Original Research Article

Morbidity and mortality pattern among babies admitted in special newborn care unit, Nellore, Andhra Pradesh, India

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ABSTRACT

Background: India contributes to 25% of neonatal mortality around the world. In developing countries neonatal mortality is quite high despite of advances in perinatal and neonatal care. The establishment of Special Newborn Care Units (SNCU) has been quite essential in reducing the neonatal morbidity and mortality. This study was conducted to assess the outcome of SNCU at a newly commissioned tertiary care teaching hospital at Nellore District, Andhra Pradesh. Aim of this study the morbidity and mortality patterns in an SNCU at tertiary care teaching hospital.

Methods: It was a Retrospective, Hospital based, Descriptive study which was done among neonates admitted to SNCU, Nellore District, Andhra Pradesh for a period of 1 year (January 2015-December 2015). All the neonates admitted to SNCU, Nellore District, Andhra Pradesh during the study period were included in the study. Data was recorded in a predesigned semi-structured proforma. the data was entered into excel-sheet and analyzed using SPSS software version 21.

Results: A total of 1015 babies were included in the study. Almost half 592(58.32%) were born in this hospital(inborn) and 423(41.67%) babies were referred from peripheral hospitals and nursing homes (out born). about 3/4th 767(75.5%) of babies were admitted in the first 24 hours of life. Almost half (53.4%) of the study group were male and 46.6% were female. The chief causes of admission in SNCU were Respiratory Distress Syndrome (40.2%) followed by birth asphyxia (19.1%), sepsis (13.3%), Neonatal Jaundice (9.9%) and prematurity (6.6%). In our study 63.0% patients were discharged, 19.3% had left hospital against medical advice, 10.1% died and 7.6% were referred to other institutions for specialized treatment.

Conclusion: Respiratory Distress Syndrome, neonatal sepsis, neonatal hyperbilirubinemia, and HIE as the major causes of morbidity. Low Birth Weight and prematurity were the commonest contributors of death, therefore, attempts to prolong the pregnancy each week might improve the neonatal outcome considerably.

Keywords: Neonate, Neonatal period, Neonatal morbidity, Neonatal mortality, Neonatal care, Perinatal care, Special newborn care unit

INTRODUCTION

The first 28 days of life is called the neonatal period, which is vulnerable to many complications that may lead to increased morbidity and mortality. India contributes to 25% of neonatal mortality around the world. In developing countries, neonatal mortality is high despite of advances in perinatal and neonatal care. This study was undertaken to study the morbidity and mortality pattern of neonates admitted to Special Newborn Care

Unit (SNCU) of a newly commissioned tertiary care teaching hospital, Nellore, Andhra Pradesh, India.

The perinatal and neonatal period, despite of its short duration, is considered as the most critical phase of life. It reflects the general health as well as the various socio-biological features of mothers and infants.[1]

Neonates are vulnerable and fragile beings. Many of them would fall sick despite precautions and care, especially in resource poor home settings. Early identification of serious illness and seeking health care are the key factors in averting neonatal morbidity.[2]

In 2004 there were 133 million live births; 3.7 million of these died in the neonatal period. Ninety-eight per cent of deaths took place in the developing world, where 90% of babies were born. According to these new estimates, neonatal mortality in developing countries was 31 deaths per 1000 live births of those deaths, 76% occurred in the early neonatal period.[3] Most neonatal deaths (99%) arise in low-income and middle-income countries.[4] About a quarter of global neonatal deaths occur in India.[5] According to the SRS Statistical report 2013, the current neonatal mortality rate (NMR) in India is 28. The percentage of neo-natal deaths to total infant deaths is 68.0 per cent at the National level. Among the bigger States, neo-natal mortality ranges 4 from 37 in Odisha to 6 in Kerala.[6] According to NFHS -3 Infant mortality rate in INDIA is 57 per 1000 live births, among this neonatal mortality is 39 per 1000 live births. But in Andhra Pradesh the Infant mortality rate (IMR) is 41.[7]

Three levels of neonatal care are envisaged. Newborn-care corners are established at every level to provide essential care at birth, including resuscitation. Level I care includes referral of sick newborns from Primary Health Centres (PHCs) to higher centres and care at Neonatal Stabilization Units (NSUs) in the first referral units. Care in the NSUs includes stabilization of sick newborns and care of low-birthweight (LBW) babies not requiring intensive care. Level II care includes functioning of Special Care Newborn Units (SCNUs) at the district hospital level. These units are equipped to handle sick newborns other than those who need ventilator support and surgical care. The level III units are the neonatal intensive care units.[8]

India has witnessed a significant reduction in the number of neonatal deaths from 1.35 million in 1990, to around 0.76 million in 2012. Over that period, from 1990-2012, while neonatal deaths reduced by 44%, child deaths (under 5 years) reduced by 59%. As a result, the contribution of neonatal deaths to under-5 deaths increased from 41% in 1990 to 56% in 2012, which is higher when compared to the contribution observed globally (44%). During the same period, the global under-5 death rate reduced by 50%, and the global neonatal mortality rate by only 37%. During the last 12 year period i.e. 2000-2012, the Average Annual Rate of Reduction (AARR) for Neonatal Mortality Rate (NMR) has been 3.4% per year, the major causes of newborn deaths in India are pre-maturity/preterm (35%); neonatal infections (33%); intra-partum related complications/birth asphyxia (20%); and congenital malformations (9%).[9]

METHODS

Study Design was a Retrospective, Hospital based, Descriptive study which was done among neonates admitted to SNCU, Nellore District, Andhra Pradesh, India. It takes 1 year (January 2015-December 2015) study period.

Inclusion criteria

All the neonates admitted to SNCU, Department of pediatrics, ACSR Government Medical College, Nellore, Andhra Pradesh during the study period were included in the study.

Exclusion criteria

The neonates whose data was not recorded/partially recorded.

Study tool

The data was collected using predesigned semi-structured proforma from hospital registers after obtaining permission from the Hospital Superintendent. The data was entered in Excel Sheet and analyzed using SPSS software version 21.

Institutional ethics committee permission was obtained for the conduct of the study.

RESULTS

A total of 1015 babies were included in the study.

It was depicted in Table:1 that Almost half (53.4%) of the study group were male and 46.6% were female. Almost half 592 (58.32%) were born in this hospital(inborn) and 423 (41.67%) babies were referred from peripheral hospitals and nursing homes (out born). About 3/4th 767(75.5%) of babies were admitted in the first 24 hours of life. Coming to the Maturity of newborns, it was found that more than half (59%) of the subjects were full term newborns while 40.6% subjects were preterm newborns. Only few 0.4% of the babies were Post term.

It was depicted in Figure 1, the chief causes of admission in SNCU were Respiratory Distress Syndrome 408(40.2%) followed by birth asphyxia 194(19.1%), sepsis 135(13.3%), Neonatal Jaundice 100(9.9%), prematurity 67(6.6%), asphyxia with Meconium stained liquor 49(4.8%), Metabolic complications 41(4%) and 0nly 21(2.1%) babies with other complications.

Figure 2 depicts regarding the Distribution of study participants based on their Outcome after admission into SNCU. It was observed that majority 639(63%) of the patients were discharged after improvement. Around 196(19.3%) had left the hospital against medical advice. Only 10.1% died in the hospital while 7.6% were referred to other institutions for specialized treatment.

It was depicted in Table 2 On applying t-test it was observed that the mean age of female patients is found to be higher (2.66 days) compared to that of male patients (2.17 days) but however the difference is not statistically significant.

Table 3 depicts regarding the age of the babies who are getting admitted into SNCU, almost 3/4th (75%)of the babies were 24hrs old, followed by babies >48hrs old (17.24%) and babies with age 24-48hrs(7.2%).

Table 4 depicts that the mean weight of female patients is found to be lower (2.18 Kg) compared to that of male patients (2.26 Kg) but however the difference is not statistically significant.

Table 5 depicts regarding maturity status compared between male and female patients; it was found that slightly higher proportion of the female patients were preterm (41.4%) compared to that of male patients (39.9%). However, the differences of maturity status by gender were not found to be statistically significant.

Table 6 depicts regarding Comparison of Outcome between male and female patients, it was found that slightly higher proportion of death was found among female patients (10.6%) compared to that of male patients (9.8%). The proportion of recovery measured by discharge was also found to be higher in female patients (64.9%) compared to that of male patients (61.3%). However the differences of outcome by gender were not statistically significant.

Table 7 Outcome compared by type of diagnosis, it was found that higher proportion of death was found among those prematurity (13.4%) followed by sepsis (12.6%) and RDS (11.3%). The proportion of recovery was found to be highest in those patients with neonatal jaundice (86.0%) and in those with birth asphyxia with meconium stained liquor (71.4%). The differences of outcome by diagnosis were also found to be statistically significant.

Almost half 542(53.4%) of the study group were male and 473(46.6%) were female. Almost half 592 (58.32%) were born in this hospital (inborn) and 423 (41.67%) babies were referred from peripheral hospitals and nursing homes (out born).

Coming to the Maturity of newborns, it was found that more than half (59%) of the subjects were full term newborns while 40.6% subjects were preterm newborns. Only few 0.4% of the babies were Post term.

Table 1: Baseline data of study participants (N=1015).

Variable	No. of patients	Percentage
Gender		
(a) Male	542	53.4%
(b) Female	473	46.6%
Type of patients		
(a) In-patient	592	58.3%
(b) Outpatient	423	41.7%
Maturity of newborns		
(a) Preterm	412	40.6%
(b) Full term	599	59.0%
(c) Post term	4	0.4%

The chief causes of admission in SNCU were Respiratory Distress Syndrome 408(40.2%) followed by birth asphyxia 194(19.1%), sepsis 135(13.3%), Neonatal Jaundice 100(9.9%), prematurity 67(6.6%), asphyxia with Meconium stained liquor 49(4.8%), Metabolic complications 41(4%) and 0nly 21(2.1%) babies with other complications.
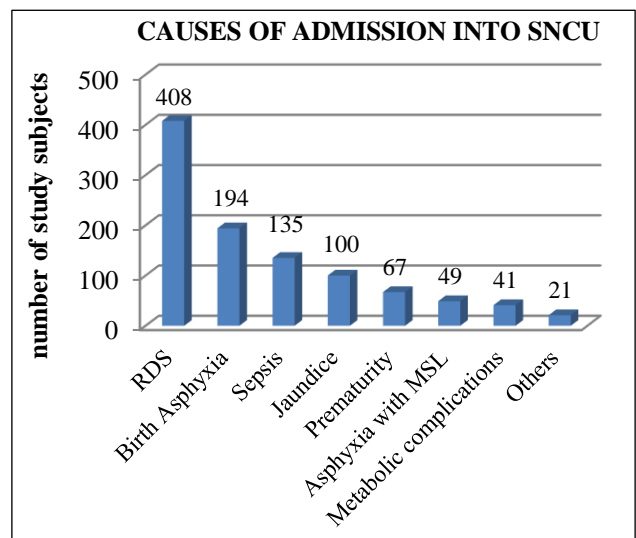
Figure 1: Distribution of study participants based on chief causes of admission in to SNCU (N=1015) diagnosis among patients.
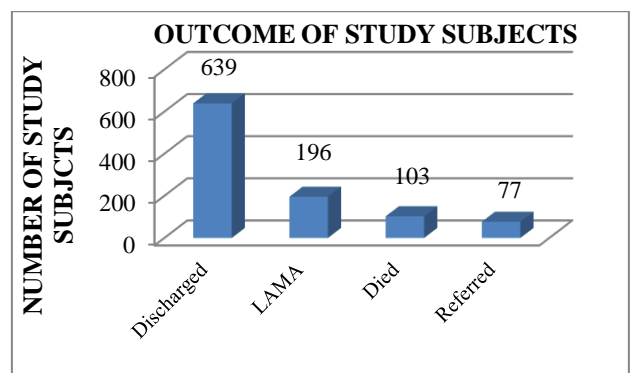
Figure 2: Distribution of study participants based on their Outcome after admission into SNCU (N=1015).

Majority 639(63%) of the patients were discharged after improvement. Around 196(19.3%) had left the hospital against medical advice. Only 10.1% died in the hospital while 7.6% were referred to other institutions for specialized treatment.

Table 2: Age in days (Mean±SD) of male and female patients.

Gender	No. of subjects	Age in days	
		Mean	SD
Male	542	2.17	3.71
Female	273	2.66	6.86
Overall	1015	2.40	5.42

t= 1.43; p=0.15; Not Significant.

Almost half 542(53.4%) of the study group were male and 473(46.6%) were female. The mean age of female patients is found to be higher (2.66 days) compared to that of male patients (2.17 days) but however the difference is not statistically significant.

Table 3: Age (in hours) in Inborn Vs Out born babies at the time of admission.

Age(in hours)	Inborn	Out born	Total
<24hrs	454(59.19%)	313(40.81%)	767(75.56%)
24-48hrs	40(54.79%)	33(45.2%)	73(7.19%)
>48hrs	95(54.29%)	80(45.71%)	175(17.24%)

Regarding the age of the babies who are getting admitted into SNCU, almost 3/4th (75%) of the babies were 24hrs old, followed by babies >48hrs old (17.24%) and babies with age 24-48hrs (7.2%). The mean weight of female patients is found to be lower (2.18 Kg) compared to that of male patients (2.26 Kg) but however the difference is not statistically significant.

It was found that slightly higher proportion of the female patients were preterm (41.4%) compared to that of male patients (39.9%). However, the differences of maturity status by gender were not found to be statistically significant (p=0.08; NS).

Table 4: Weight in Kg. (Mean±SD) of male and female patients.

Gender	No. of subjects	Weight in Kg	
		Mean	SD
Male	542	2.26	0.66
Female	273	2.18	0.67
Overall	1015	2.22	0.66

t= 1.94; p value =0.05; Not Significant.

Table 5: Maturity status compared between male and female patients.

Maturity status	Male (%)	Female (%)	Total (%)
Preterm	216 (39.9)	196 (41.4)	412 (40.6)
Full term	326 (60.1)	273 (57.7)	599 (59.0)
Post term	0 (0.0)	4 (0.9)	4 (0.4)
Total	542 (100.0)	473(100.0)	1015 (100.0)

Chi-square value (χ^2)=4.99; p value =0.08; degree of freedom=1 Not Significant

Table 6: Comparison of Outcome between male and female patients.

Outcome	Male (%)	Female (%)	Total (%)
Discharged	332 (61.3)	307 (64.9)	639 (63.0)
LAMA	112 (20.7)	84 (17.8)	196 (19.3)
Died	53 (9.8)	50 (10.6)	103 (10.1)
Referred	45 (8.3)	32 (6.8)	77 (7.6)
Total	542(100.0)	473(100.0)	1015(100.0)

Chi-square value (χ^2)=2.58; p value =0.46; degree of freedom =1 Not Significant.

It was found that slightly higher proportion of death was found among female patients (10.6%) compared to that of male patients (9.8%). The proportion of recovery measured by discharge was also found to be higher in female patients (64.9%) compared to that of male patients (61.3%). However the differences of outcome by gender were not statistically significant.

Table 7: Outcome compared by type of diagnosis.

Diagnosis	Discharged (%)	LAMA (%)	Died (%)	Referred (%)	Total (%)
RDS	237 (58.1)	87 (21.3)	46 (11.3)	38 (9.3)	408 (100.0)
Birth Asphyxia	131 (67.5)	31 (16.0)	18 (9.3)	14 (7.2)	194 (100.0)
Sepsis	85 (63.0)	22 (16.3)	17 (12.6)	11 (8.1)	135 (100.0)
Neonatal Jaundice	86 (86.0)	12 (12.0)	1 (1.0)	1 (1.0)	100 (100.0)
Prematurity	28 (41.8)	25 (37.3)	9 (13.4)	5 (7.5)	67 (100.0)
Birth Asphyxia with MSL	35 (71.4)	7 (14.3)	4 (8.2)	3 (6.1)	49 (100.0)
Metabolic complications	29 (70.7)	7 (17.1)	2 (4.9)	3 (7.3)	41 (100.0)
Others	8 (38.1)	5 (23.8)	6 (28.6)	2 (9.5)	21 (100.0)
Total	639 (63.0)	196 (19.3)	103 (10.1)	77 (7.6)	1015 (100.0)

Chi-square value (χ^2)=624; p<0.001; degree of freedom=1 Significant.

It was found that higher proportion of death was found among those prematurity (13.4%) followed by sepsis (12.6%) and RDS (11.3%). The proportion of recovery was found to be highest in those patients with neonatal jaundice (86.0%) and in those with birth asphyxia with meconium stained liquor (71.4%). The differences of outcome by diagnosis were also found to be statistically significant.

DISCUSSION

In our study admissions of male babies(53.4%) were more than those of females(46.6%). The demographic distribution of population in this study(male/female and preterm/term) is in concordance to studies of rural India. [1,10,11,12] In study 63.25% were males and 36.75% were females, In study Male (56.36%) and female (43.36%), Similar gender difference is also seen in studies done.[1,10-12] these may be due to gender bias prevalent in India where male children are given more care or a greater tendency of male children to face neonatal complications.

In our study Majority of the subjects were in-patients (58.3%) compared to out-patients (41.7%). similar results were seen in study by Modi R et al (67.51% vs. 32.49%) Out born versus inborn neonates (53.54% vs. 46.46%) were different from study in Uttarakhand and also studies in Nigeria, a developing country.[11-14]

In our study It was found that 59.0% subjects were full term newborns while 40.6% subjects were preterm newborns. similar results encountered in study (54.31% vs 45.69) in contrary (49.65% vs 50.35%).[1,11]

The commonest diagnosis was found to be respiratory distress syndrome (40.2%) followed by birth asphyxia (19.1%) and sepsis (13.3%). In study the commonest causes of admission were respiratory distress (RDS contributing 31.64% and other causes 3.64%), sepsis/pneumonia/meningitis were responsible for 11.64%, perinatal asphyxia 8.73%, and neonatal jaundice 16.73%, study the commonest causes of admission were respiratory distress (RDS contributing 18.7% and other causes 7.5%), sepsis/pneumonia/ meningitis were responsible for 17.6%, perinatal asphyxia 15.7%, and neonatal jaundice 12.6.[1,11] The most common specific morbidity for admission was neonatal sepsis (28.8%) followed by RDS (23.85%) and perinatal asphyxia (17.72%).[15] A study conducted by Gaucham*et al.* in Nepal reported that neonatal jaundice, sepsis and perinatal asphyxia as being commonest indication for admission to NICU.[16]

Studies from Africa show more admissions due to sepsis, jaundice, and tetanus.[13,14,17] In the developed countries, the scenario is different with extreme prematurity, asphyxia, and congenital anomalies being the chief causes as seen a study in Canada.[18]

In our study 63.0% patients were discharged after improved; 19.3% had left hospital against medical advice, 7.6% were referred to other institutions for specialized treatment. In contrary to our study Referral rate (5.33%) and the rate of LAMA (9.63%) in this study done in referral and LAMA rates are 4.58% & 8.32%.[1,11] and also different from the studies.[19,20]

In our study It was found that higher proportion of death was found among those prematurity (13.4%) followed by sepsis (12.6%) and RDS (11.3%). In study prematurity (25.7%) was the main cause of death followed by sepsis (21.6%), perinatal asphyxia (19.6%), and respiratory distress (17.3%) with congenital abnormalities contributing 4.7%.[11] This is similar to the causes of the rest of India NNPD and Asian countries.[21-24] where infections (36.0%), prematurity-related conditions (26.5%), perinatal hypoxia (10.0%), and malformations (7.8%) were the chief causes. The results are in contrast to developed countries where extreme prematurity-related conditions, especially gastrointestinal complications and congenital malformations, are the main causes as better neonatal care ensures lesser sepsis and better survival of children with respiratory distress, MAS, and jaundice.[18] Birth asphyxia contributes to about 10% of deaths in both developing and developed countries; In our study it is 9.3%, however in study It is much higher 19.59%.[11] The mortality rate of 10.1% in the current study is much higher than developed countries like Canada(7.6%).[19] which are equipped with better facilities like Extra Corporeal Membrane Oxygenation (ECMO), total parenteral nutrition (TPN), and a higher doctor to patient and nurse to patient ratio. Among the 15 countries with the highest NMRs, 12 were from the African region, and three were from the Eastern Mediterranean (Afghanistan, Somalia, and Pakistan). Throughout the period 1990-2009, India has been the country with the largest number of neonatal deaths.

CONCLUSION

Respiratory Distress Syndrome, neonatal sepsis, neonatal hyperbilirubinemia, and HIE as the major causes of morbidity. Low Birth Weight and prematurity were preventable causes of mortality, which must be urgently addressed. Therefore, attempts to prolong the pregnancy each week might improve the neonatal outcome considerably.

REFERENCES

1. Rohit M, Bhavesh M, Punitha KM. Study of the Morbidity and the Mortality Pattern in the Neonatal

Intensive Care Unit at a Tertiary Care teaching Hospital in Gandhinagar District, Gujarat, India. J Res Med Den Sci. (2015);3(3):208-12.

2. Behl L, Grover N, Kaushik SL. Perinatal and Neonatal Mortality-A Hospital Based Study. Indian Pediatr. 1998;35(7):683-4.

3. Zupan J, Aahman E. Perinatal mortality for the year 2000: estimates developed by WHO. Geneva: World Health Organization, 2005.

4. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why?. Lancet 2005;365:891-900.

5. Bryce J, Bishi-pinto C, Shibuya K, Balck RE. WHO estimates of the causes of death in children. Lancet 2005; 365:1147-52.

6. Registrar general and census commissioner, India. Sample Registration System Bulletin 2013. Ministry of Home affairs, Government of India, 2013. Available at: http://censusindia.gov.in/vital_statistics/SRS_Bullet ins/Bulletins.html.

7. International Institute for Population Sciences (IIPS) and Macro International. 2007. National Family Health Survey (NFHS-3), 2005–06: India: Volume. Mumbai: IIPS. Available at https://dhsprogram.com/pubs/pdf/FRIND3/FRIND3 -Vol1AndVol2.pdf.

8. Setting up a special care newborn unit in a district hospital. Toolkit for setting up of special care newborn units, stabilization units and newborn corners. New Delhi: United Nations Children's Fund; 2008;26.

9. Ministry of Health & Family Welfare, Government of India, September 2014,India newborn action plan 1-84. Available at: http://vikaspedia.in/health/nrhm/national-health-mission/india-newborn-action-plan.

10. Roy RN, Nandy S, Shrivastava P, Chakraborty A, Dasgupta M, Kundu TK. The mortality pattern of the hospitalised children in a tertiary care hospital of Kolkata. Indian J Community Medicine. 2008;33(3):187-9.

11. Rakholia R, Rawat V, Bano M, Singh G. Neonatal morbidityand mortality of sick newborns admitted in a teaching hospital of Uttarakhand. CHRISMED J Health Res. 2014;1(4):228-34.

12. Bhatia BD, Mathur NB, Chaturvedi P, Dubey AP. Neonatal mortality pattern in rural based Medical college hospital. Indian J Pediatr.1984;51(3):309-12.

13. Orimadegun AE, Akinbami FO, Tongo OO, Okereke JO. Comparison of neonates born outside and inside hospitals in a children emergencyunit, Southwest of Nigeria. Pediatr Emerg Care. 2008;24(6):354-8.

14. Owa JA, Osinaike AI. Neonatal morbidity and mortality in Nigeria.Indian J Pediatr. 1998;65:441-9.

15. Sridhar PV, Thammanna PS, Sandeep M. Morbidity Pattern and Hospital Outcome of Neonates Admitted in a Tertiary Care Teaching Hospital, Mandya. Int J Sci Stud 2015;3(6):126-9.

16. Gauchan E, Basnet S, Koirala DP, Rao KS. Clinical profi le and outcomeof babies admitted to Neonatal Intensive Care Unit (NICU). J Inst Med. 2011;33:1-5.

17. Simiyu DE. Morbidity and mortality of neonates admitted in general paediatric ward at Kenyatta National Hospital. East Afr Med J 2003;80:611-6.

18. Simpson CD, Ye XY, Hellmann J, Tomlinson C. Trends in cause-specific mortality at a Canadian outborn NICU. Pediatr. 2010;126:e1538-44.

19. Das PK, Basu K, Chakraborty S, Basak M, Bhowmik PK. Early neonatal morbidity and mortality in a city based medical college nursery. Indian J Public Health. 1998;42(1):9-14.

20. Mallick AK, Sarkar UK. One year experience of neonatal mortality and morbidity in a state level neonatal intensive care unit and its comparison with national neonatal-perinatal database. J Indian Med Assoc. 2010;108(11):738-9.

21. Morbidity and mortality among out born neonates at 10 tertiary care institutions in India during the year 2000. J Trop Pediatr. 2004;50(3):170-4.

22. Shrestha S, Karki U. Indications of admission and outcome in anewly established neonatal intensive care unit in a developing country (Nepal). Nepal Med Coll J. 2012;14(1):64-7.

23. Khan MR, Maheshwari PK, Shamim H, Ahmed S, Ali SR. Morbiditypattern of sick hospitalized preterm infants in Karachi, Pakistan. J Pak Med Assoc. 2012;62(4):386-8.

24. Chowdhury ME, Akhter HH, Chongsuvivatwong V, Geater AF. Neonatal mortality in rural Bangladesh: An exploratory study. J Health Popul Nutr. 2005;23:16-24.