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RESEARCH ARTICLE
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INCIDENCE AND PATTERNS OF NEONATAL JAUNDICE IN TERTIARY MEDICAL FACILITY

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ABSTRACT
Neonatal jaundice is yellowish discoloration of white part of eyes and skin of an infant because of elevated bilirubin level due to the difference between production and excretion of bilirubin. The jaundice frequently appears between 1-3 days of life following delivery in 60% of term and 80% preterm babies and disappears in 10-14 days which sometime required interventions. The study was aimed to assess the prevalence of neonatal jaundice and risk factors in a tertiary care hospital Lahore, Pakistan. It is important to understand and acknowledge how different risk factor causes hyperbilirubinemia in neonates. A total of 366 newborns were enrolled in this study. A questionnaire was filled with necessary information about newborns demographic parameters, blood group and serum bilirubin level. The data were analyzed by SPSS version 25. The total serum bilirubin was found up to >40 mg dL^{-1} in both gender. 53.5% neonates develop jaundice due to unknown causes. It was concluded that the main reason of neonatal jaundice was ABO and Rh incompatibility between mother and neonates. Phototherapy and immunoglobulin's were the effective ways of treating the neonatal jaundice. Low birth weight, prematurity and gender of neonates were not the risk factors.

Keywords: Neonatal Jaundice, Total serum bilirubin, Interventions, Hyperbilirubinemia, Phototherapy, Prematurity

INTRODUCTION
Neonatal jaundice is yellowish discoloration of white part of eyes and skin of an infant because of elevated bilirubin level (1). The yellowish color of skin is notable Within 7 days following delivery from the face and after that as level increased of bilirubin it precedes to the other parts of body. This condition is widespread in 50-60% of neonates (2). Infants with higher bilirubin level >15 mg/dl shows palms and soles yellow (3). As compared to adults the quantity of bilirubin production is greater in neonates, about 3.8 mg/kg (250-300 mg) is formed daily (4). The jaundice frequently appears 24 hours following delivery due to the difference between production and excretion of bilirubin (1).

There are numerous reasons of neonatal jaundice include giving birth in place except general hospital, polymorphism UGT1A1, low gestational age, low birth weight, sepsis and elevated total serum bilirubin occurs from 1st day of delivery. Other reasons include blood group incompatibility between mother and fetus or bruises on the new born's body, metabolic disease , liver disease and dissolving hematoma (5). This increase the risk of significant jaundice where afterward intervention might be necessary. The problems come across by reason of hyperbilirubinemia are neurological appearances as seen in kernicterus leading brain damage. This is also seen in a full-term newborn with no noticeable evidence of hemolysis (6).

Jaundice is also a sign of other complicated life threating diseases. Including HDN (hemolytic disease of the new born) a situation in which IgG type antibodies from the mother attack the newborns red blood cells. Neonatal infection and liver diseases can all source bilirubin level to increase (7). Therefore, neonatal jaundice is significant preventable root of neurological handicap and before time death of affected infants. If un-conjugated bilirubin increases it might be harmless, furthermore cause damage to the brain and direct to cranicetresis, which is a long-term and severe damage to the neonatal system(8). For the treatment of this type of jaundice the most common use of therapies such as phototherapy and blood transfusion are possibly will be required. Phototherapy is one of the main satisfying approach to stop bilirubin persuaded brain damage in newborns (9).The incompatibility of ABO is frequently happens in the neonates of mother with O blood group and infrequently occurs in women's with A and B blood groups. In all maternal and neonates the percentage of ABO incompatibility is about 15 to 25 percent. On the other hand hemolytic disease of the new born (HDN) come about nearly 1 percent of O blood group mothers with the great titer of antenatal IgG antibody(10). The use of immunoglobulin's (Anti-D) due to Rh incompatibility significantly reduce the frequency of hemolytic disease of the newborns (11). Pathological jaundice is described as Bilirubin levels with a nonconformity from the normal range and requiring intervention, Appearance of jaundice within 1 day as a result of increase in serum bilirubin away from 5 mg/dl/day, highest levels greater than the estimated standard range, presence of clinical jaundice over 14 days and conjugated bilirubin (dark urine staining the clothes) would be classified under this type of jaundice (12). Neonatal brest milk and brest feeding jaundice derived about after a 7 days of delivery and persist for 30 -90 days following delivery, this type of jaundice is may be due to an ingredient in brest milk that prevents conjugation and clearance of bilirubin (13). The brest feeding infants generally look like jaundice between 1-3 days of age, and shows highest level in 5-15 days of life and gradually disappears till third week of life. In these infants the level of bilirubin reported as higher (13).

The one of effective and reliable treatment option for sever hyperbilirubinemia is exchange transfusion. And now it is widely used all over the world. The exchange transfusion is the preventable tool of bilirubin persuade neonatal death and long-term disease. When phototherapy has failed to lower the total serum bilirubin level in neonatal jaundice, the exchange transfusion therefor honor as last line of resistance to stop fast increasing sever bilirubin level in the infants (14).

METHODOLOGY

A study has been conducted on the prevalence of neonatal jaundice for research in a tertiary care hospital of Lahore, Pakistan. A total of 366 newborns were included. All newborns were hospitalized with jaundice. Neonates presenting with clinical jaundice (Serum bilirubin $\geq$7 mg dl^{-1}) up to 30 days of life were included in this study. For statistical analysis SPSS version 25 was used to assess the association and prevalence between neonatal jaundice and several explanatory factors including maternal and fetal factors namely, prematurity, low birth weight, jaundice in the first 24 hours of life, mother with blood group O or rhesus negative, glucose-6-phosphate dehydrogenase (G6PD) deficiency, rapid rise of total serum bilirubin (TSB), sepsis, lactation failure during breastfeeding, high pre-discharge bilirubin level, bruises, babies of diabetic mothers, and family history of severe neonatal jaundice. The venous blood samples were drawn from appropriate site of neonates and used for to determine the neonate's blood group and serum total bilirubin.

RESULTS

Demographic parameters of neonatal jaundice

The demographic data of patients was collected. Among the patients, male to female ratio was 2.3: 1.3 (n=235/131). Among all the participants, the age of jaundiced babies ranged from <1 day to 28 days. It was observed that their weight ranged from 1.0 kg to 4.0 kg. When the duration of stay at hospital was noted in jaundiced babies, it ranged from <1 day to 28 days (table I). When the gestational age of jaundiced babies was observed, it was found that 83 % were delivered full term (37 – 42 weeks) and 17 % were preterm delivered (<37 weeks) babies. It was noted that 63.38 % (n=232) neonates were delivered by normal spontaneous vaginal delivery (SVD) and 36.62 % (n=134) were delivered by lower segment caesarean section (LSCS).

TABLE I: Demographic parameters of neonatal jaundice

Parameter	Frequency
Male	235 (64.20%)
Female	131 (35.80%)
Age (days)	<1 – 28
Weight (kg)	1 – 4
Duration of stay at hospital	<1 – 28
Gestational age (weeks)	28 – 42
Delivered by LSCS	134 (36.61%)
Delivered by SVD	232 (63.39%)

Onset of jaundice according to gender

In the present study, the onset of jaundice was observed in male and female patients. It was noted that 85 neonates develop jaundice within less than 24 hour of age, out of which 56 were male and 29 were female. While 170 neonates develop jaundice between 24 – 72 hours of age, out of which 105 were male and 65 were female. Jaundice developed by neonates after 72 hours following delivery was found in 111 neonates, out of which 74 were male and 37 were female (table II).

TABLE II: Onset of jaundice according to gender

Onset of jaundice (hours)	Male (n)	Female (n)	Total (n)	Percentage (%)
<24	56	29	85	23.23
24 – 72	105	65	170	46.45
>72	74	37	111	30.32
Total	235	131	366	100

Causes of neonatal jaundice

From the statistical results, the causes of neonatal jaundice were noted among the study participants. Present study found different causes of neonatal jaundice which were included, Brest feeding jaundice, hemolytic disease of the newborns (ABO & Rhesus incompatibility), sever sepsis and prematurity (Figure: I). from the causes of disease , 35 cases of neonatal jaundice was due to Brest feeding and ABO hemolytic disease accounting for 49. Rhesus incompatibility was found in 26 cases. ABO & Rh incompatibility was noted in 09 cases. A total of 18 meet criteria for severe sepsis. While among 33 cases, neonates develop jaundice due to prematurity. The remaining causes 196 of neonatal jaundice was unknown which was not included in our study.

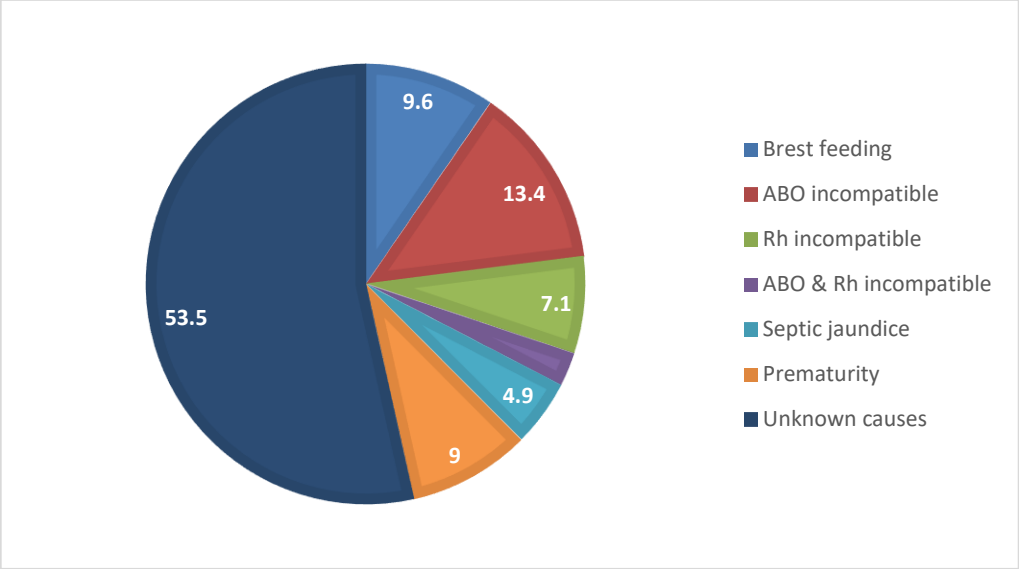

FIGURE I: Causes of neonatal jaundice

Comparison of mothers and babies blood groups among jaundiced babies

In the present study, the ABO blood groups of mother and babies obtaining with descriptive statistical analysis were compared. When the blood groups of mother and babies was noted, it was found that 19.65 % of mothers and 20.95 % of babies had blood group 'A', 30.35 % mothers and 40.47 % of babies had blood group 'B', 10.26 % mothers and 7.15 % babies 'had blood Group 'AB' and the rest 39.74 % mothers and 31.43 % babies had blood group 'O'. When the Rh factor among the participants was observed it was found that 82.58 % of the mothers and 90.47 % of the babies were Rh-positive while 17.42 % mothers and 9.53 % of the babies were Rh-negative. Details are mentioned below in table III.

TABLE III: Comparison of mothers and babies blood groups among jaundiced babies

Blood group	Mother (%)	Baby (%)
A	19.65	20.95
B	30.35	40.47
AB	10.26	7.15
O	39.74	31.43
Rh (Positive)	82.58	90.47
Rh (Negative)	17.42	9.53

Treatment given to jaundiced babies

Neonates were categorized according to treatment given. When the data was analyzed, it was observed that 27 neonates was required no treatment and 131 neonates were received phototherapy. While 161 neonates was treated with pharmacologic intervention. A small number of neonates 37 were received phototherapy and pharmacologic intervention. Minority of neonates 10 was treated with exchange transfusion mention below in figure II.

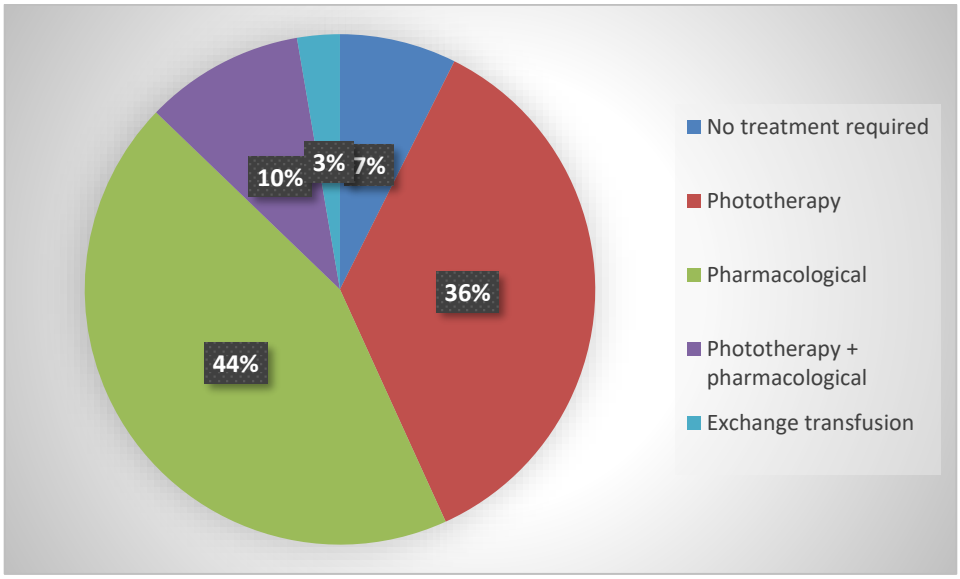

FIGURE II: Treatment given to jaundiced babies

DISCUSSION

When the total serum bilirubin (TSB) increases above the 95th percentile on behalf of age it is considered as hyperbilirubinemia. Jaundice is the yellowish discoloration of skin and sclera due to high bilirubin level. Hyperbilirubinemia is one of the dominant clinical conditions in neonatology. Which is encountered particularly in the first 7 days after delivery. The high bilirubin level may cause behavioral and neurological damage even in full term newborns (15). According to the National Neonatal Perinatal Database (NNPD), the frequency of neonatal jaundice in house live births is 3.3 percent and 22.1 percent in extramural admissions (16).

Prevalence of hyperbilirubinemia in neonates varies from country to country and even in different areas of the same country (17). In the present study the causes of neonatal jaundice were studied and it was observed that in 77% neonates of the studied group had physiological jaundice. Similar findings are seen in a previous study conducted by Siyal *et al* (18).

The major cause of hyperbilirubinemia in the present study was due to unknown causes. It has been reported 53.5 % of the study population. While the 2nd major cause of hyperbilirubinemia in the present study was ABO blood group incompatibility. The findings are same as Siyal *et al* (18). It was found that 13.4 % neonates were ABO incompatible with their mothers. while in a previous study conducted by Thakur *et al*. it was 12% (19). In the present study, it was found that the occurrence of jaundice in neonates were gender independent male and female neonates were equally affected. The findings were similar to study reported by Harsha *et al* (20). From the present study, out of 366 neonates who develop jaundice 63.38 % were delivered by spontaneous vaginal delivery (SVD) and 36.62 % were delivered by lower segment caesarean section (LSCS). It was found that the bilirubin level was higher among naturally delivered neonates compared to cesarean sections. Due to overall vacuum supported vaginal delivery, cephalohematoma, and oxytocin induction are considered as risk factors for hyperbilirubinemia. While a study conducted by Harsha *et al*., found that there is no significant association between neonatal jaundice and mode of delivery (20). In the present study, it was noted that birth weight of the baby and development of pathological jaundice were not clinically significant. While a study conducted by Bizuneh revealed that there is direct association between low birth weight and neonatal jaundice (21). In this study 7% neonates were required no treatment and 44% were treated with pharmacological interventions, 36% jaundiced babies were treated with phototherapy and 3% with exchange transfusion. IVIG extensively reduce the need of exchange transfusion. When the total serum bilirubin level raises the range of phototherapy or within 2 – 3 mg/dl of the exchange level (22). A study conducted by Okulu *et al.*, revealed that single dose of IVIG not enough to prevent from exchange transfusion and not decrease the duration of phototherapy in

neonates (22). While a study conducted by the El Fekey *et al*., concluded that IVIG reduce the bilirubin level and duration of phototherapy and need for blood transfusion in neonates (23).

CONCLUSION

It was concluded that hyperbilirubinemia were the main cause of readmission at hospital with in the 1st week of life. The main reason of neonatal jaundice was ABO and Rh incompatibility between mother and neonates. Male and female neonates were equally affected with jaundice. Prematurity, low birth weight and gender of neonates were not the risk factors for neonatal jaundice. Phototherapy, immunoglobulin's and exchange transfusion were the effective ways of treating the neonatal jaundice. There is need more study on these dimension to overcome the hyberbilirubinemia in neonates.

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