Neonatal Mortality: Review from a Tertiary Hospital in Rawalpindi

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Abstract

Background: A prospective study was conducted in the neonatal intensive care unit of department of Paediatrics, Holy Family Hospital, Rawalpindi, from 1st January, 2006 to 30th June, 2006.

Methods: All neonates admitted were enrolled in this study. Sixteen hundred thirty one neonates were admitted.

Results: The major cases admitted were 617 (37.82%) cases of neonatal sepsis, followed by prematurity 333 (20.41%), birth asphyxia, 299 (18.33%), neonatal jaundice 146 (8.95%) and 75 (4.59%) cases of meconium aspiration. The number of neonates who expired were 383 (23.48%), while 1190 (72.96%), were discharged and 58 (3.55%) left against medical advice. Among the neonates expired there were 236 (61.6%) males and 147 (38.4%) females. SVD was the predominant mode of delivery in 303 (79.0%) and LSCS in 80 (20.9%). Babies delivered at HFH were 156 (40.7%) with 102 (26.6%) home delivered, 79 (20.6%) from private hospitals while 46 (12%) were from Children Hospital and other government hospitals of Rawalpindi/Islamabad. Most neonates presented before 24 hrs of age 230 (60.1%), whereas 63 (16.4%) presented between 24 – 72 hrs and 90 (23.5%) presented between 72 hrs and 28 days.

Most expiries occurred in less than 24 hrs after admission 167 (43.6%), followed by expiries in > than72 hrs and between 24 – 72 hrs of stay, 113 (29.6%) and 103 (26.8%) respectively. The major contributors to mortality were birth asphyxia 13 (43.8%), pre maturity 129 (38.7%), meconium aspiration 13 (7.3%), neonatal sepsis 75 (12.15%) and neonatal jaundice 1 (10.27%)

Conclusion: Age of presentation is an important contributor to neonatal mortality. The importance of focusing on facility based clinical care, with involvement of outreach teams, family and community cannot be over emphasized.

Introduction

4.5 million babies die each year in their first month of life and upto half of these babies die in the first 24 hours. A child is about 500 times more likely to die on the first day of life than at one month of age1.

Neonatal mortality accounts for almost 40 percent of all under five deaths and for nearly 60 percent of infant (under one year) deaths1.

The largest absolute number of newborn deaths occur in South Asia with 57/1000 in Pakistan. Pakistan, the seventh most populous country in the world, has the second highest number, 2,70,000 of newborn deaths. Pakistan also ranks 4th on the list of countries with the highest neonatal mortality rates (NMR) 57/1000 where as this is 43/1000 in India, 38/1000 in Bhutan, 36/1000 in Bangladesh, 25/1000 in Malaysia and 11/1000 in Sri Lanka2.

A common factor in these deaths is the health of mother. Each year more than 500,000 women die during child birth or from complications during pregnancy. Babies whose mothers die during child birth have a greater chance of dying in their first year than those born to mothers who remain alive1.

The major causes of neonatal mortality in Pakistan include birth asphyxia (8-28%) low birth weight or prematurity (14-26%) tetanus (9-17%), other infections (21-43%) and congenital malformations (5-9%)2.

The high rates of birth asphyxia are due to mothers generally giving birth at home and 60% of newborns with asphyxia reach the hospital well after 24 hours of birth1. Most health care facilities are not equipped to treat birth asphyxia due to lack of equipment and medications. The children who survive birth asphyxia each year suffer from such problems as cerebral palsy, learning difficulties or other disabilities. Pakistan has the third highest burden of deaths due to neonatal tetanus in the world. WHO estimates show 26,400 neonates died of tetanus in 1997, whereas other infectious like sepsis, meningitis, diarrhea and respiratory infections are potentially lethal problems for neonates, which demand urgent diagnosis and treatment2.

Low birth weight among Pakistani newborns (25%) are still underestimated because of deliveries at home, where newborns are very rarely weighed. It is also not known how many suffer from intrauterine
growth retardation. Preterm deliveries have a major impact on neonatal mortality in developed countries, with birth before 33 weeks of gestation accounting for between 35% and 70% of neonatal deaths.

**Patients and Methods**

This prospective study was conducted in the Neonatal Intensive Care Unit of Department of Paediatrics, Holy Family Hospital (HFH), Rawalpindi from January 1st 2007 to 30th June 2007. All neonates who were admitted were enrolled. In each case detailed antenatal, natal and postnatal history was taken to assess the risk factors for the varied presentations.

All relevant information was recorded on proforma. All necessary investigations were performed in each case to confirm the diagnosis. Epidemiological risk factors studied in neonates who died were age of presentation (taken as less than 24 hrs, 24-72 hrs, greater than 72 hrs), sex, weight, mode of delivery, place of delivery. Deaths according to duration of stay in hospital were taken in groups as age of presentation. Weight of neonates who died was taken in three groups. Weight in the first group was 0.7-1.4 kg, in the second group 1.5-2.4 kg and the third group between 2.5-4 kg.

All the patients received general and specific management according to underlying condition.

**Results**

The number of neonates who expired was 383 (23.48%), 1190 (72.96%) were discharged and 58 (3.55%) left against medical advice (LAMA). Among the neonates who expired, there were 236 (61.6%) males and 147 (38.4%) females.

Weight of neonates who died was taken in 3 groups, with 83 (21.7%) weighing 0.7 - 1.4 kg, 150 (39.2%) weighing 1.5 - 2.4 kg and the same number in third group who weighed between 2.5 - 4 kg.

Two hundred thirty three (60.83%) neonates were with low-birth weight. Neonatal mortality was 64.37% in low birth weight neonates.

230 (6.1%) presented in first 24 hrs of life, 63 (16.4%) in 24-72 hrs of life, 90 (23.5%) after 72 hrs but before 28 days of life.

Spontaneous Vaginal Delivery (SVD) was the predominant mode of delivery in 303 (79.1%) and Lower Segment Caesarean section (LSCS) in 80 (20.9%).

156 (40.7%) delivered in Holy Family Hospital, 102 (26.6%) were home delivered, 79 (20.6%) delivered at private hospitals while 46 (12%) were from Children Hospital and other government hospitals of Rawalpindi, Islamabad.

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**Table 1: Causes of Neonatal Admissions.**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Asphyxia</td>
<td>51</td>
<td>40</td>
<td>59</td>
<td>45</td>
<td>46</td>
<td>58</td>
<td>299 (18.33%)</td>
</tr>
<tr>
<td>Prematurity</td>
<td>31</td>
<td>59</td>
<td>80</td>
<td>60</td>
<td>54</td>
<td>49</td>
<td>333 (20.41%)</td>
</tr>
<tr>
<td>Neonatal Sepsis</td>
<td>94</td>
<td>80</td>
<td>72</td>
<td>75</td>
<td>133</td>
<td>163</td>
<td>617 (37.82%)</td>
</tr>
<tr>
<td>Neonatal Jaundice</td>
<td>14</td>
<td>20</td>
<td>18</td>
<td>20</td>
<td>38</td>
<td>36</td>
<td>146 (8.95%)</td>
</tr>
<tr>
<td>Meconium Aspiration</td>
<td>16</td>
<td>12</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td></td>
<td>75 (4.59%)</td>
</tr>
<tr>
<td>Tetanus Neonatorum</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10 (0.61%)</td>
</tr>
<tr>
<td>Congenital Anomalies</td>
<td>4</td>
<td>1</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>19 (1.16%)</td>
</tr>
<tr>
<td>Diabetic Mother</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>10 (0.61%)</td>
</tr>
<tr>
<td>Haemorrhagic Disease</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>15 (0.91%)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>0</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>54 (3.31%)</td>
</tr>
<tr>
<td>Congenital Heart Disease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2 (0.12%)</td>
</tr>
<tr>
<td>Congenital Hypothyroidism</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td>1 (0.06%)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>12</td>
<td>12</td>
<td>7</td>
<td>50 (3.06%)</td>
</tr>
</tbody>
</table>
Sixteen hundred and thirty one neonates were admitted. Neonatal sepsis was the most common cause of admission in 617 (37.82%). It was followed by pre-maturity in 333 (20.41%), birth asphyxia in 299 (18.33%), neonatal jaundice in 146 (8.95%) while 15 (1.23%) had meconium aspiration. Other causes of admission were 54 cases of meningitis, 50 cases of pneumonia, 19 cases of congenital anomalies, 15 cases of hemorrhagic disease of newborn (HDN), 10 each of Infant of Diabetic Mother (IDM) and Tetanus Neonatorum (TNN), 2 cases of Congenital Heart Disease (CHD) and one case of congenital hypothyroidism (Tables 1-4).

There were 167 (43.6%) expires in 1st 24 hrs of life, 103 (26.8%) in 24-72 hrs of life and 113 after 72 hrs, but before 28 days of life.

Neonates who expired were 383 (23.48%). Out of 617 (37.82%), neonates with neonatal sepsis, 75 (12.15%) died, 517 (83.79%) were discharged, while 25 (4.05%) left against medical advice. Prematures were 333 (20.41%) of which 129 (38.7%) expired, 194 (58.2%) were discharged and 10 (3%) left against medical advice. There were 299 cases with Birth Asphyxia, 131 (43.8%) died, 158 (52.8%) were discharged and 10 (3.34%) left against medical advice. Neonatal jaundice accounted for 146 (8.95%) of total admission, 15 (10.27%) of these babies expired, 127 (86.98%) were discharged and 4 (2.73%) left against medical advice.

Meconium aspiration babies totaled 75 (4.59%) of which 13 (17.3%) died, 58 (77.3%) were discharged and 4 (5.33%) left against medical advice. Miscellaneous groups comprised of 161 (9.9%) neonates out of which 20 (12.4%) died, 136 (84.47%) were discharged and 5 (3.10%) left against medical advice. They died of meningitis, pneumonia, congenital anomalies and tetanus neonatorum.

**Discussion**

Data analysis shows NNS as the commonest cause of admission at our unit followed by pre-maturity, birth asphyxia, NNJ and MAS. However, the major contributors to mortality were birth asphyxia...
and pre-maturity followed by NNS, NNJ and MAS.

NNS was the main cause of admission (30.64%) in a study at Karachi\(^3\) followed by birth asphyxia (18.85%) and jaundice (13.15%). Pre-maturity accounted for 6.8% of these cases.

In a study at Lahore\(^4\) birth asphyxia was the most common cause of admission (40.67%) followed by sepsis (25.67%), pre-maturity (18.67%) and neonatal jaundice (8.33%).

From Peshawar\(^5\) data analysis shows the predominance of pre-maturity (26.50%) , NNS (26.3%), NNJ (19.95%) and birth asphyxia (16.52%).

Neonatal jaundice was reported as 3.5% of all causes of admission to a neonatal unit at Larkana\(^4\).

In our study, 23.48% neonates expired, 72.96% were discharged and 3.55% left against medical advice, compared to study at Peshawar which depicts 14.87% expiries, 71.54% discharged and 7.08% left against medical advice.

There was male pre-dominance (61.6%) similar to the preponderance noted in other studies from Karachi, Lahore, Peshawar and Islamabad\(^6\). Male gender was a significant risk factor for peri-natal deaths. Early neonatal mortality was seen in 68.75% of male neonates\(^7\).

Of neonates who expired, 60.83% were low birth weight. Home-delivered babies formed a good proportion of admitted newborns. Unhygienic deliveries and poor ante-natal care may be responsible for high number of neonatal admissions with sepsis. Infection in mother can result in low birth weight\(^8\).

In a study from Peshawar\(^5\), low birth weight was reported in 41.20% while it was 39% from Lahore\(^4\) and 36% from Larkana\(^4\). From India\(^3\), Bangladesh\(^10\) and Ethiopia\(^11\), neonatal low birth weight percentage was 20%, 13.25% and 11.02% respectively. Lack of nutritional education, low literacy and poor access to health care seemed to be the main factors responsible.

In a study at Islamabad\(^6\), 40.1% of low birth weight neonates died. From a Karachi\(^3\) study, 55.4% patients were low birth weight whereas 1.86% were below 1kg.

In our study 60.1% neonates presented in first 24 hours of life whereas in Peshawar 35% were admitted in first 24 hours\(^5\). The figures from Karachi\(^3\), Larkana\(^4\) and Lahore\(^4\) are 33.61%, 44.47% and 75% respectively.

SVD was the pre-dominant mode of delivery in 79% cases. A similar percentage was observed by a study at Lahore\(^4\).

Neonates delivered at Holy Family Hospital were 40.7%, followed by home delivered 26.6%. Those delivered at private nursing homes were 20.6% and 12% were delivered at other government hospitals. In Lahore\(^4\) study admissions show more neonates, 45% delivered at home compared to us and 55% in the Mayo Hospital. In Peshawar\(^5\) 62.33% were referred from hospitals and maternity homes, 27.03% were home delivered and 22.60% were delivered at Khyber Teaching Hospital.

Out of the total 617 cases of neonatal sepsis 12.15% died whereas deaths due to NNS at Lahore\(^4\) and Karachi\(^3\) were 20.78% and 30.75% respectively. In our study 83.79% were discharged whereas neonates discharged were 74.03%, and 44.9% from Lahore\(^4\) and Karachi\(^3\) respectively. Neonates who left against medical advice were 4.05% whereas they were 5.19% and 24.32% from Lahore\(^4\) and Karachi\(^3\) respectively. It is a major cause of neonatal mortality throughout the world\(^12\).

Neonatal sepsis is one of the most common reasons for admission to a neonatal unit in developing countries\(^13\). 50-88% of all neonatal deaths are attributable to infectious causes and 22-66% of all admissions in neonatal units are due to infections including sepsis and pneumonia\(^14\).

Among neonates with birth asphyxia 43.8% died whereas reported deaths are 37.7% and 36% from Lahore\(^4\) and Karachi\(^3\) respectively. Neonates discharged were 52.8% whereas this figure is 57.38% and 44.11% from Lahore\(^4\) and Karachi\(^3\). Those who left against medical advice were 3.34% whereas the figures from Lahore\(^4\) and Karachi\(^3\) were 4.92% and 19.78% respectively. It is one of the leading causes of admission in neonatal units with high morbidity and mortality all over the country and a major contributor to peri-natal and neonatal mortality which reflects social, educational and economic standards of a community\(^15\).

Regarding pre-maturity the outcome showed 38.7% expiries whereas pre-mature deaths were 33.93% and 38.51% from Lahore\(^4\) and Karachi\(^3\) respectively. There were 58.2% discharges from our unit compared to 46.43% and 29.62% neonates who were discharged from Lahore\(^4\) and Karachi\(^3\) respectively. Pre-mature neonates who left against medical advice were 3% whereas they were 19.64% and 31.85% from Lahore\(^4\) and Karachi\(^3\) respectively.

Pre-maturity accounted for 20.41% of total admissions in our study compared to 13% from Islamabad\(^6\). Deaths contributed by pre-maturity in our study were 33.68%. Therefore, low birth weight and pre-maturity are major contributors to neonatal morbidity and mortality.
In early neonatal deaths 65% are due to low birth weight\textsuperscript{16}. Pre-maturity and neonatal infections are leading causes of early neonatal mortality\textsuperscript{7}.

For neonatal jaundice 10.27% neonates died as compared to 8% from Lahore\textsuperscript{4}. There were 86.98% discharges compared to 92% discharges from Lahore\textsuperscript{4}. Those who left against medical advice were 2.73% in our study. On the other hand, no cases of neonatal jaundice left against medical advice from Lahore\textsuperscript{4}. A study from Bangladesh reported 30.71% cases of neonatal jaundice\textsuperscript{8}.

Out of 65 neonates with MAS 17.3% died compared to 19.17% from Karachi\textsuperscript{3}. There were 77.3% discharges compared to 53.42% from Karachi\textsuperscript{3}. 5.33% neonates were LAMA compared to 27.39% from Karachi\textsuperscript{3}. Out of the miscellaneous group 12.4% died, 84.47% were discharged and 3.10% left against medical advice.

Neonatal mortality was 23.48% in our study. Major contributors to mortality were home delivered 26.6% neonates who came in very sick condition. It was reported to be 25.85%, 34% and 38% from Karachi\textsuperscript{3}, Lahore\textsuperscript{4} and Larkana\textsuperscript{8} whereas in a study from Islamabad\textsuperscript{6} the figure was 19.7%.

The commonest causes of death were birth asphyxia 43.8% and pre-maturity 38.7% in our study. This is consistent with other studies\textsuperscript{17}. Pre-mature births are less likely among women who seek antenatal care. Ante-natal monitoring and timely referral reduce high mortality rate in this group. In a study at Nepal, out of 50 cases 4% died\textsuperscript{18}.

Results obtained from Peshawar\textsuperscript{5} show neonatal mortality due to pre-maturity as 21.60%, birth asphyxia 21% and sepsis 14.51%. In Karachi\textsuperscript{3}, infection was the major killer (46.44%) followed by birth asphyxia and pre-maturity, with a similar figure reported from India\textsuperscript{19}. Neonatal mortality due to pre-maturity was 9.42%.

In a study from Balochistan, leading causes of neonatal mortality were infections (21%), pre-maturity (14%) and birth asphyxia (11%)\textsuperscript{7}. In Multan, pre-maturity was the commonest cause of death\textsuperscript{20}.

In conclusion, facility based clinical care should include emergency newborn care for illnesses especially sepsis management, resuscitation of newborn and care of very low birth weight babies. Outreach services should provide post-natal care to support health practices along with early detection and referral of complications. Family and community should be involved in health home care including breastfeeding promotion, hygienic cord cutting, skin care, thermal care and promoting demand for care.

References

1. UNICEF. The state of the world's children 2008: 4-114