stage where further investments in monitoring and supportive equipment is necessary to achieve further improvements in survival rates and especially so for the very low birth-weight babies. This is evident from the fact that although very low birth-weight babies constitute only 1.1% of total live births for the two periods under study, they contributed to 37.1% and 54.9% of total neonatal deaths for 1969–1971 and 1979–1981 respectively. Moreover in 1981, 62.9% of all deaths in babies weighing $\leqslant$ 2 kg were deaths within 48 hours of birth, mainly from respiratory failure. Also efforts should be made to reduce the number of very low birth-weight babies as our incidence of 1.1% is much higher than the incidence of 0.32% in Singapore.[16] Our higher incidence could, in part, be due to the large number of unbooked mothers (16.9% in 1982) who presumably have little or no antenatal care. The impact, that these unbooked cases have is best illustrated by the fact that the 'corrected' perinatal mortality rate for 1982 (after leaving out the unbooked cases) was only 10.4 as compared to the 'uncorrected' rate of 16.9.

Babies delivered outside University Hospital, Kuala Lumpur and subsequently referred to us have a much higher mortality rate. Although it is true that these babies are a highly selected group and therefore at greater risks, we believe that their mortality can be very much reduced if these babies are referred earlier and under better conditions. All too frequently, these babies are referred late, hypothermic, hypoglycaemic and with insufficient antenatal or natal data.

Neonatal intensive care is without doubt an expensive affair but is the high cost justified? It has been estimated that the average bill for an infant in intensive care in the United States is about US$14,300 for an average stay of 52 days.[17] However financial costs should only be one of several factors weighed in the balance. The potential contributions of these infants and not the least the feelings of the parents (often with prolonged infertility) should be considered.[18] If in the face of a falling mortality rate and a stable (and low) morbidity rate as is now possible, then the high cost is justified.

CONCLUSION

We thus conclude that for developing countries great improvements in perinatal and neonatal mortality can be achieved by attending to the basic needs of the neonate and good antenatal care without elaborate and expensive equipment. Also of prime importance is the nursing care and nurses to patient ratio. Perhaps now is an opportune time to start a training scheme in paediatric care for our nurses and that the nurses so trained should not be subjected to frequent interdisciplinary transfers as is now the

practice. Only when these are achieved will the high cost intensive care bring about a further fall in mortality rates.

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