



ORIGINAL ARTICLE

Frequency of small bowel perforation in neonates with pneumoperitoneum.

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ABSTRACT... Objective: To determine the frequency of small bowel perforation in neonates with pneumoperitoneum. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Pediatrics Surgery, National Institute of Child Health Karachi. **Period:** November 2018 to April 2019. **Material & Methods:** An observational study conducted to identify clinical presentation, risk factors, site of perforation and outcome of pneumoperitoneum in neonates. Data collected was entered and analyzed in the SPSS version 21. Mean with standard deviation was calculated for quantitative variables like age, gestational age, weight and duration of symptoms. **Results:** A total of 87 neonate presenting with abdominal distension and bilious vomiting presenting within 24 hours diagnosed as pneumoperitoneum with chest X-ray erect shows gas under diaphragm were included in this study. The average age of the neonate was 11.02 ± 8.52 days. There were 48 (55.17%) male and 39 (44.83%) female. Frequency of small bowel perforation in neonates with pneumoperitoneum was observed in 31.03 % (27/87). **Conclusion:** It is to be concluded rate of small bowel perforation was significantly high in those neonate who had below and equal to 2 kg weight and also high in those neonates who presented with in 12-24 hours duration of symptoms.

Key words: Gastrointestinal Perforation, Pneumoperitoneum, Small Bowel Perforation.

INTRODUCTION

Neonatal pneumoperitoneum, generally a surgical emergency which has serious complications, and urgent surgical intervention is needed for survival.¹⁻² Neonatal surgery is a very demanding specialty in pediatric surgery. Neonatal gastro intestinal perforation presents important challenges and a mortality of 15-70% has been documented.³⁻⁹

In a previous study there were 54 neonates with pneumoperitoneum diagnosed at time of admission. Distended, tense and tender abdomen was the main symptom and sign (72%). Necrotizing enter colitis (NEC) (33 babies), the single common cause of pneumoperitoneum in the neonate (61%). In remaining 21 (39%) neonates, other sites of perforation none related to NEC – include gastric perforations (6), colorectal perforations (5), cecal perforations (3) and duodenal perforations (2). In remaining five cases remain idiopathic.¹⁰

On extensive search very few studies are found internationally and no local data is available regarding neonatal pneumoperitoneum. Secondly due to the scarcity of specialized care, in the majority of neonatal cases in a developing country like Pakistan, late presentation to the hospital is noted, with full-blown generalized peritonitis with purulent or fecal contamination along with septicemia. Thus, it is important to recognize neonatal pneumoperitoneum early, at the primary care level. This study was conducted to identify all those factors that are helpful in identifying the neonatal pneumoperitoneum that prompt early referral to a specialized neonatal center so to reduce morbidity and mortality.

MATERIAL & METHODS

This descriptive Cross-sectional study was conducted in Department of Pediatrics surgery, National Institute of Child Health over a period of six months from 1ST November 2018 to 30 April 2019 after the approval of institute ethical review

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board (IERB NO: 12/2018). Neonates up to 28 days of either gender presenting with abdominal distension and bilious vomiting within 24 hours diagnosed as pneumoperitoneum were included in this study. Parents not willing, neonates with multiple congenital malformation and premature neonates were excluded.

Informed consent was obtained from the parents of neonates who was diagnosed to have pneumoperitoneum presenting to the Emergency department. Brief history was taken from parents like age of the child, gender, symptoms (abdominal distention and vomiting) and duration of symptoms. Treatment was given according to general condition of neonate at the time of presentation. Primary peritoneal drain placement was done under local anesthesia followed by exploratory laparotomy indicated by ongoing sepsis, persistent intestinal discharge and abdominal distension.

Data collected was entered and analyzed in the SPSS version 21. Mean with standard deviation was calculated for quantitative variables like age, gestational age, weight and duration of symptoms. Frequency and percentage was calculated for gender and small bowel perforation. Stratification with respect to age, gender, weight,

gestational age and duration of symptoms was performed to see the effect of these on small bowel perforation. Post-stratification chi square test was applied to see the difference between strata, p value less than or equal to 0.05 was considered significant.

RESULTS

A total of 87 neonate presenting with abdominal distension and bilious vomiting within 24 hours diagnosed as pneumoperitoneum were included in this study. The average age of the neonate was 11.02 ± 8.52 days similarly mean gestational age, weight of neonate and duration of symptoms are also reported in Table-I. There were 48(55.17%) male and 39(44.83%) female. Frequency of small bowel perforation in neonates with pneumoperitoneum was observed in 45.89% (27/59). Rate of small bowel perforation was not statistically significant among different age groups of neonate and between gender as shown in Table-II.

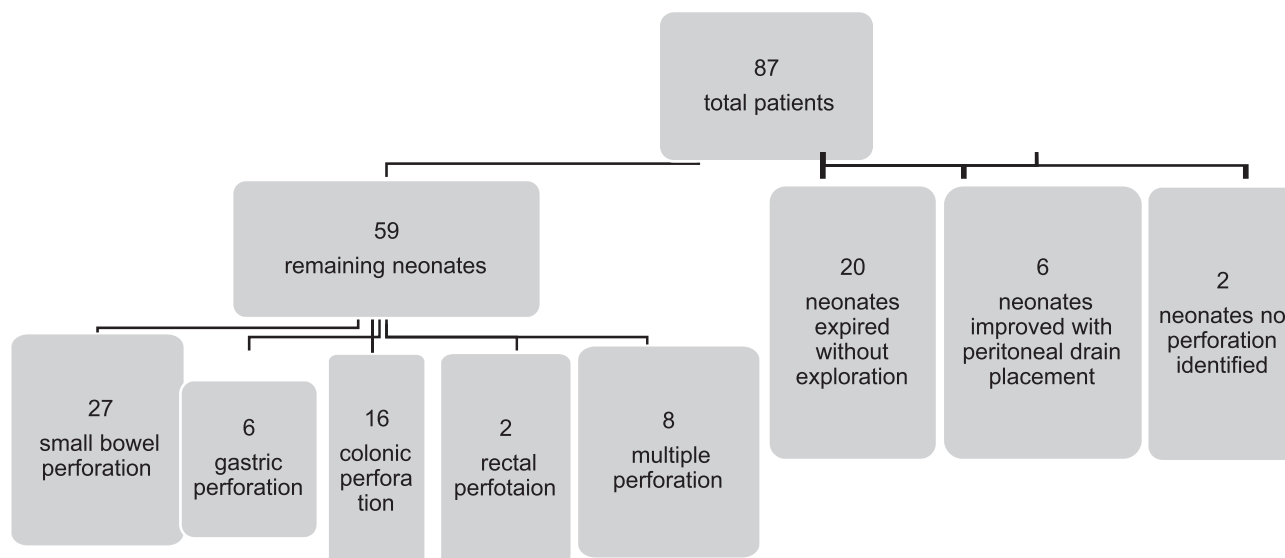
It was also not statistically significant between gestational age while rate of small bowel perforation was significantly high in those neonate who had below and equal to 2 kg weight ($p=0.029$) and also high with 12-24 hours duration of symptoms ($p=0.001$) as shown in Table-II.

Variables	Mean	95% Confidence Interval for Mean		Std. Deviation
		Lower Bound	Upper Bound	
Age (days)	11.02	9.21	12.84	8.52
Gestational age (Weeks)	38.31	38.04	38.58	1.27
Weight (kg)	2.78	2.66	2.89	0.54
Duration of symptoms(hours)	28.82	25.66	31.99	14.85

Table-I. Descriptive statistics of characteristics of neonate. n=87

Variables		Small Bowel Perforation		Total	P-Value	Chi-Square
		Yes	No			
Age (Days)	≤10 days	18(34%)	35(66%)	53	0.662	0.826
	11-20 days	6(30%)	14(70%)	20		
	21-28 days	3(21.4%)	11(78.6%)	14		
Gender	Male	18(37.5%)	30(62.5%)	48	0.148	2.09
	Female	9(23.1%)	30(76.9%)	39		
Gestational age(Weeks)	≤ 38 Weeks	18(30%)	42(70%)	60	0.756	0.097
	39 to 40 Weeks	9(33.3%)	18(66.7%)	27		
Weight (kg)	≤2 kg	9(60%)	6(40%)	15	0.029	7.01
	2.1-3kg	9(25%)	27(75%)	36		
	>3kg	9(25%)	27(75%)	36		
Duration of Symptoms (hours)	12-24 hours	21(46.7%)	24(53.3%)	45	0.001	10.64
	>24 hours	6(14.3%)	36(85.7%)	42		

Table-II. Frequency of small bowel perforation in neonates with pneumoperitoneum by different variables. n=87



DISCUSSION

Neonatal pneumoperitoneum, generally a surgical emergency which has serious complications, and urgent surgical intervention is needed for survival. In our study 20(22%) neonates expired without exploration just after peritoneal drain placement because of sepsis. This indicates the limited resources especially in developing countries for the neonatal management. The overall mortality in our study was 35(40%). Pneumoperitoneum, usually considered to be caused by a hollow viscous perforation and requires an immediate surgical intervention.¹¹ The second most common cause of neonatal pneumoperitoneum is intestinal perforation¹² and has been documented in the low-birth-weight neonates.¹³ Its incidence is 1.1% in very low birth weight and 7.4% in extremely low birth weight neonate.¹⁴ A few cases have been reported in full-term neonate.¹⁵ Regional hypo-perfusion caused by stress, hypoxia and shock can lead to transient intestinal ischemia resulting in intestinal perforation. Cardiovascular resuscitation in the perinatal period may prone the neonate to spontaneous intestinal perforation. The most common affected site is terminal ileum, however intestinal perforation is also documented in the transverse and descending colons.¹⁶ A total of 87 neonate of either gender presenting with abdominal distension or bilious vomiting presenting within 24 hours diagnosed as pneumoperitoneum confirmed in chest Xray erect with gas under the diaphragm were

included in our study. There were 48(55.17%) male and 39(44.83%) female the average age of the neonate was 11.02 ± 8.52 days in our study. Ahmed Hosni Morsi et al in their study Out of 56 patients there were 35 males (62.5%) and 21 females (37.5%). The mean age at presentation was 5.3 days.¹⁷ Charu Tiwari, et al in their study reported the mean age of 11.4 days.¹⁸

Pneumoperitoneum, usually considered to be caused by a hollow viscous perforation and requires an immediate surgical intervention. However, neonatal pneumoperitoneum without hollow viscous perforation has been reported in neonates that have been on mechanical ventilation, and have pneumomediastinum, or may be idiopathic.¹⁹ In their retrospective analysis, Khan et al²⁰ found that NEC, the single most common cause of pneumoperitoneum in the neonate. In our study NEC has been found 35(57%) of operated cases, other causes include hirschsprungs in 10(16%), spontaneous intestinal perforation in 7(11.4%), anorectal malformation in 4 (6.5%), meconium ileus in 2 (3.2%), intestinal atresia in 2(3.2%) and malrotation in 1(1.6%). In a study, Ahmed Hosni Morsi out of 379 neonates 56 (14.7%) were found to have pneumoperitoneum during the study period. There were 35 males (62.5%) and 21 females (37.5%). Cases diagnosed as NEC represented 27 neonates (48.2%). There were 29 neonatal pneumoperitoneum (51.8%) with not related to NEC, including Hirschsprung's

disease (14.2%), spontaneous intestinal perforation (8.9%), anorectal malformations (7.1%), ileal atresia (3.5%), incarcerated inguinal hernia (1.7%), meconium ileus (1.7%) and gastric perforation (1.7%).¹⁷ However, in around 50% of the patients, pneumoperitoneum was not related to NEC. Pneumoperitoneum is present in about 63% of infants with gastro intestinal perforation.²¹

In our study, 45.76% cases of Pneumoperitoneum were observed in patients of neonatal small bowel perforation. Other sites of perforation include gastric perforation in 6(10.1%), colonic perforation in 16 (27.3%), rectal perforation in 2(3.38%) and multiple perforation noted in 8(13.5%). Ekwunife Okechukwu reported 56.3% had pneumoperitoneum.²² Ahmed Hosni Morsi reported out of 56 patients of pneumoperitoneum 8.9% had small bowel perforation.¹⁷ A. L. MESTEL et al in their report of 32 children in the first two weeks of life who presented with radiological evidence of free air in the peritoneal cavity, 10 infants had perforations of the small intestine and two had perforation of a meckel's diverticulum. Making 37.5% of all cases.²³

Pneumoperitoneum should not be always considered as an absolute indication for laparotomy in neonate. Neonates with pneumoperitoneum require a proper clinical and the radiographic correlation to establish the etiology of a perforation. In our study 6 (6.8%) neonates improved with peritoneal drain placement and in 2 (2.2%) neonates, no perforation was identified upon exploration A neonate with pneumoperitoneum, with otherwise normal clinical examination (including soft non distended abdomen, nil bilious aspirate, passing stool and no sign of septicemia), could be considered for the trial of conservative management, thus avoiding unnecessary laparotomy. Significant morbidity and mortality have been associated with neonatal pneumoperitoneum the most common cause in Nec. On the other hand, pneumoperitoneum is not an absolute indication for laparotomy. Early identification and proper management can reduce the morbidity of unnecessary laparotomies.

In this study frequency of different sites of

perforation was identified, however this study is a single center study with short duration of time and a small sample size. Non- probability sampling technique is another limitation. On the other hand, this study identified common sign and symptoms for early identification of pneumoperitoneum in neonates with strict inclusion criteria in a limited resource country.

CONCLUSION

It is to be concluded that rate of small bowel perforation was significantly high in those neonate who had below and equal to 2 kg weight and also high in those neonates who presented with in 12-24 hours duration of symptoms.



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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Sumaira	Conception, Study design, Data analysis, Interpretation of data, Control review and final approval fo version to be published.	
2	Ishrat Mahtam	Drafting manuscript, intepretation of data.	
3	Nasir Saleem Saddal	Drafting manuscript and critical review final approval.	