Early Neonatal Mortality at Songklanagarind Hospital From 1987 to 1997

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Abstract

During the 11 year period (1987-1997), there were 23584 livebirths at Songklanagarind Hospital. The average incidence of low birth weight was 8.17 per cent, it has increased slightly during the last 6 year period (8.53 per cent) compared to the first 5 year period (7.59 per cent). There has been little decrease in the early neonatal mortality rate (ENMR) during the last 6 years (3.94 per 1000 livebirths) compared to the first 5 years (4.71 per 1000 livebirths). ENMR was markedly reduced when we compared ENMR of the first year (6.73 per 1000 livebirths in 1987) to the last year (1.52 per 1000 livebirths in 1997). During the last 6 year period, early neonatal mortality (ENM) of neonates less than 1000 g and 1000-1499 g has greatly reduced from 57.14 per cent to 16.67 per cent and from 50 per cent to 6.25 per cent respectively.

The major cause of ENM was congenital anomalies in the first 5 year and the last 6 year period and all birth weight groups except the group less than 1000 g of which the leading cause of death was respiratory distress syndrome.

Key word : Neonatal Mortality, Neonatal Death, Songklanagarind Hospital

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Early neonatal mortality (ENM) of each hospital is an indicator for problems of newborn infants. It reflects the efficacy of medical care and services for the mothers and neonates. It also provides useful information in planning to improve the medical care for those services.

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university hospital in the south of Thailand. It has been open since 1982 and during the first 5 years of opening, the number of births was low (only 4797 total births), early neonatal mortality rate (ENMR) was 3.36 per 1000 livebirths. The most common cause of ENM was respiratory distress syndrome[1]. Nowadays, the number of births has increased, knowledge and technology for the care of newborn infants, especially the very low birthweight infant and obstetric care, have much improved. Early neonatal mortality and cause of death should be changed compared to previously. The objective of this study was to evaluate the ENM and its cause during the last 11 year period. The result would be beneficial to identify the current problems for improvement of further obstetric and neonatal care.

MATERIAL AND METHOD

All neonates born at Songklanagarind Hospital and weighing at least 500 g from January 1987 to December 1997 were included in this retrospective study. All deaths in delivery room or neonatal intensive care unit were analysed. Causes of death were studied using clinical, roentgenogram, laboratory findings or post mortem examination. The autopsy rate during this period was 38.12 per cent.

The definitions were assigned as follows[2]:

1. Early neonatal mortality (ENM) : Deaths occurring during the first seven days of life.
2. Low birth weight (LBW): less than 2500 g.
3. Very low birth weight (VLBW) : less than 1500 g.

RESULTS

During the 11 year period (1987-1997), there were 23584 livebirths in Songklanagarind Hospital (Table 1). The number of livebirths has gradually increased from 1486 cases in 1987 to 2628 cases in 1997. Average incidence of LBW infants during this period was 8.17 per cent. In the first 5 year period, the average LBW rate was 7.59 per cent (range 7.07-7.88) and in the last 6 year period it was 8.53 per cent (range 7.75-8.94). The average VLBW rate was 0.95 per cent (range 0.56-1.2), during the first 5 year period and the last 6 year period it was 1.01 per cent and 0.92 per cent respectively. ENMR decreased from 6.73 per 1000 livebirths in 1987 to 1.52 per 1000 livebirths in 1997.

The number of deaths and age at death in each year are shown in Table 2. The total number of hospital deaths was 160 cases, one hundred (62.5 per cent) were early neonatal deaths. Age at death during 8-28 days and more than 28 days was 31 cases (19.37 per cent) and 29 cases (18.13 per cent) respectively. Early and late neonatal mortality had a tendency to reduce. However, post neonatal mortality has increased in the last period.

The number of neonatal deaths in each birth weight group and the age at death is shown in Table 3. About 51 per cent of ENM was in the VLBW group and the highest ENM was the birth weight group less than 1000 g (31 per cent). The

Table 1. Livebirths and early neonatal deaths during 1987-1997.

	Livebirths	LBW	%	VLBW	%	Early neonatal death	ENMR (per 1000 livebirths)
1987	1,486	117	7.87	16	1.07	10	6.73
1988	1,662	131	7.88	20	1.20	6	3.61
1989	1,809	128	7.07	18	0.99	7	3.87
1990	2,019	149	7.07	17	0.84	9	4.47
1991	2,157	168	7.79	21	0.97	11	5.09
1992	2,077	161	7.75	12	0.56	12	5.78
1993	2,321	204	8.79	27	1.16	15	6.46
1994	2,298	194	8.44	27	1.17	8	3.48
1995	2,465	214	8.68	21	0.85	8	3.24
1996	2,662	225	8.45	24	0.90	10	3.76
1997	2,628	235	8.94	22	0.84	4	1.52
Total	23,584	1926	8.17	225	0.95	100	4.24

Table 2. Distribution of neonatal deaths.

Year	≤ 7 day	%	8-28 day	%	> 28 day	%
1987	10	62.5	4	25	2	12.5
1988	6	66.7	2	22.2	1	11.1
1989	7	58.3	4	33.3	1	8.3
1990	9	64.3	2	14.3	3	21.4
1991	11	91.7	0	-	1	8.3
1992	12	80	1	6.67	2	13.33
1993	15	65.2	4	17.4	4	17.4
1994	8	38.1	8	38.1	5	23.8
1995	8	66.7	2	16.7	2	16.7
1996	10	55.5	3	16.7	5	27.8
1997	4	50	1	12.5	3	37.5
Total	100	62.5	31	19.37	29	18.13

Table 3. Neonatal deaths by birth weight and age 1987-1997.

BW (g)	Livebirths	Age (day) ≤ 7	%	8-28	> 28	Total	%
< 1000	75	31	41.33	9	9	49	65.33
1000-1499	150	20	13.33	10	5	35	23.33
1500-1999	365	11	3.01	5	4	20	5.48
2000-2499	1336	18	1.35	4	5	27	2.02
≥ 2500	21658	20	0.09	3	6	29	0.13
Total	23584	100	0.42	31 (0.13)	29 (0.12)	160	0.68

overall deaths of the neonate less than 1000 g before discharge was 65.33 per cent and 41.33 per cent was ENM. For neonates more than 1500 g, the higher birth weight had less mortality respectively. Sixty-one per cent of the ENM occurred within 24 hours of life.

Birth weight specific ENM in each year (Fig. 1) revealed that the ENM in the group less than 1000 g and 1000-1499 g had markedly decreased in the last 6 year period from 57.14 per cent to 16.67 per cent and from 50 per cent to 6.25 per cent respectively. In 1992, there was a great increase of ENM by statistics in the group 1000-1499 g compared to the first 5 year period, but no conclusion could be made because there were only 4 livebirths and two of them died. For the birth weight group 1500-1999 g, ENM was high (15 per cent) in 1987 and decreased to 4.08 per cent in 1997. The birth weight group 2000-2499 g and more than or 2500 g, ENM were not obviously changed, the range of ENM was 0-4.75 per cent and 0-0.22 per cent respectively. However, there were no deaths in these groups in 1997.

The causes of ENM were evaluated (Table 4). The leading cause of death was congenital anomalies (43 per cent), followed by respiratory distress syndrome (16 per cent), perinatal asphyxia (10 per cent) and pulmonary hemorrhage (10 per cent) respectively. Congenital anomalies were the most common cause of ENM in every weight group except the weight group less than 1000 g of which approximately 62 per cent of ENM was caused by respiratory distress syndrome. Perinatal asphyxia in this study was assigned to the neonate who had an Apgar score at 5 minutes of less than 4 or 4 and showed evidence of the consequence of hypoxia. Most perinatal asphyxia (84.6 per cent) was in the birth weight group lower than 1500 g. Immaturity, one of the causes of death was assigned to the neonate whose birth weight was less than 600 g because during the 11 year-period this group of neonates had no chance of survival. Two cases of

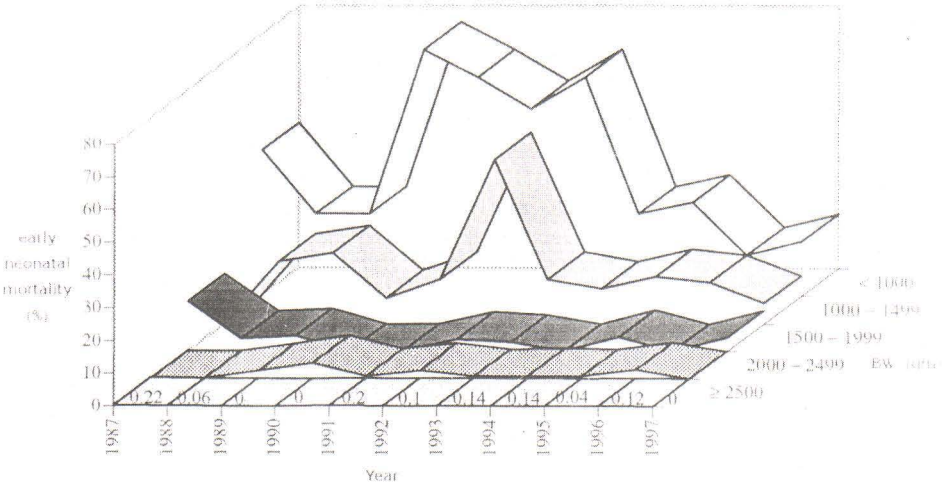

Fig. 1. Birthweight specific early neonatal mortality.

Table 4. Causes of early neonatal mortality in each birth weight during 1987-1997.

	< 1000	1000-1499	1500-1999	2000-2499	≥ 2500	Total (N=100)
Congenital anomalies	3	5	8	16	11	43
RDS*	10	4	1	1	-	16
Perinatal asphyxia	6	2	-	-	2	10
Pulmonary hemorrhage	4	4	1	-	1	10
IVH**	2	3	-	-	-	5
Immaturity (< 600 g)	3	-	-	-	-	3
MAS+	-	-	-	-	4	4
Infection	2	1	-	-	1	4
Hydrops fetalis	-	-	1	1	-	2
Pneumothorax	1	-	-	-	-	1
Pulmonary atelectasis	-	1	-	-	-	1
Diaphragmatic hernia with PPHN++	-	-	-	-	1	1

* respiratory distress syndrome
** intraventricular hemorrhage
\+ meconium aspiration syndrome
++ persistent pulmonary hypertension of the newborn

hydrops fetalis in this study, were not included in the group of congenital anomalies as well as Hemoglobin Barts' hydrops fetalis which is a lethal congenital anomaly, were caused by Rh incompatibility and the other one had unknown cause. Comparing the causes of ENM between the first 5 years and the last 6 years, the most common cause of death in both periods was congenital anomalies followed by respiratory distress syndrome (Table 5).

Congenital anomalies as the cause of ENM are shown in Table 6. The most common congenital anomaly was central nervous system anomalies (25.58 per cent), followed by chromosomal abnormalities (20.93 per cent) and multiple anomalies (16.28 per cent) respectively. Most congenital anomalies were incompatible with life and untreatable such as anencephaly, trisomy D and E, multiple anomalies, bilateral pulmonary hypoplasia, Hemoglobin Barts' hydrops fetalis and thanatophoric dysplasia. Owing to their severe abnormalities, 69.77 per cent of those died within 24 hours of life.

Table 5. Causes of early neonatal mortality between the period of 1987-1991 and 1992-1997.

	1987-1991 (N = 42)			1992-1997 (N = 58)	
	No.	%		No.	%
Congenital anomalies	16	38.1	Congenital anomalies	27	46.55
RDS	6	14.29	RDS	10	17.24
Pulmonary hemorrhage	6	14.29	Perinatal asphyxia	9	15.52
Perinatal asphyxia	1	2.38	Pulmonary hemorrhage	4	6.91
IVH	4	9.52	MAS	2	3.45
Infection	3	7.14	Hydrops fetalis (unknown)	1	1.72
MAS	2	4.76	Diaphragmatic hernia with PPHN	1	1.72
Immaturity	1	2.38	Immaturity	2	3.45
Hydrops fetalis (Rh incompatibility)	1	2.38	IVH	1	1.72
Pneumothorax	1	2.38	Infection	1	1.72
Pulmonary atelectasis	1	2.38			

Table 6. Congenital anomalies as causes of early neonatal death (N = 43).

1. Central nervous system (11)	- Anencephaly (7) Hydrocephalus (2)
	- Spina bifida (1) Major craniofacial anomalies (1)
2. Chromosome (9)	- Trisomy E (6) Trisomy D (3)
3. Multiple anomalies (7)	
4. Respiratory system (3)	- Diaphragmatic hernia with pulmonary hypoplasia and coarctation of aorta (1)
	- Bilateral pulmonary hypoplasia (1)
	- Tracheal atresia (1)
5. Cardiovascular system (2)	- Transposition of the great vessels (1)
	- Truncus arteriosus (1)
6. Others (11)	- Thanatophoric dysplasia (3)
	- Hb Barts' hydrops fetalis (2)
	- Conjoined twin : thoracoplagus (2 pairs)
	- Inborn error of metabolism : urea cycle defect (1)
	- Potter syndrome (1)

( ) number of death

After 7 days of life, the most common cause of death was infection (nosocomial), followed by congenital anomalies and necrotizing enterocolitis (Table 7). Types of congenital anomaly as the major causes of death were cardiac anomalies and chromosomal abnormalities.

Table 7. Causes of death after 7 days of life.

	8-28 day	> 28 day	Total (N = 60)
Infection	12	12	24
Congenital anomalies	4	8	12
Necrotizing enterocolitis	6	3	9
Pulmonary hemorrhage	5	-	5
IVH	2	1	3
RDS	-	1	1
Perinatal asphyxia	-	1	1
Immaturity	1	-	1
Others	1	3	4

DISCUSSION

Songklanagarind Hospital is the only medical school in southern Thailand. It is a referral center from various hospitals in southern Thailand. Several mothers who had high-risk pregnancies

were referred for further care or delivery. Almost all mothers who come to this hospital have antenatal care. But mothers who have never attended antenatal care and unregistered cases also deliver here. Approximately 9 per cent of our ENM had no antenatal care from anywhere.

During the 11 year period, overall neonatal deaths in this hospital were 160 cases (0.68 per cent). The majority of them were ENM (Table 2) as well as other reports[3-5]. The average ENMR was 4.24 per 1000 livebirths. The ENMR during the last 11 year period was slightly higher than the ENMR of the first 5 years after the hospital opened, from 1982 to 1986 (3.36 per 1000 livebirths)[1]. The reasons are firstly, the number of livebirths during the last 11 year period increased from an average of 952 livebirths per year in the first 5 year period to an average of 2144 livebirths per year in the last 11 year period. Secondly, the number of livebirths less than 1000 g who had high mortality rate during the first period (overall 4 cases)[1] was much lower than the last period (average 7 cases per year). During the early years of the 11 year period for neonates in this group, both the obstetrician and neonatologist, contemplated that they had a very small chance to survive and would have many complications giving them poor quality of life and did not manage them as aggressively as the other groups. However, the ENMR of the last 6 year period (3.94 per 1000 livebirths) decreased compared to the first 5 years (4.71 per 1000 livebirths).

Compared with official reports from other medical schools in Thailand, the ENMR during the 11 year period at Songklanagarind Hospital was higher than Ramathibodi Hospital from 1981 to 1990 (average 3.41 per 1000 livebirths)[6]. It was a little bit lower than the ENMR at Siriraj Hospital from 1983 to 1990 (average 4.41 per 1000 livebirths)[7] but lower than Queen Sirikit National Institute of Child Health (former Children Hospital) from 1983 to 1987 (6.14 per 1000 livebirths)[5] and Srinagarind Hospital (a medical school in the north east of Thailand) from 1980 to 1985 (8.76 per 1000 livebirths)[4]. Although we could not locate a recent official report regarding ENMR at those hospitals, we expect that the recent ENMR would be lower than previously reported due to advances in obsterical and neonatal care. The last official report from Queen Sirikit National Institute of Child Health revealed that ENMR in 1996 was only 2.32 per 1000 livebirths[8]. Simultaneously, the recent ENMR at Songklanagarind Hospital was markedly reduced, it was 1.52 per 1000 livebirths in 1997 although the incidence of LBW infants had increased and the VLBW infants had not significantly decreased (Table 1). The decrease in ENMR over the last 6 years is mainly due to the reduction in ENM of VLBW infants. The reduction of ENM in the group less than 1000 g and 1000-1499 g went from 57.14 per cent in 1992 to 16.67 per cent in 1997 and from 50 per cent in 1992 to 6.25 per cent in 1997 respectively (Fig. 1). The recent improvement in the survival of VLBW infants at our hospital can be attributed to improvements in several key areas of neonatal care for example : ventilatory support, artificial surfactant replacement therapy in severe respiratory distress syndrome (since 1992), nutritional support and better resuscitation. The extremely low birth weight neonates (< 1000 g) have been managed more aggressively in both prenatal and neonatal periods. The goal was to achieve the best possible outcome with the least morbidities and handicaps. For the birthweight group 1500-1999 g, the ENM was high (15 per cent) in 1987 and decreased later, but it did not decrease continuously. The birth weight group over 2000 g ENM of each year had not obviously changed.

Analysis of the causes of death revealed that the leading cause was congenital anomalies in both the first 5 years and the last 6 years (Table 5) and in all birth weight groups except those less than 1000 g (Table 4). The most common congenital anomaly, as cause of death, was central nervous system anomalies, especially anencephaly, as well as reports from other hospitals in Thailand[4,5,9]. If we excluded neonates who died from lethal congenital anomalies, the ENMR of our hospital would be greatly decreased. Since most congenital anomalies are incompatible with life and untreatable, prevention, counseling and early detection are important for decisions regarding termination of pregnancy.

For the neonates who died after 7 days of life, the major cause of death was infection (Table 7). The majority of those who died in the hospital were VLBW infants who had several risk factors for infection, for example : endotracheal intubation with prolonged mechanical ventilation, central venous catheterization for parenteral nutrition and defective immune response of their own. Therefore, standard and effective infectious control should be

performed strictly and continuously. The second leading cause of death was congenital anomalies with the major cause being cardiovascular anomalies.

SUMMARY

During the 11 year period (1987-1997), there was a decrease of ENMR in the last 6 year period compared to the first 5 year period. ENMR greatly decreased in the last year. The major cause of death in both periods was congenital anomalies. Early prenatal detection with appropriate management of congenital anomalies that are incompatible with life is very important. In addition, prevention of premature births especially tiny babies will reduce both mortality and morbidity.

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การตายของทารกแรกเกิดระยะต้นที่โรงพยาบาลสงขลานครินทร์ พ.ศ. 2530–2540

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การศึกษาย้อนหลังถึงอัตราตายและสาเหตุการตายของทารกแรกเกิดระยะต้นที่คลอดในโรงพยาบาลสงขลานครินทร์ ระหว่าง พ.ศ. 2530–2540 พบว่าจำนวนทารกเกิดมีชีพทั้งหมด 23,584 ราย อุบัติการณ์ของทารกน้ำหนักน้อย (< 2,500 กรัม) เท่ากับร้อยละ 8.17 จำนวนทารกน้ำหนักน้อยเพิ่มขึ้นเล็กน้อยเมื่อเปรียบเทียบช่วง 5 ปีแรก (ร้อยละ 7.59) กับช่วง 6 ปีหลัง (ร้อยละ 8.53) เปรียบเทียบอัตราตายของทารกแรกเกิดระยะต้นในช่วง 5 ปีแรก และ 6 ปีหลัง พบว่าลดลงจาก 4.71 ต่อจำนวนทารกเกิดมีชีพ 1,000 ราย เป็น 3.94 ต่อทารกเกิดมีชีพ 1,000 ราย ตามลำดับ อัตราตายของทารกแรกเกิดระยะต้นลดลงมากเมื่อเปรียบเทียบระหว่างปี 2530 (6.73 ต่อทารกแรกเกิดมีชีพ 1,000 ราย) กับปี 2540 (1.52 ต่อทารกเกิดมีชีพ 1,000 ราย) และพบว่ากลุ่มทารกน้ำหนักน้อยกว่า 1,000 กรัม และ 1,000–1,499 กรัม มีอัตราตายระยะต้นลดลงอย่างมากในช่วง 6 ปีหลัง คือจากร้อยละ 57.14 เหลือเพียงร้อยละ 16.67 และจากร้อยละ 50 เหลือเพียงร้อยละ 6.25 ตามลำดับ

สาเหตุการตายที่พบมากที่สุด คือ ภาวะรูปวิปริตแต่กำเนิดทั้งช่วง 5 ปีแรก และ 6 ปีหลัง และในทารกทุกกลุ่มน้ำหนัก ยกเว้น ทารกน้ำหนักน้อยกว่า 1,000 กรัม ซึ่งสาเหตุตายที่สำคัญ คือ respiratory distress syndrome

คำสำคัญ : การตาย, อัตราตาย, ทารกแรกเกิด, โรงพยาบาลสงขลานครินทร์

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