Ante Natal, Intra-Natal and Post Natal Determinants of Sick Neonates Admitted To Neonatal Intensive Care Unit (NICU) in Tertiary Care Government Hospital of Agra District

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Abstract :

Introduction: Neonatal period is a decisive stage where foundations of a healthy life are laid. Morbidity, mortality and hospital admissions during neonatal period may have an antecedent cause in pregnancy, delivery or post natal care. Precautions in each phase enables reduction in unnecessary, repeated hospitalizations. Under this background the research dwells into the ante natal, intra natal and post natal factors in the sick neonates admitted to Neonatal Intensive Care Unit (NICU) of tertiary care government hospital. **Method:** The cross sectional study was conducted among 450 sick admitted neonates. A pilot tested, face validated questionnaire was used to collect data regarding ante natal, intra natal and postnatal characteristics. Data analysis was done in Microsoft Excel 2016. **Results:** During Ante Natal Care (ANC) there was high coverage for pregnancy registration (97.3%) with 22.4% of mothers undergoing <4 ANC visits. Protection against tetanus was in 91.3% pregnancies. There were 8.2% home deliveries and 26% caesarean section. The mean age of gestation was 33.8 ±3.8 weeks and the mean birth weight was 2.08 ±0.7 kg. Immediate cry post birth was in 66.8% neonates. **Conclusion:** To sum up, in spite of good ante natal care there are more mothers with higher risk admitting their new-borns in NICU who at times are pre term or of low weight.

Key Words : Admission Neonatal Intensive Care Unit (NICU), Ante Natal Care (ANC), Determinants, Neonate, Post natal care

Introduction :

Globally in 2017 an estimated 6.3 million children and young adolescents died, of which 2.5 million were newborns approximately 7,000 deaths every day – most of whom died in the first week after birth. About 36 per cent died the same day they were born, and close to three-quarters of all newborn deaths in 2017 occurred in the first week of life. The first month is the most crucial period for child survival. The global neonatal mortality rate fell from 37 deaths per 1,000 live births in 1990 to 18 in 2017.[1] It is thus crucial that appropriate feeding and care are provided during this period, both to improve the child's, chances of survival and to lay the foundations of a healthy life.[2] Healthy and sturdy babies are likely to evolve as physically and mentally strong. Neonatal care is highly cost effective because saving the life of a newborn baby is associated with survival and productivity for over 5 decades. [3]

A healthy mother has a greater potential to deliver a healthy neonate, thus reducing admissions to neonatal centres, and so an efficient, alert and responsive ante natal care system provides a crucial window of opportunity to better the health of the mother and prepare her for delivery, complications and post natal care. Intra natal factors like place of delivery, type of delivery, skill level of birthing attendant and observations of aseptic precautions have a bearing on the well-being of the newborn as well. Sufficient post natal care also remains a vital domain in decreasing ailments in the neonate thereby shrinking their admission rates.

Thus, admission of a sick neonate to NICU is dependent directly and indirectly on a multitude of factors and this research enunciates some of the ante natal, intranatal and post natal characteristics.

Method:

This research was conducted as a cross-sectional study in the NICU of a government medical college in Agra district. Data was obtained from previous years to estimate the one year case load of neonatal

admissions which stood at approximately 1200. All neonates admitted to the NICU in a one year period were eligible for the study. Data was collected twice in a week from the NICU and due to paucity of resources and unavailability of primary care provider in many instances a total of 450 study subjects were included whose parents / guardians gave written informed consent for participation. A semi-structured questionnaire was used and details were collected by means of one to one personnel interviews. Institutional Ethical clearance (Letter no IEC/2017/35) and permission from NICU in charge was obtained for the study.

Data thus collected was entered in Microsoft Excel 2016 and analysed using the same. Mean, standard deviations, proportions and percentages were calculated wherever appropriate.

Operational Definitions :

Neonate /Newborn Period - It refers to the period of less than 28 days after birth.[4]

Low Birth Weight (LBW)- Birth weight of less than 2500 gm irrespective of gestational age.[4]

Extremely Low Birth Weight (ELBW)- Birth weight of less than 1000 gm irrespective of gestational age.[4]

Pre term - Gestational age of less than 37 completed weeks (i.e. less than 259 days) [5]

Term - Gestational age of 37 to less than 42 completed weeks (i.e. 259 to 293 days) [5]

Full Ante Natal Care- Full antenatal care is at least four antenatal visits, at least one tetanus toxoid (TT) injection and iron folic acid tablets or syrup taken for 100 or more days. [6]

Pre lacteal feeds- Foods and drinks given to a newborn baby before breastfeeding has started are called prelacteal feeds. [7]

Early initiation of breastfeeding- Provision of mother's breast milk to infants within one hour of birth.[8]

Results:

Maximum mothers of sick neonates belonged to the age group 25-30 years with the mean age being 24.97±4.1 years. Teenage pregnancies were at 4.6%. It was observed that 16.3% of mothers were married before the legal age of 18 years, and nearly half (48.1%) first conceived at an age <21 years. Maximum number of females were married in the age group of 18-20 years (47.8%) followed by 21-24 years (30.2%).Numbers of mothers for first conception rise sharply from less than 18 years to 18-20 years (39.8%), with peak at 21-24 years (40%) and trailed by a steady decrease.The mean age for marriage was 19.9 ±2.9 years and that for first conception as 21.0 ±3.0 years.   Among mothers less than half (40.7%) were illiterate. With increasing maternal education the number of mothers showed a declining trend. [Table 1] Almost all the mothers were home makers (97.6%). Birth spacing of less than three years was in 63.3% of multigravida.

There was a high coverage for pregnancy registration (97.3%) of which nearly three fourths (74.9%) are registered at a government setup. About one fifth (22.4%) of the females underwent inadequate ANC visits(<4 visits). Although IFA intake is high (74.5%), but only 36.9% of the total women took adequate iron folic acid (IFA) tablets. Complete TT immunization coverage was nearly full (91.3%). Almost every third mother has received full ante natal care.(31.8%). Nearly half (45.8%) of the mothers had anaemia, followed by hypertension (9.3%). One case of HIV and 2 cases of tuberculosis were also revealed during ANC care.[Table 2]

A substantial proportion of the deliveries were institutional (91.8%) while the rest (8.2%) were conducted at home. Among the 413 institutional deliveries nearly half (46%) were conducted in private hospitals and nursing homes, followed by community health centre (CHC) (20.8%). Most common method of delivery was normal vaginal delivery (71.7%), while 26% underwent caesarean section. Of the total admitted neonates most were outborn (85.8%) and more than two thirds of the neonates were delivered by doctors (68.7%). Of the 413 institutional deliveries 35.1% stayed for less than the recommended 48 hrs at the health facility. [Table 3]

Half (239) of the admitted neonates were pre term and 211 were term. The mean age of gestation was

Table 1: Biosocial Profile of Mother of Sick Admitted Neonates

Sr. No.	Parent Variable	Mother	N=450
		n	(%)
1.	**Current Age**		
	<18 years	2	(0.4)
	18-20 years	61	(13.6)
	21-24 years	151	(33.6)
	25-30 years	200	(44.4)
	31-35 years	28	(6.2)
	35 years	8	(1.8)
2.	**Age at Marriage**		
	<18 years	73	(16.3)
	18-20 years	215	(47.8)
	21-24 years	136	(30.2)
	25-30 years	24	(5.3)
	31-35 years	2	(0.4)
3.	**Age at First Conception**		
	<18 years	37	(8.3)
	18-20 years	179	(39.8)
	21-24 years	180	(40)
	25-30 years	51	(11.3)
	31-35 years	2	(0.4)
	>35 years	1	(0.2)
4.	**Education Status**		
	Illiterate	183	(40.7)
	Primary	116	(25.8)
	High School	64	(14.2)
	Secondary	39	(8.7)
	Undergraduate	40	(8.9)
	Post Graduate	8	(1.8)

33.8 ±3.8 weeks and the mean birth weight was computed as 2.08 ±0.7 kg. Birth weight was in normal range (>=2500 g) in 37.3% neonates, while the rest (62.7%) were LBW. LBW neonates show a decreasing trend in numbers with successive lower weight category. About two thirds (66.8%) of neonates cried immediately after birth. Merely 11.8% neonates took early bath. Talcum powder, oil was applied in almost one fifth (17.3%) of neonates. 17.6% of neonates were given pre lacteal feeds which mainly included honey, jiggery, tea and powdered milk. Early initiation of breastfeeding within 1 hr was present in merely 5.3 % neonates.Only 17.5% of neonates were completely immunized and the common reason for incomplete or no immunization was that the neonate was very sick (72.5) or lack of awareness (15.1%) among care providers. [Table 4]

Table 2: Ante Natal Care Determinants Associated with Admitted Sick Neonates

Sr. No.	Variables	Mothers of Neonates	
		n	**(%)**
1.	**Registration of Pregnancy(N=450)**		
	Yes	439	(97.3)
	No	11	(2.5)
2.	**Place of Registration (N=439)**		
	Sub centre	94	(21.4)
	PHC	74	(16.9)
	CHC	71	(16.2)
	District Hospitals (DH)	70	(15.8)
	Medical College	20	(4.6)
	Private clinics/hospitals	110	(25.1)
3.	**ANC Visits (N=450)**		
	<4	101	(22.4)
	4-7	247	(54.9)
	8-11	74	(16.4)
	>11	28	(6.2)
4.	**IFA Intake Adequacy (N=450)**		
	Adequate (>= 3 months)	166	(36.9)
	Inadequate (< 3 months)	169	(37.6)
	No Intake	115	(25.6)
5.	**Mothers Protected Against Neonatal Tetanus (N=450)**		
	Yes	411	(91.3)
	No	39	(8.7)
6.	**Full Ante Natal Care**		
	Yes	143	(31.8)
	No	307	(68.2)
7.	***Chronic Illness in Mothers**		
	Diabetes	8	(1.7)
	Hypertension	42	(9.3)
	Hepatitis B	6	(1.3)
	Anaemia	206	(45.8)
	Others(asthma, hypothyroidism, HIV TB etc)	19	(4.1)

* Multiple Response Question (Each Percentage taken out of 450)

Table 3: Intra Natal Determinants of Sick Neonates Admitted to NICU

Sr. No.	Variables	Number of Newborns	
		n	**(%)**
1.	**Place of Delivery (N=450)**		
	1. Home	37	(8.2)
	2. Institutional	413	(91.8)
2.	**Institutional Place of Delivery (N=413)**		
	PHC	18	(4.4)
	CHC	86	(20.8)
	DH/Govt Hospitals/Trust	55	(13.3)
	Medical College	64	(15.5)
	Private Hospital	190	(46.0)
3.	**Type of Delivery (N=450)**		
	Normal Vaginal Delivery	323	(71.7)
	Assisted Vaginal Delivery	10	(2.3)
	Caesarean Section	117	(26)
4.	**Delivery (N=450)**		
	Inborn	64	(14.2)
	Outborn	386	(85.8)
5.	**Delivery Conducted by (N=450)**		
	Doctor	309	(68.7)
	ANM	12	(2.7)
	Nurse	101	(22.4)
	Dai	28	(6.2)
6.	**Duration of Stay of Mother at Health Facility post Delivery (N=413)**		
	<2days	145	(35.1)
	2-6 days	245	(59.3)
	>6 days	23	(5.6)

Discussion:

In our study the mean age of mothers was 24.97 years which was similar to that found in the research by Srivastava NM et al (2009) (24.8 years), and Shah S et al (2012)(26.7 years).[9,10] Maximum mothers in our study (44.4%) belonged to the age group of 25-30 years in contrast to the study by Kawale S et al (2016) where 40.85% were from a younger age group of 15-19 years.[11] Study by Salih FA et al (2017) had 50% belonging to age group 21-35 years.[12] These demographic variations may be on account of inherent differences in the populations of these regions.

The current study identified 59.3% of mothers of admitted neonates were literate. NFHS 4 data for Agra identifies 63% of women and 86.3% men being literate in the general population, indicating more neonates of those parents who were illiterate were admitted.[37] Compared to our study Kawale S et al (2016) had less mothers (46.39%) as literates while

Table 4: Post Neonatal Factors Associated with Sick Neonatal Admissions to NICU

Sr. No.	Variables	Number of Neonates N=450	
		n	(%)
1.	**Gestational Age**		
	Preterm (<37wk)	239	(53.2)
	Term (37-<42 wk)	211	(46.8)
2.	**Birth Weight**		
	>=2500	168	(37.3)
	2499-1500	182	(40.4)
	1000-1499	74	(16.4)
	<1000	26	(5.8)
3.	**Immediate Cry at Birth**		
	Yes	301	(66.8)
	No	133	(29.6)
	Don't Know	16	(3.6)
4.	**Early Bathing of neonate**		
	Yes	53	(11.8)
	No	397	(88.2)
5.	**Application on Stump**		
	Yes	78	(17.3)
	No	372	(82.7)
6.	**Pre lacteal feeds at birth**		
	1.Yes	79	(17.6)
	2. No	371	(82.4)
7.	**Early initiation of breastfeeding**		
	1. Present	24	(5.3)
	2. Absent	426	(94.7)
8	**Immunization status**		
	Complete	79	(17.5)
	Incomplete	22	(4.9)
	None	349	(77.6)

Salih FA et al (2017) had 38.9% mothers as illiterate.[11,12]

In our study nearly all mothers were homemakers (97.6%) in contrast to study by Kawale S et al (2016) where 58.85% mothers were unemployed(students or housewives).In present study though 33.6% of mothers were educated at high school and above yet

nearly all were housewives; suggesting their only role in house despite potential employability.[11]

In this study 16.3% of mother were married before the legal age of 18 years and 8.3% first conceived at an early age of less than 18 years with 4.6% being teenagers during the current childbirth. Inability to abolish marriage before legal age may be

due to laxity in law enforcement as well as the cultural milieu encouraging early marriage. Early marriages leading to teenage pregnancies represent a risk factor for the mother and newborn which is completely avoidable. Still this rate of teenage pregnancy is lower than that observed by Kawale S et al (2016) at 40.85%. Our study found an inadequate birth spacing of less than three years in 63.3% cases.[11] Kawale S et al (2016) in their study reported 83.72% having a gap of 1-2 years.[11] Inadequate spacing of birth prevents the mother from full recovery and repeated pregnancies at short intervals may precipitate anaemia. Also spacing would enable better care of the children.

In this study 97.3% of the pregnancies were registered which was similar to that in the study by Gupta A et al (2018) with 93.2% registrations.[13] Though our study found 74.9% of registered pregnancies in public sector yet it contributed to only 54% of the institutional deliveries with the rest transferring to private sector. This may be due to several reasons like lack of availability, confidence, and accessibility in government set up.

In the current study 77.5% had four or more ante natal visits which were almost twice of that observed in NFHS 4 for Agra at 37.2%.[37] This is perhaps due to more complications in the mothers of admitted neonates warranting increased contact with health personnel during ante natal period. Study by Mishra AK et al (2017) indicated 60% with adequate ante natal visits and Buch PM et al(2012)observed 75.5% with upto 3 visits.[14,15] Differences in visits may be due to variations in health seeking behaviour among the population. Also the study by Buch PM et al(2012) used an older criteria of 3 ANC visits.[15]

In this study IFA tablets were consumed for 100 days in 36.9% mothers which is almost three times of that observed in NFHS 4 at 13.5%.[16] Full ANC was received by 31.8% mothers in the present study as compared to the district average of 9.5% found in NFHS 4. [37] In line with other ante natal care observations this increase in comparison to the district average may be attributed to high risk pregnancies and active care seeking behaviour in mothers of admitted neonates. Research by Salih FA et al (2017)reveal 52.8% while Saini AG et al (2011)

have 92% receiving some ante natal care.[12,17] Our study had 91.3% mothers protected against neonatal tetanus which is in congruence with that reported by NFHS 4 at 89.3% for Agra district.[37]

In the current study most common chronic illness was anaemia in 45.85% followed by hypertension in (9.3%) cases. However NFHS 4 data revealed anaemia to be present in 39.6% of pregnant women in Agra.[16] Research by Salih FA et al (2017) implicated 23.6% of mothers with illness.[12]

In the current study there were 91.8% institutional and 8.2% home deliveries. Similarly Kotwal YS et al (2018) had 10% and Rao SK et al (2015) had 8.5% home deliveries in their research.[18,19] District level data from NFHS 4 puts the institutional births at 78.7% which is lower than that found in our study and this may be due to better health seeking behaviour and increased ante natal contact with health facility on account of the fact that many pregnancies in our study were at higher risk.[37]

In the present study of the total neonates admitted 8.2% were home delivered, 49.3% at government and 42.2% at private institutions. Study by Samathkumar P et al (2018) had 3% home, 69% PHC, 19% government hospital and 9% private deliveries; while research by Jeganathan S et al (2017)observed deliveries at government hospitals at 80%, primary health centre (PHC) 12%, district hospital (DH) 2.6% and private 1.8%.[20,21] These differences in preferences of deliveries reflect an amalgamation of the practices, convenience, reliance and level of institutional care demanded by the population of these regions.

In the current study 71.7% were normal vaginal deliveries (NVD)and 26% as caesarean section (LSCS). This is in congruence with the study by Verma J et al (2018)with 69 % NVD and 30.4% LSCS, Rathod D et al (2015)with 78.2% NVD and Shah S et al (2012) with 72% NVD.[22,23,10]

In the current study there was a higher percentage of outborn (85.8%) admissions which may be due to extensive catchment area of the institution .Studies by Dwivedi K et al (2017) 57.63%, Mishra AK et al (2017) 56%, Prasad V et al (2011) 58.27%, and Rakholia R et al (2014) 53.54% also reported high percentage of

outborn neonates.[24,14,25,26] In our study 68% of the deliveries were conducted under the doctor's as compared to a study by Buch PM et al (2012)where 81.2% deliveries were by doctors.[15] Study by Srivastava NM et al (2009) indicated 60% skilled deliveries and in the study by Waiswa P et al (2010)58% deliveries were by skilled health professionals.[9,27] Differences in the time period and site of the study might be responsible for these variations.

A sub optimal duration (<48hrs) of postpartum stay at health facility was found among 35% mothers in our study. In contrast the study by Gupta A et al (2018)observed less than 2 days stay in 2.6%.[13] This is contrary to the recommendation of 48 hour post-partum stay in health facility, where we lose an opportunity to provide with post natal care and counseling for the mother and neonate.

The mean gestational age of the sick neonates in the current study is 33.8±3.8 weeks. In the studies conducted by Kotwal YS et al (2018), Jajoo M et al (2017), and Shah S et al (2012)the average gestational age was higher at 36.15 week, 34.28 week and 35.9 weeks respectively.[18,28,10] In the current study there is a slightly higher percentage of preterm neonates (53.2%), similarly study by Dalal E et al (2013)also had 53% preterm admissions.[29]

The current study noted a mean birth weight of 2.08±0.7 kg . Similarly low mean birth weight was observed in the studies by Jajoo M et al (2017)and Shalini B et al (2017)at 2.2 kg.[28,30] Extreme LBW was observed in 5.8% of neonates in our study. Also studies by Parekh ZR eta l(2018), Shah HD et al (2018), Narayan R et al (2017), Kawale S et al (2016), Raikwar P et al (2018) and Modi R et al(2015) observed a similar percentage of neonates with ELBW at 5.4%, 5%, 5.14%, 3.9%, 4.8% and 3.27% respectively.[31,32,33,11,34,35]

Immediate cry was present in 66.8% neonates in our research as compared to 72.2% in the study by Salih FA et al (2017).[12] In the current study incorrect post natal practices like early bathing of neonates (11.8%) and application on cord stump(17.3%) was present in relatively small proportion and implies an increased awareness regarding them. In study by Gandhi SJ et al (2014) and

Nigam S et al (2016) early bathing was in 37.8% and 13.9% of neonates.[36,37] Research by Nigam S et al (2016) observed application on stump in 35% newborns.[37] Differences may be due to variations in the cultural milieu of the study setting.

In our study 17.6% neonates were given pre lacteal feeds. This was lower than observed by Gandhi SJ et al (2014), Nigam S et al (2016) and Reshma et al (2014) at 32.1%, 63%,31% respectively.[36,37,38] These variations may be due to regional traditions and customs. Early initiation of breastfeeding was in 5.3% neonates in our study as compared to the district data at 18.6% according to NFHS 4;this lesser proportion of early breast feeding in our study may be because most of the neonates were sick at birth.[16]

Conclusion:

The study brings to light that the sick neonates admitted to NICU of a tertiary care government hospital had mothers in mainly younger age groups, illiterate, registered for pregnancy, with adequate number of ANC visits, anaemic, largely protected against maternal and neonatal tetanus, delivering in private setup and by doctors. More neonates were preterm and of low birth weight, with few instances of early bathing and pre-lacteal feeding.

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