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Bilious Vomiting Etiological Factors and Outcomes in Neonates of a Tertiary Care Hospital of Khyber Pukhtunkhwa, Peshawar; A Cross-sectional Study

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ABSTRACT

Objective: Our study aims to determine the frequency of different causes of bilious vomiting in neonates and its outcomes in a tertiary care hospital of Peshawar. **Methods:** It was a cross-sectional study conducted in neonatology department of Lady Reading Hospital, Peshawar from 1st March, 2024 to 30th June, 2024. Neonates presenting with bilious vomiting to the nursery due to any etiology were included in the study. Data was collected from 66 neonates, by consecutive sampling technique with a semistructered questionnaire and after informed written consent by the parents. Data was collected regarding age of neonate in days, age, gender gestation, presence of sepsis. Maternal use of magnesium sulphate for pre-eclampsia if there was noted, thyroid Function tests of neonate. Radiological investigations done for the patients where indicated. Outcome of the neonates was noted as alive or expired. Data was analyzed using SPSS version 27. Descriptive statistics were performed for the categorical variables. And results were tabulated as frequencies and percentages. **Results:** Data was collected from 66 neonates. Full term neonates were 60 (90.9%) and 6 (9.1%) were preterm. Females were 26 (39.4%) and 40 (60.6%) of them were males. 56 (84.8%) presented within the first 10 days of life. The mean age was 1.17 days ± 0.4 (mean ± S.D. Surgery was performed in 58 (87.9%) of cases. Out of total 50 (75.8%) neonates were alive and 16 (24.2%) neonates expired. Among 47 (94%) neonates undergoing surgical management survived but 11 (68.8%) expired. **Conclusion:** Neonates presenting with bilious vomiting may have medical or surgical underlying etiology. Congenital gut atresias remain the leading cause of bilious vomiting in our setup. Among imaging modalities gastrointestinal contrast studies are superior in making diagnosis.

INTRODUCTION

Vomiting is a common neonatal problem and describes as the expulsion of gastric contents into the mouth.[1] It may be bilious or nonbilious. Bile is yellow in color, when it enters stomach due to obstruction to its flow, it is turned green by the stomach acid. Bilious vomiting is synonymous with intestinal obstruction, be it functional or anatomical.[2] A number of congenital anomalies can cause gut obstruction from stomach till anus.[2]In neonates, it may arise from acquired diseases or from congenital anomalies of the gastrointestinal tract. Premature babies frequently exhibit intestinal immaturity, which can cause the digestive tract to become functionally obstructed.[2] Bilious vomiting has both obstructive and non-obstructive causes but it's one of the cardinal signs of intestinal obstruction.[4] Among different surgical causes gut malrotation accounts for 3-5% of cases.[5] Congenital gut malformations, malrotation, meconium ileus and necrotizing enterocolitis present with bilious vomiting and checking for patency of the anus is an important first step to exclude an anorectal malformation.[3,6] When the obstruction is proximal abdominal distention will not be there but distal obstruction like Hirschsprung's, meconium ileus, ileal or colonic obstruction in neonates lead to abdominal distention and inability to pass meconium[3].Mid-gut volvulus has been a major cause in a newborn with bilious vomiting and is of serious concern due to the complication of intestinal ischemia.[3] Other causes of intestinal obstruction such as incarcerated inguinal hernia or congenital bands should never be ignored as well.[7] Among the medical causes of bilious vomiting, neonates with sepsis, electrolyte derangements, prematurity, magnesium sulfate use by mother, hypothyroidism can present with vomitting.[2,7]Identification and differentiation between these entities is crucial but challenging. Management is variable amongst centers and often case specific and certainly always time critical. The sick neonate with suspected obstruction should be transferred to the

surgical unit immediately.[8] The first imaging of choice for a neonate with bilious vomiting is a neonatal abdominal radiograph, followed by a neonatal upper GI contrast study to look for the level of obstruction.[9] Upper GI contrast study is considered as gold standard to confirm or exclude any surgical pathology.[10] Among other imaging modalities are ultrasound, CT and MRI abdomen. But CT and MRI are reserved for complicated cases.[12]

Bilious vomiting in neonates remains an important clinical presentation. A few studies have been done over this topic but data from south Asia is lacking. The current study will help in the care, timely diagnosis and management of new born presenting with bilious vomiting.

MATERIALS AND METHODS

This cross-sectional study was conducted in neonatology department of medical teaching institute, Lady Reading Hospital, Peshawar. The study was conducted over a 6 months' time and data was collected from 1st March 2024 to 31st August, 2024 after ethical approval from Institutional Review Board. Ref No: 65/LRH/MTI dated 13th March, 2024. The sample size was calculated using Open Epi calculator, with 95% confidence interval and anticipated frequency of 4%[5], after adding for 10% non-response rate it was calculated as 66.

The objective of this study was to determine the frequency of different causes of bilious vomiting in neonates and to determine its outcome. Data was collected from neonates presenting with bilious vomiting to the neonatology level 1 emergency with consecutive sampling technique. Data was collected after informed written consent from parents of neonates. Semistructered questionnaires were used to collect data after enrolling the subjects. The following Operational definitions were considered for this study**:** Bilious vomiting: forceful expulsion of gastric contents through mouth or nose which are luminous green in color.[1]

Neonates with inborn errors of metabolism or whose parents declined content were excluded from study. Data was collected regarding age of neonate in days, age was later grouped as 1-10 days, 10-20 days, 20-30 days. Gender gestation, presence of sepsis as evident by clinical signs and symptoms of sepsis that is fever, lethargy, reluctance to feed, jaundice and confirmed by raised C-reactive protein or positive blood culture. Complete blood count, serum electrolytes levels, Maternal use of magnesium sulphate for pre-eclampsia if there was noted, thyroid Function tests of neonate, presence of abdominal erythema or distention, neonatal history of passing stool and anal patency was checked. Radiological investigations done for the patients included ultrasound abdomen-ray erect abdomen, upper GI contrast studies, CT or MRI abdomen where indicated. Data regarding investigations of patients was collected from hospital HMIS system. Neonates were managed as per nursery protocol and given medical care in the form of i.v. antibiotics and i.v. fluids. Premature neonates were given incubator care and kept nill by mouth till improvement, hypokalemia if detected was corrected. Those neonates needing any surgery based on the findings were then referred to the surgical unit for timely intervention. Outcome of the neonates was noted as alive or expired. Surgical exploration findings were also documented for diagnosis confirmation. Data was analyzed using SPSS version 27. Descriptive statistics were performed for both categorical and scale variables. And results were tabulated as frequencies and percentages.

RESULTS

Data was collected from 66 neonates presenting with bilious vomiting to the nursery. The neonates in our study were mostly full term 60 (90.9%) and 6 (9.1%) were preterm. Females were 26 (39.4%) and 40 (60.6%) of them were males. Majority of neonates presented within the first ten days of life 56 (84.8%). The mean age was 1.17 days ± 0.4 (mean ± S.D.). Abdominal distention was the predominant complaint among clinical findings being present in about 60 (90.9%) of cases. Abdominal erythema was found in 7 (10.6%) of cases. Xray erect abdomen showed the double bubble sign and triple bubble sign for the gut atresias but in 59.1% cases it showed distended gut loops. Among the final diagnosis, gut atresias was present in 22 neonates (44.7%) of cases followed anorectal malformations in 17 (25.8%) cases. Surgery was performed in 58 (87.9%) of cases. Surgery was not performed in 7 (10.6%) of cases who were diagnosed as having sepsis. Out of total 50 (75.8%) neonates were alive and 16 (24.2%) neonates expired; among them 10 neonates expired after undergoing surgery and the other 6 neonates were diagnosed as having neonatal sepsis and were managed conservatively. Among neonates who expired after undergoing surgery were diagnosed as having anorectal malformations 4 (25%) and other were having ileal or jejunal atresia 6 (75%). Neonates with anorectal malformations died postoperatively due to infection. Table:1 and 2 shows the percentage of several causes and outcomes of bilious vomiting.

Ultrasound was not performed in 15 (41.7%) cases who were clinically diagnosed as having anorectal malformations and 4 (11.1%) of Hirschsprung's disease. CT scan abdomen and MRI abdomen were not performed in our study for any case. Table No 2,3,4 show imaging findings and Table No 5 shows surgical findings in cases with bilious vomiting. Table 6 shows cross tabulation of etiology of bilious vomiting versus age of presentation. 1 (1.5%) neonate was diagnosed with Hirschsprung's between 20 to 30 days of age.

Table 1

Descriptive analysis of Clinical findings of neonates with Bilious Vomiting

Variable		Frequency	% age
Gestation	full term	60	90.90%
	Preterm	6	9.10%
Gender	Male	40	60.60%
	Female	26	39.40%
Age in days	0-<10	56	84.80%
	10-<20	9	13.60%
	20-<30	1	1.50%
Sepsis	Yes	9	13.60%
	No	57	86.40%
Hypokalemia	Yes	2	3%
	No	64	97%
Maternal MgSO4 use for Pre-eclampsia	No	66	100%
Thyroid function tests	Normal	2	3%

	not done	64	97%
Fever	Yes	3	4.50%
	No	63	95.50%
Abdominal Distention	Yes	60	90.90%
	No	6	9.10%
Abdominal Erythema	Yes	7	10.60%
	No	59	89.40%
Passing stool	Yes	10	15.20%
	No	56	84.80%
Anal patency	Yes	49	74.20%
	No	17	25.80%

Table 2

Ultrasound findings of neonates with bilious vomiting

Ultrasonography findings	n	Percent
Not done	36	54.5 %
Fluid filled gut	14	21.2 %
Normal	8	12.1 %
Jejunal web/atresia	3	4.5 %
Duodenal atresia	1	1.5 %
Gut perforation	1	1.5 %
Gut malrotation	1	1.5 %
Gut perforation	1	1.5 %
Ileal atresia	1	1.5 %

Ultrasound was able to diagnose duodenal and jejunal atresias accurately, and fluid filled gut loops were reported in 7 (50%) of cases of meconium ileus on ultrasound. While gastrointestinal (GI) contrast studies were able to identify gut malrotation and atresias in all the cases which were found to have malrotation or atresias on surgical exploration.

Table 3

Abdominal Radiograph findings (X-Ray)

Abdominal Radiograph Findings (X-Ray)	n	Percent
Normal	2	3 %
Gaseous abdomen	8	12.1 %
Distended gut loops	39	59.1 %
Double bubble sign	2	3 %
Tripple bubble sign	1	1.5 %
Air fluid levels	6	9.1 %
Pneumoperitoneum	5	7.6 %
Distended proximal gut	3	4.5 %

Table 4

Gastrointestinal Contrast Study Findings

GI contrast study findings	n	Percent
Duodenal atresia	2	3 %
Gut malrotation	3	4.5 %
Hirschsprung's disease	5	7.6 %
Ileal atresia	9	13.6 %
Ileal perforation	1	1.5 %
Jejunal atresia	8	11.5 %
Malrotation	1	1.5 %
Meconium ileus	8	12.1 %
not done	29	43.9 %

Table 5

Surgical Exploration findings in neonates

Surgical Exploration Findings	n	Percent
None	7	10.6 %
Meconium ileus	8	12.1 %
Anorectal Malformations	17	25.8 %
Duodenal atresia	2	3 %
Jejunal atresia	5	7.6 %
Gut perforation	6	9.1 %
Gut obstruction	3	4.5 %
Jejunoileal atresia	3	4.5 %
Ileal atresia	8	12.1 %
Hirschsprung's	5	7.6 %
Gut malrotation	2	3 %

Table 6

Crosstabulation of age and cause of bilious vomiting stratified according to age of presentation.

Age	meconium ileus	Anorectal malformations	duodenal atresia	jejunal atresia	gut perforation	gut malrotation	jejunoileal atresia	ileal atresia	Hirschsprung's
1-<10 days	8(14.30%)	17(30.40%)	2(3.60%)	5(8.90%)	4(7.10%)	1(1.80%)	3(5.40%)	7(12.50%)	3(5.40%)
10-<20 days	-	-	-	-	2(22.2%)	2(22.2%)	-	1(11.1%)	1(11.1%)

Table 7

Management of patients and their outcome

	Outcome	
Management	alive	dead
Medical(conservative)	3(6%)	5(31.3%)
Surgical	47(94%)	11(68.8%)

DISCUSSION

This study was performed on 66 neonates. Sepsis remained the leading cause of bilious vomiting among medical causes. Our study didn't find any neonate with hypothyroidism or maternal magnesium sulfate ingestion and surgery was performed in 58 (87.9%) cases in our study. Out of these gut atresias was present in 22 neonates (44.7%) of cases. Imaging must always be performed to rule out gut obstruction.

Our study didn't find abdominal radiographs to be accurate in diagnosing the cause of bilious vomiting. Ratnayake K et al reported that if the diagnosis is made solely on the basis of the radiographs, more than 50% of cases would go undiagnosed.[12]Until proven otherwise, vomiting, especially bilious emesis, has to be treated as a surgical emergency. It can be challenging to identify the cause of vomiting in a newborn and may need the use of several imaging modalities.[12] In our study ultrasound was able to diagnose duodenal and jejunal atresias based on presence of double bubble sign. An accurate way to diagnose duodenal atresia is with an abdominal x-ray double-bubble sign.[13] More than two bubbles may be observed, or the obstruction may expand more distally if it is jejunal or more distal. The pseudo-double-bubble sign, in which the two bubbles indicate normal fluid in the proximal and distal stomach, is a potential mimic of the double-bubble sign caused by the stomach's curved structure.[13] Midgut volvulus can mimic the duodenal atresia but distinguishable by contrast studies.[13] The majority of midgut volvulus events take place in the first month of life, and the risk lowers with age. The most common symptom is regurgitating bile. It's a fatal condition if not diagnosed in time. When diagnosing malrotation, upper gastrointestinal series is the preferred

method of investigation.[14] Nundeekasen and colleagues reported that 28.9% neonates had a surgical etiology and 7.9% had a volvulus or time-critical malrotation. According to them when a newborn has bilious vomiting, they need to be referred right away to pediatric surgery.[15] Mohinuddin and coworkers found in their study that 46% neonates had a surgical diagnosis and 14.1% had a time-critical surgical condition. Similar to our study they reported that abdominal distension, abdominal tenderness was significantly associated with the diagnosis of a surgical condition in neonates with bilious vomiting.[16]

According to Godbole and coresearchers, 38% neonates with bilious vomiting had a surgical etiology as compared to 87.9% cases from our study.[17] In 62% of instances, bilious vomiting was not associated with intestinal blockage. Hirschsprung's disease, small bowel atresia, intestinal malrotation, meconium ileus, meconium plug, colonic atresia and milk inspissation were among their diagnosis requiring surgery. Abnormal abdominal radiograph alone or associated with abdominal symptoms were present. They reported that plain radiography and clinical examination revealed nothing unusual in one infant with intestinal malrotation.[17]

CONCLUSION

Neonates presenting with bilious vomiting may have medical cause or surgical underlying etiology. Congenital gut atresias and anorectal malformations are the leading etiologies of bilious vomiting in our setup. Sepsis, hypothyroidism and maternal use of magnesium sulfate use must always be ruled out. Among imaging modalities gastrointestinal contrast studies are superior in making diagnosis as compared to ultrasound and X-ray erect abdomen.

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