Original Article

Early neonatal mortality: Effects of interventions on survival of low birth babies weighing 1000-2000g

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Abstract

Objective: In order to improve our newborn care, we instituted several changes along with training of medical and nursing staff and compared survival rates in babies < 2000g before and after these changes. We also measured Perinatal Mortality Rate (PMR) and Neonatal Mortality Rate (NMR) in general, percentage of Low Birth Weight (LBW) babies and causes of early neonatal deaths at Lady Dufferin Hospital (LDH).

Methods: It was an intervention study design. All admissions to NICU between 1998 and 2000 were entered in the register. Data included high risk obstetric factors, gestational age, birth weight, APGAR score, gender, need for resuscitation, diagnosis, complications and outcome. Data of rest of the babies was recorded from operation theatre, labour room and postnatal ward registers in a separate register.

Results: Of 783 perinatal deaths, 488 were stillbirths and 295 were early neonatal deaths; 2498/14867 (l7%) babies were LBW. The main causes of early neonatal mortality included prematurity and related complications (35%), congenital malformations (23%), sepsis l9%), and birth anoxia (l6%). Most (27/295 77%) deaths occurred in babies weighing <2500g. Deaths due to prematurity and related complications in babies weighing between 1000-1499g decreased from 17/33 (51%) in 1997 (to 13/33 (39%) 9/45 (20%), 2/38 (5%) in 1998-99 and 2000 respectively. Sepsis related deaths decreased in babies weighing between 1500 to 1999g from 5/57(8.7%) in year 1997 to 7/77 (9%), 3/76 (4%), 4/96 (4%) in 1998, 99, and 2000 respectively. The PMR/NMR decreased from 58/22.4 in year 1997 to 39/15.6, 44.4/18.6, 38.2/12.3 for year1998, 1999 and 2000 respectively.

Conclusion: There was a significant reduction in mortality in LBW babies after training of medical and nursing staff. Reduction in overall PMR & NMR was also due to decrease in mortality in LBW babies (JPMA 56:174;2006).

Introduction

Perinatal Mortality Rate (PMR) 50-60/1000 and Neonatal Mortality Rate (NMR) 50/1000 of our country is one of the highest in the world.[1-4] The causes include home deliveries, poor maternal health, low socioeconomic status, high fertility rate and high incidence of low birth weight (LBW). The incidence of LBW in Pakistan is estimated to be around 19%.[5] As Birth Weight (BW) is considered to be an index of viability, perinatal and neonatal mortality is higher in LBW babies. Due to advancement in neonatal intensive sare services in developed countries, survival of LBW babies has significantly increased.[6-8] On the contrary, in developing countries many newborn die not only because of lack of specialized care but also due to improper management during delivery and postnatal period. Many of these deaths can be prevented.

In our observation at Lady Dufferin Hospital (LDH) in 1997, many early neonatal deaths in LBW babies occurred because of improper handling by unskilled nursing and medical staff. This was also causing increased sepsis related deaths. Many of these deaths were preventable. In order to reduce mortality in LBW babies, we instituted measures to improve level-II care and compared weight and specific mortality rates before and after these measures.

Subjects and Methods

Lady Dufferin Hospital (LDH) is a large teaching hospital located in District South of Karachi. The monthly income of patients attending OPD ranges from Rs.3000-5000. An average of 3000 to 4000 babies are delivered annually with a nursery providing level II care. About 10 to 15 babies are admitted in NICU dally. The nursing care is provided mainly by midwives who are trained at LDH, under the supervision of one registered nurse. The nursery has 5 incubators, 2 overhead warmers, 2 portable suction machines, 2 oxymeters, phototherapy units and 12-15 cots. The causes of unexplained deaths in the unit were a) inability to recognize danger signs e.g. grunting, apnea, hypothermia. hyperthermia, cyanosis etc, b) feeding methods, c) skipping cleaning / sterilization of equipment between babies e.g. incubators, ambo bags, oxygen masks, face masks, reuse of nasogastrjc tubing, disposable syringes after boiling for nasogastric feeding etc. Intervention measures introduced at end of 1977 included formal lectures on common problems e.g. temperature control of LBW babies, management of respiratory distress, feeding techniques and neonatal sepsis. Written guidelines were

given on sterilization of equipment. Hand on experience was given on ambo bagging, nasogastric intubation and oropharangeal suctioning. Most doctors working in Neonatal Intensive Care Unit (ICU) had formal training in pediatrics but little training in neonatology. Problems occurred during resuscitation of LBW babies. This also resulted in high incidence of barotraumas. All doctors working in NICU were given formal training in neonatal resuscitation.

The information for year 1997 on total number of deliveries, still births, early neonatal deaths, LBW and high risk obstetric factors was retrieved from labour room, operation room, post natal ward and nurse's NICU admission registers. For detailed information of babies dying in the first week of life, individual medical records were also examined. From year 1998 onward, resident medical officer entered babies admitted to NICU in the admission register and the study register. The data induced high-risk obstetric factors, gestational age, birth weight, Apgar score, sex of the baby, need for resuscitation, reasons for admission to nursery, complications and outcome. Rest of the information was obtained daily from labour room, operation room and posnatal ward registers and was recorded separately in a study register. As per hospital policy, pediatricians examined all intra uterine deaths and fresh stillbirths. Findings were recorded on separate forms. Only external features were recorded, autopsies were not performed because parents did not give consent.

The definitions of perinatal mortality and other statistical terms were as follows:[9,10]

Preterm: Less than completed 37 weeks.

Term: 37 to 42 weeks.

Post term: More than 42 weeks.

LBW (Low birth weight): Less than or equal to 2500g.

Perinatal mortality rate (PMR): Foetal deaths+ first week deaths (both 1000g or more in weight) divided by Live births expressed as per 1000.

Stillbirth: Complete expulsion from the mother of a foetus weighing 500g or more who shows no life at or after birth.

Early neonatal mortality rate {NMR): Death of a live born infant weighing 500g or more who dies during first completed seven days of life.

The following outcomes were analyzed before and after interventions.

1. Survival rates of LBW.
2. PMR and NMR in general.
3. Percentage of LBW babies.
4. Causes of early neonatal deaths

Data analysis was performed using Statistical package for Social Sciences (SPSS version 11.0).

Results

A total of 14867 babies were born over a 4-year period. There were 783 perinatal deaths. The number of foetal deaths (antepartum and fresh stillbirths) and early neonatal deaths were 488 and 295 respectively. PMR and Neonatal mortality uncorrected and corrected are shown in Table 1. There were significant differences before and after interventions. Perinatal / Early neonatal mortality decreased from 58/2 in 1997 to 39/15.6, 44.5/18.6 and 38/12 for year 1998, 1999 and 2000 respectively.

Table 1. PMR and NMR 1997 to 2000.

Year	END	SB	LB	Total Births	PMR	NMR	*PMR/ NMR
1997	68	109	2762	2871	60	23	58 / 22.4
1998	77	121	3983	4104	48	19	39 / 15.6
1999	84	121	3665	3786	54	23	44.5 / 18.6
2000	68	137	3969	4106	49.9	17.1	38.2 / 12.3

* Corrected (for weight). Perinatal mortality

Table 2. Early neonatal deaths caused by sepsis year 1997 to 2000.

Year	500-999g	1000-1499g	1500-1999g*	2000-2500g#	2550-4200g	Total
1997	1 (5)	7 (33)	5 (57)	3 (316)	1 (2321)	17
1998	1 (16)	7 (33)	7 (77)	3 (414)	2 (3428)	20
1999	4 (17)	9 (45)	3 (76)	3 (402)	3 (3261)	22
2000	2 (19)	7 (38)	4 (96)	2 (518)	2 (3261)	17

*p-value 0.94, 0.269, 0.280 for year 1998, 1999, 2000.
#p-value 0.3 for year 2000.
+ Total numbers may appear higher because of overlap of problems.

Table 3. Survival according to births weight year 1997 to 2000.

Year	500-999g SB / LB*	1000-1499g SB / LB	1500-1999g SB / LB	2000-2500g SB / LB	2550-4200g SB / LB	>4200g SB / LB	U+
1997	5 / 5	22 / 33	10 / 57	23 / 316	22 / 2312	2 / 30	26
1998	28 / 16	22 / 33	27 / 77	16 / 414	27 / 3428	1 / 15	--
1999	22 / 17	28 / 45	23 / 76	15 / 402	26 / 3098	1 / 27	6
2000	29 / 19	29 / 38	23 / 96	15 / 518	40 / 3161	1 / 37	--
Total	84 / 57	91 / 149	83 / 306	68 / 1650	115 / 12108	5 / 109	32

* Still birth / Low birth
+ unknown weight

There were a total of 2498 (17%), LBW babies 971 (39%) were term SGA (small for gestational age) and 1527 (61%) were preterm (appropriate for gestational age and SGA). The causes of early neonatal mortality were prematurity and related complications 103 (35%), lethal

congenital malformations 67 (23%), sepsis 57 (19%) and birth anoxia 48 (16%). Most (227/295 77%) deaths occurred in babies weighing ≤ 2500gms (Table 2).

Decrease in PMR and NMR were mainly because of increase in survival rates in LBW bab weighing between 1000-l999g (Table 3).

The sepsis and prematurity with related complications were compared before and after intervention. Deaths caused by sepsis in babies weighing 1500 to 1999 gm decreased from 5/57 (8.7%) in 1997 to 7/77 (9%) p-value 0.94 in 1998, 3/76 (4%) p-value 0.26 in 1999, 4/96 (4%) p-value 0.280 in year 2000. The mortality in babies weighing 2000-2500g also decreased from 3/316 (1%) to 2/518(0.4%) p-value 0.35. (Table 2). Deaths due to prematurity and related complications in birth weight between 1000 to 1499gm decreased from 17/33 (51%) in 1997 to 13/33 (39%) 9/45 (20%),2/38 (5%) in year 1998, 1999 and 2000, p-value, 0.319, 0.003, <0.001 respectively.

There were very few survivors in babies weighing between 500 to 999 gm. Almost all babies died due to pulmonary insufficiency with or without sepsis.

Discussion

Perinatal Mortality in our country has remained constant over the last two decades.[4] Birth asphyxia, sepsis, LBW and neonatal tetanus are responsible for majority of deaths in the community. This is not surprising as most deliveries take place at home and are conducted by untrained birth attendants.[11]

In a recent study LBW infants comprised 63% all neonatal deaths, 59% of neonates who later died at the same hospital had home delivery.[12] Several recommendations are available to improve primary health care of mother and newborn.[13] The performance of hospitals in the urban areas of country has also been far from satisfactory where nearly 1/3 of deliveries take place. Most of these have inadequate facilities in terms of both equipment and trained medical staff. These results increase number of preventable neonatal/ perinatal deaths.

Level-II neonatal care has been associated with increased survival of LBW babies.[14] The changes that we brought in our institution were not only basic i.e., improvement in nursing care (level-I) but we also upgraded our services to level-II neonatal care We understand that the data shown above is hospital based and cannot be applied to population in general. LDH is a maternity hospital and more than 90% mothers who deliver at the hospital are booked patients; :, therefore cause specific mortality differ from other teaching hospitals. Significant reduction in perinatal and neonatal mortality after institution of measures indicated improvement in the level of care. The incidence of LBW was 17% at our hospital, which was slightly better than the national level. It may be related to socioeconomic class (lower middle class) attending out patient department. There was significant reduction in mortality due to prematurity and related complications in babies weighing 1000-1499g. Sepsis caused by Klebseilla pneumonia was a major problem in our nursery. The clinical presentation was sudden onset apnoec spells, seizures, temperature instability, hyperbilirubinemia, coagulopathy and death within 24 hours in a low risk baby. Although there was reduction in mortality in sepsis related deaths, difference was not significant. Our observation indicated more deaths might have occurred than what was recorded in the nursing register in 1997; this probably was the reason that difference was not significant. Portable Head ultrasound was not available in our unit during study period, therefore we could not estimate deaths caused by grade[3,4] intraventricular haemorrhage, clinical malformations of this condition which is very similar to sepsis.

We concluded that the hospital based mortality in LBW babies can decrease with improvement in neonatal intensive care.

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