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ORIGINAL RESEARCH ARTICLE

DETERMINANTS OF NEONATAL JAUNDICE AMONG NEONATES ADMITTED TO A TERTIARY CARE CENTER- A RETROSPECTIVE OBSERVATIONAL STUDY.

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ABSTRACT

Background:

Neonatal Jaundice is a common neonatal condition, affecting 60% of the neonates, in the first week of life. Although most often it is self-limiting, sometimes, the high bilirubin levels may harm the developing central nervous system and cause neurologic impairment even in term newborns. It is a major cause of hospital admissions, readmissions and neonatal mortality. Hence, we aimed to identify the determinants of neonatal jaundice among neonates admitted to a tertiary care centre, Bundelkhand Medical College, Sagar.

Methods:

A hospital based retrospective cross-sectional observational study was conducted amongst the neonates (n=375) admitted at Government Bundelkhand Medical College, Sagar, with the diagnosis of neonatal jaundice during the study period from 01 January 22 to 31 December 22 for one year. The data was collected regarding maternal and neonatal details from the SNCU records and analyzed by SPSS21.0 software.

Results:

375 neonates were admitted with Neonatal Jaundice, accounting for 22.18% of the SNCU admissions and 4.93% of the live births. The mean age of the neonates at the time of admission and gestational age were 3.7±3.1days and 37.4±1.6 weeks. There was male predominance(57.3%) and lesser female cases(42.7%) of neonatal jaundice. 77.87% cases with jaundice were full term, whereas 22.13% were preterm. 62.40% were out born, referred from health facility, whereas 37.07% were intramural (inborn) neonates. Most neonates were from urban areas (94.93%) and were delivered at Bundelkhand Medical College, Sagar (88.27%). Most neonates had vertex presentation (94.13%) and induced or caesarean delivery (73.07%). A few neonates admitted for low birth weight (3.20%), respiratory distress (2.93%) perinatal asphyxia (2.67%), abdominal distension, hyperthermia, neonatal seizures, prematurity and refusal to feeds also had neonatal jaundice.

Conclusion:

This study shows that male gender, prematurity, low birth weight, induced or caesarean delivery and perinatal asphyxia were the determinants of neonatal jaundice. High index of suspicion, prompt diagnosis and management of determinants are necessary to prevent and manage the potentially treatable entity of neonatal jaundice.

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Keywords: Neonatal Jaundice, Determinants, Hyperbilirubinemia, Bilirubin

1. INTRODUCTION:

Neonatal jaundice or neonatal hyperbilirubinemia results from elevated total serum bilirubin (TSB) and clinically manifests as yellowish discoloration of the skin, sclera, and mucous membrane. The term jaundice derives from the French word "jaune," which means yellow.[1] It is the most commonly encountered medical problem in the first two weeks of life and a common cause of readmission to the hospital after birth.[2] Neonatal Jaundice is a commonly encountered problem in the neonatal period.[3] It is estimated that about 60% of term and 80% of preterm newborns will present with clinical jaundice with TSB >5 mg/dl.[4]

In most cases, it is a mild, transient, and self-limiting condition and resolves without treatment referred to as "physiological jaundice." Physiological jaundice typically appears after 24 hours of age, peaks at around 48-96 hours, and resolves by two to three weeks in full-term infants.[4] However, it is imperative to distinguish this from a more severe form called "pathological jaundice." The high bilirubin levels may harm the developing central nervous system and cause neurologic impairment viz. bilirubin encephalopathy and associated neurological sequelae. Jaundice is considered pathological if it presents on the first day of life, TSB is more than the 95th centile for age based on age-specific bilirubin nomograms, levels rise by more than 5 mg/dL/day or more than 0.2 mg/dL/hour, or jaundice persists beyond 2 to 3 weeks in full-term infants.[5].

Universal screening of all newborns for jaundice and identifying risk factors for developing severe hyperbilirubinemia has been recommended by the American Academy of Paediatrics.[5] Major risk factors in newborns over 35 weeks gestation include pre-discharge bilirubin in the high-risk zone, jaundice observed in the first 24 hours, blood group incompatibility, gestational age 35 to 36 weeks, a previous sibling who received phototherapy, cephalhematoma or significant bruising, exclusive breastfeeding and east Asian race. Prematurity is also a known risk factor for developing severe hyperbilirubinemia.[6] Minor risk factors are serum bilirubin in the high intermediate-range, macrosomic infant of a diabetic mother, polycythemia, male gender, and maternal age older than 25 years.[5]

The risk factors of severe neonatal jaundice vary from region to region, such as male gender, rhesus iso-immunisation and gestational age 35-38 years are common factors in Europe.[7] A systemic review conducted in developing countries reported sepsis, G6PD deficiency, rhesus iso-immunisation, and low birth weight and small gestational age as common factors leading to acute bilirubin encephalopathy [8].

Neonatal Jaundice is a major cause of hospital Neonatal Intensive Care Unit (NICU) admissions, 75% hospital readmissions in the first week of life and is associated with significant mortality.[9] Hence, we aimed to identify the determinants of neonatal jaundice among neonates admitted to a tertiary care centre, Bundelkhand Medical College, Sagar.

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2. METHODS

We conducted a hospital based retrospective cross-sectional observational study amongst the neonates admitted with the diagnosis of neonatal jaundice during the period from 01 January 22 to 31 December 22 for one year. This study was performed at Special Newborn Care Unit (SNCU), at a tertiary care centre, Bundelkhand Medical College, Sagar, Madhya Pradesh, India.

A total of 375 neonates fulfilling the inclusion criteria (records of diagnosed jaundiced neonates admitted in SNCU identified clinically by Kramer's rule and confirmed by serum bilirubin estimation) were included in the study. The data was collected retrospectively, regarding maternal and neonatal details from the SNCU records. Those neonates having jaundice who were not admitted in SNCU were excluded from the study.

The neonates were studied for the characteristics of gender, determinants of neonatal jaundice, mode and place of delivery, gestational age, age at presentation, maternal antenatal visits, determinants of neonatal jaundice etc. The statistical analysis was performed using SPSS 21.0 software. Proportion and percentage were calculated for qualitative data. Mean and median were calculated for quantitative data. The Institutional Ethical Committee approval and clearance was taken before performing the study.

3. RESULTS

During the study period, 1690 neonates were admitted to SNCU. Among them 375 neonates were diagnosed with Neonatal Jaundice. Neonatal Jaundice accounted for 22.18% of the SNCU admissions. Also, there were 7600 live births during the study period, hence neonatal jaundice accounted for 4.93% of the live births.

TABLE 1: CHARACTERISTICS OF THE NEONATES WITH NEONATAL JAUNDICE

VARIABLES	MEAN	STD.DEVIATION
Gestational Age (wks)	37.4	1.6
Age of neonate (days)	3.7	3.1
Birth Weight (kg)	2.5	0.4
Head Circumference (cm)	33.1	1.6
Temperature	36.7	0.7

The mean gestational age of the neonates was 37.4±1.6 wks. The mean age of the neonates was 3.7±3. 1days. The mean birth weight of the neonates was 2.5±0.4 kg. The mean head circumference was 33.1±1.6 cm. The mean temperature was 36.7±0.7°C.

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TABLE 2: DISTRIBUTION ACCORDING TO GESTATIONAL AGE AT BIRTH

Maturity	Frequency	Percent
Full term (37to <42 Weeks)	292	77.87%
Preterm (<37 weeks)	83	22.13%
Total	375	100%

Most of the neonates (n=292, 77.87%) with jaundice were full term, 37to <42 Weeks. The preterm neonates also contributed to about one-fifth of the cases (n=83, 22.13%).

TABLE 3: DISTRIBUTION ACCORDING TO BIRTH WEIGHT

Weight	Frequency	Percent
Less than 1 kg	26	6.9%
1-1.5 kg	13	3.5%
1.5-2.5 kg	69	18.4%
More than 2.5 kg	267	71.2%
Total	375	100%

Most of the neonates (n=267, 71.2%) with jaundice were more than 2.5kg. 69 neonates (18.4%) were 1.5-2.5 kg. Extremely low birth weight neonates<1kg contributed to 6.9% cases (n=26). Least number of cases were found in 1-1.5kg weight band, n =13 contributing to 3.5% of the cases.

TABLE 4: DISTRIBUTION ACCORDING TO GENDER

Gender	Frequency	Percent
Female	160	42.7%
Male	215	57.3%
Total	375	100%

Most of the cases were males, n=215, 57.3% whereas females contributed to n=160,42.7% of cases of neonatal jaundice.

TABLE 5: DISTRIBUTION ACCORDING TO TYPE OF ADMISSION

DETERMINANTS	CATEGORY	FREQUENCY	PERCENT
Type of Admission	Inborn	139	37.07%
	Out born (Health Facility)	234	62.40%
	Out born (Community)	2	0.53%

Most of the cases of neonatal jaundice (n=234, 62.40%) were out born, referred from health facility. Intramural (inborn) neonates contributed to lesser cases (n=139, 37.07%). Few cases (n=2, 0.53%) were brought from the community.

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TABLE 6: DISTRIBUTION OF DETERMINANTS OF NEONATAL JAUNDICE

DETERMINANTS	CATEGORY	FREQUENCY(N)	PERCENT (%)
Antenatal Visits	1	7	1.87%
	2	51	13.60%
	3	141	37.60%
	≥4	176	46.93%
Mode of Transport	Govt. Provided	188	50.13%
	Self-Arranged	187	49.87%
District/Place	Sagar/Urban	356	94.93%
	Rural	19	5.07%
Place of Delivery	Govt. Hospital	26	6.93%
	BMC Sagar	331	88.27%
	Private Nursing Home	15	4.00%
	Home	3	0.80%
Presentation	Breech	19	5.07%
	Transverse	3	0.80%
	Vertex	353	94.13%
Labour	Induced	274	73.07%
	Spontaneous	101	26.93%
Thyroid	Euthyroid	48	12.80%
	Hypothyroid	15	4.00%
	Not Known	312	83.20%

The various determinants which tend to relate to neonatal jaundice have been studied. Most antenatal women had attended antenatal clinics 3 or more times. The mode of transport to the hospital was nearly same for self-arranged and government provided transport. Most neonates were from urban areas (n=356, 94.93%), whereas a few were from the rural areas. The place of delivery in most cases was at the tertiary care centre, Bundelkhand Medical College, Sagar, while others were delivered at other government hospital, private nursing home or home delivered. The presentation in most cases was vertex presentation, (n=353, 94.13%). Only 5% had breech delivery. Most neonates had induced labour (n=274, 73.07%), followed by spontaneous labour (n=101,26.93%). Hypothyroidism in mother was noted (n=15, 4.00%).

TABLE 7: DISTRIBUTION ACCORDING TO INDICATION OF ADMISSION

Indication of Admission	Frequency	Percent
Neonatal Jaundice	325	86.67%
Abdominal Distension	1	0.27%
Any Other	7	1.87%
Hyperthermia >37.5 C	1	0.27%
Low Birth Weight <1800 gm	12	3.20%
Neonatal Convulsions	2	0.53%
Perinatal Asphyxia	10	2.67%
Prematurity <34 weeks	2	0.53%
Refusal to Feed	4	1.07%
Respiratory Distress (Rate>60 or Grunt/Retractions)	11	2.93%
Total	375	100%

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The various indications with which the neonatal jaundice cases had presented were studied. Most neonates (n-=325,86.67%) had jaundice as the presenting complaint. Amongst the rest, low birth weight(n=12,3.20%), respiratory distress(n=11,2.93%) perinatal asphyxia (n=10,2.67%), abdominal distension, hyperthermia, neonatal seizures, prematurity and refusal to feeds were the indications for admission.

4. DISCUSSION

During the study period, 1690 neonates were admitted to SNCU. Among them 375 neonates were diagnosed with Neonatal Jaundice. Neonatal Jaundice accounted for 22.18% of the SNCU admissions. Also, there were 7600 live births during the study period, hence neonatal jaundice accounted for 4.93% of the live births. Research from a hospital-based study in Dharan (Eastern), Nepal found that 9.2% of infants admitted to the neonatal intensive care unit (NICU) had pathologic jaundice [10]. Estimates from recent studies show 6.7% neonatal Jaundice in Lagos, Nigeria [11] and 10.5% and 25.3% in term and near-term (35-37 weeks) newborns, respectively, in Turkey [12]. However, suspicion of neonatal jaundice is observer dependent, and presentation may vary at different levels of jaundice, hence, the incidence varies significantly between studies.

The mean gestational age of the neonates was 37.4±1.6 wks. The mean age of the neonates was 3.7±3.1days. The mean birth weight of the neonates was 2.5±0.4 kg. Reddy SC et al had similar observations showing mean gestational age of 38.32±1.14 weeks among the jaundiced neonates [13]. Brits et al similarly observed mean gestational age of 38.5 weeks and mean birth weight of the neonates as 3.15kg among the jaundiced neonates [14].

There was male preponderance in the cases of neonatal jaundice, n=215,57.3% whereas females contributed to n=160,42.7% of cases of neonatal jaundice. Similar observations have been made in studies conducted by Selvam et al (1.13 times the females) [15], Prabhu et al (54%) [16], Goyal et al (56%) [17], Pankajakshy et al [18]. In contrast higher incidence in females was also observed in studies by Garosi et al [19], Reddy SC et al [13].

In our study, prematurity was a prominent risk factor of neonatal jaundice and contributed to about one-fifth of the cases(22.13%)(n=83), while most jaundiced neonates.(n=292,77.87%) were full term. Prematurity has been observed as a risk factor in various studies by Goyal et al [17] (observed 45% full term and 55%<37 weeks period of gestation), Prabhu et al (23%) [16], Shah et al (30%) [20].

Birth weight plays a significant role as observed in the present study, low birth weight babies comprised about 28.8% of the neonatal jaundice cases, although most of the neonates(n=267,71.2%) with jaundice were more than 2.5kg. 69 neonates (18.4%) were between 1.5-2.5 kg, 26 neonates (6.9%) were extremely low birth weight neonate <1kg and 13 neonates (3.5%) were between1-1.5kg. Similar observations were made by Prabhu et al [16], Narang (34.5%) [21], Goyal et al (63%) [17].

Most of the cases of neonatal jaundice (n=234,62.40%) were out born, referred from health facility. Intramural (inborn) neonates contributed to lesser cases(n=139,37.07%). Few cases(n=2,0.53%) were brought from the community. Most antenatal women had attended antenatal clinics 3 or more times. Most neonates were from urban areas(n=356,94.93%),

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whereas a few were from the rural areas. The place of delivery in most cases was at the tertiary care centre, Bundelkhand Medical College, Sagar, while others were delivered at other government hospital, private nursing home or home delivered. The presentation in most cases was vertex presentation, (n=353,94.13%). Only 5% had breech delivery. Cephalohematoma has been reported to be a determinant factor in neonatal jaundice in studies by Bizuneh et al [9], Shetty et al [22], Singla et al [23].

Most neonates had induced labour or caesarean section (n=274,73.07%), followed by spontaneous labour(n=101,26.93%). Various studies reported association of type of delivery with NNH. Goyal et al reported 37 % of the neonates born through LSCS, [17] as also observed by Gupta et al [24] and Brits et al [14]. In a Swedish Study reduced incidence of NNH was observed in planned LSCS deliveries [25].

In the present study, hypothyroidism in mother was noted in 15 mothers (4.00%). In a study by Goyal et al [17] maternal thyroid disorders were noted in 23% mothers, as also by Menon et al [26]. Selvam et al did not observe any association of thyroid disorders with NNH [15]

The various indications with which the neonatal jaundice cases had presented were studied. Most neonates (n-=325,86.67%) had jaundice as the presenting complaint. Amongst a few neonates, low birth weight(n=12,3.20%), respiratory distress(n=11,2.93%) perinatal asphyxia (n=10,2.67%), abdominal distension, hyperthermia, neonatal seizures, prematurity and refusal to feeds were the indications for admission.

Perinatal asphyxia has been reported to be an influencing factor in neonatal jaundice in various studies by Bizuneh et al. [9], as also observed in our study(n=10,2.67%).

The retrospective nature of the study and lack of data regarding extensive investigations to find the etiology were limiting factors in the study. As the aim of the study was to find the determinants of neonatal jaundice, long term follow up could not be studied.

5. CONCLUSION

This study shows that male gender, prematurity, low birth weight, induced or caesarean delivery and perinatal asphyxia were the determinants of neonatal jaundice. High index of suspicion, prompt diagnosis and management of determinants are necessary to prevent and manage the potentially treatable entity of neonatal jaundice.

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