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Detection of Neonatal Jaundice among the Newborn Using Kramer's Criteria

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Abstract

Introduction: Jaundice is one of the most common conditions which need medical attention in newborn babies. In most babies with jaundice there is no underlying disease, and this early jaundice is termed as physiological jaundice.

Objectives: To determine the incidence of Neonatal jaundice by Kramer's criteria among Newborns in the Postnatal ward. To assess the risk factors that leads to Neonatal Jaundice.

Methodology: The research approach was Quantitative approach and Non experimental research design was adopted for this study. The sample size was 80 Newborns and purposive sampling technique was used. The data was collected by using Kramer's criteria. Results were analyzed by using descriptive and inferential statistics.

Results and findings: Out of 80 babies, 20 babies had Neonatal jaundice, total incidence rate was 25%. 43(53.8%) babies were in female sex group and 37(46.2%) babies were in male sex group According to the risk factors Majority 14(17.5%) of neonates had not given colostrums given at birth, 15(8.8%) of neonates had not initiated breastfeed within 24 hours of birth, 1(1.2%) of neonates had previous history of jaundice in siblings. According to mothers risk factors 7(8.8%) of mothers had Gestational hypertension, 7(8.8%) of mothers had Gestational diabetes mellitus, 2(2.5%) of mothers had hypothyroidism during pregnancy. There was significant association observed with the post test scores with their selected demographic variables like colostrum intake by the Newborn.

Conclusion: "Visual inspection of Neonatal jaundice by using Kramer's criteria" is a suitable low-cost and a feasible alternative modality for early detection of neonatal jaundice in a poor resource setting.

Keywords: Neonatal jaundice; Newborn; Kramer's criteria; Postnatal ward

Introduction

"*Every child born into the world is a new thought of God, an ever fresh and radiant possibility*"- Kate Douglas Wiggin.

Jaundice is one of the most common conditions needing medical attention in newborn babies. Jaundice refers to the yellow colouration of the skin and the sclera (whites of the eyes) caused by the accumulation of bilirubin in the skin and mucous membranes. Jaundice is caused by a raised level of bilirubin in the body, a condition known as Hyperbilirubinaemia [1].

More than 80% of newborns will exhibit jaundice, the clinical sign of hyperbilirubinemia, in the first few days of life. Hyperbilirubinemia can be benign at low levels but is harmful to the brain at higher levels. All newborns will have a serum bilirubin level that is higher than the adult norm, but the level of hyperbilirubinemia requiring treatment is determined by age in hours and risk factors for developing severe jaundice [2].

Jaundice is the most common problem in the first week of life. About 25-50% of all term neonates and higher percentage of preterm babies develop clinical jaundice during neonatal period. It is the commonest cause of admission to NICU in the neonatal period. Clinically, it is observed when the serum bilirubin exceeds 5 mg/dl in neonates and >2 mg/dl in adults. The peculiarities of Neonatal jaundice are its cephalocaudal progression due to relative thickness of the skin at various part, thinnest over the face and thickest over the palm and soles [3].

One tool considered for integration into the IMCI algorithm is the clinical jaundice scale, originally introduced by Kramer. The scale is used to predict the severity of hyperbilirubinemia based on the zone of skin discoloration in the neonate extending from the head (zone 1) to the palms and soles (zone 5), and assumes that an increasing zone of staining corresponds to increasing levels of serum bilirubin [4].

Delay in the diagnosis and treatment of neonatal hyperbilirubinemia, due to inadequate health worker recognition of jaundice or lack of proper diagnostic equipment, is common in developing countries and leads to preventable cases of neuro developmental impairment, disability and sometimes death [5].

Hence the researcher being a nurse interested to take this study to examine the effectiveness of Kramer's criteria for early detection of

Neonatal Jaundice. So that invasive investigations can be avoided and early management can be done and complications can be prevented.

Objectives

- To determine the incidence of Neonatal Jaundice by Kramer's criteria among Newborns in the Postnatal ward.
- To assess the Risk factors that leads to Neonatal Jaundice
- To associate the Incidence of Neonatal jaundice with the selected demographic variables and the risk factors [6,7].

Assumption

It is assumed that association of some risk factors for incidence of Neonatal Jaundice [6,7].

Methodology

A Study with 80 Newborns were selected from selected hospital at Puducherry for the study. The study approach used in the study was Quantitative Research Approach, research design was Non experimental Research Design, research variable was Neonatal jaundice and purposive sampling technique was used to select the sample for this study. Instrument used for study was structured interview schedule and Kramer's criteria to assess the bilirubin level, which is a standardized tool given by Indian Academy of Pediatrics, April 2016. Infants who were term neonates and who weighs ≥ 2000 g were selected for the study. Infants who were admitted to the neonatal intensive care unit or special care unit and who receives more than 48hr of intravenous antibiotics for concern for sepsis and Jaundiced neonates that came only on OPD Basis were excluded from the study [7,8].

The researcher obtained Formal permission from the concerned authority. The researcher introduced herself and rapport was established with the participant's mother. A brief introduction about the procedure and purpose of the study was given .Oral and written consent was obtained from each samples and reassurance was provided that the data collected would be kept confident. After the pilot study, the researcher conducted the main study at selected hospitals in Puducherry. Data was collected from the mother and baby pairs. Before starting data collection the newborns were selected on the basis of the inclusion criteria. The data was collected for 4 weeks by using Purposive sampling technique. To measure the level of jaundice the infant's skin was blanched using thumb pressure and the colour of the underlying skin noted. Observations were taken under natural lighting during daylight hours. The progression of yellow discolouration of the skin from the head to the feet or cephalocaudal progression was done by using Kramer's scale. The scale consists of 5 specific 'dermal zones' 1) head and neck, 2) upper trunk, 3) lower trunk and thighs, 4)arms & lower legs , 5) palms & soles. Lowest bilirubin levels were associated with yellow discolouration of the head and neck only and highest levels where the discolouration extended to the hands and feet. After collection of data by using Kramer's criteria, those babies who were diagnosed as Neonatal jaundice are subjected phototherapy and thorough clinical examination of babies was done and it was followed regularly till discharge of the baby. Kramer's criteria was used to detect the incidence of neonatal jaundice among newborns in the postnatal ward. Recording of responses were done simultaneously [8-10].

Kramer's criteria to assess and track progression of neonatal jaundice (Indian academy of pediatrics, April 2016)

Analysis was done by using descriptive and inferential statistical methods. Descriptive statistics like frequency and percentage distribution were used to analyse the demographic & obstetrical variables. Percentage distribution was used to find the Incidence of Neonatal jaundice by Kramer's criteria results among the subjects in the postnatal ward. Inferential statistics like chi-square test were used to associate Post test scores with selected demographic variables (Table 1) [9-11].

Site	Serum bilirubin levels
Head and neck	4-8 mg/dl
Upper trunk	5-12 mg/dl
Lower trunk and thighs	8-16 mg/dl
Arms & lower legs	11-18 mg/dl
Palms & soles	>15 mg/dl

Table 1: Serum bilirubin levels of different sites of the body.

Results and Findings

Table 2 shows that As per the mother's age group majority of the subjects; 44(55%) were between age group of 21-25 years, 75(93.8%) of them were Hindus, 70(87.5%) were homemaker 46(57.5%) subjects family had income of Rs.1501-3000 per month, 45(56.2%) had studied secondary school level of education, Regarding age of the newborn 71(88.8%) were under the age group of <24 hr, 43(53.8%) were in female sex group, 37(46.2%) were under the birth weight of >3.5 kg, 68(85%) were under 40 weeks of gestation.

Demographic Variables	Frequency	Percentage
Mother's age		
18-24 yrs	9	11.20%
21-25 yrs	44	55.00%
26-30 yrs	23	28.80%
>30 yrs	4	5.00%
Religion		
Hindu	75	93.80%
Muslim	2	2.50%
Christian	3	3.70%
Education		
Illiterate	1	1.2
Primary	6	7.5
Secondary	45	56.2
Graduate	26	32.5
Post-graduate	2	2.5

Occupation		
Self-employee	2	2.5
Private	7	8.8
Government	1	1.2
Homemaker	70	87.5
Any other	0	0
Income		
Up to Rs.900	16	20
Rs.900-Rs.1500	16	20
Rs.1501-Rs.3000	46	57.5
>Rs.3000	2	2.5
Age of The Baby		
<24 hr	71	88.8
24 -2 day	7	8.2
2-3 day	1	1.2
3-4 day	1	1.2
Sex of The Baby		
Male	37	46.2
Female	43	53.8
Birth Weight		
<2.5 kg	2	2.5
2.5k g	5	6.2
2.6 -3 kg	36	45
>3.5 kg	37	46.2
Weeks of gestation		
36-38 wks	0	0
39 wks	12	15
40 wks	68	85
>40 wks	0	0

Table 2: Distribution of demographic variables of the subjects among the newborns in the postnatal ward.

Table 3 shows that 58(72.5%) were first Gravida, 59(73.8%) were first parity [11,12].

Obstetric Variables	Frequency	Percentage
Gravida		
1	58	72.5
2	20	25
3	1	1.2
>3	1	1.2
Parity		
1	59	73.8
2	21	26.2
3	0	0
4	0	0

Table 3: Distribution of obstetric variables of the subjects among the newborns in the postnatal ward.

Table 4 shows that, Most of the newborns 15(18.8%) had risk factor associated with not initiation of Breast feed within 24hrs, whereas 14(17.5%) had risk factor associated with not giving colostrums at birth, Only 1(1%) newborn had risk factor of Previous history of Jaundice in siblings. Most of the Mothers 7(8.8%) had risk factor associated with GDM, whereas 7(8.8%) had risk factor associated with GHTN, 2(2.5%) Mothers had hypothyroidism as risk factor [12,13].

Risk factors of neonatal jaundice	Frequency	Percentage
Previous history of jaundice in siblings	1	1.20%
Colostrum not given at birth	14	17.50%
GDM	7	8.80%
GHTN	7	8.80%
Hypothyroidism during pregnancy	2	2.50%

Table 4: Percentage distribution of risk factors of Neonatal jaundice among the Newborn N=80.

Table 5 depicts that 60(75%) had serum Bilirubin <4mg/dl, 8(10%) had serum bilirubin in the range of 4-8 mg/dl, 7(8.75) were in the range of 5-12 mg/dl and 5(6.25%) were in the range of 8-16 mg/dl. Out of 80 subjects, 20 subjects had neonatal jaundice, total incidence rate was 25%.

Serum bilirubin	Frequency	Percentage
<4mg/dl	60	75.0
4–8 mg/dl (Zone 1)	8	10.0
5–12 mg/dl (Zone 2)	7	8.75
8–16 mg/dl (Zone 3)	5	6.25
11–18 mg/dl (Zone 4)	0	0
>15 mg/dl (Zone 5)	0	0

Table 5: Frequency and Percentage distribution of Incidence of Neonatal jaundice among Newborns in the Postnatal ward N=80.

The Table 6 shows colostrum intake had shown statistically significant association with level of serum bilirubin among Newborns in the Postnatal ward [14].

Neonate demographic variables	4-8 mg/dl		5-12 mg/dl		8-16 mg/dl		Chi-square value
	No.	%	No.	%	No.	%	
Colostrum given at birth	-	-	-	-	-	-	χ^2=6.190
Given	1	5	4	20	0	0	d.f=2
Not given	7	35	3	15	5	25	p=0.045(S*)
*p<0.05 , S-Significant, N.S-Not Significant							

Table 6: Association of level of serum bilirubin among Newborns with Neonatal Jaundice in the Postnatal ward with their selected demographic and obstetric variables and Risk factors N=20.

Discussion

In this study, the percentage distribution of incidence of Neonatal jaundice among Newborns in the Postnatal ward. Hence results revealed that 60(75%) babies had serum Bilirubin <4 mg/dl, 8(10%) babies had serum bilirubin in the range of 4-8 mg/dl, 7(8.75) babies were in the range of 5-12 mg/dl and 5(6.25%) babies were in the range of 8-16 mg/dl. Out of 80 Newborns, 20 Newborns had Neonatal Jaundice, total incidence rate was 25%. The subject risk factors associated with Neonatal Jaundice shows that majority 14(17.5%) babies had delayed initiation of Breast feed i.e. after 24 hrs, 1(1.2%) babies had previous history of jaundice in siblings. According to Mothers risk factors 7(8.8%) of Mothers had Gestation Hypertension, 7(8.8%) of Mothers had Gestational Diabetes Mellitus, 2(2.5%) of Mothers had hypothyroidism during pregnancy.

There is a significant association found with the demographic variables like colostrums intake which is the one of the risk factor for Neonatal jaundice towards the Post test scores. Due to lack of early initiation of Breast feeding and delayed intake of colostrum at birth leads to Neonatal jaundice.

Tikma et al. conducted a similar study on "Incidence of neonatal hyperbilirubinemia: a population –based prospective study in Pakistan". The result of this study showed that the proportion of newborns with bilirubin ≥ 15mg/dl was significantly higher among those assigned a Kramer score of 4-5 compared to those receiving a score of 1-3 (P-value 0.00004). They had concluded that a significant burden of untreated severe neonatal jaundice, causing potential neurological sequelae, exists in developing countries such as Pakistan. WHO guidelines were needed for screening and appropriate management of neonatal jaundice in developing countries [4].

Aiswarya et al. conducted a similar study on "The incidence, Risk factors and Management of Neonatal jaundice in a Government Hospital, Palakkad District, Kerala". It was a prospective study and results of this study showed that out of 231 cases collected 38.09% of mothers were in the age group 21 to 25, 19.04% were born preterm and 54.11% had jaundice in 3 or 4th day of birth. And they concluded that several Maternal Neonatal factors cause Neonatal Jaundice, but due to the decrease or lack of breast feeding along with the comorbid condition of baby, the severity of jaundice is increased [15].

Serifat et al. conducted a similar study on" prevalence and factors associated with neonatal jaundice: A case study of University college Hospital, Ibadan" binary logistic regression analysis which model neonatal jaundice as a response variable while neonate age, sex, birth weight, mode of delivery, settlement, mother illness during pregnancy, mother level education, parity of the mother and gestational age were the risk factors. The result showed that gestational age, place of delivery, mother illness during pregnancy were statistically significant risk factors for neonatal jaundice [16].

Abu Bakar et al. conducted a similar study on "Neonatal Jaundice" Jaundice clinically apparent when the level of serum bilirubin rises up to 5mg/dl. Current technique in evaluating jaundice of new born infant is based on Kramer's Rule, which is non-invasive method and they concluded that it can avoid babies from getting a skin infection when a blood sample is drawn which is feasible method for early detection of neonatal jaundice [17].

Webster et al. conducted a similar study on "An appraisal of the use of the Kramer's scale in predicting hyperbilirubinaemia in healthy full term infants". And they concluded that by Using Kramer's scale to assess which infants require intervention for jaundice leads to over servicing. If the number of unnecessary tests is to be reduced, more accurate methods for identifying infants who may be at risk for hyperbilirubinaemia must be used [10].

Hatzenbuehler et al. conducted a similar study on "Validity of neonatal jaundice evaluation by primary health-care workers and physicians in Karachi, Pakistan". The purpose of this study was to validate primary health-care workers' and physicians' visual assessment of neonatal hyperbilirubinemia in Karachi, Pakistan. Primary health-care workers identified hyperbilirubinemic neonates with adequate sensitivity. They concluded that with proper training and supervision, their assessment could improve the referral of hyperbilirubinemic neonates in low-resource settings in the developing world [5].

Conclusion

The major conclusion drawn from the study was that the result shows that Out of 80 babies, 20 babies had Neonatal Jaundice, total incidence rate was 25%. There is a significant association found with the demographic variables like colostrums intake which is the one of the risk factor for Neonatal jaundice towards the Post test scores. Due to lack of early initiation of Breast feeding and delayed intake of colostrum at birth leads to Neonatal jaundice. Hence the above result concluded that the present study is that screening for Neonatal jaundice using Kramer's criteria is a suitable low-cost and a feasible alternative modality for early detection of neonatal jaundice in a poor setting. Nurses and midwives are in a prime position to make use of many opportunities that present themselves in their everyday work encourage and influence Mothers to be more aware of Neonatal jaundice to care of their Newborns.

Recommendations

- A similar study can be conducted on a large sample size for the generalization of findings
- A study can be conducted on effectiveness of Kramer's criteria, Trancutaneous bilirubinometer, Icterometer for identification of neonatal jaundice in comparison for future studies
- A study can be conducted on caesarean section newborns and other modes of delivery too.
- A similar study can be done with large sample in different setting and different populations like preterm babies.
- A similar study can be conducted in community setting for early detection of Neonatal jaundice.

Conflict of Interest

Author declares that they have no conflict of interest. Informed consent was obtained from all patients and patient identity not disclosed.

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