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Study of Epidemiological Factors Affecting Neonatal Morbidity and Mortality in the Neonates Admitted to Nicu of Tertiary Care Center

KEYWORDS: Neonatal morbidity, NICU

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ABSTRACT *Background: Neonatal period is the most vulnerable period of human life for various health problems and infections and most of these are preventable. There is an interplay of different demographic, educational, socio economic, biological and care seeking factors, which are responsible for the differentials and the high burden of neonatal mortality. The present study was aimed to assess various epidemiological factors affecting neonatal morbidity and mortality. Material and methods: The present study was a hospital based descriptive study was undertaken in neonatal intensive care unit (NICU) of department of paediatrics of Dr.VM. Govt Medical College, Solapur. In present study, all the neonates admitted in neonatal intensive care unit from 1st January 2013 to 31st December 2013 were included, which were 1050. Results: Study shows neonatal admissions in mothers of age group 15-19 years were 429 (40.85%) followed by ≥30 years 271 (25.80%), 20-24 years 192 (18.28%) and 25-29 years 158 (15.04%). Out of 1050, 554 (52.76%) were multipara and 177(16.85%) were grand multipara mothers.*

Statistically no significant association was found between gender and morbidity wise distribution of neonates (p>0.05) except for low birth weight and prematurity with male preponderance. Conclusion: Study shows many Social Factor also influence the out come of neonatal admission. These factor can improve out come of pregnancy, ultimately neonatal morbidity and mortality will reduced.

INTRODUCTION

Neonatal period is the most vulnerable period of human life for various health problems and infections and most of these are preventable[1]. A neonate is 500 times more likely to die on first day of life than at one month of age [2]. The global burden of neonatal death is primarily concentrated in developing countries, where care of neonates is practically non-existent [3]. In India alone, of the 25 million babies born every year, one million die, India accounts for 25% of the neonatal mortality around the world.

The neonatal mortality rate (NMR) of the country did decline from 52 per 1000 live births in 1990 to 29 per 1000 live births in 2012 [4] but the rate of decline has been slow, and lags behind that of infant and under-five child mortality rates. The slower decline has led to increasing contribution of neonatal mortality to infant mortality. With the current infant mortality rates of 42 per 1000 live births, about 70% of infant deaths occur in the neonatal period. Among neonatal deaths, the rate of decline in early neonatal mortality rate (ENMR) is much lower than that of late NMR. The Average Annual Rate of Reduction for NMR was zero, just before introduction of NRHM (between 2003 and 2005), but has increased to 4.6% per year in the period between 2009 and 2011under NRHM which included JSSK. This is true for almost all states but there is still a huge disparity in NMR between and even within the states. The disparity is further compounded by rural-urban, poor-rich, and gender differentials. There is an interplay of different demographic, educational, socio economic, biological and care seeking factors, which are responsible for the differentials and the high burden of neonatal mortality [4].

Neonatal mortality and disease pattern is a sensitive indicator of availability, utilization and effectiveness of mother and child health services in the community. [5] Understanding of hospital burden due to different neonatal morbidity could contribute to a more effective approach in designing appropriate service. The present study was aimed to assess various epidemiological factors affecting neonatal morbidity and mortality in the babies admitted to neonatal intensive care unit.

MATERIAL AND METHODS

The present study was a hospital based descriptive study was undertaken in neonatal intensive care unit (NICU) of department of paediatrics of Dr.VM. Govt Medical College, Solapur. In present study, all the neonates admitted in neonatal intensive care unit from 1st January 2013 to 31st December 2013 were included, which were 1050. Daily visits were done to the neonatal intensive care unit for data collection of new admissions and follow up of patients was done with the help of interns for knowing the their outcome. The information regarding the study variables was recorded on a predesigned, pretested questionnaire. The various socio-demographic information of the cases were collected by interviewing of the parents or guardians of the child. On arrival in neonatal unit, baby was examined and managed by attending neonatologist / paediatrician of the paediatric department in NICU. Informed consent was taken before enrolling them in the study. Neonates having some condition i.e. Medico-legal cases (orphans, unknown babies, illegitimate babies), Brought dead neonates, Patients absconded, Patients who could not be contacted due to some other reasons, patient's parents or guardian not willing to take part in the study were not included in study. Institute Ethical committee approval was taken prior to the study.

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RESULTS

Table 1: Socio-demographic data of neonates and his family (n=1050)

Sex	No. of cases	Percentage (%)
Male	584	55.61
Female	466	44.38
Z test, Z=3.64, p<0.01		
Religion	No.	Percentage (%)
Hindu	418	39.80%
Muslim	411	39.14%
Buddha	103	9.80%
Sikh	061	5.80%
Jain	042	4%
Christian	015	1.42%
Occupation (mother)	No. of cases	Percentage (%)
Clerical ,skilled	102	09.71
Semi-skilled	183	17.42
Unskilled	147	14.00
Unemployed(housewife & students)	618	58.85
Total	1050	100
X^2 = 654.48, D.F. = 3, p < 0.01, Statistically significant		
Socioeconomic status of family	No. of cases	Percentage (%)
S.E.Class I	000	00
S.E.Class II	029	02.70
S.E.Class III	203	19.30
S.E.Class IV	424	40.30
S.E.Class V	394	37.50
X^2 = 386.42, D.F. = 3, p < 0.01, Statistically Highly significant		
Type of family	No. of cases	Percentage (%)
Nuclear	490	46.66
Three generation	307	29.23
Joint	253	24.09
Area of residence	No. of cases	Percentage (%)
Urban	449	(42.7)
Rural	601	(57.2)
Literacy status	Mother (%)	Father (%)
Illiterate	563 (53.61)	414(39.42)
Primary education	108(10.28)	157(14.95)
Secondary	197 (18.76)	120(11.42)
S.S.C.	159 (15.14)	170(16.19)
H.S.C.	022 (02.09)	110(10.47)
≥Graduate	001 (00.09)	079(07.51)

Among the 1050 neonates admitted, there was male preponderance with male to female ratio of 1.3:1. There was statistically highly significant association found between sex and neonatal admission. Above table shows neonatal admissions seen in Hindu were 418(39.80%) followed by Muslims 411(39.14%), Buddhist 103(09.80%), Sikh 61(5.80%), Jain 42(4%) and Christian 15(1.42%). Neonatal admissions seen in unemployed mothers were 618 (58.85%), semiskilled mothers 183 (17.42%) and unskilled mothers 147 (14%). While there were less number of admissions from clerical skilled 102 (9.71%). There were no cases from professional and managerial occupation of the mothers. Maximum numbers of neonates were from socioeconomic class IV i.e. 424 (40.3%) followed by socioeconomic class V 394 (37.5%) and socioeconomic class III 203 (19.3%) and no cases from S.E. class I. Neonatal admissions from nuclear family were 490(46.66%), three generation family were 307(29.23%) and joint family were 253(24.09%). Study showed that 563(53.61%) of the mothers and 414 (39.42 %) of the fathers were illiterate.

Table 2: Distribution of neonates according to Age and Parity of mother (n=1050)

Maternal age (in years)	No. of cases (%)
15-19	429 (40.85)
20-24	192 (18.28)
25-29	158 (15.04)
≥30	271 (25.80)
Total	1050 (100)
Chi-square = 29.7, D.F. = 3, p < 0.01, Statistically Highly significant	
Parity of mother	No. of cases (%)
Primipara	319 (30.38)
Multipara	554 (52.76)
Grand multipara	177 (16.85)
Total	1050 (100)
Chi-square = 207.2, D.F. = 2, p < 0.01, Statistically Highly significant.	
Interval between pregnancies (years)	No. of cases (%)
< 1	09 (01.23)
1-2	612 (83.72)
2-3	70 (09.57)
>3	40 (05.47)
Total	731 (100)
X^2 = 1354, D.F. = 3, p < 0.01, Statistically Highly significant.	

The above Table showed that neonatal admissions in mothers of age group 15-19 years were 429 (40.85%) followed by ≥30 years 271 (25.80%), 20-24 years 192 (18.28%) and 25-29 years 158 (15.04%). A statistically highly significant association was found between maternal age in years and neonatal morbidities (p<0.01). Out of 1050, 554 (52.76%) were multipara and 177(16.85%) were grand multipara mothers. A statistically highly significant association was found between parity of mother and neonatal morbidities (p < 0.01). As out of 1050 mothers, 319 were primipara. So among the rest 731 mothers 612 (83.72%) had 1-2 years interval between pregnancies followed by 70 (9.57%) between 2-3 years, 40 (5.47 %) >3 years and 09 (1.23%) ≤ 1year. A statistically highly significant association was found between inter pregnancy interval and neonatal morbidities (p<0.01).

Table 3: Birth weight of the neonates in grams (n=1050)

Birth weight (gm)	No. of cases	Percentage
Up to 999 (ELBW)	041	03.90
1000- 1.499 (VLBW)	080	07.61
1500-1.999 (LBW)	082	07.80
2000-2.499 (LBW)	159	15.14
≥2500	688	65.52
Total	1050	100%
Gestational weeks	No. of cases	Percentage
28 to <31	024	02.28
31 to <34	041	03.90
34 to <37	103	09.80
37 to <40	739	70.38
40-42	143	13.61

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The above table showed that maximum 688(65.52%) number of babies were in the birth weight group >2500grams. But 159(15.14%) babies were having birth weight 2000-2499 grams, 82(7.80%) 1500-1999 grams and 80(7.61%) 1000-1499grams (VLBW) and 41(03.90%) up to 999 grams (ELBW). The above table showed that 882 (84%) were term babies and 168 (16%) babies were preterm. Out of the total preterm babies, 103 (61.30%) were seen in gestational weeks of 34 to <37 weeks.

Table 4: Season-wise distribution of neonatal admissions (n=1050).

Season	Percentage
Rainy (June-Sept.)	(577)55%
Summer (Feb.-May)	(263)25%
Winter(Oct.-Jan.)	(210)20%

The above figure showed that maximum i.e. 577 (55%) neonatal admissions occurred in rainy season as compared to summer season 263 (25%) and winter 210(20%).

Table 5: Gender and morbidity wise distribution of neonates (n=1050)

Neonatal morbidity	Male	Female	Total (100%)	Z-value	P value
Low birth weight	214	148	362 (34.47)	3.46	<0.05
Sepsis	112	100	212 (20.20)	0.82	>0.05
Prematurity	103	065	168 (16)	2.93	<0.05
Respiratory distress syndrome	080	077	157 (15.04)	0.23	>0.05
Perinatal asphyxia	076	073	149 (14.19)	0.24	>0.05
Hypoxic ischeamic encephalopathy	067	059	126 (12.07)	0.71	>0.05
Meconium aspiration syndrome	065	054	119 (11.33)	1.00	>0.05
Hyperbilirubinemia	058	056	114 (10.85)	0.18	>0.05
Congenital anomalies	046	035	081 (7.71)	1.22	>0.05
Congenital heart disease	011	010	021 (02)	0.21	>0.05
Necrotizing enterocolitis	011	006	017 (1.61)	1.21	>0.05
Miscellaneous	007	004	012 (1.23)	0.57	>0.05

*Total more than n=1050 due to coexistent morbidities.

Statistically no significant association was found between gender and morbidity wise distribution of neonates (p>0.05) except for low birth weight and prematurity with male preponderance (p<0.05).

Table 6: Outcome of total neonatal admissions (n=1050).

Outcome of total admissions	No. of cases (%)
Cured and discharged	730 (69.52%)
Expired	179 (17.04%)
DAMA	079 (07.52%)
Referral	062 (05.90%)
Total	1050 (100%)

Chi-square = 1140.57, D.F. = 3, p < 0.01, Statistically Highly significant.

The above table shows that out of total 1050 neonatal admissions, 730 (69.52%) babies were cured and discharged. While fatality rate in NICU was 179 (17.04%), 79 (07.52%) babies were taken against medical advice discharge and 62 (05.90%) babies were referred for further management. Significantly high number of neonates were cured and discharged (p<0.01).

DISCUSSION

In the present study, 362 (34.47%) of the neonates were low birth weight (LBW) of which 41 (3.90%) extremely low birth weight (ELBW) and 80 (7.61%) very low birth weight (VLBW). In present study 168 (16%) neonates were delivered prematurely, In a hospital based study, the incidence of the premature deliveries was 16.3%.[108] Birth asphyxia was an important cause of neonatal morbidity and mortality. The incidence of moderate to severe grade birth asphyxia with HIE was observed in 14.19 % (149) neonates in the present study, similar finding was observed by Chandra et al (1997)[6]. Kamaljit Singh et al (1997)[7], they found that low birth weight (20%) and birth asphyxia (20%) were the common morbidity conditions followed by neonatal infections, birth trauma and respiratory distress syndrome. In present study, 10.85 % of the newborns had jaundice. In a study from Pakistan [8], an overall home based surveillance detected that the rate of hyperbilirubinaemia (bilirubin >5 mg⁄ dl) among 1690 newborns was 39.7⁄1000 live births and that 27.6% were referred for treatment to hospitals. Rabindra Nath Roy et al (2014)[9] studied Mortality Pattern of Hospitalized Children in a Tertiary Care Hospital of Kolkata, major causes of neonatal admissions were birth asphyxia (42.93%), septicaemia (37.56%), prematurity (8.79%),meningitis (2.92%), congenital malformations (1.46%) and miscellaneous causes (6.34%).

In the present study, among the 1050 neonates admitted, there were 584 (55.61%) males and 466 (44.38%) females, showing male preponderance with male to female ratio of 1.3:1. There was statistically highly significant association between sex of baby and neonatal admissions (p<0.01). The male preponderance of admission has been documented in various studies[1O]. Mukhtar Yola M et al (2007)[11] has done a review of neonatal morbidity and mortality in Aminu Kano Teaching Hospital, northern Nigeria. Out of the total 2963 neonatal admissions, 1455 (49.1%) were inborn and 1508 (50.9%) were outborn babies. The sex ratio was 1.25 : 1 in favour of males.

Current study showed that neonatal admissions seen in unemployed mothers were 618 (58.85%), semiskilled mothers 183 (17.42%), unskilled mothers 147 (14%) and from clerical skilled 102 (9.71%). There were no cases from professional and managerial occupation of the mothers.

Our study showed that the maximum numbers of neonates were from socioeconomic class IV i.e. 424 (40.3%) followed by socioeconomic class-V 394(37.5%), socioeconomic class-III 203(19.3%) and socioeconomic class-II 29 (2.7%). Nitin Joseph et al (2014) [11] found that majority 174 (89.7%) were of poor socio-economic class. Study showed that maximum numbers of neonatal admissions were from nuclear family i.e. 490 (46.66%). Probably it shows current pattern of family structure.

In contrast to present study, Gagan agrawal et al (2012) [12] has done a study on Maternal Risk study showed that 563 (53.61%) of the mothers were illiterate while 414 (39.42%) of the fathers were illiterate. A statistically highly significant association was found between illiteracy of parents and

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neonatal morbidities (p < 0.01). Joshi S et al (2000) [13] observed that education had a significant effect on the birth weight of newborn. The percentage of low birth weight was as much as 52% in illiterate women. The incidence of LBW decreased rapidly in women who were educated upto secondary level (19%) higher. Present study showed that maximum 554 (52.76%) multipara mothers contributed to neonatal admissions followed by 319 (30.38%) primipara and 177(16.85%) grand multipara. A statistically highly significant association was found between parity of mother and neonatal morbidities (p < 0.01). Joshi S et al (2000) [13] observed that the percentage of LBW increased with increase in parity. In present study, as out of 1050 mothers, 319 were primipara, so among the rest 731 mothers maximum 612 (83.72%) had 1-2 years interval between pregnancies followed by 70 (9.57%) between 2-3 years, 40 (5.47 %) >3 years and 09(1.23%) ≤ 1year. A statistically highly significant association was found between spacing and neonatal morbidities (p<0.01).

Present study showed that neonatal admissions in mothers of age group 15-19 years were 429 (40.85%) followed by ≥30 years 271 (25.80%), 20-24 years 192 (18.28%) and 25-29 years 158 (15.04%). Deswal B. S. et al (1999)[14] carried out a study to find out risk factors for LBW. The maximum (30.9%) LBW babies were born to mothers below 20 years of age with decreasing trend with advancement in maternal age. According to one study in AIIMS, Delhi (2006)[15], 18.4% of cases of preterm deliveries before 34 weeks of gestation were due to pregnancy induced hypertension. The study findings were similar to the present study.

Statistically no significant association was found between gender and morbidity wise distribution of neonates (p>0.05) except for low birth weight and prematurity in which male babies were more (p<0.05). Present study showed that maximum i.e. 577 (55%) neonatal admissions occurred in rainy season as compared to summer season 263 (25%) and winter 210(20%).

Present study showed that maximum 688 (65.52%) number of babies were in the birth weight group >2500 grams. But 159 (15.14%) babies were having birth weight ranging 2000-2499 gm, 82 (7.80%) 1500-1999 gm and 80 (7.61%) 1000-1499 gm (VLBW) and 41 (03.90%) up to 999 gm (ELBW). A statistically highly significant association was found between birth weight and neonatal admissions (p<0.01). Shabbir Hussain et al (2014)[16] studied Neonatal Morbidity Pattern in a Tertiary Care Neonatal Unit and found that 53.8% babies were < 2.5kg while 46.2% babies were > 2.5 kg. Present study showed that 882 (84%) were term babies and 168 (16%) babies were preterm. Out of the total preterm babies, 103 (61.30%) were seen in gestational weeks of 34 to < 37 weeks. Present study shows that out of total 1050 neonatal admissions 730 (69.52%) babies were cured and discharged. While fatality rate in NICU was 179 (17.04%), 79 (07.52%) babies were taken against medical advice discharge while 62 (05.90%) babies were referred for further management. Significantly high number of neonates were cured and discharged (p<0.01). Similar study conducted by Gauchan E et al (2012)[17] at Manipal Teaching Hospital, Pokhara they found 76.9% babies were discharged after improvement, 6.5% left against medical advice while 1.62% were referred for further management.

SUMMARY AND CONCLUSION

Low bith weight, septicaemia and prematurity are found most common morbidities, which can be positively influenced by good ante natal care (ANC). Male neonate preponderance was probably due to people's bias toward male child or more vulnerability of male child. Many of leading cause of morbidity were infective origin, which were showing current pattern of neonatal morbidity in developing countries. Also the study shows parity , birth weight, gravida, mother age at pregnancy and interval between pregnancy; these are some factor which can be a significantly affect the neonatal morbidity. Good Ante natal care (ANC), hygiene IEC activities about various social factor like parity, interval between pregnancy and age at delivery can also improve the present scenario.

Limitations of Study: This study has some limitations. As it was a hospital based study and as most of the patients had a low socio-economic status, the results of this study may not reflect the true burden which is prevalent in the community as a whole. Also it is single centric study so to draw a more significant conclusion it will need multi-centric large study.

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