

## Why our neonates are dying? Pattern and outcome of admissions to neonatal units of tertiary care hospitals in Peshawar from January, 2009 to December, 2011

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### Abstract

**Objectives:** To find out the frequency of neonatal mortality in tertiary care hospitals to determine the common causes.

**Methods:** The descriptive retrospective study was conducted in the Paediatric wards of Kuwait Teaching Hospital and Khyber Teaching Hospital, Peshawar, Pakistan, and comprised data from hospital registers from January, 2009 to December, 2011. A structured proforma was used as the data collection tool.

**Results:** There were 4497 neonatal admissions in both hospitals; 4067(90.4%) at Khyber and 430(9.5%) at Kuwait. Overall neonatal deaths were 726(16%); 703(17.2%) in Khyber and 22(5.1%) in Kuwait. Major causes of neonatal deaths were Multiple 341(48.50%), General 99(14%) and Infections 81(11.52%) at Khyber Teaching Hospital, whereas at Kuwait Teaching Hospital, they were Central Nervous System 8(36.30%), General 5(22.72%), and Infections 4(18.10%).

**Conclusion:** Increased awareness regarding timely referral to tertiary care hospitals is essential for the health workers who conduct deliveries at home, maternity homes, private hospitals and clinics.

**Keywords:** Neonatal death, Preterm birth, Neonatal sepsis, Birth asphyxia, Hypoxic ischaemic encephalopathy. (JPMA 66: 40; 2016)

### Introduction

Around 12 million children <5 years of age die every year in the Third World,<sup>1</sup> and of them a large majority die before reaching the first birthday.<sup>2</sup> Half of infant mortality is constituted by neonatal mortality, mostly during first week of life.<sup>3,4</sup> The death of a baby in the first 28 days of life is called neonatal mortality.<sup>5</sup> It is estimated that the neonatal component of deaths in children <5 years (38% in 2000) is increasing worldwide.<sup>6</sup> The severity of the issue can be judged by the fact that approximately 19,000 babies died in their first month of life in the United States alone during 2006.<sup>7</sup>

Neonatal mortality is common in 10 countries; most of them being in Asia, accounting for 2/3rd of the global neonatal mortality. Unfortunately, Pakistan stands 3rd among these countries. An estimated 298000 neonatal deaths occur annually in Pakistan, accounting for 7% of neonatal deaths worldwide.<sup>8,9</sup> Major causes accounting for 87% of neonatal deaths worldwide include Infection (36%), preterm birth (28%) and birth asphyxia (23%).<sup>10</sup> Neonatal mortality causes vary by country, and depends upon the availability and the

provision of healthcare services because neonatal mortality has intimate relation to these factors.<sup>11</sup>

In Pakistan, data regarding neonatal mortality mostly comes from hospital studies. The Millennium Development Goal (MDG) for child survival seems unachievable if extraordinary efforts for reducing neonatal mortality are not made.<sup>12</sup> In Pakistan, a gradual decline has been noted in infant mortality during the last 3 decades, but there has been no or little change in neonatal mortality.<sup>13</sup> It is due to poor perinatal health services and insufficient information about the factors responsible for high neonatal mortality in Pakistan.<sup>14</sup> While other factors need to be determined and serious attention must be paid to ensure reduction in neonatal mortality, it is basically due to poor perinatal health services and insufficient information about the factors responsible for high neonatal mortality in Pakistan.<sup>14</sup> A lot of efforts have been made to prevent mortality from neonatal tetanus in this country.<sup>15</sup> According to the World Health Organisation (WHO), preterm birth accounts for 30% of global neonatal deaths, sepsis or pneumonia for 27%, birth asphyxia for 23%, congenital abnormality for 6%, neonatal tetanus for 4%, diarrhoea for 3%, and other causes for 7% of all neonatal deaths.<sup>16</sup>

A retrospective study carried out in Neonatal Unit (NNU) of Rawalpindi General Hospital (RGH) from January to December 1995, concluded that neonatal infections and

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birth asphyxia were two major causes of neonatal mortality (37% and 31% respectively), followed by idiopathic respiratory distress syndromes (IRDS), meconium aspiration syndrome (MAS) and congenital malformations. Besides, 68% mortality was contributed by low birthweight (LBW), 74% of them being preterm, suggesting high mortality among LBW-preterm infants. Other less common contributory factors were maternal medical disease, complicated deliveries and multiple gestation.<sup>17</sup> Hospital studies conducted in Pakistan indicated that neonatal infections and birth asphyxia were the two major causes of neonatal mortality, followed by others such as IRDS, MAS and congenital anomalies. Other factors still need to be determined and serious attention must be paid to ensure reduction in neonatal mortality.<sup>18,19</sup>

Since 2007, no study on the issue has been conducted in Peshawar. As neonatal mortality is increasing, not decreasing, and the nation lagging behind MDG targets, the grave matter needs to be highlighted. The current study, as such, was planned to identify the common causes for neonatal mortality in Peshawar district, with an urgent need to plan and propose preventive and effective measures to safeguard against its very high incidence.

## Patients and Methods

The descriptive retrospective study was conducted at Khyber Teaching Hospital and Kuwait Teaching Hospital, Peshawar, Pakistan, from December 17, 2012, to January 30, 2013, and comprised records from the two sites related to the three-year period between January, 2009 and December, 2011.

Khyber Teaching Hospital has been providing tertiary healthcare to the local population and teaching facilities to undergraduate as well as postgraduate medical students in the Khyber Pakhtunkhwa (KP) province since 1976. Kuwait Teaching Hospital is a private charity-based hospital with 250-bed capacity, delivering health services to the poor, miserable and ailing community of entire KP, federally administered tribal areas (FATA) and adjoining areas of Afghanistan, along with teaching services to undergraduate and postgraduate medical students. Both hospitals have Neonatal Intensive Care Unit (NICU) with sufficient beds and human resources for such services except ventilators. Both hospitals are situated on the busy Jamrud Road, having the same catchment area, and offering medical umbrella services. Both NICUs admit all patients except those requiring mechanical ventilation and those with surgical problems as separate units are available for such patients.

As it was a retrospective review of the hospital registers, the sample size was not calculated. Data was recorded on

a structured proforma, containing patient's identity, gender, neonatal age, address and cause of death. Weight of the neonates was not mentioned in the registers so that was not taken into account.

All causes of neonatal deaths were classified system wise, as General (preterm, prematurity, LBW), Infections (neonatal sepsis), Respiratory (pneumonia, IRDS, MAS), Central Nervous System (hypoxic ischemic encephalopathy, meningitis, birth asphyxia), Cardiovascular (heart disease), Metabolic (jaundice, infant of diabetic mother), other (hypothermia, severe anaemia), and Congenital (dysmorphism, meningocele, congenital anomalies).

Neonatal mortality is expressed as the number of such deaths per 1000 live births in a specific geographic area or institution in a given time. Preterm birth is when birth occurs at less than 37 completed weeks/259 days of gestation;<sup>20</sup> neonatal sepsis is a blood infection that occurs in an infant younger than 90 days old;<sup>21</sup> birth asphyxia is the failure to establish breathing at birth,<sup>22</sup> hypoxic ischaemic encephalopathy (HIE) is characterised by clinical and laboratory evidence of acute/sub-acute brain injury due to asphyxia which is also known as perinatal asphyxia.<sup>23</sup>

Records included related to neonates who succumbed to death in the first 28 days of life at the hospital without any re-admission. Those who died after 28 days of life were excluded.

Consent was taken before data collection from the Head of Department of the Paediatric wards and Medical Superintendents of the two hospitals, and patient identity and personal information were kept confidential.

Data was entered into Microsoft Excel 2007, and frequencies and percentages were calculated.

## Results

There were 4497 neonatal admissions in both hospitals; 4067(90.4%) at Khyber and 430(9.5%) at Kuwait. Overall neonatal deaths were 726(16%); 703(17.2%) in Khyber (Figure-1) and 22(5.1%) in Kuwait (Figure-2).

Major category-wise causes of neonatal deaths were Multiple 341(48.50%), General 99(14%) and Infections 81(11.52%) at Khyber Teaching Hospital, whereas at Kuwait Teaching Hospital, they were Central Nervous System 8(36.30%), General 5(22.72%), and Infections 4(18.10%) (Table).

Multiple causes of neonatal deaths in the Kuwait Teaching Hospital accounted for 3 (4.50%) of HIE and neonatal sepsis, preterm and neonatal sepsis and IRDS and hypothermia. All the 3(13.6%) deaths due to Multiple

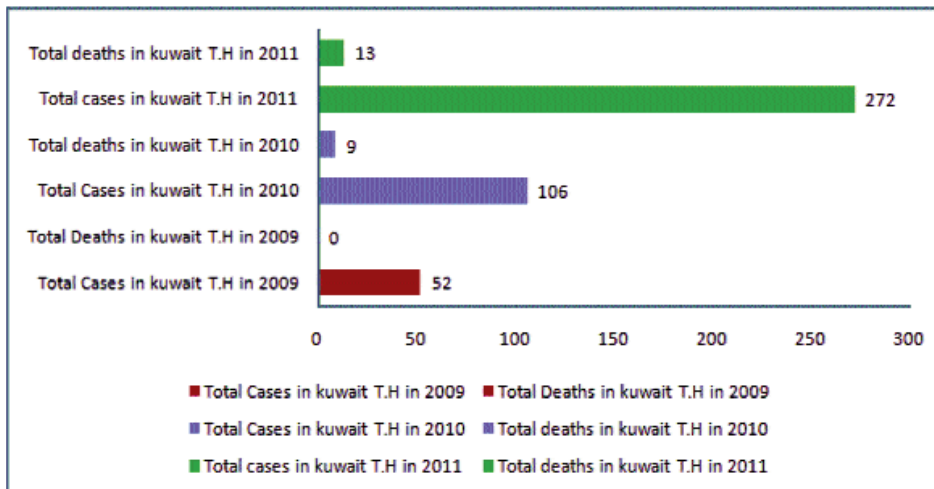


Figure-1: Mortality profile at Kuwait Teaching Hospital, Peshawar.

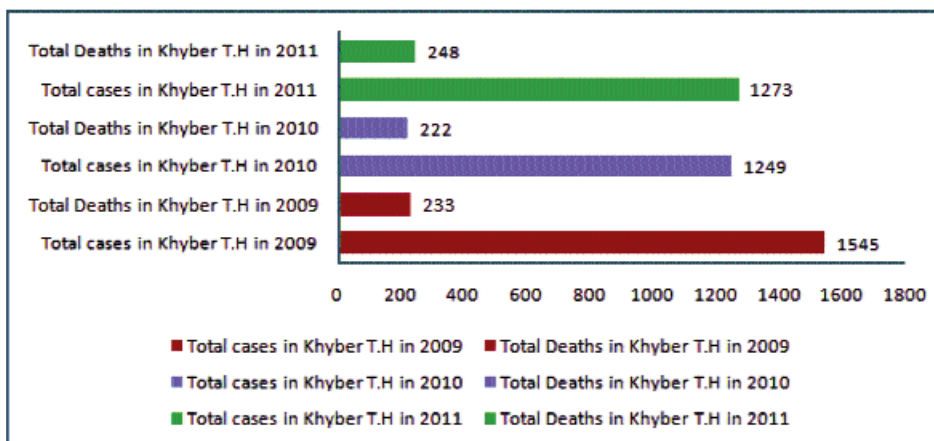


Figure-2: Mortality profile at Khyber Teaching Hospital, Peshawar.

causes in Kuwait Hospital occurred in 2011, and they included HIE in combination with neonatal sepsis 1(33.3%), preterm birth in combination with neonatal sepsis 1(33.3%) and IRDS in combination with hypothermia and apnoea spells 1(33.3%).

Of the 341(48.5%) deaths due to Multiple causes at Khyber Hospital were in combination of different diseases. In 2009, most deaths were due to sepsis in combination with HIE 33(9.6%), neonatal sepsis in combination with preterm birth 24(7%), preterm birth in combination with IRDS 24(7%), neonatal sepsis with pneumonia 22(6.45%) and neonatal sepsis with Jaundice 18(5.27%). In 2010, neonatal deaths were caused by sepsis/asphyxia, preterm neonatal sepsis/IRDS, preterm neonatal sepsis/congenital malformations, preterm birth IRDS/hydrops foetalis,

preterm birth/pneumonia and preterm birth/jaundice; with the frequency being 2(0.58%) for each combined cause. More causes under the Multiple head were neonatal sepsis/intrauterine growth retardation (IUGR), neonatal sepsis/jaundice, neonatal sepsis/hypothermia and preterm birth, sepsis/hypokalaemia 1(0.29%) each.

Combined causes for neonatal deaths in 2011 were preterm/hydrocephalus, preterm/congenital heart disease (CHD), pneumonia CHD / congenital, pneumonia/meningitis, meningocele/neonatal sepsis, meningocele/congenital anomalies and intracranial bleeding 1(0.29%) each.

The most common single causes of neonatal mortality at Khyber Hospital were preterm, neonatal sepsis, HIE and jaundice, accounting for 98(27%), 81(22.3%), 73(20.1%) and 41(11.4%) deaths. In terms of categories, these deaths were reported under General, Infections, Central Nervous System (CNS) and Metabolic causes respectively.

At Kuwait Hospital, 8(42.1%) neonates died due to birth asphyxia falling under the CNS category, 4(21%) due to preterm and LBW causes of the General category and 1(4.5%) death each attributed to MAS under the Respiratory category, and neonatal jaundice under the Metabolic causes.

Gender-wise distribution was found higher in males at Khyber Hospital compared to females, contributing to 483(68.7%) of total deaths. At Kuwait Hospital, neonatal mortality was higher in females compared to the males, accounting for 14(63.6%) deaths. At Khyber Hospital, 379(53.9%) of the total deaths were reported from Peshawar, 56(8.3%) cases came from Charsadda, and 42(5.9%) from Malakand. At Kuwait Hospital, 18(81%) deaths related to cases from Peshawar, 2(9.1%) from

**Table-1:** Causes of Neonatal deaths in Khyber and Kuwait teaching hospitals.

Causes In Khyber Teaching Hospital	Numbers	Percentages
Multiple	341	48.50%
General	99	14.08%
Infections	81	11.52%
Central Nervous System	80	11.37%
Metabolic	43	6.11%
Respiratory System	32	4.55%
Others	18	2.56%
Congenital Anomalies	6	0.85%
Cardiovascular System	3	0.42%

Causes In Kuwait Teaching Hospital	Deaths	Percentages
Central Nervous System	8	36.30%
General	5	22.72%
Infections	4	18.10%
Multiple	3	13.60%
Respiratory System	1	4.50%
Metabolic	1	4.50%
Cardiovascular System	0	0%
Congenital Anomalies	0	0%
Others	0	0%

Nowshera, and 1(4.5%) from Kurram Agency, FATA.

## Discussion

Studies conducted worldwide and in other regions of Pakistan clearly show prematurity, sepsis and birth asphyxia as the major causes of neonatal mortality, particularly in developing countries.<sup>6,8,10,14</sup> These results are exactly in accordance with our study results for neonatal mortality. A study conducted in Rawalpindi General Hospital showed 9% neonatal mortality 268/3005.<sup>15</sup> Compared to our results, the percentage is considerably low, and one of the reasons may be that the number of patients admitted at Kuwait Teaching Hospital were quite less compared to the number of patients admitted in the Rawalpindi General Hospital.<sup>15</sup> Another reason, which was provided by doctors in the Paediatric ward of Kuwait Hospital, can be that many of the serious patients from Kuwait Hospital, are referred to other hospitals and they are not admitted in Kuwait Hospital at all.

An international study clearly stated that neonatal mortality in public-sector hospitals is 7 times higher compared to private-sector hospitals,<sup>16</sup> which is in accordance with the results computed in our study showing high mortality at public-sector Khyber Teaching Hospital. However, to determine the exact reason for this difference, further research needs to be done.

A study conducted at Georgia concluded that neonatal mortality was higher in male infants and more

pronounced for infants weighing between 1501-2500 gm.<sup>17</sup> This is also in accordance with our study and suggests that high incidence of IRDS is because of slower maturation among male foetuses, which is a major contributing factor to gender difference in neonatal mortality. The only difference with this study was that we did not take into account weights of the neonates.

Another study carried out in Malaysia found females having lower odds of mortality than males during the first month of life,<sup>18</sup> which is consistent with our results. According to WHO,<sup>19</sup> almost half of the premature deaths in low-income settings are due to a lack of feasible, cost-effective care, such as warmth, breastfeeding support, and basic care for infections and breathing difficulties, that may be the reason for prematurity as one of the major causes of neonatal mortality in both Khyber and Kuwait hospitals.

Neonatal sepsis can occur due to maternal causes or it can be hospital-acquired.<sup>26</sup> The common maternal causes are infection of the mother with Group B streptococci during pregnancy, early rupture of maternal membranes (almost 24 hours before delivery), and premature birth of the baby and infection of the placental tissue or amniotic fluid. The common hospital-acquired reasons are prolonged catheterisation of the neonate after birth, prolonged stay of the neonate in hospital after birth.<sup>24</sup> These causes of neonatal sepsis clearly signify that lack of perinatal and antenatal care leads to death of majority of the neonates due to sepsis. HIE and it is prequel birth asphyxia, are mainly caused due to maternal factors, such as anaemia, hypotension and abruption of placenta. In most cases, the cause remains unknown.<sup>24</sup> However, considering the above-mentioned factors which lead to birth asphyxia and HIE, proper antenatal care can reduce mortality both due to birth asphyxia and HIE to some extent.

Most of the cases of neonatal mortality in our study belonged to district Peshawar. The obvious reason for this may be the fact that since there is a high prevalence of poverty in Pakistan and people often do not have enough expenses to receive treatment in hospitals which are located outside their cities, therefore they prefer to get treated at local hospitals that are usually cost-effective and easy to access. However, we could not find a study to support this explanation.

In terms of limitations, the data was taken from hospital records retrospectively and there is a possibility that the cause of death in some neonates was not properly diagnosed or error may have crept in to the hospital charts. This might have led to some error in the determination of common causes of neonatal mortality in the two hospitals.

The causes of neonatal mortality reflect poor prenatal



health services in the country. Hence, there is a need for coordinated efforts to organise and regionalise maternal, child health and prenatal health services with the help of a neonatal task force. Mortality could be reduced by proper antenatal checkup of the pregnant women, timely intervention, in-time referral to tertiary care centres for deliveries of all high-risk pregnancies and conducting sterile and safe deliveries at homes. Another important factor is to create awareness among all health workers dealing with pregnant women for timely referral of high-risk pregnancies. Increased number of deaths due to infection and premature/LBW babies could be prevented by adopting the simple strategy of proper hand-washing, minimal handling and close observation for all these neonates in the Neonatal Unit.

The government needs to invest more in the healthcare system to ensure quality care for women and newborns. Community-based intervention is also required and should focus on child-spacing, childbearing at a younger age, and poverty eradication programmes, particularly in rural areas, to reduce avoidable neonatal deaths in Pakistan.

## Conclusion

Preterm birth, birth asphyxia, LBW and neonatal sepsis were the major causes of deaths in neonates in both hospitals studied. Males were the victims of neonatal mortality at public-sector hospital, whereas the reverse was true of the private-sector facility. Peshawar was the most vulnerable district regarding these neonatal deaths.

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## References

1. The state of world's children; UNICEF. New York, USA: Oxford University Press, 1993; 1-24.
2. The state of the world's children 1998. UNICEF. New York, USA: Oxford University Press, 1998
3. Jalil F, Lindblad BS, Hanson LA, Khan SR, Yaqoob M, Karlbug J. Early child health in Lahore, Pakistan: IX. Perinatal events. *Acta Paediatr Supp* 1993; 82 Supp 390: 95-107.
4. Government of Sindh and UNICEF. Situation analysis of children and women in Sindh. UNICEF; 1993.
5. Mosby's medical dictionary. 8th ed. 2009. [Online] [Cited 2012 Dec 11]. Available from: URL: <http://medical-dictionary.thefreedictionary.com/neonatal+death>
6. Lawn JE, Cousens S, Zupan J; Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: When? Where? Why? *Lancet* 2005; 365: 891-900.
7. Heron M, Hoyert DL, Murphy SL, Xu J, Kochanek KD, Tejada-Vera B. Deaths: Final data for 2006. *National Vital Statistics Reports* 2009; 57.
8. World Health Report 2005. Make every mother and child count. Geneva: WHO; 2005.
9. Jalil F. Perinatal health in Pakistan: a review of the current situation. *Acta Paediatr* 2004; 93: 1273-9
10. Lawn JE, Cousens SN, Wilczynska K. Estimating the causes of four million neonatal deaths in the year 2000: statistical annex. In: *The world health report 2005*. Geneva: WHO; 2005
11. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L, et al. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; 365: 977-88.
12. Martines J, Paul V, Bhutta ZA, Koblinsky M, Saucat A, Walker N, et al., et al. Neonatal survival: a call for action. *Lancet* 2005; 365: 1189-97.
13. Bhutta ZA. Epidemiology of neonatal sepsis in Pakistan. An analysis of available evidence and implications for care. *J Coll Physicians Surg Pak* 1996; 6: 12-7.
14. Bhutta ZA. Priorities in newborn care and development of clinical neonatology in Pakistan. Where to now? *J Coll Physicians Surg Pak* 1997; 7: 231-4.
15. Suleiman O. Mortality from tetanus neonatorum in Punjab (Pakistan). *Pak Paediatr J* 1982; 6: 152-83.
16. Bryce J, Boschi-Pinto C, Shibuya K, Black RE. The WHO Child Health Epidemiology Reference Group. WHO estimates of the causes of death in children. *Lancet* 2005; 365: 1147-52.
17. Tariq P, Kundi Z. Determinants of Neonatal Mortality. *J Pak Med Assoc* 1999; 49: 56-60
18. Rehman A, Qureshi AM, Najeel S, Siddiqui TS, Idris M, Ahmad T. An Audit Of Morbidity And Mortality Of Hospitalized Neonates In Neonatal Care Unit Of A Tertiary Care Hospital In Abbottabad. *J Ayub Med Coll Abbottabad* 2011; 23: 23-5
19. Esteves PAP, Gama SGN, Leal MC. Infant mortality in a sample of births in the municipality of Rio de Janeiro 1999-2001: linkage with the Mortality Information System. *Rev Bras Saude Mater Infant* 2007; 7: 83-8..
20. Preterm Birth. November 2012. [Online] [Cited 2013 Feb 2]. Available from: URL: <http://www.who.int/mediacentre/factsheets/fs363/en/index.html>. Accessed February 2, 2013
21. Neonatal Sepsis. September 2011; [1 screen]. Available from URL: <http://www.nlm.nih.gov/medlineplus/ency/article/007303.htm>.
22. Ola Didrik Saugstad. Birth Asphyxia. 2007. [Online] [Cited 2013 Feb 2]. Available from URL: [http://www.curoservice.com/health\\_professionals/news/pdf/10-09-2007\\_birthing\\_asphyxia01.pdf](http://www.curoservice.com/health_professionals/news/pdf/10-09-2007_birthing_asphyxia01.pdf).
23. Hypoxic- Ischemic Encephalopathy-Medscape Reference. [Online] [Cited 2013 Feb 2] Available from: URL: <http://emedicine.medscape.com/article/973501-overview>
24. Khoury MJ, Marks JS, McCarthy BJ, Zaro SM. Factors effecting the sex differential in neonatal mortality. *Am J Obstet Gynecol* 1985; 151: 777-82.