Original Research Article

Post neonatal mortality in a tertiary care center at Garhwal Uttarakhand, India: a retrospective study of 10 years

Varun Kumar Tiwari[1]*, Haroon Ali[2]

[1]Department of Pediatrics, [2]Department of Community Medicine, Vir Chandra Singh Garhwali Government Institute of Medical Science and Research, Srikot, Garhwal, Uttarakhand, India

*Correspondence:
Dr. Varun Kumar Tiwari,
E-mail: drvkt@yahoo.co.in

ABSTRACT

Background: Institutional childhood morbidity, mortality analysis and their trends reflect the local disease occurrence, changes in treatment modalities and quality of treatment available. This study was aimed to evaluate the magnitude of post neonatal mortality and its seasonal pattern at Hemawati Nandan Bahuguna Teaching Base Hospital, Srikot over a period of 10 years.

Methods: A retrospective cross-sectional descriptive analysis was done on post neonatal mortality data by Pediatric Department of the Hemawati Nandan Bahuguna Teaching Base Hospital, Srikot from April 2008 to March 2018. Neonates admitted to PICU, referral and LAMA patients were excluded from the study. Data was analyzed using SPSS 16.0.

Results: Overall post neonatal mortality of 1.83% was found in the study. Mortality amongst the boys was 119 (54.34 %) and the girls were 100 (45.66 %). Three most common causes of mortality were septicemia (27.40 %) followed by encephalitis (11.41 %) and protein energy malnutrition/underweight (9.58 %). Among the 219 children who died, the number of deaths were recorded in 29days to 1-year age group (n=102, 46. 57%). Mortality of the girls was higher than boys in 10-14year age group. Maximum mortality was seen in the month of June (29, 13.24%) followed by May (23, 10.5%), August (22, 10.04%) and January (20, 9. 13%). The occurrence of mortality with respect to month was found to be significant (p=0.01).

Conclusions: This study showed infectious diseases and protein energy malnutrition/ underweight together constituted two-third of mortality in the institution. Strengthening vaccination program, facilities at tertiary care centers and healthy dietary practices in the community can reduce the post neonatal deaths.

Keywords: Mortality, Post neonatal, Pattern, Protein energy malnutrition, Septicemia, Seasonal pattern

INTRODUCTION

Childhood mortality is one of the very important indicators which reflect the country's development and level of healthcare standards. Globally under 5 mortality rates in 2016 was 41 deaths per 1000 live births.[1] 75% of all under 5 deaths occur within 1 year of age.[2] Above 5-year mortality statistics worldwide is 7.9 per 1000 live births.[3] In India, IMR is 34 per 1000 live births and U-5MR is 55 per 1000 live births.[4,5] In NFHS 4, Uttarakhand had IMR and U5MR being 44 and 49 per 1000 live births which is much behind the Indian statistics.[6]

The burden of diseases and survival of children differs from institution to institutions. The pattern and trend of

diseases also vary with year and each season. The audit of institutional records of childhood morbidity and mortality and trends reflects the local disease occurrence, changes in treatment modalities and quality of treatment available. Similarly, in India, the civil registration of deaths generates standardized death statistics.[7] Also the regional mortality data have been used for local assessment of the burden of diseases. Analysis of these records is important for local policy making, utilization of available resources and quality improvement.

This also paves way for quality improvement in health care at the local health facility level and at community level. In regions where, limited resources and infrastructure is available; use of triage in the emergency department, use of standardized protocols, mortality auditing and effective monitoring of sick children can reduce case fatality rates.[8]

WHO and UNICEF had developed integrated management of childhood illness strategy which has addressed the challenge to provide quality health care for sick children in low resource settings.[9] Considering the altitude differences in hilly regions, children living at high altitude are more prone to hypoxemia during intercurrent illnesses such as lower respiratory tract infection. Awareness of these unique risks involved during illnesses at high altitude can improve child survival.[10]

In the Uttarakhand state of India, NFHS 4 has revealed high prevalence of malnutrition, poor complementary feeding practices in the community and missed vaccination.6 Poor cares seeking behavior, access to health care services and other factors are contributory to missing or incomplete vaccination.[11] Incomplete immunization leads to inadequate protection from vaccine preventable diseases. Vaccine preventable diseases such as Sepsis, pneumonia and diarrhea are a preventable cause of mortality.[12,13] In the published data, less is known regarding pediatric mortality and its causes in age beyond 5 years. Diarrhea, pneumonia and infectious diseases are the predominant cause of mortality at age 5 or more.[14,15]

Regionally, survival from pediatric illness depends upon ethnic considerations, taboos, facilities available, late referrals. Also, poor transportation facilities in hilly areas, self-treatment, over the counter medications and Baba treatment are very prevalent in Uttarakhand. Lack of awareness amongst people and lack of trained medical personnel further exacerbates the quality of medical care provided.

As no previous work regarding pediatric mortality was available from the region, this study was conducted with an aim to know the magnitude of post neonatal mortality and its trends in HNB base hospital at Srikot, Uttarakhand over 10 years.

METHODS

A retrospective cross-sectional descriptive analysis was done on data of all the pediatric patients who expired in the Pediatric unit at the HNB teaching hospital over a period of 10 years from April 2008 to March 2018.

The Hemwati Nandan Bahuguna (HNB) Teaching Hospital is the associated hospital to Vir Chandra Singh Garhwali Government Institute of Medical Science and Research. It serves people of four districts of Uttarakhand namely Tehri Garhwal, Rudraprayag, Chamoli and parts of Pauri Garhwal. This tertiary care center is in a remote hilly region at srikot, Uttarakhand, India on Badrinath highway.

The pediatric unit of the HNB Teaching hospital has 60 bedded pediatric wards, 5 bedded fully equipped PICU and 30 bedded SNCU. Children over 28 days and under 14 years are admitted in the pediatric unit from both Outpatient department and emergency.

The deaths of all hospitalized children from the 29th day of life to 14 years of age were included in the study. Incomplete data, neonates admitted to PICU, referral and LAMA patients were excluded from the study.

Data was retrieved from the mortality register in the pediatric ward. Data extracted included age, sex, underlying diagnosis leading to death, month and year of mortality. Data was analyzed using SPSS 16.0.

This study has been approved by the Institutional Ethical Committee of Vir Chandra Singh Garhwali Government Institute of Medical Science and Research.

RESULTS

A total of 11,963 patients was admitted to the pediatric unit in HNB Base Teaching Hospital during the study period from April 2008 to March 2018.
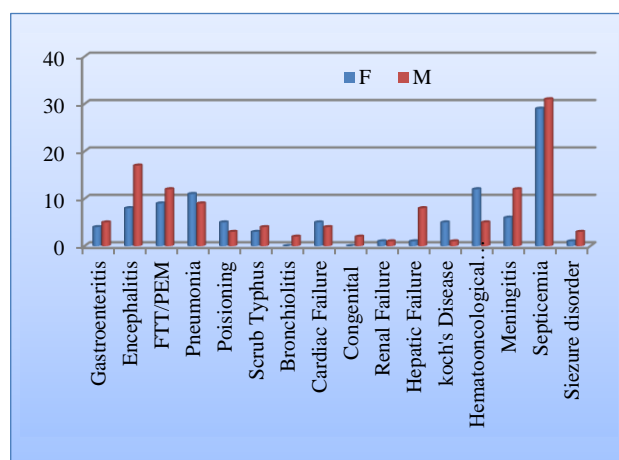

Figure 1: frequency of underlying cause of death with gender.

Referrals were 3% and LAMA was 7.8% of total admissions. During this period 219 pediatric deaths were recorded with overall mortality of 1.83%. Among the 219 expired children, males were 119 (54.34 %) and females were 100 (45.66 %) respectively.

For analysis, the deaths were categorized in four age groups, i.e. 29 days to 1 year, 1-5 years, 5-10 years and 10-14 years.

Deaths were 102 (46.57%) in 29 days 1 year, 59 (26.95%) in 1-5 year, 35 (15.98%) in 5-10 year and 23 (10.5%) in 10-14year age group respectively and relation of mortality to gender was insignificant

Table 1: Age and Sex distribution of post neonatal mortality.

Age group	Female deaths (%)	Male deaths (%)	Total
29 days to 1 year	43 (43)	59 (48.58)	102 (46.57)
1-5 year	28 (28)	31 (26.05)	59 (26.95)
5-10 year	14 (14)	21 (17.65)	35 (15.98)
10-14 year	15 (15)	8 (6.72)	23 (10.5)
Total	100 (100)	119 (100)	219(100)

Male to female death ratio in 29 days- 1 year, 1-5-year, 5-10 year and 10-14-year age group was found to be 1.37:1, 1.1:1, 1.5:1 and 0.54:1 respectively.

Table 2: Underlying cause of death in different age groups.

Diagnosis	29 days to 1 year	1-5 year	5-10 year	10-14 year	Total (%)
Gastroenteritis	6 (5.88%)	1 (1.69%)	2 (5.71%)	0 (0%)	9 (4.11)
Encephalitis	7 (6.86%)	8 (13.55%)	8 (22.85%)	2 (8.69%)	25 (11.41)
FTT/PEM	12 (11.76%)	8 (13.55%)	1 (2.85%)	0 (0%)	21 (9.58)
Pneumonia	11 (10.78%)	6 (10.16%)	3 (8.57%)	0 (0%)	20 (9.13)
Poisioning	2 (1.96%)	3 (5.08%)	1 (2.85%)	2 (8.69%)	8 (3.65)
Scrub typhus	2 (1.96%)	2 (3.38%)	1 (2.85%)	2 (8.69%)	7 (3.19)
Bronchiolitis	2 (1.96%)	0 (0%)	0 (0%)	0 (0%)	2 (0.91)
Cardiac failure	4 (3.92%)	3 (5.08%)	1 (2.85%)	1 (4.34%)	9 (4.11)
Congenital	2 (1.96%)	0 (0%)	0 (0%)	0 (0%)	2 (0.91)
Renal failure	0 (0%)	0 (0%)	2 (5.71%)	0 (0%)	2 (0.91)
Hepatic failure	5 (4.90%)	0 (0%)	3 (8.57%)	1 (4.34%)	9 (4.11)
Koch's disease	1 (0.98%)	2 (3.38%)	1 (2.85%)	2 (8.69%)	6 (2.73)
Hemato-oncological disorders	4 (3.92%)	8 (13.55%)	1 (2.85%)	4 (17.39%)	17 (7.76)
Meningitis	11 (10.78%)	5 (8.47%)	1 (2.85%)	1 (4.34%)	18 (8.21)
Septicemia	32 (31.37%)	11 (18.64%)	9 (25.71%)	8 (34.78%)	60 (27.40)
Siezure disorder	1 (0.98%)	2 (3.38%)	1 (2.85%)	0 (0%)	4 (1.82)
Total	102 (100%)	59 (100%)	35 (100%)	23 (100%)	219 (100)

The risk of death was more in females in the age group 10-14 years when compared with male (Table 1). In the age group 29 days to 1 year, septicemia (31.37 %), protein energy malnutrition (11.76 %) and pneumonia (10.78%) were the leading causes of death.

In the age group 1 to 5 years, septicemia (18.64 %), encephalitis and PEM with complications (13.55% each) and pneumonia (10.16%) were the leading causes of mortality. In the age group 5-10-year, septicemia (25.71%) and encephalitis (22.85 %) were leading causes of mortality. In 10 - 14 year of age group, septicemia (34.78%) and hemato-oncolgical malignancy (17.39%) were the leading causes of death. The P-value was not significant for age group and disease mortality (Table 2).

The primary disease-causing mortality in the study population was septicemia (27.40 %) followed by encephalitis (11.41 %) and protein energy malnutrition/underweight (9.58 %). Diarrhea and Pneumonia had 4.11 % and 9.13 % contribution to mortality.
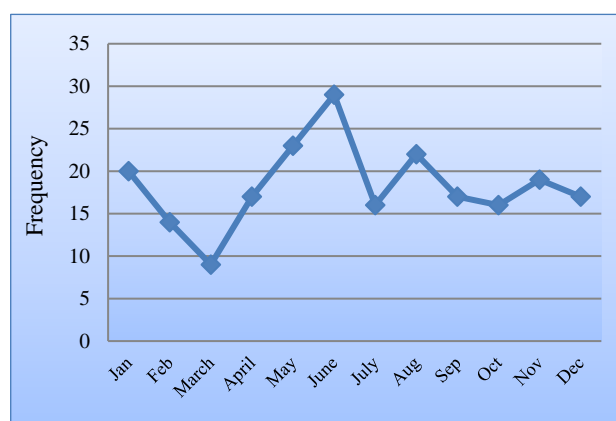

Figure 2: Seasonal variation of mortality in children.

Meningitis contributed to 8.21 % of total mortality. Meningitis, septicemia, Pneumonia, encephalitis and protein energy malnutrition/ underweight together constituted 61.64 % of underlying causes of mortality in 219 expired children (Table 2) and (Figure 1).

Over 10 years, maximum mortality was seen in the month of June (n=29, 13.24%) followed by May (n=23, 10.5%), August (n=22, 10.04%) and January (n=20, 9. 13%). Minimum mortality was seen in the month of March (n=9, 4. 10%). The occurrence of mortality with respect to month was found to be significant (p=0.01) (Figure 2).

DISCUSSION

In this study an overall mortality was 1.83%, which is similar to study by Selvakumar and Reghupathy.[16] Studies done overseas have mortality ranging from 0.1-11.2%.[17-23] Studies in India have shown childhood mortality ranging from 1.58-34.7%.[24-31] Higher mortality in some studies may be due to the inclusion of neonatal population. Lower mortality in the present study may be due to good referral, primary health care system in Uttarakhand, good 108 services for transport and institutional vigilant treatment. On the other hand, low admissions to this tertiary center may also be a reason of low mortality.

Mortality pattern was higher in male sex than in females in the entire post-neonatal groups except the 10-14-year age group. Study by Selvakumar and Reghupathy showed a male preponderance in the age group 1 month to 1 year and 1 to 5 years, but the age group more than 5 years showed a female predominant mortality.[16] The male preponderance in mortality data has been observed by previous researchers.[18-22,24,26,27,29,32] In this study, greater mortality in male sex may be due to the greater male sex ratio of Uttarakhand and negative behavior towards the female sex.

The Under 5 mortalities in the post-neonatal population is 68.24%, a finding similar to previous studies.[13,14] The under 5 populations are a vulnerable group as they are more prone to infectious agents.

This study shows that Meningitis, Septicemia, Pneumonia, Encephalitis and Protein energy malnutrition/underweight together constituted 61.64 % of underlying causes of mortality. Septicemia took life of nearly one-fourth of all children studied (27.39 % of total mortality). Similar observations were made in other studies with septicemia as the leading cause of death.[24,25,27,29,30]

In contrast, malaria was the leading cause of institutional mortality in Africa region.[20,22,32] Uttarakhand is a hilly state of India has very less incidence of malaria. In the current study, deaths due to CNS infections are 19.63 %, which is similar to study by Deenadayalan.[30] In this study, mortality due to protein energy

malnutrition/underweight and its complications (9.59 %) was higher than the study by Panyang et al.[24] ARI is the leading cause of death worldwide.[33] We found Pneumonia having 9.13 % contribution to mortality, which is similar to other studies by Patil and Godale and Naik et al.[27,29] In the present study, PEM with complications was responsible for 9.76% of total deaths, 11.76% of deaths in age group 29 days to 1 year and 13.55% in the age group 1 year to 5 years. Educating people regarding proper complementary feeding and dietary advice can reduce malnutrition in this region of Uttarakhand.

In this study, septicemia was the most common cause of mortality in all age groups. The study by Selvakumar and Reghupathy showed most common cause of mortality in infants being septicemia, age 1-5 years ARI and beyond 5 years AES.[16]

Studies by Roy et al and Deenadayalan et al found meningoencephalitis as the most common cause of mortality in 1-4 years and 5-12 years.[13,17] In the age group 29 days to 1 years, septicemia was the most common cause of mortality which is similar to other studies.[16,26,27,29,30] Malaria was the predominant cause of mortality in all age groups studied by Bilkisu et al.[32]

The present study shows mortality peaks in May-June, August and January. The occurrence of mortality with respect to month was found to be significant (p=0.01). Studies by Deendayalan et al and Naik et al showed bimodal peaks.[25,26,30]

Shortcomings of the current study are non-inclusion of neonates. Neonatal deaths are the predominant causes of mortality in India.[34] Also risk assessment of mortality with pediatric mortality scores was not done in the study.

Proper documentation of causes of death without any missed data is the strength of the current study. This hospital-based study also reflects mortality pattern in the community in the Garhwal region of Uttarakhand as this is the sole hospital accepting inpatients in this Garhwal region of Uttarakhand.

With the current study certain research gaps are identified in Garhwal region of Uttarakhand. The reasons behind LAMA from hospital treatment, complementary feeding assessment, missed opportunities to use vaccination facilities and missed opportunities to use the health care facility needs to be evaluated with future studies.

CONCLUSION

This study showed infectious diseases and protein energy malnutrition/ underweight together constituted two-third of mortality in the institution. Strengthening vaccination program, facilities at tertiary care centres and healthy dietary practices in the community can reduce the post neonatal deaths.

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