

Nutritional Status by Anthropometric Evaluation of Infants Suffering From Neonatal Cholestasis Attending Department of Paediatric Gastroenterology and Nutrition, BSMMU, Dhaka, Bangladesh

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Abstract

Original Research Article

Background: Neonatal cholestasis is an uncommon but potentially serious condition that indicates hepatobiliary dysfunction. Nutritional deficiencies are common in infants with any chronic hepatitis diseases, especially when cholestasis is present and its onset occurs in the first of life. It is important to assess nutritional status in infant with neonatal cholestasis for nutritional intervention and better prognosis. However very few organized effort has been made to evaluate the nutritional status of infants with neonatal cholestasis. **Objective:** To observe the nutritional status by anthropometric evaluation of infants suffering from neonatal cholestasis attending department of Paediatric Gastroenterology and Nutrition, BSMMU. **Study design:** Cross-sectional observational study. **Study setting and period:** This study was conducted in department of Paediatric Gastroenterology and Nutrition, BSMMU, during 6 month period from April, 2013 to September, 2013. **Study population:** Eighty infants of neonatal cholestasis attending in department of Paediatric Gastroenterology and Nutrition, BSMMU, who developed conjugated hyperbilirubinemia (appears before or beyond 14 days and progress after this time or does not resolve at this time but appears within 3 months of age) were included in this study. **Methods:** All data were recorded in a specially designed semi structured questionnaire form. All patients with symptoms of neonatal cholestasis (jaundice, pale stool and dark urine) who attended the department of paediatric gastroenterology and nutrition, BSMMU, Dhaka, Bangladesh were enrolled for the study. Detailed history taking and physical examination including anthropometric measurements of all these patients were done and recorded by researcher herself. The assessment included weight (W) and length (L). Nutritional status were determined from the Z score (Z) for the following indices: W/A, LA, W/L and using reference values from the World Health organization (WHO). **Results:** The mean weight were found 4.73 (± 1.16) kg in total 80 infants, 4.66 (± 1.32) kg in infants with intrahepatic cholestasis and 3.03 (± 0.87) kg in Infants with extrahepatic cholestasis. The mean length were found 56.63 (± 4.56) cm in all 80 infants, 57.02 (± 5.12) cm in infants with intrahepatic cholestasis and 56 (± 3.54) cm in infants with extrahepatic cholestasis. As a whole 52 (65%) Infants were found to have malnutrition. 75% of malnutrition was found in Infants with intrahepatic cholestasis and 50% of malnutrition was found in Infants with extrahepatic cholestasis. Stunting of the infants were most frequent among three parameters (underweight, wasting and stunting, that is W/A, W/H and H/A respectively). Stunting indicates chronic malnutrition. This study evaluated that among 80 infants 12.5% had severe underweight, 32.5% had moderate underweight, 11.2% had severe wasting, 15% had moderate wasting, 22.5% had severe stunting and 21.25% had moderate stunting. In the group of infants with extrahepatic cholestastasis among 32 infants only 3.1% showed severe wasting, whereas infants with intrahepatic cholestasis group, 13.75% found to have severe stunting. **Conclusion:** Independent of etiology 65% infants with neonatal cholestasis had malnutrition in the form of underweight, wasting and stunting. Stunting of the infants were more frequent compare to wasting and underweight. On other hand malnutrition was more prominent in infants with intrahepatic cholestasis than infants with extrahepatic cholestasis.

Keywords: Nutritional Status, Anthropometric, Neonatal Cholestasis, Intrahepatic Cholestasis, Extrahepatic Cholestasis.

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INTRODUCTION

Nutritional deficiencies are common in infants with any chronic hepatic diseases, especially when cholestasis is present and its onset occurs in the first year of life [1-5]. The frequency of malnutrition is approximately 50%, particularly in infants with established cirrhosis [1] and severe malnutrition affects approximately 60% of the infants with chronic liver disease [6]. Cholestatic jaundice affects approximately 1 in every 2,500 infants [7-9]. Neonatal cholestasis is an uncommon but potentially serious condition that indicates hepatobiliary dysfunction. Early detection of cholestatic Jaundice by the primary care physician and timely, accurate intervention by the pediatric gastroenterologist are important for successful treatment and a favorable prognosis [7-9]. Cholestasis in a newborn can be due to infectious, genetic, metabolic, or undefined abnormalities giving rise to mechanical obstruction of bile flow or to functional impairment of hepatic excretory function and bile secretion. Mechanical lesions include stricture or obstruction of the common bile duct; biliary atresia is the prototypic obstructive abnormality. Functional impairment of bile secretion can result from congenital defects or damage to liver cells or to the biliary secretory apparatus [10]. There is no diagnostic "gold standard" for assessing nutritional status in Infants with liver disease. No single criterion should be neglected when assessing nutritional status in these infants. The assessment must be as complete as possible and should include the following components: medical and dietary history, subjective global assessment, anthropometric measurements, biochemical parameters and indices, and a more complex body composition analysis [11]. But the measurement of anthropometric parameters have been considered to be a reliable and safe method to assess nutritional status even in patients with cirrhosis [12]. Nutritional deficiencies and malnutrition among the Infant with chronic liver diseases have been documented in recent studies. Prevalence of acute and chronic malnutrition was 34.2% and 39.4% in Infants with neonatal cholestasis, respectively found in a study done In Ege hospital of Turkey done by Sokol *et al.*, and also found that most of the children with chronic liver disease were under weight and had stunted height and approximately 60% of the children had depleted fat stores [4]. Moreover Mattar *et al.*, divided the Infants into two groups according to the presence of cholestasis and found that cholestatic infants exhibited more severe nutritional deficiency than the non-cholestatic infants. They found that 64.3% of the children with cholestatic liver disease had stunted height [13]. Cywes and Millar found that eighth often infants with biliary atresia had chronic malnutrition [14]. Carvalho *et al.*, found that, independently of the disease etiology 75.3% of the patients showed some degree of protein-calorie malnutrition, which was moderate or severe in 38.3% of them among non-hospitalized patients with liver cirrhosis [11]. Anthropometric evaluations of 60

children and adolescents after orthotopic liver transplantation, during the first hours in a tertiary pediatric intensive care unit revealed 50.0% under nutrition by height /age; 27.3% by weight/age, 11.1% by weight/height or weight/length: 10.0% by body mass index/age; 61.6% by arm circumference/age and 51.0% by triceps skin fold/age [15]. Nutritional and growth assessment by doing anthropometry proves the presence of growth failure in these group of infants and establish the requirement of adequate nutritional support for proper management of both extrahepatic and intrahepatic groups of patients. But to our knowledge, there has been few documented study to know the nutritional status of children with neonatal cholestasis. In Bangladesh no known study has been conducted to assess the nutritional status in these type of infants. On other hand measurement of anthropometric parameters have been considered as a good and reliable method for assessment of nutritional status. So this study aims to evaluate the anthropometric status of infants with cholestatic Jaundice attending BSMMU, Dhaka, Bangladesh.

MATERIALS AND METHODS

Type of study: The present study was a Cross-sectional observational study to assess the nutritional status of infants with neonatal cholestasis by anthropometric evaluation.

Place of study: This study was conducted in Department of Pediatric Gastroenterology and Nutrition, BSMMU, Dhaka, Bangladesh.

Study period: This study was conducted during 6 months period from April, 2013 to September, 2013.

Study population: Infants with neonatal cholestasis who attended the department of Paediatric were selected for the study.

Method of estimating sample size: Sample size is calculated using the following equation: According to this formula the estimated final sample size was 91. Ultimately 80 respondents were enrolled as sample.

Selection Criteria

Inclusion Criteria

1. All infants of neonatal cholestasis attended in department of paediatric gastroenterology and nutrition, BSMMU, who developed prolonged conjugated hyperbilirubinemia (appears before or beyond 14 days and progress after this time or does not resolve at this time but appears within 3 months of age) were included in this study.

Exclusion Criteria

1. Patients/attendants unwilling to take part in study.
2. Very sick patient.

Study procedure

All data were recorded in a specially designed semi structured questionnaire form. All patients with symptoms of neonatal cholestasis (jaundice, pale stool and dark urine) who attended the department of paediatric gastroenterology and nutrition, BSMMU were enrolled for the study. Detailed history taking and physical examination including anthropometric measurements of all these patients were done and recorded by researcher herself after establishing the final diagnosis. The assessment included weight (W) and length (L). Body weight (W) was measured without clothing using a standard beam balance. Length (L) was measured using an Infant meter. Using these data of weight and length, following indices were calculated:

- Weight for age Z score
- Length for age Z score
- Weight for length Z score.

Nutritional status were determined from the Z score (Z) for the following indices: W/A, L/A, W/L and using reference values from the World Health Organization (WHO) [16]. WHO Anthro (version

3.1)/2010 and WHO Anthro Plus/2007 were used for the calculations.

Data Analysis

All the data were processed and analyzed by using SPSS programme, Version 16.0. Data were expressed as percentage and mean ± standard deviation. $p \leq 0.05$ was considered statistically significant.

RESULTS

In this study, total 80 Infants were included who developed symptoms of neonatal cholestasis. Anthropometric measurement of these infants were taken and weight for age, length for age and weight for length Indices were calculated according to WHO growth chart and then classified according to Z score. All relevant findings were presented on the following tables and figures. Fig-1 shows the distribution of infants according to the type of cholestasis. Among 80 infants with neonatal cholestasis, 48 (60%) infants had intrahepatic type of cholestasis and 32 (40%) infants had extrahepatic type of cholestasis.



Fig-1: Distribution of infants according to type of cholestasis.

Table-1: Distribution and comparison of mean age (±SD) of Infants with different type of cholestasis (N=80)

Catagories	Mean age (Months)	SD
All Infants	3.48	±3.30
Intrahepatic	3.77	±1.84
Extrahepatic	3.03	±1.69

Table-1 shows the distribution and comparison of mean age (±SD) of infants with different type of cholestasis. The mean age (±SD) of all the infants with neonatal cholestasis was 3.48 (±3.30) months. The

mean age (±SD) of infants with intrahepatic and extrahepatic cholestasis were 3.77 (±1.84) and 3.03 (±1.69) respectively.

Table-2: Distribution and comparison of age range of Infants in different type of cholestasis (N=80)

Age ranges	Intrahepatic n=48	Extrahepatic n=32	All Infants n=80
0 to 1½ month	6 (12.5%)	6 (18.8%)	12 (15%)
1½ to 3 month	18 (37.5%)	16 (50%)	34 (42.5%)
3 to 6 month	16 (33.3%)	8 (25%)	24 (30%)
6 to 12 month	8(16.7%)	2 (6.2%)	10(12.5%)

Table-2 shows distribution and comparison of age ranges among different type of cholestasis. Among total 80 infants 12 (15%) patients were between 0 to 1½ months, 34 (42.5%) patients were between 1½ to 3 months, 24 (30%) patients were between 3 to 6 months and 10 (12.5%) patients were between 6 to 12 months of age. Among 48 infants with intrahepatic cholestasis 6(12.5%) patients were between 0 to 1½ months,

18(37.5%) patients were between 1½ to 3 months, 16(33.3%) patients were between 3 to 6 months and 8(16.7%) patients were between 6 to 12 months of age. Among 32 infants with extrahepatic cholestasis 6(18.7%) patients were between 0 to 1½ months, 16 (50%) patients were between 1½ to 3 months, 8 (25%) patients were between 3 to 6 months and 2(6.25%) patients were between 6 to 12 months of age.

Table-3: Distribution and comparison of socio-economic status of infants in different type of cholestasis (N=80)

Socio-economic status	Intrahepatic n=48	Extrahepatic n=32	All Infants n=80
High	6 (12.5%)	4 (12.5%)	10 (12.5%)
Middle	19 (39.6%)	13 (40.6%)	32 (40%)
Poor/low	23 (47.9%)	15 (46.9%)	38 (47.5%)

Table-3 shows distribution and comparison of socio-economic status of infants in different type of cholestasis. Among total 80 infants with neonatal cholestasis 38(47.5%) patients were from low socio-economic background, 32 (40%) patients were from middle socio-economic background where as only 10 (12.5%) patients were from high socioeconomic background. Among 48 intrahepatic group 23(47.9%) patients were from low socioeconomic background,

19(39.6%) patients were from middle socioeconomic background but only 6(12.5%) patients were from high socioeconomic background. Among 32 extrahepatic group 15(46.9%) patients were from low socioeconomic background, 13(40.6%) patients were from middle socioeconomic background and only 4(12.5%) patients were from high socio-economic background.

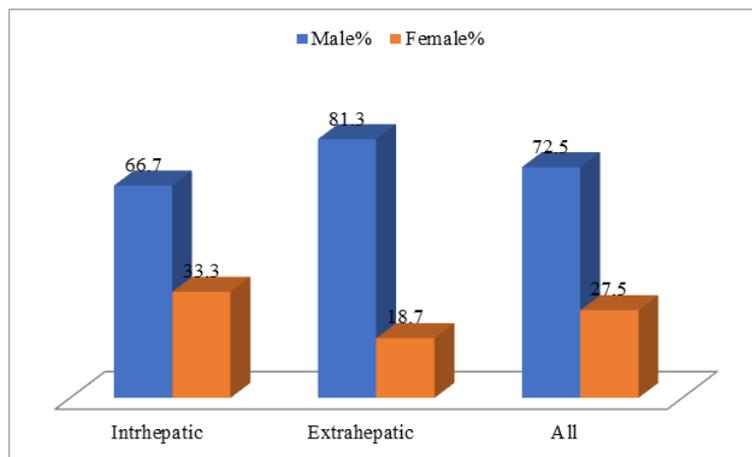


Fig-2: Distribution and comparison of infants according to sex in different type of cholestasis.

Figure-2 shows distribution and comparison of infants according to sex in different type of cholestasis. Among 80 infants 58 (72.5%) infants were male and rest of the 22 (27.5%) infants were female. Among 48

infants with intrahepatic cholestasis 32 (66.7%) were male and 16 (33.3%) were female and among 32 infants with extrahepatic cholestasis 26 (81.3%) were male and 6 (18.7%) were female.

Table-4: Distribution and comparison of Infants according to the consanguinity (N=80)

Consanguinity	All Infants n=80 (%)	Intrahepatic n=48 (%)	Extrahepatic n=32 (%)
Present	13 (16.2)	6 (12.5)	7 (21.9)
Absent	67 (83.8)	42 (87.5)	25 (78.1)

Table-4 shows the distribution and comparison of infants according to the consanguinity of parents in different type of cholestasis. Out of 80 infants, 13 (16.2%) babies had consanguineous parents and 67 (83.8%) babies had non consanguineous parents.

Among 48 infants with intrahepatic cholestasis 6 (12.5%) had consanguineous parents but consanguinity of patients were more frequent in infants with extrahepatic cholestasis. Among 32 infants 7 (21.9%) had consanguineous parents.

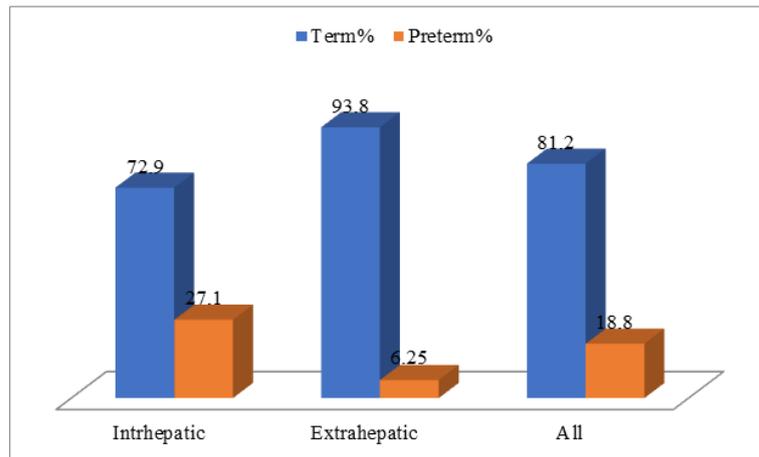


Fig-3: Comparison of infants according to gestational age in different types of cholestasis.

Figure-3 shows the distribution and comparison of infants according to the gestational age. Out of 80 neonates, 65 (81.2%) babies were term and rest of the 15 (18.8%) babies were preterm. Among 48

infants with intrahepatic cholestasis 35 (72.9%) were term and 13 (27.1%) were preterm but among 32 infants with extrahepatic cholestasis only 2 (6.2%) were preterm and rest of the 30 (93.8%) were term.

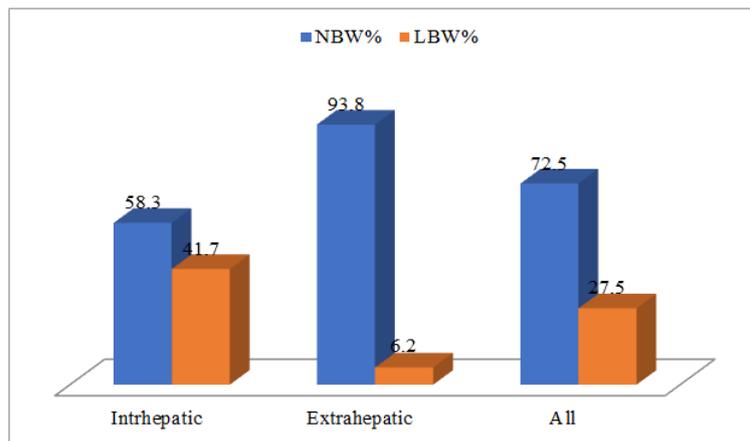


Fig-4: Distribution and comparison of infants according to birth wt in different types of cholestasis.

Figure-4 shows the distribution and comparison of infants according to the birth weight. Among total 80 infants 58 (72.5%) babies had normal birth weight and 22 (27.5%) babies had low birth weight. Among 48 infants with intrahepatic cholestasis

28 (58.3%) had normal birth weight and 20 (41.7%) had low birth weight, which was more frequent than infants with extrahepatic cholestasis. Here among 32 infants, 30 (93.8%) had normal birth weight and only 2 (6.2%) had low birth weight.

Table-5: Distribution and comparison of infants according to symptoms and signs (N=80)

Clinical features	Intrahepatic n=48	Extrahepatic n=32	All Infants n=80
Prolonged jaundice	48 (100%)	32 (100%)	80 (100%)
Dark urine	48 (100%)	32 (100%)	80 (100%)
Acolic stool	48 (100%)	32 (100%)	80 (100%)
Icterus	48 (100%)	32 (100%)	80 (100%)
Hepatomegaly	48 (100%)	32 (100%)	80 (100%)
Splenomegaly	35 (72.9%)	21 (65.6%)	56 (70%)
Ascites	15 (31.2%)	2 (6.2%)	17 (21.2%)
Bleeding manifestations	9(18.8%)	2(6.2%)	11(13.8%)
other anomalies	2 (4.1%)	2 (6.2%)	4 (5%)
Eye signs	2 (4.1%)	2 (6.2%)	4 (5%)

(Each baby had more than one symptom)

Table-5 shows the distribution and comparison of infants according to the presenting symptoms and signs of neonatal cholestasis in different types of cholestasis. Among 80 infants, 80 (100%) infants presented with prolonged jaundice, dark urine, acolic stool and hepatomegaly. Among them 11 (13.8%) presented with bleeding manifestations, splenomegaly found in 32 (40%), ascites found in 17 (21.2%), other anomalies found in 4 (5%) cases and eye signs found in

5 (6.2%) cases. Among 48 infants with intrahepatic cholestasis 9 (18.8%) presented with bleeding manifestations, 15 (31.2%) with ascites, 2 (4.1%) with other anomalies and with 2 (4.1%) eye signs. on the other hand among 32 infants with extrahepatic cholestasis 2 (6.2%) presented with bleeding manifestations, 2 (6.2%) with ascites, 2 (6.2%) with other anomalies and 2 (6.2%) with eye signs.

Table-6: Distribution and Comparison of weight for age of irvants with different types of cholestasis (N=80)

WAZ score	Under weight	Intrahepatic n=48	Extrahepatic n=32	All Infants n=80
<-3	Severe	6 (12.5%)	4 (12.5%)	10 (12.5%)
-3 to-2	Moderate	20 (41.7%)	6 (18.8%)	26 (32.5%)
>- 2	No	22 (45.8%)	22 (68.7%)	44 (55%)

Table-6 shows the weight for age status of the Infants. Severe underweight was found in 10 (12.5%) cases, moderate underweight found in 26 (32.5%) cases and normal weight found in 44 (55%). Among 48 infants with intrahepatic cholestasis severe underweight was found in it (12.5%) cases, moderate underweight

found in 20 (41.7%) cases and normal weight found in 22 (45.8%). Among 32 infants with extrahepatic cholestasis severe underweight was found in 4 (12.5%) cases, moderate underweight found in 6 (18.8%) cases and normal weight found in 22 (68.7%).

Table-7: Distribution and comparison of weight for length of infants with different types of cholestasis (N=80)

WLZ score	Wasting	Intrahepatic n=48	Extrahepatic n=32	All Infants n=80
<-3	Severe	8(16.7%)	1 (3.1%)	9 (11.2%)
-3 to-2	Moderate	8 (16.7%)	4 (12.5%)	12 (15%)
>- 2	No	32 (66.6%)	27 (84.4%)	59 (73.8%)

Table-7 shows the weight for length status of the infants. Severe wasting was found in 9 (11.2%) cases, moderate wasting was found In 12 (15%) cases and no wasting was found in 59 (73.8%) cases. Among 48 infants with intrahepatic cholestasis severe wasting was found in 8 (16.7%) cases, moderate wasting was

found in 8 (16.7%) cases and no wasting was found in 32 (66.6%) cases. Among 32 infants with extrahepatic cholestasis severe wasting was found only in (3.1%) cases, moderate wasting was found in 4 (12.5%) cases and no wasting was found in 27 (84.4%) cases.

Table-8: Distribution and comparison of length for age of Infants with different types of cholestasis (N=80)

Z Score	Stunting	Intrahepatic cholestasis n=48	Extrahepatic cholestasis n=32	All Infants n=80
<-3	Severe	18 (37.5%)	0 (0%)	18 (22.5%)
-3 to-2	Moderate	6 (12.5%)	11 (34.4%)	17 (21.2%)
>- 2	No	24 (50%)	21 (66.6%)	45 (56.3%)

Table-8 shows the length for age status of the infants. Severe stunting was found in 18 (22.5%) cases, moderate stunting was found in 17 (21.2%) cases and no wasting was found In 45 (56.3%). Among 48 infants with intrahepatic cholestasis severe stunting was found in 18 (37.5%) cases, moderate stunting was found In 6

(12.5%) cases and no wasting was found in 24 (50%) cases. Among 32 infants with extrahepatic cholestasis severe stunting was found In 0 (0%) cases, moderate stunting was found In 11 (34.4%) cases and no wasting was found in 21 (66.6%).

Table-9: Distribution and comparison of malnutrition in infants (N=80)

Malnutrition	Intrahepatic cholestasis n=48	Extrahepatic cholestasis n=32	All infants n=80
Present	36 (75%)	16 (50%)	52 (65%)
Absent	12 (25%)	16 (50%)	28 (35%)

Table-9 shows the distribution and comparison of multi-nutrition in infants. Among 80 infants 52 (65%) had malnutrition/under nutrition. Among 48

infants with intrahepatic cholestasis 36 (75%) and among 32 infants with extrahepatic cholestasis 16 (50%) had multi-nutrition/under nutrition.

Table-10: Distribution and comparison of total wasting (acute malnutrition) and stunting (chronic malnutrition) in infants with different type of cholestasis (N=80)

Catagories	Intrahepatic cholestasis n=48	Extrahepatic cholestasis n=32	All Infants n=80
Wasting (W/L)	16 (33.3%)	5 (15.6%)	21 (26.3%)
Stunting (H/A)	24 (50%)	11 (34.4%)	35 (43.7%)

Table-10 shows distribution and comparison of total wasting (acute malnutrition) and stunting (chronic malnutrition) in infants with different type of cholestasis. Total wasting was found in 21 (26.3%) of all infants, 16 (33.3%) of infants with intrahepatic cholestasis and 5 (15.6%) of infants with extrahepatic. Total wasting was found in 35 (43.7%) of all infants, 24 (50%) of infants with intrahepatic cholestasis and 11 (34.4%) of infants with extrahepatic cholestasis. Here total wasting included, both severe and moderate wasting and total stunting included, both severe and moderate stunting.

DISCUSSION

Cholestasis jaundice, characterized by elevation of serum conjugated bilirubin, is an uncommon but potentially serious condition that indicates hepatobiliary dysfunction. Malnutrition is an important complication of cholestatic jaundice and nutritional status is one of the major prognostic factors. In this present study anthropometric parameters of the infants with neonatal cholestasis were evaluated for nutritional assessment of these infants. Weight and length indices were recorded for this assessment to evaluate the wt for age, length for age and wt for length status. The mean weight of the infants was 4.73 (11.16) kg, mean weight of the infants with intrahepatic group was 4.66(±11.32)kg and 3.03 (±0.87) kg in extrahepatic group. The mean length of the infants was 56.63(±4.56) cm, mean length of the infants with intrahepatic group was 57.02 (±15.12) cm and 56.63 (±04.56) cm in extrahepatic group. As a whole 52 (65%) infants found to have malnutrition. In this study malnutrition was defined by severe and moderate under-weight, severe and moderate wasting and severe and moderate stunting Traub J *et al.*, [17]. Found that, 75.3% of the patients showed some degree of protein-calorie malnutrition, which was moderate or severe in 38.3% of them among non-hospitalized patients with liver cirrhosis independent of the disease etiology". In the present study, infants with intrahepatic cholestasis were more frequent to have malnutrition than extrahepatic cholestasis. Seventy five percent of malnutrition was found in Infants with intrahepatic cholestasis and 50% of malnutrition was found in Infants with extrahepatic cholestasis. It has been documented in different study that malnutrition is more frequent in intrahepatic causes of cholestasis than intrahepatic causes. But with increase of age malnutrition more develops in extrahepatic causes [18]. Prado CC *et al.*, [19] conducted a study to evaluate the nutritional status and growth pattern in infants with intrahepatic cholestasis and extrahepatic cholestasis and most substantial deficit

found in the Extrahepatic group. This study evaluated that among 80 Infants 12.5% had severe underweight, 32.5% had moderate underweight, 11.2% had severe wasting, 15% had moderate wasting, 22.5% had severe stunting and 21.25% had moderate stunting. Stunting of the infants were most frequent among three parameters (underweight, wasting and stunting, that is W/A, W/H and H/A respectively). Stunting indicates chronic malnutrition Sokol *et al.*, [4]. In their study found that most of the children with chronic liver disease were underweight and had stunted height. Wasting is less frequent. It may be due to masking of underweight by ascites, edema and organomegaly. As a whole total infants with stunting were 38 (43.7%) but infant with wasting were 21 (26.3%). Yuksekkaya HA *et al.*, [20] found prevalence of acute (wasting) and chronic malnutrition (stunting) were 34.2% and 39.4% in infants with neonatal cholestasis assessed by height for age and weight for age, respectively. This result almost similar to the present study. In the group of infants with extrahepatic cholestasis among 32 infants only 3.1% showed severe wasting, whereas infants with intrahepatic cholestasis group 13.75% found to have severe stunting. Stunting is more common in infants with extrahepatic etiology. The patients with biliary atresia and cholestasis presented the highest nutritional injury in a study conducted by Saron, M. L *et al.*, [21]. To evaluate the nutritional status of pediatric-age patients with autoimmune hepatitis and biliary atresia related to serum levels of vitamins A, D and E and U1e disease severity. In intrahepatic group total wasting were 16 (33.3%) and total stunting were 24 (50%). Where as in extrahepatic group total wasting were only 5 (15.6%). But total stunting were more, that is 11 (34.4%). Similar data has also been documented in different studies. Prevalence of in their study differed from the present study. It may be due to some unavoidable circumstances, such as super added poor socioeconomic condition, illiteracy, lack of education, late evaluation, diagnosis and reference of these patients to appropriate centre etc. Another cause may be due to late age of patient during diagnosis and evaluation. Because stunting is more found at late stage of infancy.

Limitations of the present study

The original study design may not have accounted for all potential confounders and parameters that could have affected the findings of present study. In this study only wt and length parameters were included for anthropometric evaluation. But other parameters SUCH as OFC, MUAC and TST etc. were not included for proper evaluation. However these two parameters has been considered to be a reliable and safe method to assess nutritional status.

CONCLUSION

The findings of present study evaluated that, independent of etiology 65% infants with neonatal cholestasis had malnutrition in the form of underweight, wasting and stunting. Stunting of the infants were more frequent compare to wasting and underweight. On other hand malnutrition was more prominent in infants with intrahepatic cholestasis than infants with extrahepatic cholestasis.

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