

# Disease Patterns and Outcomes of Neonatal Admissions at a Secondary Care Hospital in Pakistan

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## أنماط المرض والنتائج لحديثي الولادة المرقدين في مستشفى مرجعي ثانوي في باكستان

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**الملخص:** هدفت الدراسة إلى تحديد أنماط المرض والنتائج لحديثي الولادة المرقدين في مستشفى مرجعي ثانوي في باكستان خلال الفترة من يناير إلى ديسمبر 2009. **الطريقة:** تم تحليل بيانات المرض في السجلات الطبية لكل حديثي الولادة المرقدين بأثر رجعي خلال فترة الدراسة (العمر، الوزن، الجنس، سبب الترقيد، مدة الترقيد، التشخيص، النتيجة النهائية للعلاج). تم فحص الاتجاهات لمعرفة مؤشرات الوفاة في حديثي الولادة المرقدين في المستشفى. **النتائج:** تم حصر 1,554 حالة منهم 979 من الذكور (63%) و575 حالة من الإناث (37%). تمت ولادة 891 حالة في المستشفى (57.3%) بينما ولدت 663 حالة خارجها (42.7%). تم ترقيد معظم الحالات خلال الأربع والعشرين ساعة الأولى بعد الولادة (51.3%). أظهرت النتائج أن وزن الولادة في 13 حالة (0.8%) كان أقل من 1 كجم، و1-1.49 كجم في 85 (5.4%) و من 1.5-2.5 كجم في 587 (37.7%). كان السبب الرئيسي للترقيد هو الابتسار في 27.9% والعدوى في 20.33% من الحالات تلاهما الاختناق اثناء الولادة (13%) واليرقان الوليدي (11.3%). تم السماح لعدد 1,287 حالة (82.8%) بمغادرة المستشفى، بينما تركت 41 حالة (2.6%) المستشفى ضد المشورة الطبية، وتم تحويل 59 حالة (3.79%) إلى مستشفيات الرعاية الثالثية. بلغ العدد الإجمالي للوفيات 106 حالة (6.8%). الخلاصة: في هذه الدراسة كانت الأسباب الرئيسية لترقيد حديثي الولادة هي الابتسار ونقص وزن الوليد والاختناق الوليدي واليرقان الوليدي. من الممكن خفض هذه النسب عن طريق العناية الملائمة والتدخل المبكر والتحويل في الوقت المناسب إلى مستشفيات الرعاية الثالثية. وكان السبب الرئيسي للوفاة هو الابتسار.

**مفتاح الكلمات:** رضيع؛ مبتسر؛ نقص الوزن عند الولادة؛ اليرقان؛ الوليدي؛ الاختناق؛ باكستان.

**ABSTRACT: Objectives:** This study aimed to determine the disease patterns and outcome of patients admitted to the neonatal unit of a secondary care hospital in Pakistan from January to December 2009. **Methods:** Retrospective data from the medical records of all neonates admitted during the study period were reviewed and analysed for age, weight, sex, reason for admission, duration of hospital stay, diagnosis and final outcome. Trends were examined to identify the indicators of inpatient neonatal deaths. **Results:** The total number of neonates admitted during the study period was 1,554; 979 were male (63%), and 575 were female (37%). A total of 891 patients (57.3%) were born in the hospital while 663 (42.7%) were born elsewhere. The majority were admitted during the first 24 hours of life (51.3%). A total of 13 patients (0.8%) weighed <1 Kg; 85 (5.4%) weighed 1–1.49 Kg, and 587 (37.7%) between 1.5–2.5 Kg. Prematurity and infection were the main reasons for admission (27.9% and 20.33%, respectively), followed by birth asphyxia (13%) and neonatal jaundice (11.3%). A total of 1,287 patients (82.8%) were discharged, 41 left against medical advice (2.6%), 59 were referred to tertiary care hospitals (3.79%) and 106 (6.8%) died. **Conclusion:** Prematurity, low birth weight, birth asphyxia and neonatal jaundice were the major causes of neonatal admissions. This could be reduced by appropriate antenatal care, timely intervention, and in-time referral to tertiary care centres for the deliveries of all high-risk pregnancies. The major cause of neonatal mortality was prematurity.

**Keywords:** Neonatal Prematurity; Infant, Low Birth Weight; Neonatal Jaundice; Asphyxia Neonatorum; Pakistan.

### ADVANCES IN KNOWLEDGE

- This study supports using research to identify the most prevalent causes of neonatal morbidity and mortality since mortality rates for under-5-year-olds in developing countries have declined significantly in the last 30 years, while maternal and newborn mortality rates have not changed noticeably
- It may also facilitate a dialogue with policy makers regarding the importance of investing in measures to ensure neonatal health.

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**APPLICATIONS TO PATIENT CARE**

- *This study may help to improve neonatal care in developing countries by understanding the causes of admission, complications, length of stay and outcome for neonatal patients.*

**N**eonatal morbidity and mortality rates reflect a nation's socioeconomic status, as well as the efficiency and effectiveness of their healthcare services.<sup>1</sup> These important indicators are useful in planning for improved healthcare delivery.<sup>1</sup> Basic neonatal care (Level I) is not available at the majority of centres in Pakistan where neonates are delivered or admitted;<sup>2</sup> therefore, these babies are referred to secondary level hospitals. Annually, approximately 3,000 births take place at the Aga Khan Maternal and Child Care Center (AKMCC) in Hyderabad. The AKMCC neonatal service has an experienced, full-time paediatrician and staff who are trained in newborn care. AKMCC is also a primary referral centre for the primary care centres in the inner Sindh province. Almost half of the infant deaths in Pakistan occur within the first 28 days of life, which is the most precarious period of time in terms of healthcare.<sup>3</sup> The prognosis for these neonates depends upon their underlying condition, its severity and the subsequent management. In view of this situation, a neonatal audit is periodically carried out in the AKMCC in order to raise awareness of neonatal problems and their management. This study aimed to help identify the major causes of neonatal morbidity and mortality in Pakistan, which may facilitate dialogue with policy makers about investing in this often neglected area of healthcare.

## Methods

The study was conducted from January to December 2009 at the neonatal unit of the AKMCC in Hyderabad, the second largest city in the Sindh province, Pakistan. The study was approved by the Ethical Review Committee of the Aga Khan University Hospital (approval #2213-Ped-ERC-12). The neonatal unit admits all neonatal patients except those with tetanus, as no separate facilities are available. Neonates requiring surgical intervention and mechanical ventilation are referred to tertiary care hospitals after being stabilised.

The following data were extracted for analysis and documented: age, sex, place of birth, weight on admission, duration of hospital stay, and diagnosis both upon admission and discharge. Furthermore, the presence of fever, cough, convulsion, diarrhoea, vomiting, jaundice, hypoxaemia, respiratory distress, impaired consciousness, agitation or bulging fontanelle and impaired perfusion were also recorded. Additionally, the study also noted culture results, full blood count and the patient's survival outcome upon discharge.

The diagnosis of prematurity and low birth weight (LBW) was mainly based on the World Health Organization definitions. Prematurity is described as live born neonates delivered before 37 weeks. LBW is described as the patient having a birth weight of <2.5 Kg; very low birth weight (VLBW) is a birth weight of <1.5 Kg and extremely low birth weight (ELBW) is a birth weight of <1 Kg.<sup>4</sup> The diagnosis of sepsis and meningitis was made after isolating the pathogenic organism from the blood or cerebral spinal fluid whenever possible. Congenital heart disease was diagnosed on the basis of a clinical examination, supported by chest X-rays; babies were then referred to a tertiary care hospital for a confirmation of this diagnosis by echocardiography and further management. Birth asphyxia was mainly diagnosed with a history of delayed crying or poor respiratory effort after birth. Neonatal jaundice (NNJ) was determined by an estimation of the serum bilirubin level. Diagnosis of pneumonia, meconium aspiration syndrome and transient tachypnoea of the newborn were made on the basis of clinical, haematological and radiological findings.

## Results

The total number of neonates admitted during the study period was 1,554. There were 979 males (63%) while 575 (37%) were females. Of the 1,554 admitted, 891 (57.3%) were born in the hospital while a significant 663 (42.7%) were born elsewhere and referred to the AKMCC neonatal unit for further management—as this unit is the only

**Table 1:** Disease pattern of the neonatal admissions

Diagnosis	n (N = 1,554)	%
<b>1. Prematurity</b>	<b>435</b>	<b>27.9</b>
Without sepsis	182	41.8
With sepsis	87	20
With respiratory distress syndrome	68	15.6
With asphyxia	35	8
With jaundice	34	7.8
Other	29	6.67
<b>2. Neonatal infections</b>	<b>316</b>	<b>20.33</b>
Sepsis	224	70.8
Pneumonia	40	12.6
Acute gastroenteritis	26	8.22
Meningitis	12	3.79
Aspiration pneumonia	12	3.79
Urinary tract infection	02	0.63
<b>3. Birth asphyxia</b>	<b>203</b>	<b>13</b>
<b>4. NNJ</b>	<b>176</b>	<b>11.3</b>
<b>5. Respiratory distress</b>	<b>121</b>	<b>7.78</b>
Transient tachypnoea of the newborn	53	43.8
Meconium aspiration syndrome	37	30.5
Pneumothorax	2	2.47
<b>6. Observation</b>	<b>115</b>	<b>7.4</b>
Feeding issues	27	23.4
Meconium-stained liquor	22	19.1
Poor obstetric history	19	16.5
Excessive crying	03	0
Birth injury	02	0
Other	20	17.3
Reason not given	22	19.1
<b>7. IUGR</b>	<b>70</b>	<b>4.5</b>
<b>8. IDM</b>	<b>40</b>	<b>2.57</b>
<b>9. Neonatal seizures</b>	<b>26</b>	<b>1.67</b>
<b>10. Surgical problems</b>	<b>13</b>	<b>0.83</b>
<b>11. Congenital heart disease</b>	<b>12</b>	<b>0.77</b>

NNJ = neonatal jaundice; IUGR = intrauterine growth restriction; IDM = infant of a diabetic mother.

**Table 2:** Major causes of neonatal deaths (n = 106)

Cause	Deaths n (%)	Case fatality rate (%)
<b>Prematurity, LBW (n = 435)</b>	56 (52.8)	12.8
<b>Neonatal infections (n = 316)</b>	10 (9.4)	3.2
<b>Birth asphyxia (n = 203)</b>	22 (20.8)	0.8
<b>Others (n = 600)</b>	18 (17.0)	3

LBW = low birth weight.

secondary care centre catering to three districts in the Sindh province. The majority of the newborns (51.3%) were admitted during the first 24 hours of life. Regarding the birth weight of these babies, 13 patients were categorised as having ELBW (0.8%), 85 as VLBW (5.4%) and 587 as LBW (37.8%). Prematurity and infections were the main causes of admission to the neonatal unit, at 27.9% and 20.33%, respectively. Birth asphyxia was the third most common cause of admission (13%) followed by NNJ (11.3%). The major causes of infections were sepsis (70.8%), pneumonia (12.6%) and acute gastroenteritis (8.22%). There were 115 neonates admitted for observation due to other causes (7.4%). Among them, 23.4% had feeding issues, 19.1% had a history of meconium-stained liquor and 16.5% of babies had a history of maternal complications related to pregnancy and admitted for observation in the neonatal unit [Table 1].

Among the 106 neonates who did not survive, the leading causes of death were prematurity and LBW (56, 52.8%), followed by birth asphyxia (22, 20.8%) and neonatal infections (10, 9.4%). The case fatalities for the main neonatal diagnoses were prematurity (12.8%), neonatal encephalopathy (10.8%), neonatal infections (3.2%) and other causes (3%). The major causes of neonatal mortality are compiled in Table 2, and the outcomes of neonatal admissions are shown in Table 3.

**Table 3:** Outcomes of the neonatal admissions

Outcome (N = 1,554)	n	%
<b>Discharge</b>	1,348	86.7
<b>Death</b>	106	6.8
<b>Referral</b>	59	3.8
<b>Leaving against medical advice</b>	41	2.7

## Discussion

This study showed that 51.3% of newborns were admitted during the first 24 hours of life. This figure is higher than studies conducted elsewhere in Pakistan; for instance the figure was 35% in a study in Peshawar,<sup>5</sup> 33.6% in a Karachi study,<sup>6</sup> 44.47% in a Larkana one,<sup>7</sup> and is lower than a study conducted in Lahore, which reported 75% of neonates admitted during the first 24 hours of life.<sup>8</sup> There is also a male predominance noted in this study, which is consistent with the above studies conducted in Pakistan. This is most likely due to cultural and social factors, whereby male children are more likely to receive medical care compared to females.

For more than 25 years, LBW has been observed to be one of the major risk factors for neonatal admissions in multiple studies conducted in many developing countries.<sup>9</sup> In this study, LBW was found in 37.7% of patients; this can be compared to 39% in Lahore,<sup>8</sup> 36% in Larkana,<sup>7</sup> 55.4% in Karachi<sup>6</sup> and 41.2% in Peshawar.<sup>5</sup> The incidence of LBW is higher in Pakistan compared to other developing countries; for instance, LBW was 20% in a study done in India,<sup>10,11</sup> 13.25% in a Bangladesh study<sup>12</sup> and 11.02% in an Ethiopian one.<sup>13</sup> The higher rate of LBW observed in Pakistan may be due to multiple factors, including the poor nutritional status of mothers, inadequate facilities for antenatal care and the high illiteracy rate.

Preterm birth rates have been reported to range from 5% to 7% of live births in some developed countries, but are estimated to be substantially higher in developing countries.<sup>14</sup> In this study, prematurity was the reason for admission in 27.9% of neonates. This rate was higher than in a study done in Karachi<sup>6</sup> which reported that 6.8% of neonates were admitted for prematurity. The figure from the current study is higher as the AKMCC neonatal unit is the primary referral center for newborns from rural areas, and the majority of preterm babies (41.8%) are admitted for care.

In this study, infection as the reason for admission accounted for 20.33% of cases, as compared to 28.72% reported in Peshawar<sup>5</sup> and 45.2% in Karachi.<sup>6</sup> The majority of neonatal infections are due to unhygienic conditions and unsterilised delivery practices.<sup>9</sup> Neonatal sepsis continues to be a major cause of morbidity and mortality in Pakistan. It is

also one of the major causes of neonatal mortality in developing countries in general—contributing to 15% of all neonatal deaths.<sup>15</sup> Neonatal sepsis in this study was the most prevalent infection, accounting for 70.8% of all infections. Additionally, acute gastroenteritis was also seen in 8.22% of the cases.

In this study, birth asphyxia was 13% as compared to 16.52% of neonates in the study conducted in Peshawar,<sup>5</sup> 18.85% in the Karachi study<sup>6</sup> and 40.66% in Lahore.<sup>8</sup> The important risk factors for birth asphyxia reported from a study conducted in Hyderabad, India, include the lack of antenatal care, poor nutritional status, antepartum haemorrhaging, maternal toxemia and having a home delivery.<sup>2</sup> Antenatal monitoring of high-risk pregnancies, timely referrals, resuscitation at the time of birth and improving maternal health levels are mandatory to reduce the high number of case fatalities and morbidities related to birth asphyxia.

Neonatal hyperbilirubinaemia resulting in clinical jaundice is a common problem among infants.<sup>16</sup> Information about the incidence of NNJ in developing countries is lacking, as the vast majority of births occur at home. The majority of the data is from tertiary care or intensive care nurseries with no population denominator.<sup>17</sup> NNJ was responsible for 11.3% of neonatal admissions to the AKMCC neonatal unit, in comparison to 20% in the study done in Peshawar,<sup>5</sup> 15% in Karachi<sup>6</sup> and 8.3% in Lahore.<sup>8</sup> Higher incidences of jaundice in neonates have been reported from other developing countries, such as Bangladesh and Nigeria (30.71% and 17.25%, respectively).<sup>18,19</sup>

The neonatal mortality rate reported in this study was 6.8%. This is significantly lower than the rates reported from other locations, for instance in the Peshawar study the rate was 14.87%,<sup>5</sup> in the Karachi one 25.85%,<sup>6</sup> in Lahore 34%<sup>8</sup> and in Larkana 38%.<sup>7</sup> The major causes of neonatal mortality in the current study were prematurity (52.8%), birth asphyxia (20.8%) and neonatal infections (9.4%) [Table 2].

This study showed that 7.4% of the neonates required admission during the initial 24 hours after birth only for observation; there is no comparative data available from other studies. The major reason for neonates needing admission for observation were feeding issues, meconium-stained liquor or a previous poor obstetric history. This rate of admission for observation is due to the non-

availability of 'rooming-in' nurseries (where the baby stays in the same room as the mother) and the inadequate care of newborns at maternal wards in primary care centres across the Sindh province. In this study, 86.7% were satisfactorily discharged after receiving the necessary treatment. This percentage could be due to an increased awareness among health workers about neonatal care, and the provision of the best possible care in spite of limited resources. The second factor is the large number of infants (7.4%) admitted with minor problems requiring observation. Additionally, the rate of patients leaving against medical advice in this study was lower than that reported in the Peshawar study (7.08%),<sup>5</sup> and is potentially due to the increased awareness among parents regarding the better management of their children in hospitals.

A limitation of this study was that blood cultures and other markers suggestive of neonatal infections, including C-reactive protein, were not performed in all cases of suspected neonatal sepsis.

## Conclusion

Prematurity, LBW, birth asphyxia and NNJ were the major causes of neonatal admissions in this study. The number of admissions due to these causes could be reduced by encouraging proper antenatal care for pregnant women, timely interventions, and the proper and in-time referral of all high-risk pregnancies to tertiary care centre.

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