Original Article

Profile and predictors of babies admitted to SNCUs of two tribal districts of Chhattisgarh

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Abstract

Background: The neonatal period is the crucial and vulnerable period of the human life cycle. Various research has been conducted worldwide that provide the baseline data on clinical profiles and predictors of outcomes of babies admitted to sick newborn care units (SNCUs). Nonetheless, studies on tribal areas and community outreach areas are rare. In the present study, predictors and profiles of patients admitted to SNCU, in the Dantewada and Bijapur districts of Chhattisgarh, India, were evaluated which shall help prioritize patient care and preventive approaches. **Methods:** This retrospective study was undertaken from January 2019 to December 2020 in the SNCUs of Dantewada and Bijapur. Neonatal and maternal characteristics, course during labor, treatment given to the neonates, and outcome data were obtained and analysed. **Results:** In total, 1,531 neonates were enrolled in the study. Mothers had a mean age of 25.6 years (standard deviation [SD] ±4.9) with birth spacing less than 2 years (60.3%) and antenatal care (ANC) visits less than 4 (50.4%). Neonates were low birth weight (43.75%) and were home-delivered (15.8%). One hundred forty-nine neonates died. In the multivariate regression model, extremely low birth weight babies, less than 1 kg (odds ratio [OR]: 11.59 confidence interval [CI] 4.625–31.58), gestational age less than 34 weeks (OR: 2.13 CI 1.291–3.532), central cyanosis (OR: 10.40 CI: 3.269–32.35), duration of IV fluid > 3 days (OR: 2.16 CI 0.793–0.880), duration of antibiotic >3 days (OR 0.63 CI 0.408–0.979) were found to be independent predictors of mortality among neonates. **Conclusion:** The prevalence of newborns aged less than 12 h is higher among the study population. Birth asphyxia, prematurity, neonatal jaundice, and sepsis were fundamental and leading causes of morbidity. Preterm birth and low birth weight babies had significantly high mortality. The government needs to focus on marginalized communities with target-based interventions and policies.

Keywords: Neonates, newborn mortality, predictors, tribal

Introduction

The neonatal period is an extremely crucial and vulnerable period of the human life cycle because most of the preventable morbidity and mortalities occur in this period.[1] There is around 30 times higher risk of mortality in the first 4 weeks of life than in the post-neonatal period. Nonetheless, until the last decade, newborn health did not receive the attention it deserved. Most nations, including India, have seen a modest decline in neonatal mortality rates (NMR), which has impeded their efforts to meet the millennium development goals.[2]

Approximately 3.1 billion babies die worldwide in the first month of life every year.[3] The majority of neonatal death is seen in developing nations. Over the years, the infant mortality rate (IMR) has reduced worldwide and in India, but neonatal mortality has not decreased proportionately. Out of the total IMR, 40% accounts for neonatal mortality. Yet, more than 24 million newborns have been saved worldwide because of the decline in neonatal mortality since 1990. More than half of all neonatal deaths occurred in five countries of the world (44% of global live births) such as India 27.8% (19.6% of global

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live births), Nigeria 7.2% (4.5%), Pakistan 6.9% (4.0%), China 6.4% (13.4%) and the Democratic Republic of the Congo 4.6%.[4] Between 1990 and 2009, the global NMR declined by 28%, from 33.2 deaths per 1000 live births to 23.9. In India, neonatal mortality accounts for two-thirds of infant deaths and around half of under-five deaths. In 2018 neonatal mortality rate in India was 29/1000 live birth, which reduced to 22.5 in 2020. In the country, the maximum number of deaths in the last 3 years reached 235,428, around 4.5% of total hospital admission. West Bengal topped the death chart, followed by Madhya Pradesh, Assam, Orissa, and Chhattisgarh.[5]According to National Family Health Survey (NFHS) 5, Chhattisgarh accounts for 32.4 neonatal deaths per 1,000 live births,[6] which is higher than the national average, that is, 24.9. The main reason behind this is the tribal population who are living in hard-to-reach areas, devoid of emergency health services.

Neonatal care is deeply enrooted in the community's sociocultural environment. For instance, a study in Uganda has identified practices such as applying lizard droppings to the umbilical cord, which could have put the neonate at a higher risk of infection and health.[7] Similarly, in Honduras, researchers have seen how newborns were more vulnerable to infections owing to some inherent rituals. In India, also, a few studies showed a picture of cultural practices such as cutting the umbilical cord by crushing stones and feeding newborns with herbal paste, goat's milk, and honey.[8] There is a need for an hour to curb these practices for the better development of neonates and mothers.

Most causes of morbidity and mortality in the neonatal period are preventable by good antenatal care and by early intervention. This can be achieved by establishing special newborn care units (SNCUs) in rural and urban hospitals. Several services such as resuscitation of asphyxiated newborns, management of sick newborns, hypothermia, hypoglycaemia, post-natal care, follow-up of high-risk newborns referral, and immunization services are being provided by SNCUs. These SNCUs are equipped with life-saving equipment such as radiant warmers, phototherapy units, oxygen concentrators, pulse oximeters, intravenous infusion pumps, and highly skilled staff.

Numerous descriptive studies have already provided baseline data on the trends and causes of neonatal mortality. However, studies on tribal areas and outreach communities are rare. There is a need for research in such places to make the intervention more impactful, fulfilling the condition of its implementation. Thus, this study provides relevant data regarding the demographic, clinical characteristics, treatment methods, and related outcomes, which will extend efforts to improve the outcome with an analysis of critical variables.

Materials and Methods

Study design and sample size

This was a retrospective study conducted at SNCUs of Dantewada and Bijapur: two tribal districts of Chhattisgarh. It was approved by the All India Institute of Medical Sciences (AIIMS), Raipur, Ethics Committee (Letter number 1490/IEC-AIIMSRPR/). The neonates admitted to SNCUs of the Bijapur and Dantewada districts from January 2019 to December 2020 (1531) were included in the study. Babies more than 28 days and those who were not admitted to SNCUs were excluded.

Data collection

Information regarding epidemiology, clinical presentation, neonatal characteristics, maternal characteristics, including age, gender, weight on admission, place of delivery, cause of admission (diagnosis), duration of hospital or clinic stay, and final outcome of the babies, were documented on preformed proformas.

Statistical analysis

Ms-Excel was used to enter and compile data. Categorical variables are described as frequencies and percentages. Continuous variables are described using mean, median, and interquartile range (IQR). When the data had a normal distribution, the independent group student's *t*-test was performed, and when they had a non-normal distribution, the Mann–Whitney U test was employed. To compare the proportions Chi-square test was employed. Univariate analysis and multiple logistic regression were employed to determine death-related risk factors. A *P* value of <0.05 was considered to be significantly significant. For analysis, SPSS version 26.0 and STATA-12 were used.

Results

Baseline characteristics

Neonatal characteristics

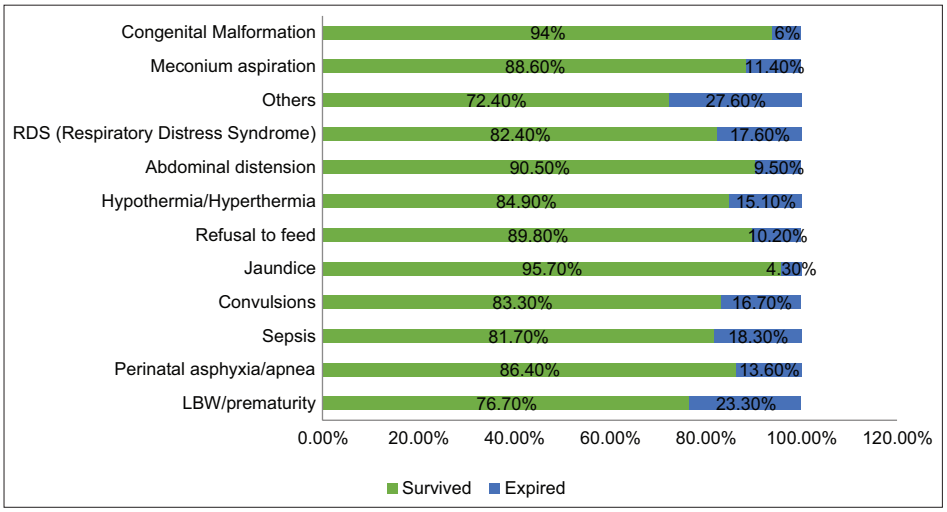
The study was completed among 1,531 neonates, which included 783 and 748 from districts Dantewada and Bijapur, respectively. There were around 848 males with a male-to-female ratio of 1.2:1. Out of the total study population, 43.56% were low birth weight (1.5–2.49 kg) and 3.7% were extremely low birth weight (<1 kg). There were 15.8% of babies who were home-delivered. The reason for admission was prematurity and low birth weight (26.1%), followed by perinatal asphyxia (23.1%), jaundice (12.1%), and respiratory distress syndrome (5.9%). The average duration of an SNCU stay was 6.2 days, and the range varied from less than 24 h to more than 30 days. Inborn neonates were 51.9%. A total of 149 (9.7%) neonates were non-survivors [Table 1 and Graph 1].

Maternal characteristics

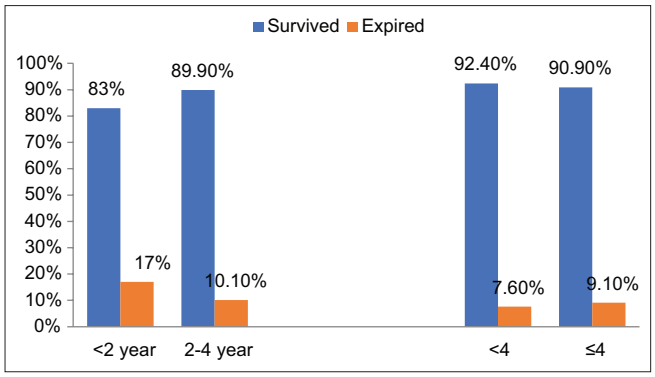
The mean maternal age was 25.6 years, ranging from 24 to 46 years. The mothers' weight ranged from 35 kg to 60 kg, with an average of 47.6 kg. Around 60% of the mothers had a birth spacing of fewer than 2 years. Almost 15% of the mothers had a parity of more than two. Almost half of them (50.4%) had their antenatal care (ANC) visit less than four [Table 2 and Graph 2].

Table 1: Neonatal characteristics

Variable	*n* (%)			Chi-Square Test (*P*)
	Total (*n*=1531)	Outcome Survived (*n*=1,382)	Expired (*n*=149)	
Place of delivery				
Public	1246	1,076 (86.4%)	170 (13.6%)	
Home	241	188 (78%)	53 (22.0%)	0.003
Private	43	38 (88.3%)	5 (11.6%)	
Maturity				
Full-term	1050	937 (89.2%)	113 (10.8%)	
Post-term	27	26 (96.3%)	1 (0.4%)	0.000
Preterm	454	340 (74.9%)	114 (25.1%)	
Weight on admission				
<1 kg	57	35 (61.4%)	22 (38.6%)	0.000
1-1.499 kg	269	218 (81%)	51 (19%)	
1.5-2.499 kg	667	585 (87.7%)	82 (12.3%)	
≥ 2.5 kg	535	462 (86.4%)	73 (13.6%)	
Neonatal mortality				
LBW/prematurity	399	306 (76.7%)	93 (23.3%)	
Perinatal asphyxia/apnoea	359	310 (86.4%)	49 (13.6%)	0.000
Sepsis	60	49 (81.7%)	11 (18.3%)	
Convulsions	12	10 (83.3%)	2 (16.7%)	
Jaundice	186	178 ((95.7%)	8 (4.3%)	
Refusal to feed	167	150 (89.8%)	17 (10.2%)	
Hypothermia/hyperthermia	73	62 (84.9%)	11 (15.1%)	
Abdominal distension	21	19 (90.5%)	2 (9.5%)	
RDS	91	75 (82.4%)	16 (17.6%)	
Others	29	21 (72.4%)	8 (27.6%)	
Meconium aspiration	70	62 (88.6%)	8 (11.4%)	
Congenital malformation	50	47 (94%)	3 (6%)	
Age at admission				
<12 h	848	734 (86.6%)	114 (13.4%)	0.000
12-24 h	32	31 (96.9%)	1 (3.1%)	
24-72 h	250	239 (95.6%)	11 (4.4%)	
3-7 day	195	185 (94.9%)	10 (5.1%)	
>7 d	206	193 (93.7%)	13 (6.3%)	
Duration of SNCU stay				
≤4 D	828	680 (82.1%)	148 (17.9%)	0.000
>4 D	702	622 (88.6%)	80 (11.4%)	



Graph 1: Neonatal mortality



Graph 2: Birth spacing and ANC visit

Table 2: Maternal characteristics

Variable	*n* (%)			Chisquare test (*P*)
	Total (*n*=1,531)	Survived (*n*=1,382)	Expired (*n*=149)	
Birth spacing				
<2 year	559	464 (83%)	95 (17%)	0.003
2-4 year	368	331 (89.9%)	37 (10.1%)	
ANC visit				
<4	772	377 (92.4%)	31 (7.6%)	
≥4	408	702 (90.9%)	70 (9.1%)	0.736
Delivery attended by				
Doctor	317	280 (88.3%)	37 (11.7%)	
Nurse	936	805 (86%)	131 (14%)	0.002
ANM	16	14 (87.5%)	2 (12.5%)	
Dai	151	113 (74.8%)	38 (25.2%)	
Other/relative	110	90 (81.8%)	20 (18.2%)	

Risk factors associated with neonatal mortality

In univariate analysis, age less than 12 h, preterm neonates, and newborns with extremely low weight (<1 kg) were significantly associated with mortality. Apnoea, absence of cry or feeble cry, abnormal color (pale, peripheral, and central cyanosis), and (The APGAR score comprises five components: 1) color, 2) heart rate, 3) reflexes, 4) muscle tone, and 5) respiration, each of which is given a score of 0, 1, or 2) score below 6, had a significant association with mortality. Indication for admission, which includes perinatal asphyxia, jaundice, refusal to feed, meconium aspiration syndrome, and congenital malformation, were the predictors of mortality. Also, the treatment, including the duration of antibiotic given for less than 3 days and more than 3 days and IV fluid administered for less than 3 days and more than 3 days, had a significant association with mortality. Gestational age of more than 36 weeks, delivery attended by the dais, and lower segment caesarean section (LSCS) delivery were also significantly associated risk factors of death [Tables 3 and 4].

In multivariate analysis, very low and extremely low birth weight babies, prematurity, absence of cry, duration of antibiotic and duration of IV fluid given were found to be independent predictors of mortality.

Discussion

The present study compared the baseline characteristics, maternal characteristics, and neonatal characteristics between the surviving and non-surviving neonates admitted to the SNCU. We set out to discover the determinants of newborn mortality in tribal communities because there is a significant disparity in neonatal mortality rates between urban and tribal areas, as well as unequal resource distribution in our country.

Maternal characteristics

There is an increased risk of adverse effects such as premature births, mortality, and growth restriction with increased parity and maternal age. The study compares variables of birth spacing, ANC visits, and the delivery attendant by specific personnel. A significant association was seen in the birth spacing between 2 and 2 to 4 years, as well as, significance when the delivery was attended by a doctor. Eighty-seven percent of the births were still performed by midwives. This is supported by a study conducted in Bangladesh that shows that traditional birth attendants are the first choice of preference.[9] Prevalence of traditional views, poverty and illiteracy was of major influence on the preference of birth attendants.

Neonatal mortality

A total of 1,531 neonates were included in our study. Out of which, nearly three-fourths of the patients were discharged, and around 10% were deceased. A study done in Nepal by Paudell *et al.* and a study by Soni LK *et al.* in central India had coherence with the outcome of our study. Approximately 50% of newborns were inborn.[10,11] A similar study was conducted in the Raigarh district of Chhattisgarh by Soni *et al.*,[12] which had inborn admission of more than 50% (57.7%) [Graph 1].

Males get more attention on the part of caregivers and are brought to the hospital to seek health services. This was also evident in our study as more than 50% of the study cohort was male. Male predominance is seen in different parts of the world, as a cross-sectional study conducted in Northern Ethiopia shows concurrence as the majority were males.[13] In our study, the majority of the new-borns admitted were of age less than 12 h, whereas, in a similar study in the Western region of Ghana and Western Asia region in Yemen, most neonates were of age less than 72 h and less than 24 h, respectively[14,15] In addition, the age of the babies admitted was found as an independent predictor of mortality in our study. More than 40% of the baby's weight between the range of 1.5 to 2.499 kg shows coherence with a similar study conducted in the NICU Kathmandu, Nepal.[16]

As per our study, around 30% of neonates were preterm. This was further suggested by studies conducted in various parts of the country by Chintha *et al.*,[17] Mahajan *et al.*,[18] and Sachan *et al.*[19] that nearly one-third of total admitted babies were preterm. According to the recent Million Death

Table 3: Univariate analysis

Indicator	Non-adjusted odds ratio	*P*	Confidence interval
Age at the time of admission			
>7 d	1		
3-7 day	0.80	0.611	0.343-1.875
24-72 h	0.68	0.366	0.299-1.559
12-24 h	0.47	0.486	0.060-3.791
<12 h	2.30	0.006	1.271-4.181
Maturity			
Full term	1		
Preterm	2.78	0.000	2.084-3.709
Post-term	0.31	0.264	0.428-2.372
Weight of the neonate			
≥2.5 kg	1		
1.5-2.499 kg	0.32	0.000	0.176-0.598
1-1.499 kg	0.13	0.000	0.074-0.243
<1 kg	0.11	0.000	0.064-0.218
Indication for admission			
Low birth Weight/prematurity	1		
Perinatal asphyxia/apnea	0.52	0.001	0.355-0.760
Sepsis	0.73	0.392	0.369-1.478
Convulsion	0.65	0.593	0.141-3.056
Jaundice	0.14	0.000	0.070-0.311
Refusal to feed	0.37	0.000	0.214-0.648
Hypothermia/hyperthermia	0.58	0.122	0.295-1.154
Abdominal distension	0.34	0.159	0.079-1.263
Respiratory distress	0.70	0.238	0.390-2.923
Other	1.25	0.601	0.537-0.918
Meconium aspiration syndrome	0.42	0.030	0.196-0.918
Congenital malformation	0.21	0.010	0.063-0.690
Hypogylcemia	1		
Gestational age			
<28 week	1		
28-32	1.32	0.486	0.602-2.908
32-36	1	0.989	0.442-2.284
>36	0.57	0.031	0.343-0.950
Apnea			
Absent	1		
Present	5.33	0.000	3.241-8.761
Cry			
Normal	1		
Absent	4.54	0.000	3.085-6.691
Feeble	1.85	0.003	1.231-2.772
High Pitch	1.24	0.839	0.153-10.06
Color			
Pink	1		
Peripheral cyanosis	3.85	0.000	2.485-5.979
Pale	2.11	0.004	1.263-3.545
Central cyanosis	7.90	0.000	3.523-17.747
Duration of IV fluid			
Not given	1		
<3 days	2.38	0.011	1.219-4.655
>3 days	3.92	0.000	2.486-6.183
Duration of antibiotic			
Not given	1		
<3 days	3.44	0.000	2.385-4.966
>3 days	0.46	0.012	0.258-0.846
APGAR at 5 min			
7 and above	1		
4 to 6	1.87	0.007	1.183-2.967
0 to 3	3.16	0.019	1.205-8.288
Type of delivery			
NVD	1		
LSCS	0.44	0.003	0.269-5.299
AVD	0.71	0.583	0.211-410
Delivery attended by			
Doctor	1		
Nurse	1.23	0.295	0.834-1.817
ANM	1.08	0.920	0.236-4.946
Dai	2.54	0.000	1.539-4.206
Others/relative	1.68	0.086	0.928-3.044

Survey (MDS) report prematurity is the most important cause of neonatal deaths, accounting for 40% of neonatal mortality in India.[20] Although in our study, preterm birth holds 57% of total mortality. A premature newborn is more likely to develop apnoea, hypothermia, difficulty in feeding, and life-threatening infections such as pneumonia, and neonatal sepsis leading to death.

Risk factors

Our study found a lower APGAR score at 5 min to be the associated risk factor of mortality among neonates. The Ministry of Education-Shanghai Key Laboratory of Children's Environmental Health and the University of the School of Medicine has studied the relationship between APGAR score and neonatal mortality and showed identical results.[21]

The possible risk factors for low APGAR scores in our study include health, demographic, and socioeconomic features of the parents, as well as abnormalities in gestational duration and prenatal growth, and congenital deformities. Half of the babies had body temperatures less than 36.5ºC and were found to have 2.9 times of odds of mortality than the neonates who had normal body temperatures. However, an observational study conducted by PGIMER, Chandigarh, along with the University of Melbourne, revealed that 90 times the odds of mortality were seen in hypothermic neonates. PGIMER, Chandigarh, being a tertiary care institute, catches the sickest of the babies; hence, the difference is observed.[22] History of absence or feeble cry was common among non-survivors in our study, whereas, absence of cry was found to be a significant predictor of mortality. A study conducted by Roro *et al.*[23] in Ethiopia showed consonance with the findings, as the absence of cry was the independent predictor of mortality.

In a study conducted by Baruwa *et al.*,[24] unskilled birth attendants were found to be the independent risk factor for neonatal mortality, whereas, in our research, non-skilled birth attendance was the risk factor in univariate analysis.[24] Although

Table 4: Multivariate analysis

Outcome	Odds ratio	*P*	[95% Conf. interval]
Weight at the time of admission			
Normal weight (>2.5 kg)	1		
Low birth weight (1.5-2.499 kg)	3.22	0.050	1.433-1.575
Very low-birth-weight (1-1.49 kg)	11.33	0.005	4.625-27.77
Extremely low-birth-weight (<1 kg)	11.59	0.011	4.258-31.58
Duration of antibiotic given			
Not given	1		
≤3 D	0.49	0.002	0.290-0.844
>3 D	0.63	0.001	0.408-0.979
Maturity			
Full-term	1		
Preterm	2.13	0.003	1.291-3.532
Post-term	0.69	0.724	0.088-5.400
Duration of IV fluid			
Not given	1		
≤3 D	1.81	0.043	0.945-0.998
>3 D	2.16	0.132	0.793-0.880
Color			
Pink	1		
Peripheral cyanosis	3.59	0.000	1.861-6.924
Pale	2.50	0.017	1.181-5.319
Central cyanosis	10.40	0.000	3.269-32.35
Cry			
Normal	1		
Absent	3.55	0.000	2.117-5.969
Feeble	1.77	0.511	0.723-1.917
High pitch	2.19	0.472	0.257-18.80

this was not a significant factor in multivariable analysis, the higher NMR in these groups could be indicative of poor hygiene or an unskilled attendant (dais) who was unable to treat pregnancy issues.

Limitations and research gap of the study: Because of the retrospective nature of the study, the cause of death was determined by the extent and depth of information in the official records. It is subjected to a lack of accuracy related to missing data and documentation errors. Improving and effectively implementing critical preventive services such as maternal and newborn care, timely interventions, and timely referral to tertiary care centres for delivery of high-risk pregnancies and neonatal care in high-risk situations. Strengthening antenatal, intrapartum, and post-partum care is very important to combat all the risk factors associated with mothers and newborns.

Need Of The Hour: To make people aware and strengthen the existing SNCU neonatal facilities with modern gadgets and equipment. Accessibility to health care and increased health awareness of the tribal society by outreach campaigns by forming more centres with ANC clinics.

Strength of the study: SNCUs are the only approachable units in tribal remote areas that fulfils medical needs. This study emphasizes the need to increase the building capacity of the SNCU, thereby decreasing the NIMR and IMR.

Conclusions

According to our study, newborns aged less than 12 h were admitted with male predominance; LBW and prematurity were the common causes of admission to the SNCU. Birth asphyxia, prematurity, neonatal jaundice, and sepsis were fundamental and leading causes of morbidity. The preterm birth and low birth weight babies had significantly high mortality, which must be urgently addressed if India hopes to achieve sustainable development goals by 2030.

The data from this study will act as a baseline from which the effects of various interventions for newborn care can be evaluated and will help in health policy planning for the tribal community in the area of Bastar in Chhattisgarh.

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Conflicts of interest

There are no conflicts of interest.

References

1. Pathirana J, Muñoz FM, Abbing-Karahagopian V, Bhat N, Harris T, Kapoor A, *et al.* Neonatal death: Case definition and guidelines for data collection, analysis, and presentation of immunization safety data. Vaccine 2016;34:6027.
2. Millennium Development Goals (MDGs).Available from: https://www.who.int/news-room/fact-sheets/detail/millennium-development-goals-(mdgs).[Last accessed on 2022 Nov 18].
3. 'Newborns: Improving survival and well-being'. Available from: https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality.[Last accessed on 2022 Nov 18].
4. Alkema L, Chao F, You D, Pedersen J, Sawyer C. National, regional, and global sex ratios of infant, child, and under-5 mortality and identification of countries with outlying ratios: A systematic assessment. Lancet Glob Health 2014;2:e521–30.
5. Jain SK, SamvadV. SNCU analysis of India for the period of 2017-18 to 2019-20. no. January 2017, 2020.
6. 'National Family Health Survey (NFHS-5)'.Compendium of fact sheets. Ministry of health and family welfare, Government of India; 2019-21.Available from: https://main.mohfw.gov.in/sites/default/files/NFHS-5_phase-II_0.pdf.
7. Coffey PS, Brown SC. Umbilical cord-care practices in low- and middle-income countries: A systematic review. BMC Pregnancy Childbirth 2017;17:1.
8. Pati S, Chauhan AS, Panda M, Swain S, Hussain MA. Neonatal care practices in a tribal community of Odisha, India: A cultural perspective. J Trop Pediatr 2014;60:238–44.
9. Sarker BK, Rahman M, Rahman T, Hossain J, Reichenbach L, Mitra DK. Reasons for preference of home delivery with traditional birth attendants (TBAs) in Rural Bangladesh:

A qualitative exploration. PLoS One2016;11:e0146161.doi: 10.1371/journal.pone.0146161.

10. Sharma RK. Newborn Care among Tribes of Central India: Experiences from Micro Level Studies. Social Change 2010;40:117–37. https://doi.org/10.1177/004908571004000202.
11. PaudelL, KalakhetiB, Sharma K. Prevalence and outcome of preterm neonates admitted to neonatal unit of a tertiary care center in Western Nepal. J Lumbini Med Coll 2018;6:1–5.
12. Soni LK, Rathore P, Rani N. Neonatal morbidity and mortality profile of newborns admitted in sncu@ lt. Lam government medical college, Raigarh, Chhattisgarh. Int J Recent Sci Res 2019;10:30584.
13. DesalewA, Sintayehu Y, Teferi N, Amare F, Geda B, Worku T, *et al.* Cause and predictors of neonatal mortality among neonates admitted to neonatal intensive care units of public hospitals in eastern Ethiopia: A facility-based prospective follow-up study. BMC Pediatr 2020;20:1–11.
14. Tette EMA, Nartey ET, Nuertey BD, Azusong EA, Akaateba D, Yirifere J, *et al.*The pattern of neonatal admissions and mortality at a regional and district hospital in the Upper West Region of Ghana; a cross sectional study. PLoS One 2020;15:e0232406. doi: 10.1371/journal.pone.0232406.
15. Eze P, Al-Maktari F, Alshehari AH, Lawani LO. Morbidities and outcomes of a neonatal intensive care unit in a complex humanitarian conflict setting, Hajjah Yemen: 2017-2018. Confl Health 2020;14:53.
16. Nepal D, Agrawal S, Shrestha S, Rayamajhi A. Morbidities and outcomes of a neonatal intensive care unit in a complex humanitarian conflict setting, Hajjah Yemen. JLumbini Med Coll 2020;6:1–10.
17. Chintha LP, Bollipo S, Gottumukkala RP, Palepu P. Morbidity and mortality pattern among babies admitted in special newborn care unit, Nellore, Andhra Pradesh, India. Int J Contemp Pediatrics 2019;6:1898.
18. Mahajan S, Bajaj M, Vaid A, Thakur A. A one year review of clinical profile and treatment outcomes of neonates admitted to Sick Newborn Care Unit (SNCU) at Regional hospital in Himachal Pradesh draining a rural area. J Med Sci Clin Res 2019;7:235–41.
19. Sachan R, Singh A, Kumar D, Yadav R, Singh DK, Shukla KM. Predictors of neonatal mortality referred to a tertiary care teaching institute: A descriptive study. The Indian journal of child health 2016;3154:18–27.
20. Bassani DG, Kumar R, Awasthi S, Morris SK, Wager JFS. Causes of neonatal and child mortality in India: A nationally representative mortality survey. NIH Public AccessBone 2011;23:1–7.
21. Li F, Wu T, Lei X, Zhang H, Mao M, Zhang J. The Apgar score and infant mortality.PLoS One 2013;8:1–8.
22. Narang A, Kumar P, Narang R, Ray R, Carlin JB, Greenwood P, *et al.* Clinico-epidemiological profile and validation of symptoms and signs of severe illness in young infants (<60 days) reporting to a district hospital. Indian Pediatr2007;44:751–9.
23. Roro EM, Tumtu MI, Gebre DS. Predictors, causes, and trends of neonatal mortality at Nekemte Referral Hospital, east Wollega Zone, western Ethiopia (2010–2014). Retrospective cohort study. PLoS One 2019;14:1–13.
24. Baruwa OJ, Amoateng AY, Mkwananzi S. Association between type of birth attendants and neonatal mortality: Evidence from a national survey. Afr Health Sci 2021;21:1870-6.