Morbidity profile and outcome of new-born admitted in sick newborn care units of Uttar Pradesh, India

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ABSTRACT

Introduction and aim. Reduction in child morbidity and mortality is result of upgradation of infrastructure and quality of public health care services. India alone accounts for 30% of the global neonatal deaths occur in India that occurs due to preventable cause. So, the aim of this study was to assess the pattern and status of neonatal mortality observed in SNCUs of Uttar Pradesh, India.

Material and methods. Descriptive study was conducted based on secondary data obtained from sick new born care units (SNCU) online database from 89 Government-supported SNCUs of Uttar Pradesh, from April 2014 to March 2016. Data obtained included age, weight, sex, diagnosis, and outcome.

Results. 22933 neonates admitted in SNCU were included in study with 14269 (62.2%) were males and 8664 (37.8%) females. Majority of the subject (20070; 87%) were in 0-5 days old age group. Most (72.5%) of admitted new-born improved and discharged. Low birth weight was significantly ($\chi^2 = 1334.2, p<0.001$) related with outcome. Birth asphyxia contributed to maximum (36.11%) number of deaths, followed by respiratory distress syndrome (25.21%), sepsis (15.38%), prematurity and extremely low birth weight (5.8%).

Conclusion. Improved antenatal care, improved access to health facility, timely referral of high-risk cases, capacity building, intensive interventional management can reduce neonatal mortality and its complications. Study also warrants, in-depth community-based qualitative study to identify gender-specific, equity issues.

Keywords. low birth weight, morbidity profile, mortality profile, respiratory distress
el II (CHC/FRU) and MCH level III (district hospital/medical college/tertiary care hospital) respectively.\textsuperscript{5-11} Traditional practices like applying something on the umbilical stump, oil instillation into the nose, etc. also contribute to the newborn risk of morbidity and mortality.\textsuperscript{2} FBNC at various levels is critical to strengthen the care of sick, premature, and low birth weight newborns.

**Aim**

The current study aimed to assess the pattern of neonate mortality observed in SNCUs of Uttar Pradesh and medical college-attached hospitals.

**Material and methods**

**Study design and settings**

A cross-sectional descriptive study was conducted based on secondary data collected from SNCUs of Uttar Pradesh. The study includes all Government-supported 89 designated SNCUs during the year April 2014–March 2016. SNCU is a neonatal unit nearby labour room which provides special care (all care except assisted ventilation and major surgery) for sick newborns. As per government guidelines, any facility with more than 3000 deliveries per year should have an SNCU. Most district and few sub-district hospitals fulfilled this criterion. In our study, we have included SNCU data from 75 district hospitals and 14 Subdistrict Hospitals. Approval from the Institutional Ethics Committee (IEC) was taken prior to starting the study (IEC/Rama medical college/2023/5678).

**Study population**

Neonates admitted in SNCUs were considered as study participants. These were categorized into two sections: 1) Inborn – who have delivered in same facility, and 2) Out born – who have referred to the facility from peripheral health facilities.

**Study period**

January 2022 to March 2022 was the study period and aggregated yearly data were taken for the study.

**Data collection**

The source of information was SNCU monthly reports generated from admitted neonates (Indoor cases only). In SNCUs, neonates are referred from MCH level facilities 1-2, private health facilities and from community by direct contact admission or by frontline health workers: Accredited Social Health Activist, Auxiliary Nurse Midwife, or Multi-Purpose Worker. The primary data have been recorded in predefined registers and case sheets of SNCUs filled up by paediatricians and staff nurses.

**Inclusion criteria**

The study included all neonates, who had ≤28 days of life admitted in SNCUs.

The SNCU monthly report is predefined format from Ministry of Health and Family Welfare, Government of India, which includes data on admission information, reasons of admission, course of admission, and mortality reasons (if any) with treatment outcomes. It also includes information on gender, birth weights, gestation age, and duration of stay. Ethical permission was sought from the concerned authority of State Health and Family Welfare Department, Government of Gujarat. The aggregated data of SNCU reports were analyzed and due efforts were made to conceal identity of hospitals and patients.

**Data analysis**

Statistical analysis was done analyzing the percentages, proportions, and Chi-square using Statistical Package for the Social Sciences (SPSS) version 17 (SPSS-Inc., IBM, USA). After analysis, the efforts were made to share the analysis with concerned SNCU in charge to take corrective actions in consultation with State officials.

**Limitation of analysis**

Detailed information of each neonate had not been collected. The aggregated data of indicators was taken into the study. Only Government-supported SNCUs were studied. Data pertaining to gestational age of neonates was not available. The follow-up on discharged, leaving against medical advice (LAMA), and referred neonates were not done during the study.

**Results**

Total 22933 neonates admitted in SNCU were included in study. We can depict age and sex distribution of study subjects from Table 1. 14269 (62.2%) were males and 8664 (37.8%) were females. Majority of the subject (20070; 87%) were in 0–5 days old age group, among these 12469 were (62.1%) male and 7601 (37.9%) females.

**Table 1. Age and gender wise distribution of neonates admitted in SNCU (n=22933)**

<table>
<thead>
<tr>
<th>Age Group (days)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 (20070; 87.5%)</td>
<td>14269 (62.1%)</td>
<td>7601 (37.9%)</td>
</tr>
<tr>
<td>6–10 (1356; 5.9%)</td>
<td>832 (61.4%)</td>
<td>524 (38.6%)</td>
</tr>
<tr>
<td>11–20 (929; 4.1%)</td>
<td>593 (63.8%)</td>
<td>336 (36.2%)</td>
</tr>
<tr>
<td>&gt;20 (578; 2.5%)</td>
<td>375 (64.9%)</td>
<td>203 (35.1%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14269 (62.2%)</strong></td>
<td><strong>8664 (37.8%)</strong></td>
</tr>
</tbody>
</table>

Outcome of neonates admitted in SNCU among different birth weight groups is described in Table 2 and Figure 1. Most of them 16628 (72.5%) improved and discharged in satisfactory condition, 2790 (12.2%) referred to higher centres, 1983 (8.6%) expired and 1503 (6.6%) left against medical advice. This relationship between birth weight group of newborn and outcome was found statistically significant ($\chi^2=1334.2$, df =15,
Causes of neonatal death admitted in SNCU among different birth weight groups (n=22904)

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Outcome</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0-1.5</td>
<td>1246 (50%)</td>
<td>2484 (100%)</td>
</tr>
<tr>
<td>1.6-2</td>
<td>2696 (72.3%)</td>
<td>3724 (100%)</td>
</tr>
<tr>
<td>2.1-2.5</td>
<td>4332 (76.4%)</td>
<td>5667 (100%)</td>
</tr>
<tr>
<td>≥ 2.5</td>
<td>8354 (75.6%)</td>
<td>11029 (100%)</td>
</tr>
</tbody>
</table>

Total: 16628 (72.5%) | 1983 (8.6%) | 1503 (6.6%) | 2790 (12.2%) | 22904 (100%)

χ² = 1334.2, df = 15, p<0.001

Causes of neonatal death admitted in SNCU among different birth weight groups. Out of total 1983 (8.6%) neonatal deaths, most of the neonatal deaths 716 were occurred due to HIE/moderate-severe birth asphyxia, of which maximum 323 (45.1%) occurred among birth weight group >2.5 kg followed by 201 (28.1%) among birth weight group 2.1‒2.5 kg, 104 (14.5%) among birth weight group 1.6‒2 kg weight group and rest 88 (12.3%) were amongst birth weight group 0-1.5 kg. Total 500 deaths due to respiratory distress syndrome maximum 186 (37.2%) were among birth weight group 0-1.5 kg, 125 (25.0%) among birth weight group 1.6-2 kg, 106 (21.2%) among >2.5 kg and rest 83 (16.6%) among 2.1-2.5 kg weight group. Out of total 305 deaths were due to sepsis; most of these 108 (35.4%) were among birth weight group 0-1.5 kg, 72 (23.6%) among 1.6-2 kg, 66 (21.6%). Total 151 deaths occurred due to prematurity (<28 weeks of gestation) 118 (78.1%) were among birth weight group 0-1.5 kg, 19 (12.6%) among birth weight group 1.6-2 kg weight group. Total 118 deaths due to extremely low birth weight (ELBW) (weight less than 1000 g) 105 (91.3%) were among birth weight 0-1.5 kg (Table 3).

Discussion
This study aimed at understanding morbidity pattern, causes of mortality among newborns admitted across 89 government supported SNCUs across Uttar Pradesh, a northern state in India. Improvement of new-born health outcome aimed at comprehensive continuum of maternal and child health care services with context-specific investment. Maximum reduction in child morbidity and mortality can be met if high-coverage programme of universal outreach and family-community care becomes an integrated intervention.2,3 Reduction in child morbidity and mortality is result of upgrading of infrastructure in public health care facilities, with increased number of SNCUs, which are advanced newborn care centres in tertiary level health care centres.12-15

Present study reflects that male admission outnumbered female admission (62.2% vs 32.8%) simulating findings in other studies.5,12,16-18 This may be due to gen-

Fig. 1. Outcome of newborns admitted in SNCU

Fig. 2. Causes of death among newborns in SNCU
under bias prevalent in India, where male children are given more importance. This societal gender bias is also evident in Sex Ratio at birth in India. National family Health Survey conducted in 2109-20 also reported sex ratio at birth to be 929 females per 1000 males. Biological vulnerability of the male gender could also be the other reason behind male ponderance in SNUC admissions. It warrants in-depth community-based observations to identify gender-specific, equity issues.12,16

SNUC admissions were maximum in early neonate period (0-5 days). Over 90% admissions were within first 10 days of birth in our study. This is consistent with many previous studies.4,5,10 This finding emphasizes that the most vulnerable period is the first week of life. This period must be prioritized to further decrease neonatal mortality and thereby infant mortality. Infant mortality rate have long been used as overall health status indicator of countries.

Most of the admitted new-born (72.5%) improved and discharged in satisfactory condition, 12.2% referred and 8.6% expired. These findings are better than outcome status reported by other studies.12,15 This could be due to regional differences and upgradation of infrastructure with time in various facilities. Indian government launched a big initiative with name of India Newborn Action Plan (INAP) in 2014. INAP targets towards the goals of Single Digit Neonatal Mortality Rate and Single digit Stillbirth Rate by 2030. INAP has been implemented under within the existing RMNCH+A framework. It has been guided under principles of integration, equity, gender, quality of care, convergence, accountability and partnerships with six pillars of intervention packages. It focusses on preconception and antenatal care; care during labour and childbirth; immediate newborn care, care of healthy newborn, care of small and sick newborn and care beyond newborn survival.20-23

Low birth weight was significantly related with outcome simulating findings of Mahajan et al.13 This findings emphasizes on the fact that to curb neonatal mortality we will have to ensure good preconception and antenatal care prioritizing maternal nutrition. Food related myths are quite prevalent in the Indian society. Raising awareness about them can be big step towards improving maternal nutrition. This can be achieved by periodic training of frontline workers like ASHA, Anganwadi Workers etc.

HIE/moderate-severe birth asphyxia contributed to maximum (36.11%) number of deaths, followed by respiratory distress syndrome (25.21%), sepsis (15.38%), prematurity and ELBW (5.8%) predominant causes of death in our study. Our study present better finding than other previous studies which reported, neonatal jaundice, prematurity, low birth weight, perinatal asphyxia and sepsis as major causes for SNUC admission and also for morbidity and mortality.5,12,15,17,19,24,25 This may be due to improved health care system and infrastructure. Moderate-severe birth asphyxia being the top cause of neonatal mortality in SNUCs suggests importance of upscaling of resuscitation at SNUCs and Human resource employment and periodic training.

Conclusion
Neonatal mortality is one of the major contributors to the Infant Mortality. To address the issues of higher neonatal and early neonatal mortality, FBNC services at health facilities have been emphasized by setting up of facilities for care of sick newborn such as SNUC at different levels is a thrust area.

The present study showed that greater number of male infants admitted to SNUC. Male preponderance is still prevalent in spite of various efforts of government to create awareness about female health. Further qualitative studies are required to explore reasons of the male predominance.

The commonest cause for death was birth asphyxia followed by respiratory distress syndrome, sepsis, prematurity and E.L.B.W. All health care personnel involved in new-born care should undergo skill development training on simple immediate newborn care and resuscitation in equipped peripheral institutions. Prevalence of sepsis among new-born born is a matter of grave concern. Proper aseptic procedure, sanitation and hygiene should be maintained to prevent it.

Declarations
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Author contributions

Conflicts of interest
No conflict of interest has been declared by the authors.

Data availability
Data will be provided on demand from the corresponding author.

Ethics approval
This study was approved by the local ethics committee (IEC/Rama medical college/2023/5678).
References


