

A STUDY OF 8 YEAR NEONATAL DEATHS (1982-1989) OF TOA PAYOH HOSPITAL

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ABSTRACT

A study of 233 neonatal deaths out of 30910 livebirths over an 8 year period in the Toa Payoh Hospital is done. The Hospital has since ceased providing obstetric and neonatal intensive services from April 1990 due to restructuring of hospital care. The Neonatal Mortality Rates (NNMR) from 1982-1989 ranged from 6.52 to 9.55 and there was no significant fall in trend ($p=0.13$). One hundred and thirteen (48.5%) neonates who died were below 1500gm (VLBW). Various causes of neonatal deaths were examined and there was a decline in respiratory distress syndrome (RDS) death rates ($p<0.0002$). Deaths due to asphyxia ($p>0.05$) and infections ($p>0.05$) have not declined significantly over the same period. It is also observed that less VLBW babies died over this 8 year period and the VLBW mortality rates ($p<0.02$) have declined. However, the congenital malformation mortality has also not declined significantly ($p=0.92$) though early study (1972-1981) showed an increasing trend of malformation deaths among total neonatal deaths ($p<0.02$). Improvement in VLBW and RDS management has not contributed to a significant decline in NNMR.

It is observed that more VLBW babies were born during this 8 year period ($p=0.01$) especially so in the <1000 gm group ($p=0.0005$) and the survival of VLBW babies has improved (45.5% to 75.8% alive) as a result of advances in neonatal intensive care. The reasons for increase in incidence of VLBW births in the past few years are not known.

Though it is reported that Malays and Indians have higher NNMRs than that of Chinese in other hospitals in Singapore, this was not our experience. There was no significant difference among the Chinese, Malay and Indian NNMRs. There were slightly more male neonatal deaths than female (121:112 or 51.9%:48.1%). Most babies died within 7 days of life (179 or 76.9%) and the trend remains the same over the 8 year period ($p=0.60$). The causes of neonatal deaths are extremely low birth weight (ELBW) (<1000gm) babies, congenital malformations, infection, RDS and asphyxia with ELBW emerged as the leading cause of death in 1989. Prevention of premature births and early detection of congenital malformation should be the goal of our perinatal care.

Keywords: Neonatal mortality, perinatal mortality

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INTRODUCTION

Toa Payoh Hospital first started its obstetric and neonatal services in March 1969, functioning as a regional hospital by providing obstetric, gynaecological and neonatal care for people living in the Toa Payoh region in Singapore. Neonatal care was essentially that of Level I until 1972 when a full-time paediatrician (NKH) was posted to the Hospital. However, neonatal intensive care commenced only in 1978 when the hospital acquired its first ventilator.

Perinatal mortality in the Hospital (1972-1981) was presented previously⁽¹⁾. Neonatal intensive care was set up in the Hospital in 1978 and we were able to approach the requirement of that of Level III care only after 1981 though the medical and nursing complements were still below recommended standard.

The purpose of this report is to examine the effect of Level III care on neonatal mortality and the trends of various causes of neonatal deaths over the past 8 years.

MATERIALS AND METHOD

Data and figures of hospital deliveries, total livebirths, stillbirths, first week deaths, neonatal deaths, autopsy records and causes

of deaths were retrieved from the Department of Neonatology Patient Record Book and the Death Record Book. These data were also stored in the personal computer by using Database 3 plus programme, to enable easy retrieval of information.

RESULTS

From 1982 to 1989, 30910 babies were delivered in Toa Payoh Hospital. The yearly distribution of births as well as total number of neonatal deaths is shown (Table I & Fig 1). The neonatal mortality rates ranged from 6.52 to 9.55 deaths per 1000 livebirths. There was no significant fall in trend in neonatal mortality rates over this 8 year period ($\chi^2 = 2.28$, $p=0.13$). We also failed to see a significant decline in perinatal mortality rates over the same period (range = 9.16 to 15.65 per 1000 livebirths plus stillbirths, $\chi^2 = 3.756$; $p>0.05$) (Table II & Fig 2). It was noted in a previous study (1972-1981)⁽²⁾ that there was a significant fall in trend in perinatal mortality rates only when lethal malformations were excluded. Such trends were still observed in the 1982-1989 period when lethal malformations were excluded from the perinatal deaths for computation of perinatal mortality rates ($\chi^2 = 4.597$, $p=0.03$) (Table III & Fig 3).

There were also no significant falls in trend in stillbirth rates ($\chi^2 = 1.26$; $p=0.26$), neonatal deaths from infection ($\chi^2 = 1.326$; $p=0.25$), neonatal deaths from asphyxiated births ($\chi^2 = 0.28$; $p=0.59$) as well as lethal malformations ($\chi^2 = 0.0092$; $p=0.92$). However neonatal deaths from respiratory distress syndrome (RDS) ($\chi^2 = 18.4$; $p=0.0002$ and deaths of babies weighing less than 1500 gm, $\chi^2 = 6.12$; $p=0.013$) showed significant decline (Table IV, Fig 4a & 7).

Neonatal deaths by ethnic group were examined (Table V & Fig 5) and there were no significant differences among the Chinese, Malay and Indian groups. These findings are different

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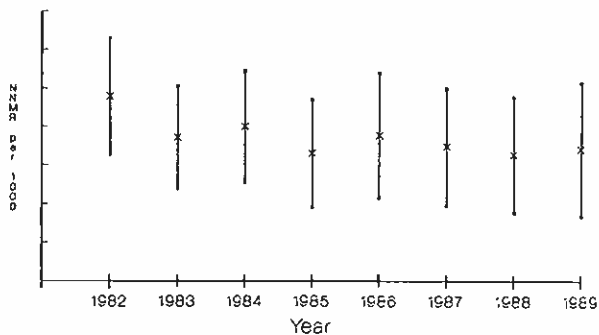
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Table I
Livebirth, Neonatal Deaths, Neonatal Mortality Rates
Toa Payoh Hospital (1982 - 1989)

Year	Livebirths	Neonatal Deaths	Neonatal Mortality Rate Per 1000 Livebirths	95% CI
1982	4815	46	9.55	6.52-12.58
1983	4852	36	7.42	4.76-10.08
1984	4518	36	7.97	5.11-10.83
1985	3939	26	6.60	3.81-9.39
1986	3325	25	7.52	4.28-10.76
1987	3456	24	6.94	3.89-9.99
1988	3373	22	6.52	3.53-9.51
1989	2632	18	6.84	3.37-10.31
TOTAL	30910	233	-	-

$\chi^2 = 2.28$ $p = 0.13$ CI = Confidence Interval

Fig 1 - Livebirth, Neonatal Deaths, Mortality Rates, Toa Payoh Hospital (1982 - 1989)



NNMR = Neonatal Mortality Rate with 95% CI

from that of other hospitals in which the Malays and Indians had significantly higher incidence of perinatal and neonatal mortality⁽³⁾.

There were also more male neonatal deaths than female in this 8 year period (121 male or 51.9% as compared to 112 female or 48.1% neonatal deaths).

Most babies (179 or 76.9% of all neonatal deaths) died within 7 days or 168 hours of life, demonstrating that the first week of life is the most critical period for the neonate. In addition, the Department had 14 babies who died after 28 days of life (beyond the neonatal period).

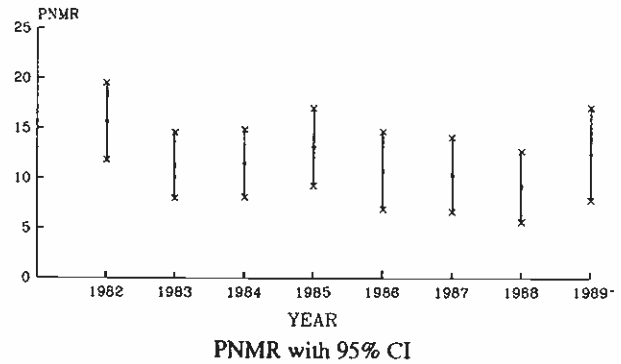
The major causes of neonatal death are quite similar to that of other hospitals in this country and in overseas centres⁽⁴⁾. Though congenital malformation deaths have been the leading

Table II
Perinatal Mortality

Year	Stillbirth	First Week Death	Livebirth Plus Stillbirth	Perinatal Mortality Rate	95% Confidence Interval (CI)
1982	40	36	4855	15.65	11.80-19.50
1983	23	32	4875	11.28	8.01-14.55
1984	24	28	4542	11.45	8.05-14.85
1985	30	22	3969	13.10	9.20-17.00
1986	18	18	3343	10.76	6.90-14.62
1987	21	15	3477	10.35	6.64-14.06
1988	12	19	3385	9.16	5.62-12.70
1989	18	15	2650	12.45	7.80-17.10

$\chi^2 = 3.756$ $p = 0.052$

Fig 2 - Perinatal Mortality, Toa Payoh Hospital (1982 - 1989)



cause of neonatal deaths, VLBW deaths emerged as the leading cause of death in 1989 (Fig 6).

It is also observed that there were more VLBW babies born during this 8 year period especially so in the < 1000 gm group (the Extremely Low Birthweight or ELBW babies) (Table IV & Fig 4b). Survival of VLBW babies has improved ($p=0.01$) (Fig 7).

DISCUSSION

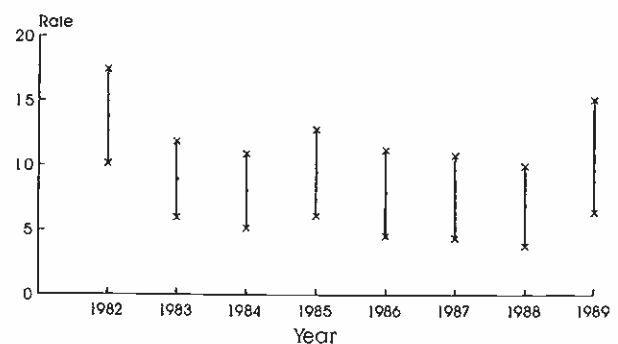
It is important to review the pattern of neonatal diseases and neonatal deaths at regular intervals so that planning of neonatal care can be improved and this serves as a perinatal audit for the department. Hein and Lathrop pointed out that knowledge of causes of neonatal deaths may be helpful to evaluate perinatal outcome⁽⁴⁾.

Table III
Perinatal Deaths, Livebirths and Stillbirths and Perinatal Mortality Rate Excluding Lethal Malfunctions (1982 - 1989)

Year	Perinatal Death	Livebirth & Stillbirth	Perinatal Mortality Rates	95% Confidence Interval (CI)
1982	66	4779	13.8	10.15-17.45
1983	43	4820	8.92	5.99-11.85
1984	36	4491	8.02	5.15-10.89
1985	37	3918	9.44	6.10-12.78
1986	26	3307	7.86	4.54-11.18
1987	26	3441	7.56	4.37-10.75
1988	23	3356	6.85	3.77-9.93
1989	28	2618	10.7	6.36-15.04

$\chi^2 = 4.597$ $p = 0.032$

Fig 3 - Perinatal Mortality Rate excluding lethal malfunctions (1982 - 1989)



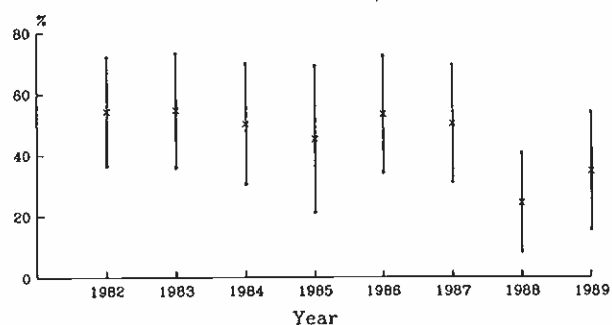
Rates with 95% CI

Table IV
Deaths of Very Low Birth Weight Babies (<1500 grams)
(1982 - 1989)

Year	Total VLBW Deaths	Total VLBW Babies	Total Livebirths	Rate of VLBW Per 1000 LB	95% Confidence Interval (CI)	Deaths of VLBW Babies (%)	95% Confidence Interval (CI)
1982	20	37	4815	7.68	4.96-10.4	54.1	36.4-71.8
1983	18	33	4852	6.80	4.25-9.35	54.5	35.8-73.2
1984	15	30	4518	6.64	4.04-9.24	50.0	30.3-69.7
1985	9	20	3839	5.07	2.57-7.57	45.0	21.0-69.0
1986	17	32	3305	9.62	5.94-13.3	53.1	34.0-72.2
1987	16	32	3456	9.26	5.74-12.78	50.0	30.9-69.1
1988	8	33	3373	9.78	6.12-13.44	24.2	8.1-40.3
1989	10	29	2632	11.62	7.22-16.02	34.5	15.4-53.6

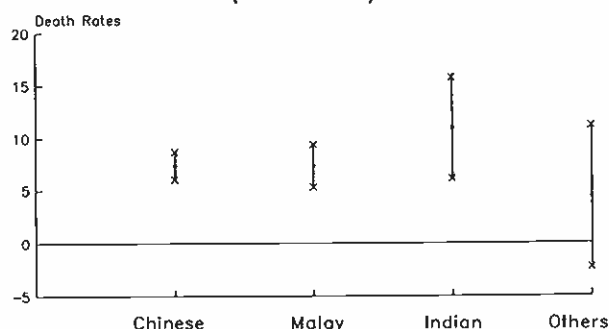
$\chi^2 = 6.123$ $p = 0.013$

Fig 4a - Deaths of <1500 gm Babies (1982 - 1989)



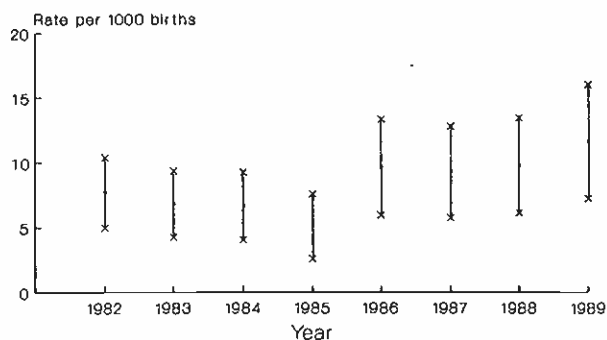
Deaths of VLBW (<1500 gm) with 95% CI

Fig 5 - Neonatal Deaths by Ethnic Group (1982 - 1989)



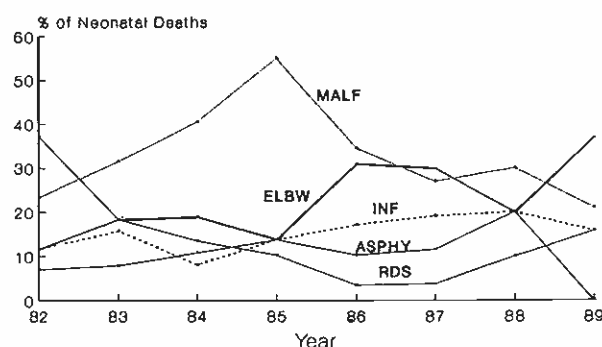
Death Rate per 1000 livebirths with 95% CI

Fig 4b - VLBW Babies per 1000 Births (1982 - 1989)



Rates with 95% CI

Fig 6 - Causes of Neonatal Deaths, Toa Payoh Hospital (1982 - 1989)



salvageable neonates available at different levels of care and to suggest future directions for education and research. For the same reason, costing of neonatal care can also be projected. The increase in VLBW births may prompt us to study the reasons for such a rise in recent years and to see any demographic changes. Are we facing the same problems as that of the Western societies as most people attributed to a high incidence of VLBW births to teenage pregnancy, unmarried mothers, smoking, alcohol, drugs etc?^(6,7) Or could it have been that the result of foetuses at risk are delivered prematurely? Such foetuses would have been aborted or stillborn now born alive but premature.

There was improvement in the VLBW mortality. However, such a fall has not contributed significantly to a decline in neonatal perinatal and neonatal mortality rates and much more could be done to improve the NNMR and PNMR further. The improved survival of VLBW infants show a improvement in medical care, as it is observed in other centres⁽⁸⁾, and also from

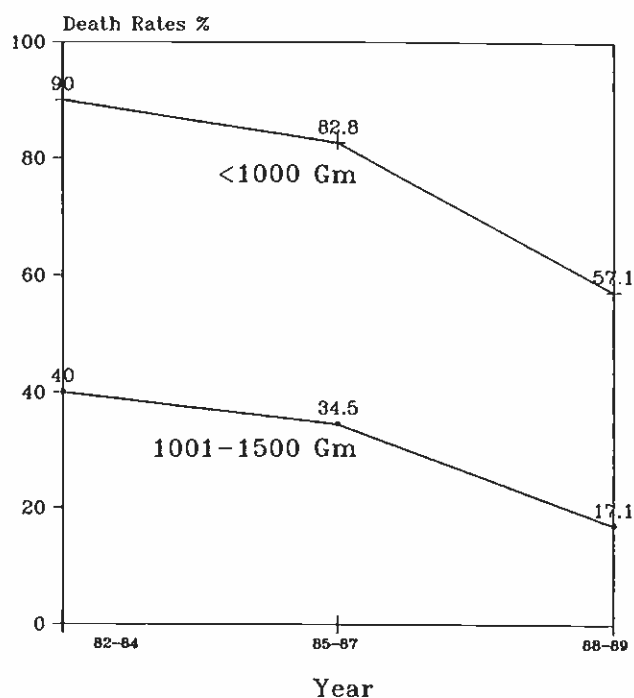
Table V
Neonatal Deaths by Ethnic Group
1982 - 1989

Ethnic Group	Chinese	Malay	Indian	Others
Total Deaths	147	61	24	2
Total Births in Hospital	19955	8303	2198	454
Death Rate Per 1000 Births	7.36	7.34	10.9	4.4
95% Confidence Interval (CI)	(6.05-8.67)	(5.32-9.36)	(6.11-15.69)	(-2.3-11.1)

$p > 0.05$ - Not Significant

It also enables us to see the impact or changes in neonatal care⁽⁹⁾. Thus the setting up of the High Risk Baby Follow-Up Clinic is necessary to achieve this purpose. Also, the data can be used to project an estimate of the numbers of potentially

Fig 7 - Death Rates of ELBW & VLBW Babies, Toa Payoh Hospital (1982 - 1989)



better knowledge of pathophysiology of the neonates. Nevertheless, premature births have not been reduced or prevented. VLBW is a preventable cause of neonatal death and decline in VLBW births will be followed by a decline in NNMR. We agree with Lee et al⁽⁹⁾ and Gordon⁽¹⁰⁾ that probably

more important than effective treatment of the VLBW infants is the reduction in admissions in this group.

Though it is observed that malformations as a cause of neonatal deaths is increasing in many other countries as other causes of death become less frequent⁽⁴⁾, it is not the experience of this Department. Congenital malformations had not contributed significantly a rise or fall in NNMR.

In developed countries, PNMR and NNMR are predominantly determined by premature births (VLBW) and lethal congenital anomalies. Since 50% of the neonatal deaths were less than 1500 gm and 1/3 of the neonatal deaths were due to congenital defects (some of whom were VLBW), reducing VLBW and congenital malformations are the goals if NNMR is to be further reduced.

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