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"NEONATAL PROFILE AND OUTCOME OF THE NEONATES ADMITTED IN NICU: A HOSPITAL BASED PROSPECTVE STUDY"

Neonatal

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ABSTRACT

BACKGROUND: India contributes to about 1.2 million deaths every year out of the four million newborn babies who die in the first month of life out of which. India thus faces the biggest newborn health challenge of any country in the world. A study of NICU was undertaken at SKIMS Srinagar to determine the profile and outcome of the neonates admitted to a NICU of a Tertiary Care Teaching Hospital in Jammu & Kashmir.

MATERIAL AND METHODS: A descriptive case series hospital based prospective study was conducted over a period of one year from with effect from 1st January 2013 to 31st December 2013 in NICU of SKIMS Srinagar by following neonates from admission to discharge, LAMA or death collecting the data by using a proforma.

RESULTS: The three most common cause of admission was Neonatal Jaundice (26.7%), Septicemia (19.1%), and Prematurity (12.5%). The neonatal mortality in the NICU was 9.8%. The neonatal mortality in late neonatal period was slightly more than in the early neonatal period (12.0% versus 9.2%; p-value =0.014). The gender wise outcome of the neonates admitted to NICU revealed that neonatal mortality in male was slightly more than female (11.1% versus 8%; p-value=0.1012). It was found that death in pre-term (<37 weeks) was more than those born at term (37-42 weeks) (16.8% versus 5.4%; p-value <0.0001). About 3/4th of the extremely low weight (<1000g) neonates expired and the p- value was calculated at <0.0001 meaning thereby that weight on admission is very strongly associated (p<0.0001) with outcome of the neonates. For the outcome according to place of delivery it was found that the mortality in the neonates born in the health institution was less than neonates born at home (8% versus 25.5%; p-value < 0.0001). The neonatal mortality in the neonates born to illiterate mothers was more than literate mothers (17.7% versus 6.3%; p-value <0.00001).

CONCLUSIONS: The study showed that the age at admission, gestational age, weight on admission, place of delivery and literacy of mothers is associated with outcome. However, the gender , place of residence and type of family is not associated with outcome of the neonates in NICU.

KEYWORDS

Profile, Neonate, Outcome, NICU

INTRODUCTION

Childbirth is an occasion for joy and celebration. However, there is a threat of serious illness or death of a newborn and it places serious responsibilities on health care providers to respond appropriately and with effective therapy. World over, four million newborn babies die in the first month of life—99% in low and middle-income countries every year. [1] In India, 26 million babies are born every year, and 1.2 million die in the first four weeks of life, which accounts for a quarter of global neonatal deaths. India thus faces the biggest newborn health challenge of any country in the world. [2] Neonatal deaths constitute about two-thirds of infant deaths in India with 45% of the deaths occurng within the first two days of life.

[3] The common cause of neonatal mortality in India are asphyxia, prematurity and low birth weight, infections like pneumonia and gastroenteritis and a variety of surgical problems. It has been observed that improved level of newborn care can bring down the mortality rates. [4] While high infant mortality rates were recognized by the British medical community at least as early as the 1860s, modern neonatal intensive care is a relatively recent advance. [5] High neonatal mortality rate in a country reflects the poor availability of quality and quantity of infrastructure and utilization of neonatal care of that country. Improved neonatal care can lead to increased infant survival.

The Neonatal Intensive Care Units (NICU) have a role in developing countries like India; although neonatal intensive care is among the more expensive services that any health care systems can provide. [6] The cost of establishing a neonatal intensive care unit runs into crores of rupees in India in which equipment cost formed two-thirds of the establishment cost and ancillary personnel salary comprised the largest proportion of the running costs. [7] Neonatal intensive care is cost intensive and rational use of neonatal unit services by targeting its utilization for the very low birth weight neonates and maintenance of community based home-based newborn care is required. [8] In developing countries where budgetary constraints limit technological advances, the judicious implementation of neonatal intensive care measures can result in reduction of morbidity and mortality. The study was under taken with the objective to determine the bio-social profile and outcome of the neonates admitted to a Level-III NICU of Sher-i-Kashmir Institute of Medical Sciences (SKIMS) Srinagar (Jammu and Kashmir) which is the only Tertiary Care Teaching Hospital in Jammu & Kashmir.

MATERIAL AND METHODS

This descriptive case series, hospital based prospective study was conducted over a period of one year from with effect from 1st January 2013 to 31st December 2013 in Level-III NICU of Sher-i-Kashmir Institute of Medical Sciences(SKIMS) Srinagar (Jammu and Kashmir). This NICU of SKIMS Srinagar receives the out born neonates who are referred by the other health institutions of Kashmir Province of Jammu and Kashmir State of India as high-risk babies.

The NICU provides the Intensive Care, Incubation, Resuscitation, Ventilation, Exchange Transfusion, Phototherapy, Ultrasonography, ECG, Echo, and Diagnostic Laboratory services. The NICU has 18 Open care system, 5 Syringe pumps, 5 Infusion pumps, 10 Incubators, 2 Resuscitators, 5 Phototherapy units, 5 Ventilators, 18 Incubator Cots/ Beds, 1 Ultra Sound Machine and other equipments. The NICU has a Nurse: Patient ratio varies from 1:7 in the morning shift to 1: 15 during the afternoon and night shifts. In addition, there are usually, 2 Consultants, 1 or 2 Senior Residents, and 2 Junior Residents including Post Graduate Residents, covering the neonatal unit depending on the rotations.

The data was collected in a predesigned standardized proforma. The progress of the patient and eventual outcome following the management of the child were also recorded. On arrival in neonatal unit, baby was examined by Senior Resident/ PG Resident and then by Neonatologist/ Pediatrician. The neonates were followed from the time of admission up to the time of discharge or LAMA or death. Neonatal data was collected at time of admission and finalized after

discharge or LAMA or death. Diagnosis of Pre-maturity was Clinical or based on WHO definition for pre-maturity (live born neonates delivered before 37 weeks from 1st day of last menstrual period). Weight of neonates was measured using electronic weighing machines having gram as smallest division. WHO definition for Low Birth Weight (LBW), Very Low Birth Weight (VLBW), and Extreme Low Birth Weight (ELBW) were used for classfication as Low Weight (LW), Very Low Weight (VLW), and Extreme Low Weight (ELW) neonates. All the sick neonates brought alive to neonatal unit with definitive symptomatology and diagnosis were included and the study and the neonates brought dead and those who left the neonatal unit against the medical advice (LAMA) were excluded from the study. Approval for the study was obtained from the SKIMS Hospital's Ethical Committee. No Financial assistance was taken from any individual, association, Organization or institution. The data collected was analyzed by using SPSS version 20 software and the frequency and percentages were calculated.

RESULTS AND OBSERVATION

The data analysis showed that there were 1017 neonates admitted to NICU during the one-year period of study i.e. 1st January-31st December 2013 out of which the two (2) neonates that left against medical advice (LAMA). Being insignificant in numbers these two neonates were excluded from analysis and data was analyzed for only 1015 neonates..

The Average Length of Stay (ALS) of the neonates admitted to NICU was 5.65 days (Standard Error = 0.167, 95% Confidence Interval for Mean between 5.97 upper & 5.32 lower, Median =4.00, Variance = 28.274 and Standard Deviation= 5.317). The minimum and maximum Average Length of Stay (ALS) of the neonates was 1 and 28 days respectively with a Range of 27. The average age on admission of the neonates was 4.84 days (Standard Error = 0.168, 95% Confidence Interval for Mean between 5.17 upper & 4.51 lower, Median =3.00, Variance = 28.639 and Standard Deviation= 5.352). The minimum and maximum age was 1 and 28 days respectively with a range of 27.

The distribution of admitted neonates revealed that four-fifth (4/5th) of the neonates were in the age group of 0-7 days i.e. in early neonatal period whereas about one-fifth (1/5th) were in the late neonatal period. The ratio of males and female neonates was 1:0.7. The average gestational age at birth of the neonates admitted to NICU was 36.15 weeks (Standard Error = 0.081, 95% Confidence Interval for Mean between 36.31 upper & 35.99 lower, Median =37.00, Variance = 6.638 and Standard Deviation= 2.576).

The minimum and maximum gestational age of the neonates was 25 and 43 weeks respectively. The distribution of neonates according to gestational age at birth revealed that about two-fifth (38.5) were born prematurely and a negligible number (0.9%) were born at post-term of gestation. The study showed that the average weight on admission of the neonates was 2525.65 grams (Standard Error = 19.817, 95% Confidence Interval for Mean between 2564.54 upper & 2486.77 lower, Median =2590.00, Variance = 399408.455 and Standard Deviation= 631.988).

The minimum and maximum weight of the admitted neonate was 920 and 4350 grams respectively. More than half of the admitted neonates were of normal weight (2500-3500 grams). Most of the neonates were born in health institutions and small number were born at home. More than 2/3rd of the neonates were resident of rural area and almost similar number born in joint families. The literacy rate and employment rate among mothers of the neonates were less than among the fathers. More than half of the neonates belonged to families having Below Poverty Line (BPL) ration cards. The distribution of neonates is shown in Table-1

Table-1: Showing profile of the neonates admitted to NICU

Characteristics	N	%	
Neonatal Age on Admission	0-7 days	806	79.4
	8-14 days	124	12.2
	15-21 days	64	6.3
	22-28 days	21	2.1
Gender	Female	427	42.1
	Male	588	57.9
Gestational Age	Pre-term (<37 weeks)	392	38.61
	Term (>37-42 weeks)	614	60.51
	Post-term (>42 weeks)	9	0.9
Weight on Admission	High (>4000 g)	17	1.7
	Normal (2500-4000g)	591	58.2
	Low (1500-2499g)	335	33.0
	Very Low (1000-1499g)	68	6.7
	Extremely Low (<1000g)	4	0.4
Residence	Rural	694	68.4
	Urban	321	31.6
Place of Delivery	Hospital	913	90.0
	Home	102	10.0
Type of Family	Joint Family	728	71.7
	Nuclear Family	287	28.3
Literacy status of Mother	Illiterate	305	30.1
	Literate	710	69.9
Ration Card	Above Poverty Line	438	43.2
	Below Poverty Line	577	56.8
Total		1015	100

The distribution of admitted neonates revealed that the three most common cause of admission was Neonatal Jaundice, Septicemia**, and Prematurity (Table-2).**

Table-2: Showing common cause admission of the neonates to NICU

Disease	Total	
	N	%
NNJ	271	26.7
Septicemia	194	19.1
Prematurity	127	12.5
Birth Asphyxia	71	6.9
RDS	58	5.7
Hypernatremic Dehydration	42	4.1
Hypoglycemia	40	3.9
Seizure Disorder	35	3.4
TTN	33	3.3
MAS	30	3
Congenital Anomalies	26	2.6
Pneumonia	24	2.4
Polycythemia	19	1.9
Meningitis	14	1.4
Diarrhea	8	0.8
Others	23	2.3
Total	1015	100

It was observed that out of 1015 neonates admitted most were discharged (90.2%) whereas as some expired (9.8%) (Table-3).

Table-3: Showing outcome of the neonates who were admitted to NICU

Outcome	N	%
Discharged	916	90.2
Expired	99	9.8
Grand Total	1015	100

The data was also analyzed for association of age at admission, gender, gestational age at birth and weight on admission with outcome. As shown in Table-4, the neonatal mortality in late neonatal period was slightly more than in the early neonatal period (12.0% versus 9.2%; p-value =0.014) and the age wise outcome of admitted neonates showed strong association ($p<0.05$) . The gender wise outcome of the neonates admitted to NICU revealed that neonatal mortality in male was slightly more than female (11.1% versus 8%; p-value=0.1012) neonates however the gender is not associated ($p>0.05$) with outcome. It was found that death in pre-term (<37 weeks) was more than those born at term (37-42 weeks) (16.8% versus 5.4%; p-value <0.0001) neonates and gestational age wise outcome of admitted neonates is very strongly associated ($p<0.001$) with outcome. About 3/4th of the

extremely low weight (<1000g) neonates expired and the p- value was calculated at <0.0001 meaning thereby that weight on admission is very strongly associated (p<0.0001) with outcome of the neonates. The mortality in the neonates belonging to rural was more than belonging to urban neonates (10.8% versus 7.5%; p-value =0.0963) indicating that the residence is not associated (p>0.05) with outcome. For the outcome according to place of delivery it was found that the mortality in the neonates born in the health institution was less than neonates born at home (8%) versus 25.5%; p-value < 0.0001) and the place of delivery is very strongly associated (p<0.0001) with outcome.

The study also found that the neonatal mortality in the neonates belonging to joint family was slightly more than neonates belonging to the nuclear family (10.9% versus 7%; p-value =0.0604) however the type of family is not associated (p>0.05) with outcome. It was also observed that the neonatal mortality in the neonates born to illiterate mothers was more than literate mothers (17.7% versus 6.3% ; p-value <0.00001) indicating that the literacy of mothers is very very strongly associated (p>0.05) with outcome of the neonates in NICU (Table-4)

DISCUSSION

Accurate data on the bio-social profile and outcome of the neonates admitted to a Level-III NICU are useful for many reasons. It is important for the providers of care, investigators, local and national health administrators, and for decision makers to design interventions for prevention and treatment and to implement and evaluate health care programs. Reporting of neonatal bio-social profile and outcome from time to time contributes to identify deficiencies and assists health planners and workers to pay their due attention. Perhaps this is the first published data concerning Neonatal Intensive Care Unit issue in Jammu & Kashmir. This is a hospital-based study and may not present what is going on in the community. So, the results of this study should be compared cautiously with other similar studies, because NICU of SKIMS Srinagar doesn't have a birthing site and only out-born neonates are admitted here.

This one-year prospective study was done in order to document the bio-social profile and outcome of the neonates admitted to a Level-III NICU of SKIMS Srinagar. It was found that a total of 1017 neonates were admitted in the NICU during the period of study i.e. 1St Jan-31st Dec 2013. Only outborn neonates are admitted in SKIMS Srinagar. The bio-social profile provides us an indication for the area of neglect and the need to take corrective measures in this regard. There were 1017 neonates admitted out of which the two (2) neonates that left against medical advice (LAMA). The age wise distribution of admitted neonates in our study revealed that most the neonates were in the age group of 0-7 days (79.4%) group followed by 12.2% in 8-14 days age group. Thus the findings of our study were similar to the study by Anjum ZM and Shamoon M (2009) [9]. Our study also showed that males (58%) outnumber their female (42%) counterparts. It is consistent with local literature reported by Kumar MK, et al. (2012)

Characteristics	Outcome	Total	χ2 test	p-value					
	Discharge	Death							
	N	%	N	%	N	%			
Neonatal Age on Admission	0-7 days	732	90.8	74	9.2	806	100	Fisher's exact test 10.187	.014
	8-14 days	108	87.1	16	12.9	124	100		
	15-21 days	61	95.3	3	4.7	64	100		
	22-28 days	15	71.4	6	28.6	21	100		
Gender	Female	393	92.0	34	8.0	427	100	Pearson Chi-Square static value= 2.687	0.101
	Male	523	88.9	65	11.1	588	100		
Gestational Age	Pre-term (<37 weeks)	326	83.2	66	16.8	392	100	Fisher's Exact Test static value=36.658	<0.0001
	Term (>37-42 weeks)	581	94.6	33	5.4	614	100		
	Post-term (>42 weeks)	9	100	0	0	9	100		
Weight on Admission	High (>4000 g)	17	100	0	0	17	100	Fisher's Exact Test value=40.988	<0.0001
	Normal (2500-4000g)	558	94.4	33	5.6	591	100		
	Low (1500-2499g)	286	85.4	49	14.6	335	100		
	Very Low (1000-1499g)	54	79.4	14	20.6	68	100		
	Extremely Low (<1000g)	1	25.0	3	75.0	4	100		
Residence	Rural	619	89.2	75	10.8	694	100	Pearson Chi-Square value=2.765	0.0963
	Urban	297	92.5	24	7.5	321	100		
Place of Delivery	Hospital	840	92.0	73	8.0	913	100	Pearson Chi-Square value=31.902	<0.0001
	Home	76	74.5	26	25.5	102	100		
Type of Family	Joint Family	649	89.1	79	10.9	728	100	Pearson Chi-Square value=3.526	0.0604
	Nuclear Family	267	93.0	20	7.0	287	100		
Literacy status of Mother	Literate	665	93.7	45	6.3	710	100	Pearson Chi-Square =31.3168	<0.0001
	Illiterate	251	82.3	54	17.7	305	100		

[10] (60 % male versus 40 % female). The ratio of males (590) and female (427) neonates was 1:0.7 almost similar to a study conducted by Nahar J, et al. (2007) [11]. The average age of gestation of neonates was 36.15 week which was similar to a study conducted by Nahar J, et al. (2007) [11].

in which it was 35.6 ± 3.4 weeks. In this study about two-third of the neonates were of full term (60.6%) gestation and one-third were preterm (38.5%) which was similar to another study conducted by Gauchan E, et al. (2011) [12] in which there were 67.5 % term babies and 31.3% preterm babies. In contrast to our findings a study conducted by Seyal T, et al. (2011) [13] found that 42.8% neonates were preterm. Our findings are understandable because probably Janani Suraksha Yojana (JSY) & Janani Shishu Sawasthaya Karyakram (JSSK) Scheme of National Rural Health Mission (NRHM) has enhanced the Ante-Natal Check Up, hospital deliveries and neonatal care among the general population.

The average weight of the neonates on admission in our study was 2525.7 grams which was similar to a study conducted by Nahar J, et al. (2007) [11] in which it was 2420 ±808 gm. The results of our study are comparable to a similar study done by Hussain S (2014) [14]. Our study also revealed that most of the admitted neonates were delivered in health institutions (90%) and only small number were delivered at home (10%). The findings of our study are comparable the findings of Rahim F, et al. (2007) [15] and Seyal T, et al. (2011) [13] studies. Nahar J, et al. (2007) [11] found that most of the babies were born in hospital (83%) whereas Jan AZ, et al. (2013) [16] found that 66% were delivered at hospital, 28% were delivered in home and 6% were delivered at other place. The findings of more number of health institution deliveries in our study are probably due to Janani Suraksha Yojana & Janani Shishu Sawasthaya Karyakram Scheme of National Rural Health Mission.

There is a great variation in neonatal mortality statistics between NICUs from different parts of the world. This variation probably reflects the difference in the attending population, antenatal care, admission criteria, specific exclusion & inclusion criteria and level of neonatal care.

In our study it was observed that out of 1017 neonates admitted, 916 (90.07%) of the neonates were discharged, 99 (9.73%) died and 2 (0.2%) left against medical advice (LAMA). The neonatal mortality (9.73%) in NICU of SKIMS Srinagar is similar to a study conducted by Sarkar S, et al (2010) [17] (9.7%), and Tariq P, and Kundi Z (1999) [18] (9%) . Unlike observations in our study higher rates have been reported by Rahim F, et al. (2007) [15] (14.87%) Seyal T, et al. (2011) [13] (30.9%) and Prasad V and Singh N (2011) [19] (18.69%). Low neonatal mortality rates were found by Sankaran K, et al (2002) [20] (4%) & Zullini MT, et al (1997) [21] (6%) respectively.

Out of 1015 admitted neonates (after exclusion of two LAMA neonates), most of the expired neonates were in the age group of 22-28 days (28.6%) which is similar to a study by Anjum ZM and Shamoon M (2009) [9]. The gender wise outcome of the neonates admitted to NICU revealed that mortality in male (11.1%) neonates was more often than female (8%) neonates which was expected as the number of males neonated admtted is more than female neonates. The death in pre-term (16.8%) neonates was more often than those born at term (5.4%) which was probably due to physiological prematurity of the neonatal organs. The mortality in Normal Weight, Low Weight, Very Low Weight and Extremely Low Weight neonates admitted to NCU was 5.6%, 14.6%, 20.6%, and 75% respectively which was probably due to anatomical and physiological prematurity of the neonatal organs. It was found that most of the neonates born in Health Institution (80%) survived probably due to immediate access to treatment facilities whereas neonatal motality was 25.5% in those with home births due to lack of access to treatment facilities as well as mis handling.

LIMITATIONS OF STUDY

i. This is a hospital based study and may not represent what is going on in community
ii. We were unable to diagnose inborn errors of metabolism due to lack of diagnostic facilities

CONCLUSION

The study of neonates who were admitted in Level-III NICU of a Tertiary Care Teaching Hospital in Jammu & Kashmir-India showed that the age at admission, gestational age , weight on admission, place of delivery and literacy of mothers is associated with outcome. However, the gender , place of residence and type of family is not associated with outcome of the neonates in NICU.

RECOMMENDATIONS

i. Institutional Deliveries must be enhanced and home births prevented
ii. There is a need for early & timely referral to a tertiary care hospital from peripheral and non-tertiary setups to prevent neonatal mortality.
iii. Further studies to evaluate the risk factors and causes of neonatal infections in our environment will assist in appropriate interventions to bring about a reduction in mortality.

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