EVALUATION OF PROGNOSTIC FACTORS IN NEONATAL INTESTINAL OBSTRUCTION

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CERTIFICATE

This is to certify that this dissertation titled '**EVALUATION OF PROGNOSTIC FACTORS IN NEONATAL INTESTINAL OBSTRUCTION'** is a bonafide work of **Dr.KARTHIK S.BHANDARY**, under my guidance and supervision in the Department of Paediatric Surgery during the period of his Post Graduate study at Coimbatore Medical College, Coimbatore for the degree of M.Ch. Paediatric Surgery (Branch V) from 2007 - 2010.

Professor and Head **Dean**

Dept. of Paedeatric Surgery **Coimbatore Medical College Hospital**

Coimbatore Medical College Hospital

DECLARATION

I solemnly declare that the dissertation titled **"EVALUATION OF PROGNOSTIC FACTORS IN NEONATAL INTESTINAL OBSTRUCTION"** has been prepared by me.

This is submitted to the **Tamilnadu Dr.M.G.R.Medical University**, Chennai in partial fulfillment of the requirements for the award of M.Ch. Paediatric Surgery (Branch V) to be held in August 2010.

Place: Coimbatore

Date: **Dr.KARTHIK S.BHANDARY**

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CONTENTS

INTRODUCTION

Neonatal surgical emergencies cause considerable mortality and morbidity with intestinal obstruction being a common cause. The etiology ranges from Duodenal / Jejunal atresias to Malrotation, Annular pancreas, duplication cyst, volvulous, meconium ileus, pyloric stenosis, Hirschsprungs disease to anorectal anomalies.

The mode of presentation can be acute or more chronic with systemic upset due to shock. Neonates, more so than older children, with unrecognized intestinal obstruction deteriorate rapidly, show an increase of associated morbidity and mortality .Early diagnosis depends largely on the prompt detection of Obstructive manifestations and the subsequent accurate interpretation of radiographic findings and other investigations, leading to surgical treatment, which should always be preceded by appropriate resuscitation/ preparation of the neonate.

With the advent of neonatal intensive care the prognosis is mainly determined by the coexistence of other major congenital anomalies (eg, cardiac, respiratory, renal), delays in referral or coexisting factors as prematurity ,sepsis, low birth weight, respiratory distress ,operative procedure/ time .

This study focuses on etiology, clnical presentation, and operative details and follow up with emphasis on the good and poor prognostic factors affecting the outcome.

AIMS OF THE STUDY

1. To know the frequency, mode of presentation of the various causes of neonatal intestinal obstruction.
2. To identify the good and poor prognostic factors associated with neonatal intestinal obstruction.
3. To evaluate the various surgical interventions and their outcome.
4. To analyse the relationship between the prognostic factors and outcome post operatively.

MATERIALS AND METHODS

Study Design – Retrospective and prospective study evaluating the prognostic factors in neonatal intestinal obstruction.

Study Period - December 2004 – December 2009.

Study Centre – Department of Paediatric Surgery, Coimbatore Medical College Hospital.

INCLUSION CRITERIA

1. Newborn less than 28 days old.
2. Presenting clinically with vomiting, abdominal distension, failure to pass meconium.

EXCLUSION CRITERIA

1. Babies older than 28 days.
2. Babies diagnosed as cases of Hirschsprungs, Anorectal anomaly, Esophageal atresia.

Study Group: Totally 94 neonates were evaluated and underwent operative management during the study period.

DEMOGRAPHICS

The following data were collected in the data sheet for evaluation.

1. History of any foetal anomaly detected during antenatal scans, of polyhydromnios ,maternal diabetes ,family history of newborn intestinal obstructions , history of cystic fibrosis in the family.
2. Gestational age, sex, weight.
3. Presence of associated cyanosis, respiratory distress, other congenital malformations.
4. Day of presentation of symptoms, earliest symptom, presenting symptoms.
5. Presence of dehydration, sepsis, hypothermia.
6. Surgical procedure undertaken – operative time.
7. Number of reoperations, mortality, length of stay.
8. Post op wound infections, abdominal wall dehiscence, sepsis.

EVALUATION

A detailed history was taken including mothers antenatal history in all babies who presented in the neonatal period with bilious vomiting, abdominal distension, failure to pass meconium.

Antenatal history included history of any foetal anomaly detected during antenatal scans and the number of scans taken with specific reference to the presence or absence of polyhydromnios, maternal history of diabetes ,family history of newborn intestinal obstructions for predisposition to jejunal atresias, history of cystic fibrosis in the family.

SYMPTOMATOLOGY

VOMITING:

Vomiting was the commonest and earliest presenting symptom and it was bile stained in cases of obstruction beyond the second part of duodenum. Copius and forceful frequent and early bilious vomiting was seen in duodenal / jejunal atresia, malrotation, and proximal jejunal atresia. Vomiting was delayed and was preceeded by progressive abdominal distension in distal ileal atresia, meconium ileus.

ABDOMINAL DISTENSION:

Abdominal distension Is a significant symptom and the degree of abdominal distension was dependant on the level of obstruction. Distension is progressive in distal bowel obstruction, higher the level of obstruction lesser is the abdominal distension with only gastric distension and visible peristalisis. Late presenters had massive abdominal distension of which perforation was seen in a considerable number of cases.

PASSAGE OF MECONIUM:

Normal neontes 94% pass meconium within 24 hrs of birth and 98% by 48 hrs[1]. Delayed passage or late passage of meconium was seen in cases of distal atresias and meconium ileus. Few far separated in time of passage of meconium was seen in incomplete obstruction

Delayed presenters presented with dilated veins over abdomen, periumblical flare, edema and erythema of the abdominal wall, respiratory distress, dehydration, hypothermia and sepsis.

PRE – OPERATIVE MANAGEMENT

Pre-operative management was an integral part of treatment of our neonates with intestinal obstruction though the treatment was primarily surgical. They can be broadly divided into the following headings.

- Incubator care (normothermia)
- Low grade nasogastric suction
- Estimation of serum electrolytes, Hb%, full blood count,
- Intravenous fluids – correction of dehydration and electrolyte
- Antibiotics, vitamin k injections
- Hourly TPR and abdominal girth measurements.

RADIOLOGICAL ASSESSMENT

Radiological assessment was vital in the preoperative planning a significant number of cases were diagnosed primarily on the basis of supine and lateral x rays. Upper GI contrasts were used in instances to throw more light in cases of suspected malrotation. Contrast enemas were used in cases of suspected distal ileal obstruction to rule out colonic obstruction. USG was used selectively in cases of suspected malrotation and Infantile hypertrophic pyloric stenosis (IHPS).

OPERATIVE PROCEDURE

On making the decision of surgical procedure the neonate is shifted to the warm operation theater with specific care about

- maintenance of temperature
- maintenance of hydration
- maintenance of adequate oxygenation
- adequate nasogastric aspiration .

ACCESS

The muscle cutting right supraumblical transverse incision was used to enter the abdomen the incision was extended across the midline when necessary.

On laparotomy fluid in the abdomen, flakes, bowel distension, atretic segments, position of ceacum, congenital bands, thick meconium pellets, volvulus, malrotation, pyloric thickening, etc., were looked for meticulously to identify the cause. Surgical options were planned depending on the cause as follows.

RAMSTEDS PYLOROMYOTOMY FOR IHPS

On laparotomy the liver edge was retracted and greater curvature of the stomach grasped and the thickened pylorus was delivered out .The serosa on the anterior wall of the hypertrophied

pylous was incised from just distal to antral pyloric junction to just proximal to pyloric vein [2] myotomy was completed by blunt dissection with either the back of the scalpel or belly of the curved artery forceps. Completion of myotomy was checked by individual movement of parts of the ring and the buldging submucosa is checked for perforation .The pylorus is placed back and abdomen wall was closed in layers.

DUODENO – DUODENOSTOMY FOR DUODENAL ATRESIA / ANNULAR PANCREAS

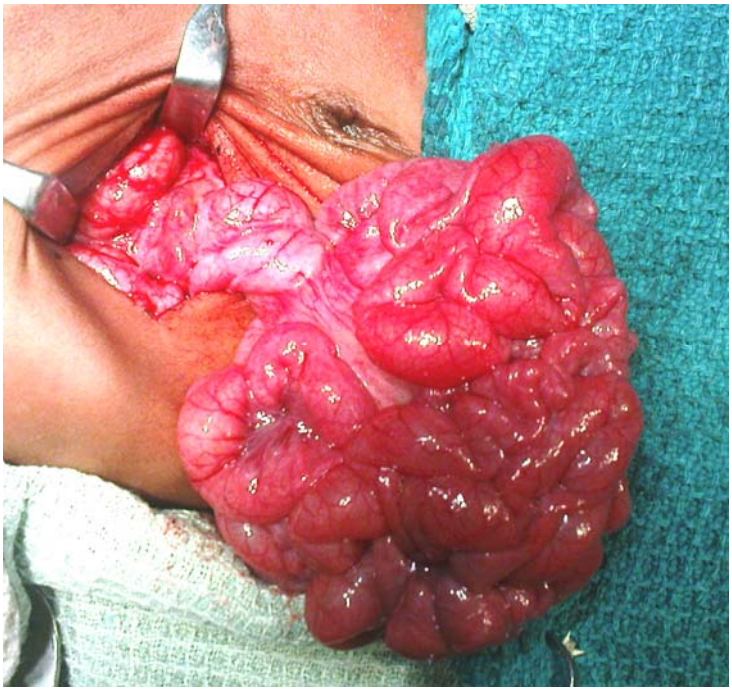
The stomach and duodenum proximal to the obstruction was found dialated and the distal small bowel contracted. The site of obstruction was identified by pushing air through nasogastric tube and negotiating a number 10 size feeding tube through the duodenotomy. When an annular pancreas was located at the second part of duodenum it was not transected for it will lead to pancreatic fistula. The procedure of choice was kimuras diamond shaped anastomosis with approximating the tip of the vertical incision of the distal segment with the midpoint of transverse incision of the proximal segment.

LADD S PROCEDURE – MALROTATION OF MIDGUT

In case of malrotation the small bowel loops were encountered first instead of transverse colon on laparotomy , the ceacum was malpositioned in the left hypochondrium , ladds bands were seen. Ladds procedure consists of the following important steps in the proper sequence [3]

- evisceration of bowel and inspection of mesenteric root
- counterclockwise derotation of midgut volvulus
- lysis of ladds bands and straightening of duodenum and duodenojejunal loop along the right abdominal gutter.
- Appendectomy
- Placement of ceacum in left lower quadrant.

MALROTATION WITH VOLVULUS



JEJUNO – ILEAL ATRESIA:

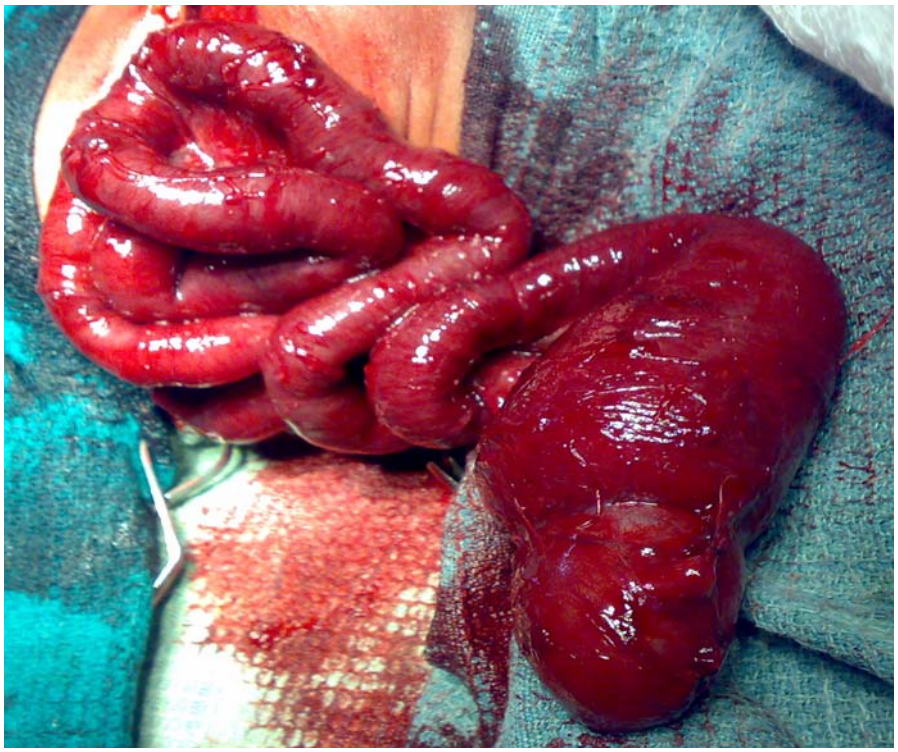
The entire length of small bowel was inspected for multiple atresias and the type of atresia made out. Distal patency was checked by milking saline. After resection when adequate length of bowel was preserved to prevent short bowel syndrome, an end to back primary anastomosis was done with a 90 degree cut in proximal bowel and a 45 degree oblique cut in distal bowel in case of discrepancy in single layer with 5-0 vicryl. To prevent short bowel a tapering jejunoplasty was done in selected cases.

In cases of volvulus with compromised vascularity, associated meconium ileus or meconium peritonitis, diversion procedures as

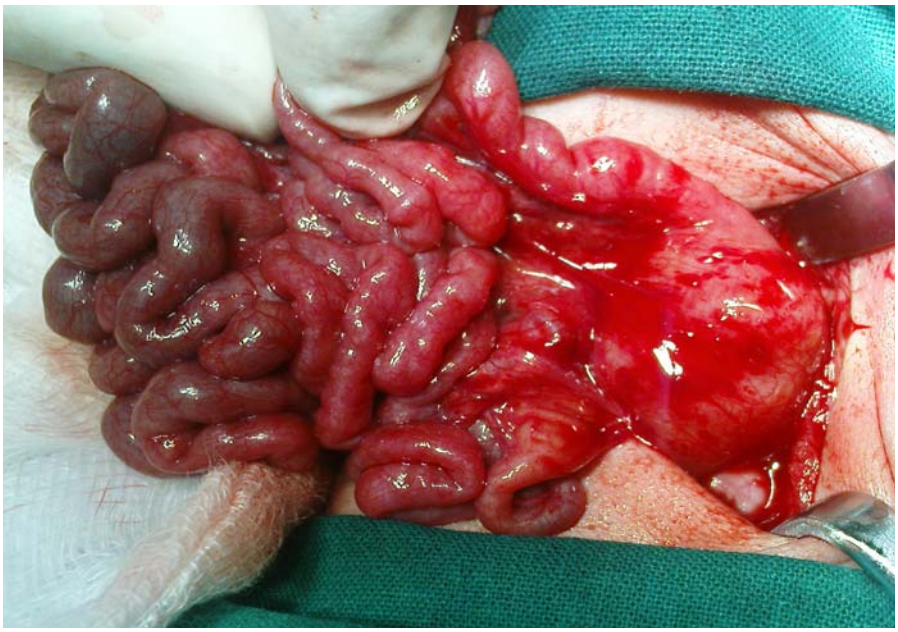
- Double barreled enterostomy (Miculicz)
- Proximal chimeney enterostomy (Santulli)
- Distal chimeney enterostomy (Bishop –koop)

Were undertaken, followed by their closure by 4-6 weeks.

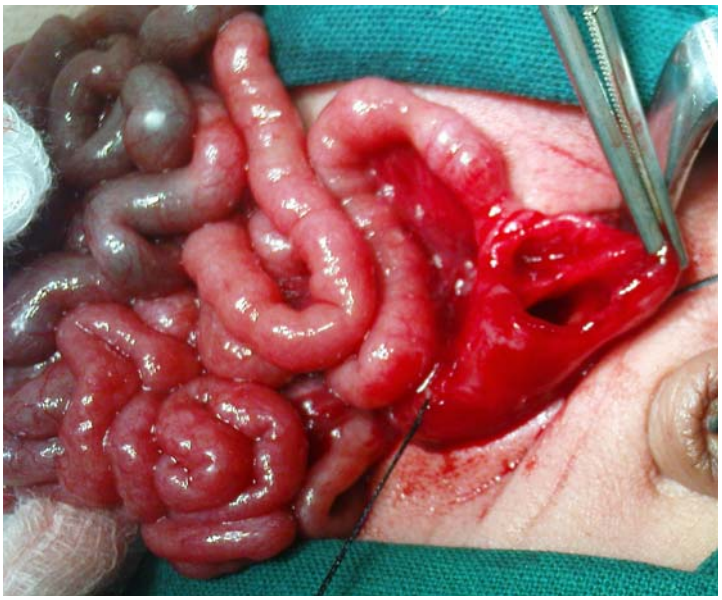
ILEAL TRESIA



JEJUNAL TRESIA



JEJUNAL TRESIA



MECONIUM ILEUS

In uncomplicated ileus when the thick inspissated meconium was not dissolved by gastrograffin enemas or in complicated meconium ileus a spectrum of procedures depending on the operative diagnosis from enterotomy and saline irrigation followed by diversion procedures as mentioned previously to resection and primary anastomosis in cases of volvulus and atresia and cyst excision and enterostomy in cases of giant meconium cyst.

Cases of meckels diverticulum underwent resection and anastomosis.

POST OPERATIVE CARE

Is broadly divided into the following headings

- Incubator care – maintain normothermia
- I.V fluids – maintain tissue perfusion
- Appropriate antibiotic coverage
- Nasogastric suction hourly and continuous free drainage
- Electrolyte , blood gas estimation, complete hemogram when needed.
- For ileostomy skin and stoma care.

Post procedure the patients were evaluated on the basis of need for mechanical ventilation, return of bowel movements, time for starting of oral feeds, length of stay, need for reoperations, wound complications as infection, wound dehiscence, sepsis, mortality etc.

Patients were followed up regularly to know the rate of recurrent obstructions, weight gain, etc.

RESULTS

Hospital records and gasterointestinal surgical registers maintained at our department were reviewed from the year 2004-2009.

In this retrospective and prospective study conducted from December 2004 - December 2009 a total of 94 neonates were operated for intestinal obstruction. 53 neonates were male and 41 were female.

Out of the 94 cases only 15(15.95%) cases were diagnosed antenatally by ultrasound.

Etiology	No of cases
Duodenal atresia	4
Jejunal atresia	4
Ileal atresia	5
Meconium ileus	2

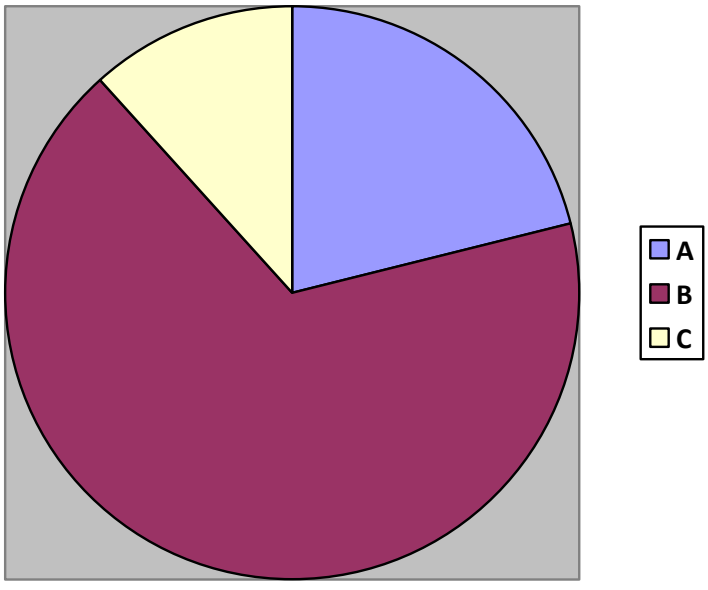
Polyhydromnios antenatally were noted by ultrasound in 4 cases of duodenal atresia, 2 cases of jejunal atresias,2 cases of ileal atresias and 3 cases of malrotation.

BIRTH WEIGHT

Depending on their birth weight babies were grouped into three groups as A, B, C. Babies in group A weighed between 2.5 – 3 kgs. In group B they ranged between 2- 2.5 kgs and and less than 2 kgs in group C.

TABLE I – WEIGHT DISTRIBUTION

GROUP	WEIGHT RANGE(kg)	No (%)
A	2.5 – 3	20(21.2%)
B	2- 2.5	63(67%)
C	< 2	11(11.7%)

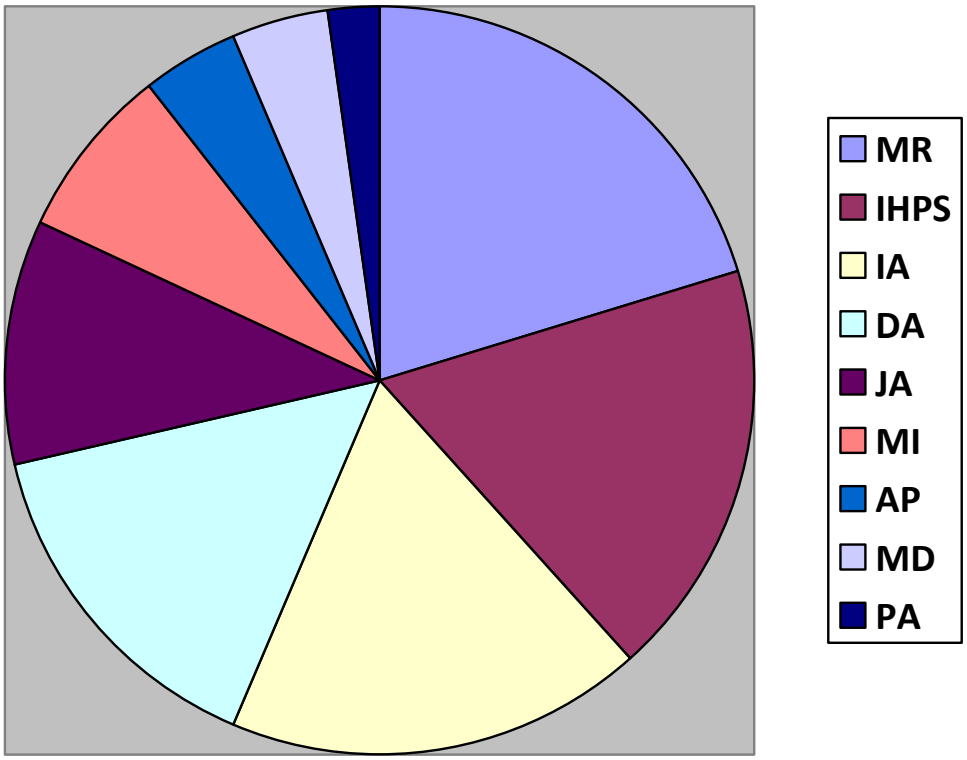


ETIOLOGY

Based on the etiology the number and percentage of each specific cause is as follows. The commonest cause in this study being malrotation followed by equal numbers of IHPS, ileal atresia, and duodenal atresia.

TABLE II - ETIOLOGY

ETIOLOGY	NO OF CASES (%)
MALROTATION(MR)	19(20.2%)
IHPS	17(18%)
ILEAL ATRESIA(IA)	17(18%)
DUODENAL ATRESIA(DA)	14(14.8%)
JEJUNAL ATRESIA(JA)	10(10.6%)
MECONIUM ILEUS(MI)	7(7.4%)
ANNULAR PANCREAS(AP)	4(4.2%)
MECKELSDIVERTICULUM (MD)	4(4.2%)
PYLORIC ATRESIA (PA)	2(2.1%)



Jejunoileal atresias are the commonest cause of intestinal obstruction seen in seen in 28.7% of cases followed by malrotation in 20.2% and IHPS and ileal atresia in 18% each .

PRE OPERATIVE PROGNOSTIC FACTORS

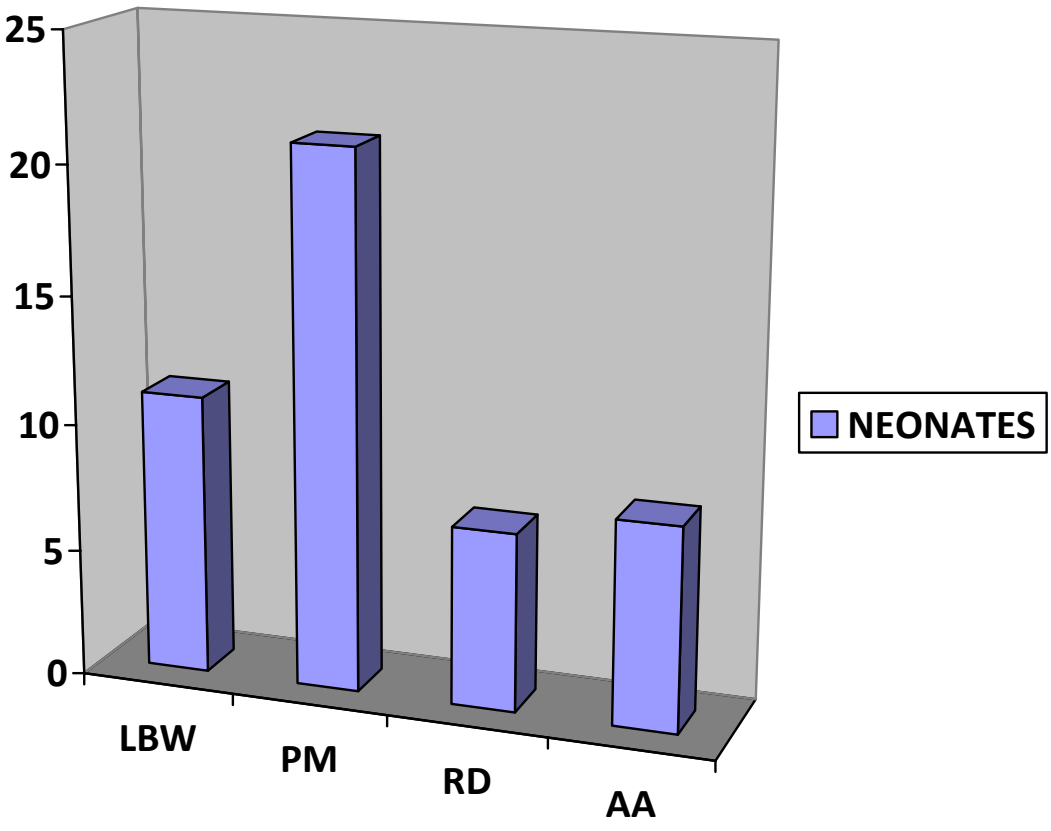
The following pre operative prognostic factors were present in the following frequencies in the specific etiologies.

TABLE III

ETIOLOGY	LBW	Prematurity (PM)	Respiratory Distress (RD)	Associated Anomalies (AA)
MALROTATION		3		4 – RENAL
IHPS		2		
ILEAL ATRESIA	2	5	2	
DUODENAL ATRESIA	3	6	3	4 – DOWNS
JEJUNAL ATRESIA	3	2		
MECONIUM ILEUS	2	2	2	
ANNULAR PANCREAS	1	1		

Majority of cases of Low birth weight (LBW) were seen in neonates with duodenal and jejunal atresia with 3 cases in each group which constituted to 27% in each group. Out of 21 cases of

premature neonates born before 37 weeks of gestation 6 (28.5%) were of duodenal atresia and 5 (23.8%) were of Ileal atresia. 4(21%) neonates with malrotation had renal anomalies and 4(28.5%) cases of downs syndrome were recognized in neonates with duodenal atresia



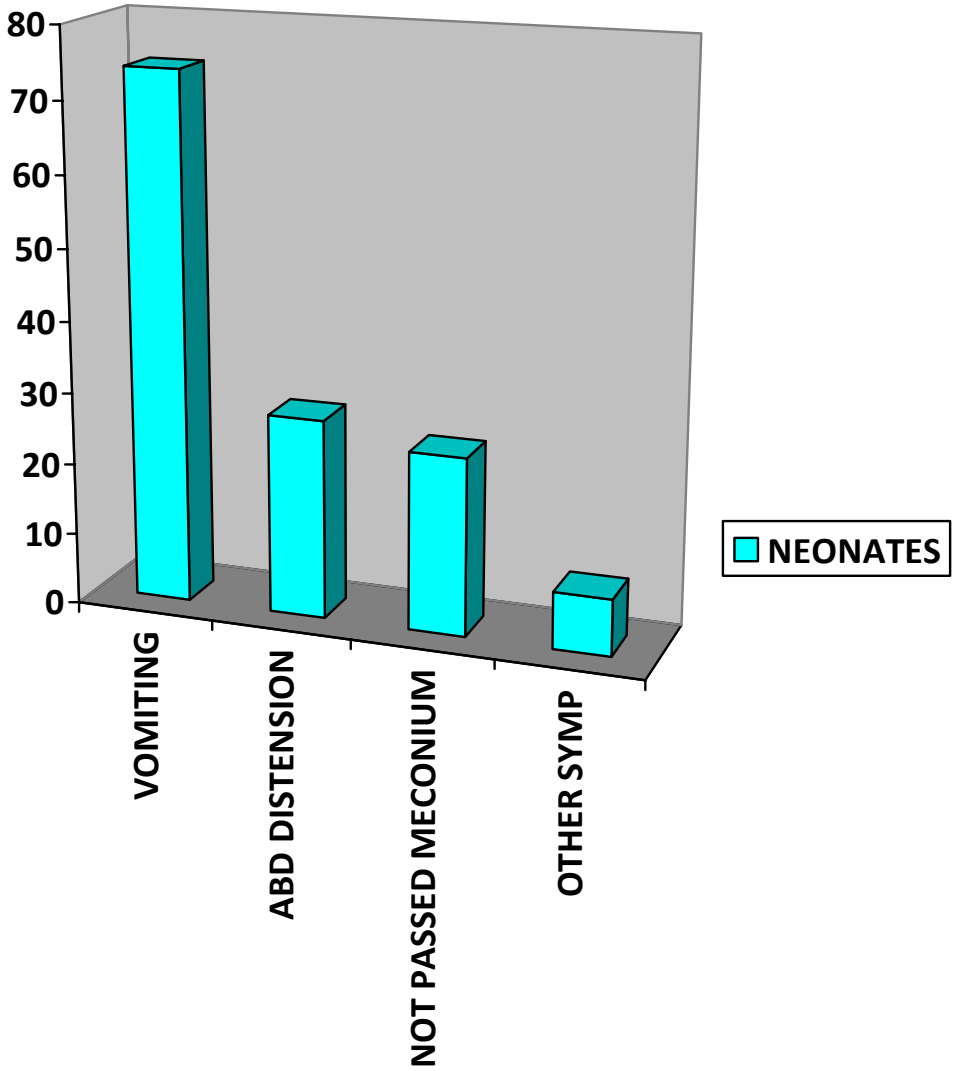
PRESENTING SYMPTOMS

TABLE IV – PRESENTING SYMPTOMS

ETIOLOGY	VOMITING	ABDOMEN DISTENSION	NOT PASSED MECONIUM
MALROTATION	15		
IHPS	17		
ILEAL ATRESIA	10	15	12
DUODENAL ATRESIA	14		
JEJUNAL ATRESIA	7	5	6
MECONIUM ILEUS	3	6	6
ANNULAR PANCREAS	4		
MECKELS DIVERTICULUM	2	2	1
PYLORIC ATRESIA	2		

Vomiting was the commonest complaint seen in about 72(76%) cases except for cases of IHPS it was bilious vomiting .The next commonest symptom was abdominal distension which

was early and marked in distal small obstruction seen in 28(29.7%), followed by failure of passage of meconium in 25(26.6%).Failure to pass meconium was seen more in case of distal atresias.



OPERATIVE TIME

The total number of cases were divided into three groups based on the time taken for the operative procedure. As less than half an hour, ½ hour to 1 hour, and 1 – 1 ½ hour groups.

Most of the cases of pyloric stenosis 16(94.1%) were operated within half an hour except one case where there was mucosal perforation.

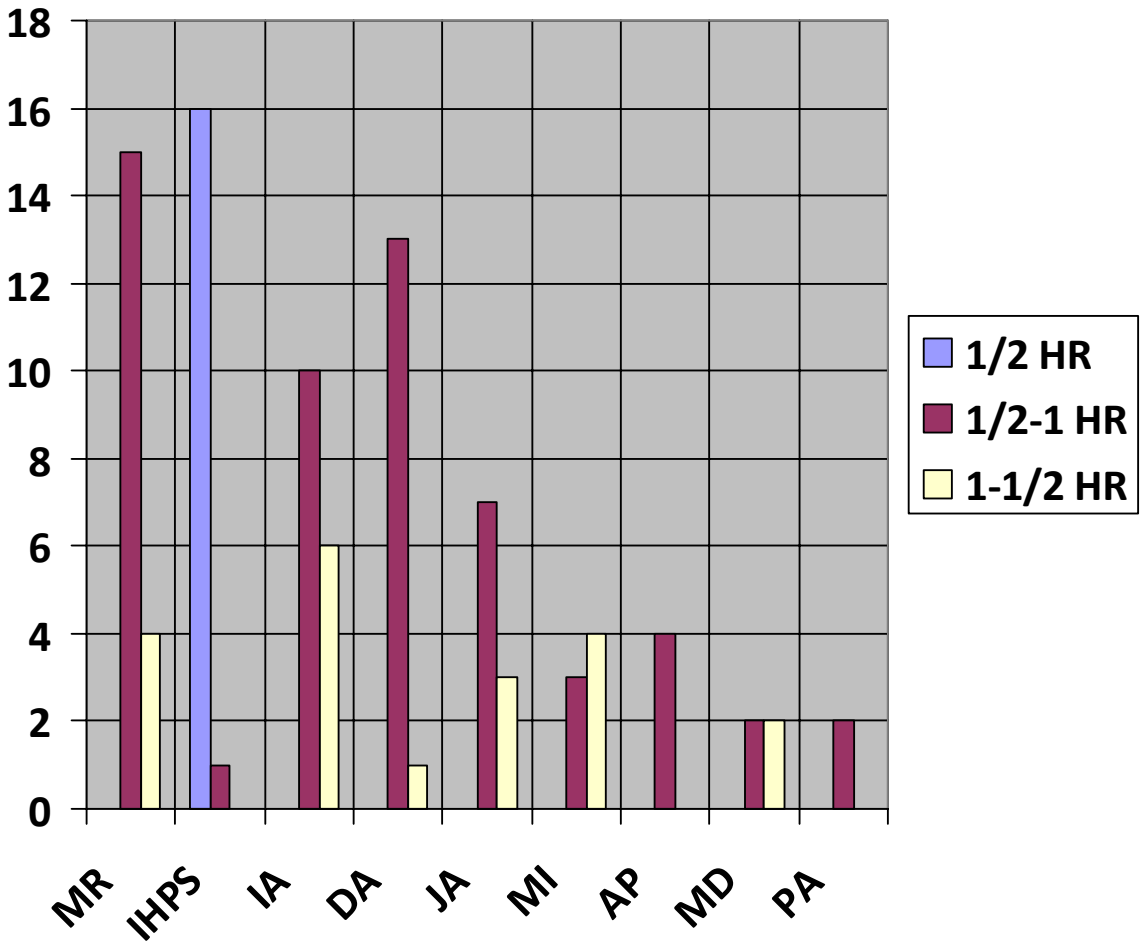
Out of the 94 procedures 55(58.5%) were completed in one hour period as they involved minimal dissection and resection of bowel.

18(19%) neonates were operated for > 1 hour to 11/2 hours in these cases there was gross soiling and dense adhesions, gangrenous bowel .

TABLE V-OPERATIVE TIME

ETIOLOGY	30 MINUTES	30 – 60 MINUTES	1-1½ HOURS
MALROTATION		15	4
IHPS	16	1	
ILEAL ATRESIA		10	6
DUODENAL ATRESIA		13	1
JEJUNAL ATRESIA		7	3
MECONIUM ILEUS		3	4
ANNULAR PANCREAS		4	
MECKELS DIVERTICULUM		2	2
PYLORIC ATRESIA		2	

OPERATIVE TIME



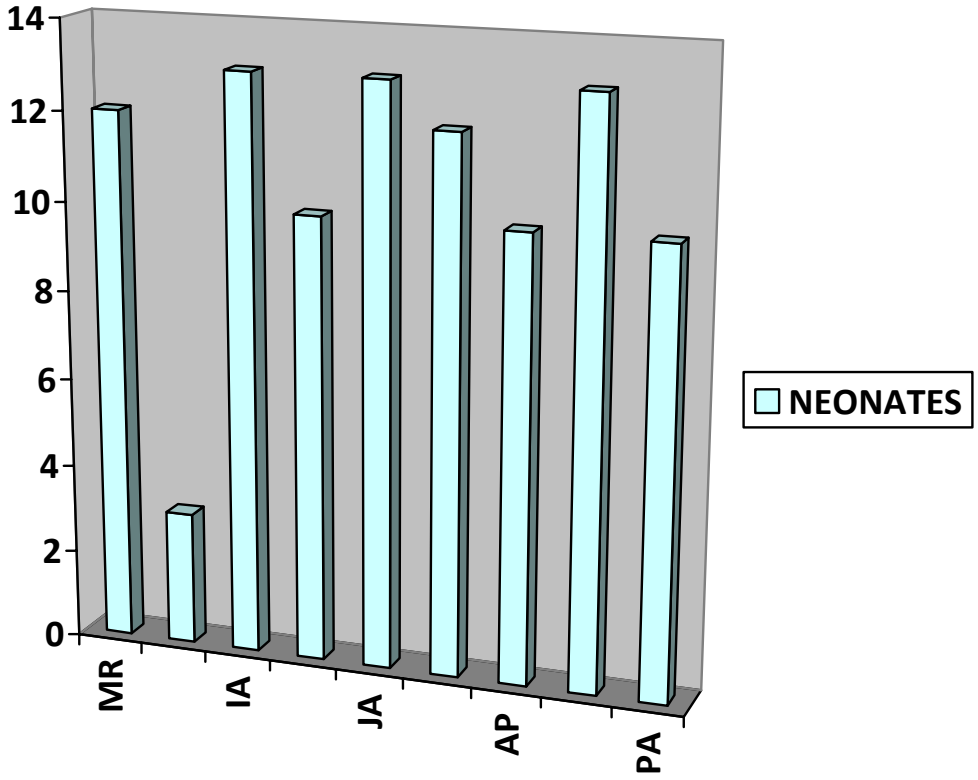
POST OPERATIVE

In the post operative period the variables evaluated were length of stay, reoperations, wound complications as infection, burst abdomen, sepsis and mortality. The observations are in the following table.

TABLE VI - POST OPERATIVE VARIABLES

Etiology	LOS	Re-Op	Wound Complications	Sepsis	Mortality
MALROTATION	12	3	4	4	5
IHPS	3				
ILEAL ATRESIA	13	4	3	3	4
DUODENAL ATRESIA	10	1		2	5
JEJUNAL ATRESIA	13	1	2	2	3
MECONIUM ILEUS	12	2	2	2	3
ANNULAR PANCREAS	10			1	1
MECKELS DIVERTICULUM	13	1	1	1	1
PYLORIC ATRESIA	10				

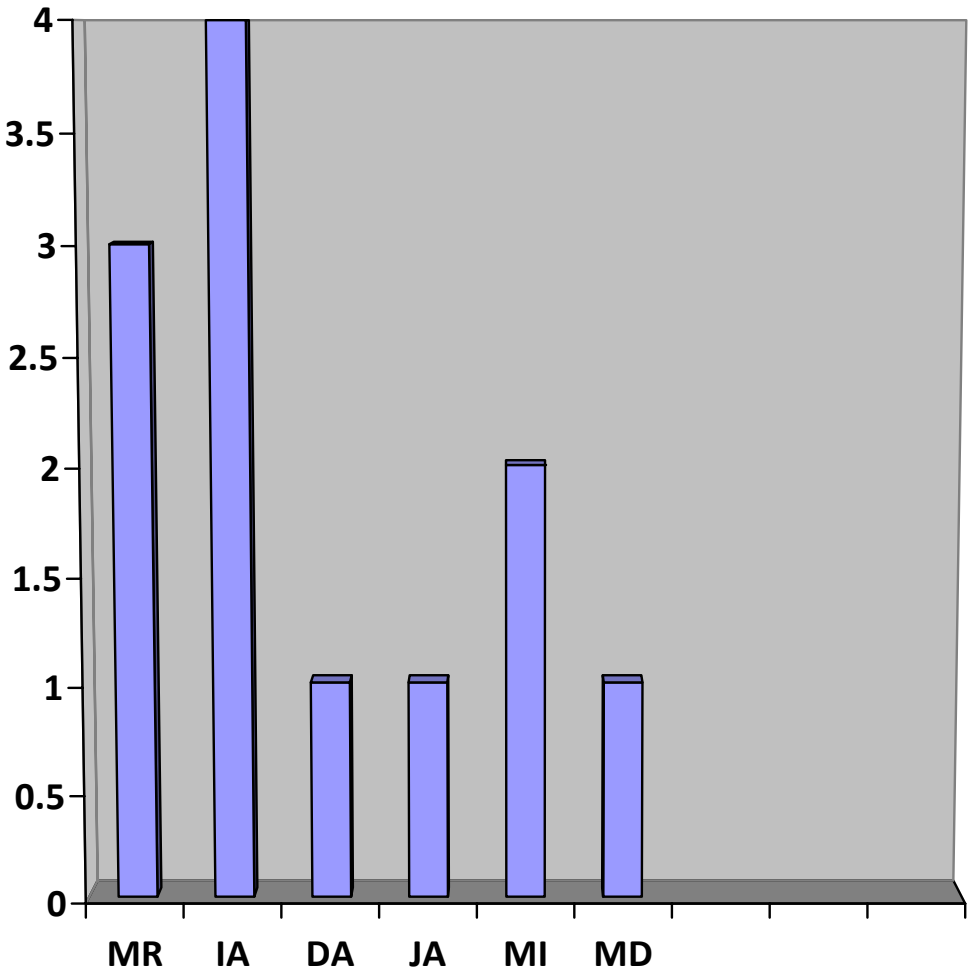
LENGTH OF STAY



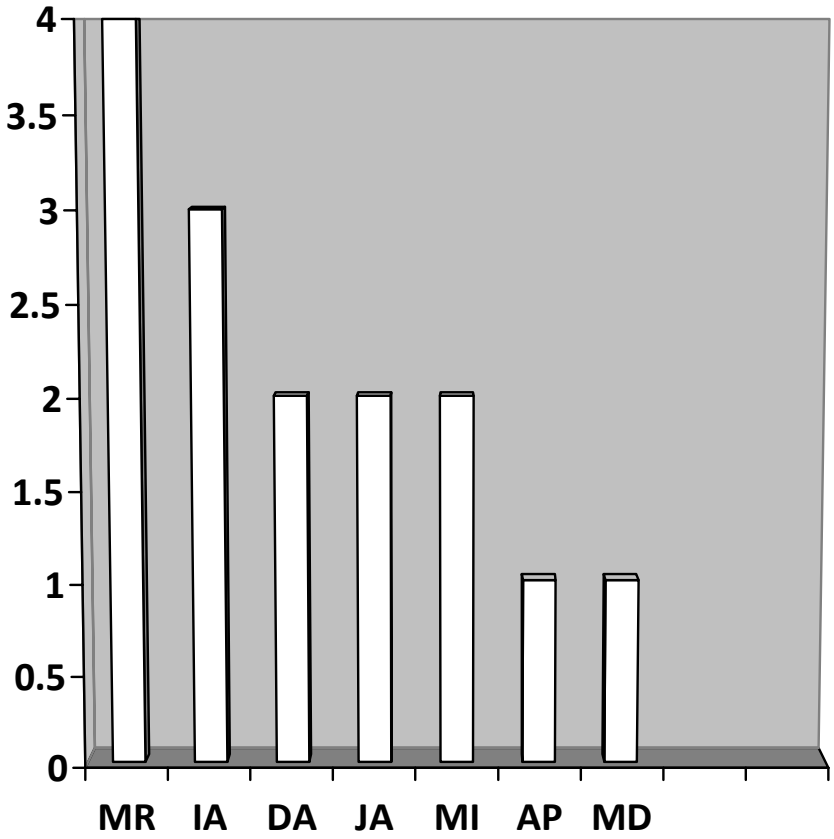
The maximum average number of days of hospital stay were seen in cases of jejunal, ileal atresia and meckels diverticulum with 13 days each. Followed by malrotation and meconium ileus with an average stay of 12 days.

REOPERATIONS

4 cases of ileal atresia needed reoperations for 3 cases developed adhesive obstruction whereas one case developed anastomotic dehiscence. 3 cases of malrotation were operated for adhesive obstruction and adhesiolysis done. adhesiolysis was also done for 2 cases of complicated meconium ileus.

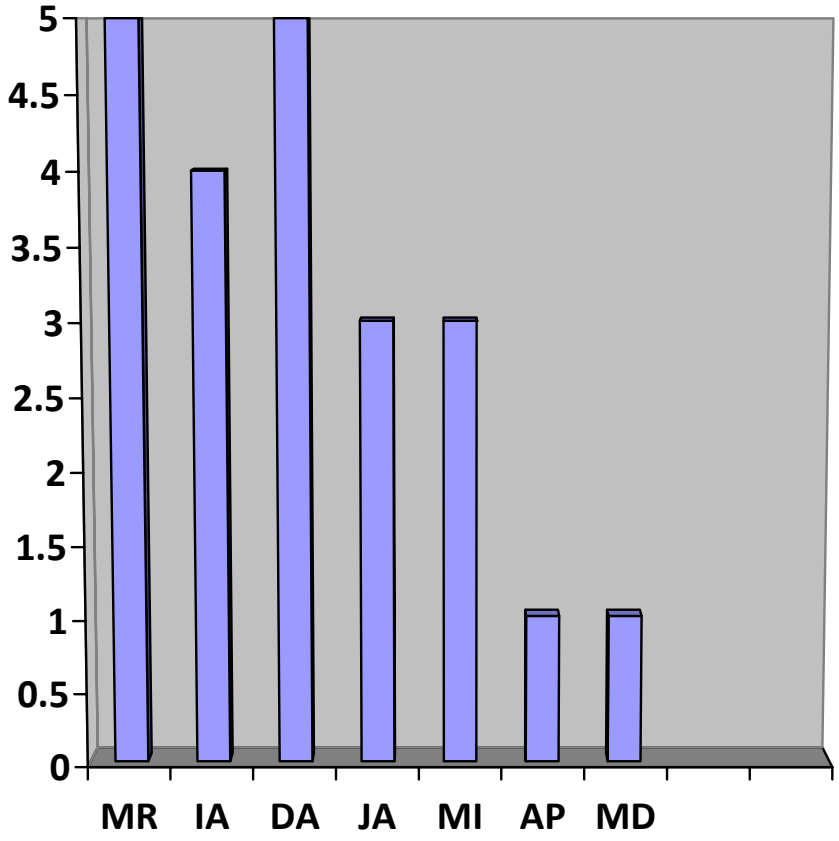


SEPSIS



Post operative sepsis was seen in 4 cases of malrotation, 3 cases of ileal atresia and 2 cases each of duodenal atresia, jejunal atresia, meconium ileus.

MORTALITY



Maximum neonatal deaths were seen in malrotation 5 (22%) and duodenal atresia (22%) followed by 4(18%) cases of Ileal atresia and 3 (13.6%) cases of jejunal atresia and meconium ileus each.

REVIEW OF LITERATURE

Intestinal obstruction is one of the commonest diagnosis at admission in a neonatal surgical unit. Appropriate evaluation and successful management is of utmost importance and is the yardstick for the quality of neonatal care. With the technological advances in NICU and surgical techniques and antibiotics considerable progress has been achieved. But attention should be focused on the associated factors which add up to the considerable mortality and morbidity like the coexistence of other major congenital anomalies (eg., cardiac, respiratory, renal), delays in referral or coexisting factors as prematurity ,sepsis, low birth weight, respiratory distress ,operative procedure/ time.

A variety of lesions exist that cause intestinal obstruction in the neonatal period. The lesions can be separated into high anatomic obstructions, low anatomic obstructions, and functional obstructions. High anatomic obstructions are caused by lesions that interrupt bowel continuity proximal to the midportion of the jejunum. The high lesions include pyloric atresia, duodenal obstruction from atresia, stenosis, annular pancreas, preduodenal portal vein, malrotation with or without midgut volvulus, and

proximal jejunal atresia or stenosis. Low anatomic obstructions are distal to the midportion of the jejunum. Low obstructive lesions include ileal atresia or stenosis, colonic atresia or stenosis, meconium ileus, Hirschsprung's disease, imperforate anus, small left colon syndrome, meconium plug syndrome, intussusception, and anorectal malformations. Functional obstructions may be caused by sepsis, electrolyte imbalance, necrotizing enterocolitis (NEC), and hypothyroidism. Table below lists the common causes of intestinal obstruction in the neonate[4] .

Causes of Neonatal Intestinal Obstruction		
High Obstructive Lesions	**Low Obstructive Lesions**	**Functional Obstruction**
- Pyloric atresia or pyloric stenosis - Duodenal obstruction: atresia, stenosis, annular pancreas, - congenital peritoneal bands, - preduodenal portal vein - Malrotation Malrotation with volvulus - Proximal jejunal atresia or stenosis	- Ileal atresia or stenosis - Meconium ileus Intussusception (rare) - Colonic atresia or stenosis (rare) - Small left colon syndrome - Meconium plug syndrome - Hirschsprung's disease	- Necrotizing enterocolitis - Sepsis Hypothyroidism Electrolyte imbalance

Through advancements in neonatal anesthesia, and total parenteral nutrition, significant progress has been made in the management of neonates with intestinal obstruction. Despite improvements in care, neonatal intestinal obstruction continues to provide a diagnostic challenge and a cause of morbidity because of the associated prognostic factors mentioned earlier.

Most clinical series have examined each obstructive lesion individually. However, studies by Reyes et al.[5] and Santulli[6] reviewed the broad topic of intestinal obstruction in the neonate.

In 1954, Santulli reported a mortality rate of 44.8%[6], compared with the mortality rate of 2.8% in 1989 [5]. These data are consistent with other more recent studies that looked at lesions responsible for neonatal bowel obstruction. In three series that reviewed intestinal atresia, the operative mortality for jejunoileal atresia was 0.8% and increased to 4% for duodenal atresia when associated with a cardiac anomaly [7.] The long-term survival ranged from 86% to 93% [8,9,10].

CLINICAL PRESENTATION:

Vomiting is one of the earliest and most consistent signs of intestinal obstruction in neonates. The onset, character, and severity of the vomiting is dependent on the cause of obstruction. Bilious vomiting is characteristic of obstruction distal to the ampulla

of Vater. Bilious emesis should be considered to be due to obstruction until proven otherwise.

With proximal lesions, bilious vomiting has a sudden presentation and may be forceful in nature. The frequency of bilious emesis in neonates with duodenal obstruction ranges from 66% to 91% [7,8] and was 46% to 100% in neonates with intestinal malrotation [11,12,13] In approximately 15% of neonates with duodenal atresia, the obstruction is proximal to the ampulla of Vater, and emesis will be nonbilious. However, bilious vomiting may also be a clinical symptom present in low obstructive lesions, such as ileal atresia, intussusception, colonic atresia or stenosis.

Failure to pass meconium is another sign of intestinal obstruction. Meconium should be passed within 24 hours of birth in 95% of full-term infants, and the remainder will usually pass meconium within 48 hours . Failure to pass meconium within the first 24 hours of life is a classic finding for meconium ileus, meconium plug. Failed passage of meconium is also present in jejunoileal atresia, colonic atresia or stenosis, and intussusception. Neonates with proximal intestinal obstructions may pass meconium within the first 24 to 48 hours, but they will fail to have subsequent stools. With more proximal lesions, sufficient cells can

be shed from the intestine distal to the point of obstruction to account for the meconium.

Neonates with incomplete obstruction may pass meconium and subsequent stool. Abnormal findings in the stool of a neonate may suggest threatened bowel. Passage of blood per rectum is an ominous sign that represents intestinal ischemia. This may be present in neonates with malrotation with midgut volvulus and necrotizing enterocolitis .Any finding that may be consistent with threatened bowel viability must be immediately diagnosed to allow for prompt definitive care.

Abdominal distention is a common sign of neonatal intestinal obstruction, and is a characteristic and frequent finding of low obstructive lesions of the neonate. The degree of distention caused by low obstructive lesions tends to be progressive and severe. In neonates with high obstructive lesions, abdominal distention is variably present. When present, the distention tends to be confined to the epigatrium. The remainder of the abdomen may have a scaphoid appearance due to the lack of air passing the point of obstruction into the distal areas of bowel. Frequent vomiting relieves gastric distention; therefore, abdominal distention is an unreliable finding in intestinal obstruction due to high lesions.

PRENATAL DIAGNOSIS

Many of the anomalies that lead to intestinal obstruction in the neonate develop during fetal life. With the current technical capabilities of ultrasonography, many obstructive lesions can be accurately diagnosed during the prenatal period. Diagnosis in the prenatal setting facilitates the care of the pregnant mother and future patient.

Prenatal diagnosis provides the opportunity for appropriate counseling and for planning the delivery in a tertiary care center with a pediatric surgeon and a neonatal intensive care unit. Timely resuscitation and appropriate surgical management can be optimized.

The accuracy of prenatal ultrasonography is dependent on the level of intestinal obstruction.

Corteville et al. reviewed the ultrasonographic findings of 16,471 consecutive fetuses, 89 of which had a suspected bowel lesion [14]. The study revealed a sensitivity of 100% and positive predictive value of 73% for the diagnosis of small bowel lesions. Large bowel lesions had a low sensitivity of 8% and positive predictive value of 18%. Therefore, prenatal ultrasound accurately predicts the presence of high lesions, but it is a poor test for detecting low lesions.

Specific ultrasound criteria is useful in defining obstructive lesions. Isolated gastric distention and polyhydramnios is usually seen in rare cases of pyloric atresia [15].

In duodenal atresia, a sonographic double-bubble is usually diagnostic, and polyhydramnios is present in one-half of the fetuses with duodenal atresia[16,17]. Jejunoileal atresias are diagnosed by dilated fluid filled loops of bowel with increased peristalsis. Only 24% of cases of jejunal atresia are associated with maternal polyhydramnios. Distal atresias are less often associated with polyhydramnios[18].

Midgut volvulus may also present with distended fluid-filled loops of bowel, increased mural thickness, and increased peristalsis[17]. Intraabdominal calcifications and ascites should raise suspicion for meconium peritonitis from intestinal obstruction with perforation. However, calcifications and ascites can be produced by a variety of other causes[17].

On antenatal evaluation presence of hyper echogenic bowel and dilated bowel had prognostic significance moreso when on serial evaluation there was persistence of the findings. Hyperechogenicity is more common than dilation and more likely to be transient.

PREMATURITY AND LOW BIRTH WEIGHT

Neonates born before 37 weeks are considered as premature and weighing less than 2500 gm are assigned as low birth weight. Low birth weight babies can be again grouped as [19]

- Moderately low birth weight (1501- 2500 g) .represents 82% of all premature infants. The mortality rate in this group is 40 times than in term neonates.
- Very low birth weight (1001 – 1500 g). This group represents 12% of premature infants. The mortality rate in this group is 200 times than in full term babies.
- Extremely low birth weight (< 1000 g). This group represents 6% of premature infants. The mortality rate in this group is 600 times than in full term babies.

Prematurity and low birth weights are important indicators of mortality. Premature neonates regardless of preoperative history develop apnea in the post operative period. Recovery from general anaesthesia may unmask central respiratory regulation or decrease upper airway tone

Moreover the immaturity of the preterm liver and renal system to metabolise the anaesthetic drugs adds up to the postoperative morbidity.

In Fonkalsrud' s survey of 503 infants on the survival of babies with duodenal obstruction mortality was related to associated malformations and prematurity in 50 % of cases[20].

ASSOCIATED ANOMALIES

Syndromic or non syndromic association of cardiac/ renal / respiratory anomalies are one of the major determinants of mortality.

Congenital duodenal obstruction is commonly associated with other serious congenital anomalies, which account for most of the morbidity and mortality in these patients. Various reports put the incidence of associated conditions between 50% and 80%.

Congenital heart disease and trisomy 21 (Down syndrome) are the most common associated conditions, each occurring in about 30% of cases[21]. Not infrequently, all three conditions coexist in the same patient[22]. In patients with trisomy 21 who underwent prenatal ultrasonography, about 4% were found to have prenatal evidence of duodenal atresia[23].

Other associated anomalies include intestinal malrotation (20%), esophageal atresia or imperforate anus (10% to 20%), heterotaxia, and gallbladder agenesis. The outcome for patients with duodenal atresia depends more on the severity and

correctability of these associated anomalies than on the surgical management of the obstruction.

Sumit Dave and D.K Gupta observed that in cases of duodenal atresia there is a 17-22 % association of congenital heart defects[24] .In the present era complex cardiac defects associated with duodenal atresia are the main cause of mortality.

Nixon et al used the Waterson classification to identify three risk groups in jejunoileal atresia [25]

- Group A > 2.5 kg , no associated significant anomaly
- Group B 1.8 – 2.5 kg or moderate to severe associated anomalies
- Group C < 1.8 kg with or without severe anomalies.

The survival rates were as follows

SITE	GROUP A / B	GROUP C
High jejunal	60%	0%
Mid small bowel	82%	32%
Terminal ileal	100%	60%

This study highlighted how associated anomalies in combination with birth weight were indicators of mortality.

PEROPERATIVE FACTORS

In most developed centres, early diagnosis, including prenatal diagnosis and planned delivery in a fully equipped paediatric surgical centre, has greatly improved survival in neonates with surgical conditions. Uba *et al* [26] reported that late presentation increased the mortality rate in neonates with intestinal obstruction.

Aspiration during vomiting, splinting of the diaphragm by abdominal distension (which impedes breathing), and the high propensity to sepsis are the factors which impact negatively to the outcome of neonatal intestinal obstruction.

Intestinal perforation and/or gangrene with resultant peritonitis were associated with severe preoperative morbidity and post-operative complications such as wound infection, endotoxic shock, burst abdomen, nutritional problems, and a high mortality rates.

Operative time also has to be taken into consideration ,clean or minimally contaminated laprotomies with minimum adhesions and procedures that involved minimal handling of the bowel and minimal dissection and resection of bowel usually took lesser time and had more favorable prognosis compared to prolonged

procedures which was dependant on the etiology per say and the time of referral.

Reoperation, postoperative bleeding and sepsis were associated with poor outcome. The increased mortality associated with reoperation may be related to repeated exposure to anaesthesia within short intervals, their immature livers not being able to sufficiently metabolise the anaesthetic drugs, some of which are hepatotoxic [27,28].

Stress of additional surgery may also contribute to mortality in these patients, many of whom are also in sepsis.

The overall prognosis in cases of jejunoileal atresia is good. Since the mid-1970s, advances in neonatal care have allowed progressive reduction in mortality from a historical high of more than 90%. Many authors have now reported overall survival exceeding 90%[7,29]. The most significant improvement over that time period has been the ability to provide long-term nutritional support, which is usually necessary for a period of weeks to months after the surgical repair.

Type I, II, and IV atresia each account for about one-fourth of the patients with atresia. Less common but potentially more serious are the type IIIb atresias that comprise less than 10% of atresias seen, but have been associated with a disproportionate

amount of the perioperative morbidity and mortality. Previous reports have suggested a mortality rate as high as 20% in the setting of type IIIb atresia. More recent data no longer show such a striking disparity, especially in early mortality [30,31]. These patients do, however, have the potential to volvulize segments of bowel due to the tenuous blood supply, and simple overdistension of the proximal limb may cause necrosis. They are also more likely to have issues with short gut based on overall available intestinal length and malabsorption or mucosal dysfunction in the gut.

Operative mortality is quite low, typically less than 1%. In the early postoperative period, complications seen are most commonly infectious, such as pneumonia, peritonitis, and generalized sepsis. Early morbidity and mortality may also be related to comorbidities such as prematurity, congenital heart disease, and other associated problems.

Late mortality is related to complications of short gut, namely, sepsis and liver disease. Specific surgical complications include small bowel obstruction due to adhesions, anastamotic dysfunction, and anastamotic leak. Anastomotic leak has been as high as 10% to 15% in older series, with more recent reports around 5%.

Infants with isolated atresia and with normal overall intestinal length should be expected to have an excellent outcome. Certainly, all patients undergoing major surgical intervention in the neonatal period are at some risk of early complications, such as anastamotic leak and infectious and respiratory complications. The mortality rate from early complication should be less than 1% to 2%.

However, neonates with significant loss of length are more complicated. In addition to the early potential morbidity, they are also subject to long-term complications of nutritional supplementation. Sepsis, multiorgan failure, cholestasis , and eventually liver failure may ensue with long-term TPN requirements. The absolute minimum bowel length required for survival is not clear. With advances in supportive care and elemental feedings, infants with ever-shorter lengths of bowel down to 10 to 20 cm have been reported survivors. In extreme cases, gut-lengthening procedures or even transplantation may be required.

DISCUSSION

In the present series of 94 cases there was a slight male preponderance 53:41. Similar preponderance have been reported earlier [32,26,33]

ETIOLOGY:

In the present series on neonatal intestinal obstruction. The commonest cause was malrotation(20.2%) followed by equal numbers of IHPS(18%), ileal atresia(18%),and duodenal atresia(14.8%), jejunal atresia(10.6%) . This is comparable to other series as that of Sumit dave and DK Gupta who stated that with a occurrence of 1/330-3000 live births jejunoileal atresia are the commonest cause of neonatal intestinal obstruction[1]. Similar observations were noted by Evan CH in his series.

ANTENATAL ULTRASOUND DIAGNOSIS:

Out of the 94 cases only 15(15.95%) cases were diagnosed antenatally by ultrasound .This was due to non availability of ultrasound to a considerable number of cases. Moreover diagnosis by ultrasound is both observer dependant and equipment dependant.

History of polyhydromnios antenatally were noted in 4 cases of duodenal atresia,2 cases of jejunal atresias,2 cases of ileal atresias and 3 cases of malrotation.

Prenatal diagnosis provided the opportunity for appropriate counseling and for planning the delivery in a tertiary care center with a pediatric surgeon and a neonatal intensive care unit. Timely resuscitation and appropriate surgical management was optimized. The morbidity due to time delay and complications could be avoided only one neonate of duodenal atresia succumbed in this group due to associated cardiac anomalies.

SYMPTOMATOLOGY

In our series vomiting was the commonest complaint seen in about 72(76%) cases except for cases of IHPS it was bilious vomiting and it was the earliest symptom in neonates with upper GI and proximal small bowel obstructions.

The next commonest symptom was abdominal distension which was early and marked in distal small obstruction seen in 28(29.7%), followed by failure of passage of meconium in 25(26.6%).failure to pass meconium was seen more in case of distal atresias.

LOW BIRTH WEIGHT

Depending on their birth weight babies were grouped into three groups as A,B,C. Babies in group A weighed between 2.5 – 3 kgs .In group B they ranged between 2- 2.5 kgs and and less than 2 kgs in group C. The mortality in the respective weight groups were as follows. 54.5 % mortality was seen in the less than 2 kg neonates whereas only 10% mortality was seen in the 2.5 – 3kg range.

GROUP	WEIGHT RANGE(kg)	No (%)	MORTALITY
A	2.5 – 3	20(21.2%)	2(10%)
B	2- 2.5	63(67%)	14(22%)
C	< 2	11(11.7%)	6(54.5%)

Nixon and Tawes suggested the use of risk and treatment groups for critical evaluation of survival in neonatal intestinal obstruction and identified three risk groups.

- Group A > 2.5 kg , no associated significant anomaly
- Group B 1.8 – 2.5 kg or moderate to severe associated anomalies
- Group C < 1.8 kg with or without severe anomalies.

The infants in group C had worst survival data 32% whereas infants in group A and B had 81% survival rate [25]. This data is comparable to our series.

PREMATURITY

The total number of premature neonates i.e., born before 37 weeks of gestation were 21 cases. The number of neonates survived in this group was 12 neonates that is 57% .This is comparable to Fonkalsrud' s survey of 503 infants on the survival of babies with intestinal obstruction mortality was related to associated malformations and prematurity in 50 % of cases.

ASSOCIATED ANOMALIES

In our present series associated anomalies as significant cardiac and renal anomalies which were detrimental to survival were seen in 4 cases of duodenal atresia who had associated downs syndrome and renal anomalies were associated with 4 cases of malrotation . This association of congenital heart disease to duodenal atresia is comparable to the series by Sumit Dave and D.K Gupta who showed a 17-22% association [24]. There was 50% mortality in both associations comparable to Fonkalsruds series.

PEROPERATIVE FACTORS

OPERATIVE TIME AND TYPE OF PROCEDURE:

In the present series operative time was taken into consideration. Operative time was an indirect indicator of the complexity of the procedure whereas clean cases with minimal or no soiling or gangrenous bowel involved less time whereas on the other hand lengthy procedures were associated with contamination and adhesions which were major determinants of outcome. The total number of cases were divided into three groups as less than half an hour, ½ hour to 1 hour and 1 – 1 ½ hour groups.

Most of the cases of pyloric stenosis were operated within half an hour with speedy post op recovery and least hospital stay of 3 days except one in which due to mucosal injury the pylorus was closed with a onlay omental patch and turned 180 degrees and pyloromyotomy done over the posterior wall.

Out of the 94 procedures 55(58.5%) were completed in one hour period as they involved minimal handling of the bowel and minimal dissection and resection of bowel these patients had reduced length of stay and post operative wound infection rate and sepsis and had more favorable prognosis.

18(19%) neonates were operated for > 1 hour to 11/2 hours in these cases there was gross soiling and dense adhesions, gangrenous bowel which was dependant on the etiology per say and the time of referral. The length of stay of these neonates return of bowel function were considerably longer, and incidence of wound infection rates and sepsis were more in this group.

LENGTH OF STAY

In the present series the maximum average number of days of hospital stay were seen in cases of jejunal, ileal atresia and meckels diverticulum with 13 days each. Followed by malrotation and meconium ileus with an average stay of 12 days. Early recovery were seen in cases of pyloric stenosis with a length of stay of 3 days.

The increased length of hospital stay was due to delayed presentation, with soiling of abdomen and delayed recovery and associated wound complications.

REOPERATIONS AND SEPSIS

In our series 4 cases of ileal atresia needed reoperations for 3 cases developed adhesive obstruction whereas one case developed anastomotic dehiscence ,3 neonates went in for post

operative sepsis with 2 survivors . 3 cases of malrotation were operated for adhesive obstruction and adhesiolysis done. 2 neonates went in for post operative sepsis with 1 death. Adhesiolysis was also done for 2 cases of complicated meconium ileus . 1 neonate went in for post operative sepsis who eventually succumbed.

Post operative sepsis per say was seen in 4 cases of malrotation , 3 cases of Ileal atresia and 2 cases each of duodenal atresia ,jejunal atresia, meconium ileus. Increased mortality were seen in septic neonates.

Similar observations were noted by Ademuyiwa AO, Sowande OA, Ijaduola TK and Adejuyigbe O who stated that reoperation, postoperative bleeding and sepsis were associated with poor outcome [34] . The increased mortality associated with reoperation may be related to repeated exposure to anaesthesia within short intervals, their immature livers not being able to sufficiently metabolise the anaesthetic drugs.

MORTALITY

In the present study maximum neonatal deaths were seen in malrotation 5 (22%) with equal number of cases of duodenal

atresia (22%) followed by 4(18%) cases of Ileal atresia and 3 (13.6%) cases of jejunal atresia and meconium ileus each.

The contributory factors varied according to the cause and operative findings. In cases of duodenal atresia 2(40%) deaths were in the early post operative period and were related to associated cardiac anomalies. The rest of the mortality were due to prematurity and respiratory distress.

In neonates with jejuno ileal atresia , malrotation and meconium ileus mortality were mainly related to operative findings as gross soiling and dense adhesions, gangrenous bowel which was dependant on delay in referral , late presentation

The etiology per say was a important determinant as in cases of type 3 b atresia (apple peel variety) which had a bad prognosis in our series. Milissa A. McKee observed similar high mortality in cases of type 3 b . Festen S, Brevoord JC, Goldhoorn GA, et al and Waldhausen JH, Sawin RS in their recent reports contradict the previous mortality rate of 20% especially in early mortality[30,31]. These patients do, however, have the potential to volvulize segments of bowel due to the tenuous blood supply, and simple overdistension of the proximal limb causing necrosis.

CONCLUSION

1. Jejunoileal atresias are the commonest cause of neonatal intestinal obstruction.
2. Bilious Vomiting is the cardinal and thecommonest presenting symptom. The next commonest symptom is abdominal distension, followed by failure of passage of meconium seen more in case of distal atresias. Early suspecion is necessary to prevent the morbidity due to late referral.
3. Prenatal Ultrasound diagnosis provides the opportunity for appropriate counseling and for planning the delivery in a tertiary care center with a pediatric surgeon and a neonatal intensive care unit.
4. Low birth weight and prematurity are significant bad prognostic factors associated with considerable early post operative mortality.
5. Complex cardiac defects which pose a high anaesthetic risk is a negative prognostic factor.
6. Longer operative time which indicates complex procedures with adhesiolysis, gross contamination of the abdomen and

gangrenous bowel are associated with increased morbidity and mortality signifying their prognostic value.

7. Reoperations and Postoperative sepsis are associated with poorer outcome.
8. Neonates with birth weight >2.5 kgs, term babies, early referrals all add up to the early recovery with minimum length of hospital stay and are of good prognostic value.
9. Surgical interventions per say though not based on the operative findings had major prognostic value shorter surgical endeavours as pyloromyotomy and clean procedures carry good prognosis in contrary to adhesiolysis, tapering enteroplasties and diversion procedures.

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PROFORMA

S.NO.

NAME: AGE/SEX: GESTATIONAL AGE:

WEIGHT PS.NO. IP.NO.

ADDRESS DATE OF REGISTRATION:

D.O. A. D.O.S. D.O.D

ANTENATAL HISTORY

-POLYHYDROMNIOS, DIABETES, CYSTIC FIBROSIS

DAY OF PRESENTATION, EARLIEST PRESENTING SYMPTOM

ASSOCIATED CYANOSIS, RESPIRATORY DISTRESS

ASSOCIATED CONGENITAL MALFORMATIONS

PRESENCE OF DEHYDRATION /SEPSIS/ HYPOTHERMIA

INVESTIGATIONS

X –RAYS - PLAIN / CONTRAST

ULTRASONOGRAM

OPERATIVE DETAILS

- OPERATIVE FINDINGS
- OPERATIVE TIME
- PROCEDURE UNDERTAKEN

POST OPERATIVE

- WOUND COMPLICATIONS
- SEPSIS
- REOPERATIONS
- LENGTH OF STAY
- MORTALITY

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
1	B/O Vijayalakshmi	25/ M	16618	2.8	No	No	2/12/04	IHPS	PYLOROMYOT OMY	1/2	NO
2	B/O Renugadevi	10/ F	34099	2.5	NO	NO	4/2/05	MALROTAT ION	LADDS	½-1	S
3	B/O Vijaya	3/ M	34832	2.4	NO	NO	5/2/05	MECONIU M ILEUS	PAUL MICKULITZ STOMA	½-1	NO
4	Praveenkumar	28/ M	35039	2.9	NO	NO	9/2/05	IHPS	PYLOROMYOT OMY	1/2	NO
5	B/o Anmaveni	6/ M	41841	1.9	NO	NO	8/3/05	MECONIU M ILEUS	BISHOP KOOPS STOMA	1-1 1/2	WC,M
6	B/O Prema	21/ F	49190	2.7	NO	NO	17/4/05	IHPS	PYLOROMYOT OMY	1/2	NO
7	B/O Thulasimani	5/ M	52695	2.5	NO	NO	6/6/05	MALROTAT ION	LADDS	½-1	NO
8	B/O sivagami	1/ M	55590	2.3	NO	NO	22/6/05	MALROTAT ION	LADDS	1-1 1/2	RO, S,M
9	B/O Chitra	8/ M	56369	1.5	YES	NO	29/6/05	ANNULAR PANCREAS	DUODENODUO DENOSTOMY	½-1	SW,M

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
10	B/O Sindhiya	3/ F	59028	1.8	YES	No	7/7/05	ILEAL ATRESIA	ILEAL R&A	½-1	NO
11	B/O Poongodi	2/ M	60024	2.7	NO	NO	7/9/05	ANNULAR PANCRES	DUODENODUO DENOSTOMY	½-1	NO
12	B/O Ambika	26/ F	62054	2.8	NO	NO	12/9/05	IHPS	PYLOROMYOT OMY	1/2	NO
13	Gopinath	27/ M	65045	3	NO	NO	20/10/0 5	IHPS	PYLOROMYOT OMY	1/2	NO
14	B/O Shakuntala	26/ M	74321	2.9	NO	NO	17/11/0 5	IHPS	PYLOROMYOT OMY	1/2	NO
15	B/O Rani	2/ F	75358	1.7	YES	NO	24/11/0 5	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	NO
16	Golkula sundari	8/ F	12618	2.5	NO	NO	18/1/06	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	NO
17	B/O Grahalakshmi	2/ M	13818	2.4	NO	NO	5/3/06	MALROTAT ION	LADDS	½-1	NO
18	B/O Deepa	3/ M	13924	2.3	NO	NO	6/3/06	ILEAL ATRESIA	ILEAL R&A	½-1	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
19	Manikandan	20/ M	28832	2.6	No	NO	31/3/06	IHPS	PYLOROMYOT OMY	½	NO
20	B/O Selvi	28/ M	31496	2.5	NO	NO	7/5/06	ANNULAR PANCREAS	DUODENODUO DENOSTOMY	½-1	NO
21	B/O Banu	1/ F	46032	2.4	NO	NO	31/6/06	ILEAL ATRESIA	ILEAL R&A	½-1	NO
22	B/O Uma	6/ F	54289	1.6	YES	NO	18/8/06	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
23	Santhosh	27/ F	56736	2.7	NO	NO	27/8/06	IHPS	PYLOROMYOT OMY	1/2	NO
24	Madhumitha	26/ F	67681	2.9	NO	NO	15/10/0 6	IHPS	PYLOROMYOT OMY	1/2	NO
25	B/o Shakila begum	22/ M	69870	2.3	NO	NO	20/10/0 6	MALROTAT ION	LADDS	1-1 1/2	RO, S,M
26	B/O Azeen	2/ M	71028	2.5	NO	NO	22/10/0 6	ILEAL ATRESIA	ILEAL R&A	½-1	NO
27	B/O Selvi	15/ M	76618	2.2	YES	NO	12/12/0 6	MALROTAT ION	LADDS	½-1	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
28	B/O Ranjitha	25/ M	78428	2.4	No	No	20/12/0 6	MALROTAT ION	LADDS	½-1	NO
29	B/O Jeenitha	1/ F	15034	1.5	NO	D	30/1/07	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	RO,S,M
30	B/O Chandra	2/ F	16436	1.5	YES	NO	14/2/07	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	NO
31	B/O Laxmi	2/ M	16720	2.5	NO	NO	21/2/07	PYLORIC ATRESIA	POSTERIOR G.J	½-1	NO
32	B/O Kavitha	1/ M	24567	2.9	NO	NO	3/4/07	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
33	B/O Seetha	2/ F	35689	2.4	NO	R	10/4/07	MALROTAT ION	LADDS	1-1 1/2	WC
34	B/O Vijayalakshmi	4/ M	43987	2.3	NO	NO	4/6/07	MALROTAT ION	LADDS	½-1	NO
35	B/O Kousalya	9/ F	44000	2.6	NO	NO	5/6/07	MALROTAT ION	LADDS	½-1	RO,WC,M
36	B/O Renuka	1/ M	46238	1.8	YES	NO	26/8/07	ILEAL ATRESIA	ILEAL R&A	½-1	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
37	B/O Kanniyammal	16/ F	56678	2.5	No	No	10/9/07	PYLORIC ATRESIA	POSTERIOR GJ	½-1	NO
38	Nithinkumar	22/ M	66187	2.7	NO	NO	12/9/07	IHPS	PYLOROMYOT OMY	1/2	NO
39	B/O Sharadha	7/ F	67821	2.4	NO	NO	21/9/07	MECKELS DIVERTICU LUM	R&A	½-1	NO
40	B/O Devikruthika	2/ M	77890	2.3	NO	NO	14/10/0 7	ILEAL ATRESIA	ILEAL R&A	½-1	WC
41	B/O Priya	2/ M	79854	2.6	NO	NO	28/10/0 7	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	RO,S,M
42	B/O Vijaya	1/ F	85932	2.4	NO	D	19/11/0 7	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	S,M
43	B/O Dhanalakshmi	1/ M	85934	2.2	NO	NO	19/11/0 7	MALROTAT ION	LADDS	1-1 1/2	WC ,M
44	Sumathy	1/ F	90348	2.5	NO	NO	10/12/0 7	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
45	Abhilash	6/ M	91457	2.4	NO	NO	14/12/0 7	JEJUNAL ATRESIA	JEJUNAL R&A	1-1 1/2	WC,S,M

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
46	B/O Ruby Juliet	4/ F	14530	2.3	YES	No	8/1/08	MECONIU M ILEUS	BISHOP KOOPS STOMA	1-1 1/2	NO
47	B/O Dhanalakshmi	5/ M	15987	2.5	YES	NO	23/2/08	ILEAL ATRESIA	ILEAL R&A	½-1	WC
48	B/O Thilaga	10/ F	26618	2.4	NO	NO	22/3/08	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
49	B/O kala	7/ F	27818	2.4	NO	NO	25/3/08	ANNULAR PANCREAS	DUODENODUO DENOSTOMY	1-1 1/2	NO
50	B/O Angaleeshwari	3/ M	32190	2.3	NO	NO	10/4/08	MECONIU M ILEUS	SANTULI BLANC STOMA	½-1	WC
51	B/O Kavitha	1/ M	33458	2.5	YES	NO	14/4/08	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	NO
52	B/O kavitha	28/ F	44896	2.7	NO	NO	30/5/08	IHPS	PYLOROMYOT OMY	1/2	NO
53	B/O Senbagavalli	9/ M	51000	2.5	NO	R	3/6/08	MALROTAT ION	LADDS	½-1	WC
54	B/O Selvanayagi	5/ F	52765	2.4	YES	NO	7/6/08	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	M

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
55	B/O Umamaheshwari	28/ M	53618	2.5	No	No	10/6/08	IHPS	PYLOROMYOT OMY	1/2	NO
56	B/O Sellvi	5/ F	54789	1.6	NO	NO	16/6/08	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	NO
57	B/O Sudha	8/ M	55008	2.4	NO	NO	18/6/08	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
58	B/O Sathya	28/ F	56091	2.7	YES	NO	26/6/08	IHPS	PYLOROMYOT OMY	1/2	NO
59	B/O Gokula	25/ F	57004	2.8	NO	NO	30/6/08	IHPS	PYLOROMYOT OMY	½-1	NO
60	Mohanasundaram	26/ M	67000	2.5	NO	NO	4/8/08	IHPS	PYLOROMYOT OMY	1/2	NO
61	Jayachandran	10/ M	68900	2.3	YES	NO	10/8/08	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	M
62	B/O Saradhamani	3/ F	69134	2.4	NO	NO	12/8/08	MALROTAT ION	LADDS	½-1	NO
63	B/O Muthulakshmi	25/ F	70158	2.5	NO	NO	9/10/08	IHPS	PYLOROMYOT OMY	1/2	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
64	B/O Vennila	2/ M	85618	2.4	No	No	18/11/0 8	ILEAL ATRESIA	ILEAL R&A	½-1	NO
65	B/O Kavitha	1/ M	96186	2.5	NO	NO	14/12/0 8	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	RO,S,M
66	B/O Bhuvaneeshvari	7/ F	12568	2.3	YES	NO	22/1/09	MALROTAT ION	LADDS	½-1	S,M
67	B/O Bathurinissa	2/ F	23987	2.5	NO	NO	2/2/09	ILEAL ATRESIA	ILEAL R&A	½-1	WC
68	B/O Indurani	8/ M	28976	2.4	NO	NO	23/3/09	MALROTAT ION	LADDS	½-1	NO
69	B/O Sugandhi	9/ F	30561	2.3	NO	NO	28/4/09	MALROTAT ION	LADDS	½-1	NO
70	B/O Rathna	2/ M	32678	1.8	NO	NO	30/4/09	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	RO,S,M
71	B/O Radhika	1/ F	41087	2.5	YES	NO	31/5/09	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
72	B/O Lakshmi	8/ M	46078	2.4	NO	D	14/6/09	Duodenal ATRESIA	DUODENODUO DENOSTOMY	½-1	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
73	B/O Vijaya	25/ M	46618	2.9	No	No	2/7/09	IHPS	PYLOROMYOT OMY	½	NO
74	B/O Deepa	15/ M	49876	1.7	NO	NO	15/7/09	JEJUNAL ATRESIA	JEJUNAL R&A	1-1 1/2	S,M
75	B/O jyothi	23/ M	51430	2.5	NO	R	26/7/09	MALROTAT ION	LADDS	½-1	NO
76	B/O Bindu	14/ F	66780	2.3	YES	NO	4/8/09	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	RO,M
77	B/O Nithya	2/ F	67000	2.5	NO	NO	6/8/09	MECONIU M ILEUS	BISHOP KOOPS	½-1	NO
78	B/O Ramya	5/ M	73690	2.4	YES	NO	20/8/09	Duodenal Atresia	DUODENODUO DENOSTOMY	½-1	M
79	B/O Priya	20/ F	75480	2.2	NO	NO	1/9/09	MECKELS DIVERTICU LUM	R&A	½-1	NO
80	B/O Kanchana	3/ M	76595	2.3	YES	NO	4/9/09	MECONIU M ILEUS	BISHOP KOOPS	1-1 1/2	RO,S,M
81	B/O Thulasi	10/ M	87653	2.5	NO	NO	17/9/09	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	NO

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATIO N
82	B/O Pavithra	3/ F	89901	2.5	No	D	2/10/09	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	½-1	NO
83	B/O hema	11/ F	90006	2.3	NO	NO	3/10/09	MALROTAT ION	LADDS	½-1	NO
84	B/O Latha	2/ M	93078	1.5	NO	NO	20/10/0 9	MECONIU M ILEUS	SANTULI BLANC STOMA	1-1 1/2	RO,S,M
85	B/O Rathna	25/ M	93406	2.4	NO	NO	3/11/09	MECKELS DIVERTICU LUM	R & A	1-1 1/2	NO
86	B/O Prabha	5/ F	94055	2.5	NO	NO	3/11/09	DUODENA L ATRESIA	DUODENODUO DENOSTOMY	1-1 1/2	NO
87	B/O Poongodi	5/ M	95073	2.5	NO	NO	15/11/0 9	JEJUNAL ATRESIA	JEJUNAL R&A	½-1	NO
88	B/O Parvathi	20/ F	96841	2.3	NO	NO	20/11/0 9	MECKELS DIVERTICU LUM	R &A	1-1 1/2	RO,WC,S,M
89	B/O Nazreen	4/ M	97812	2.3	NO	NO	30/11/0 9	ILEAL ATRESIA	ILEAL R&A	½-1	NO
90	B/O Rama	6/ M	98875	1.8	NO	NO	2/12/09	JEJUNAL ATRESIA	JEJUNAL R&A	1-1 1/2	RO,WC,M

S NO	NAME	AGE/ SEX	IP.NO	WT	PM	A.A	DOS	DIAGNOSIS	PROCEDURE	T Hrs	COMPLICATION
91	B/O Kanaga	8/ M	98960	2.4	No	No	12/12/09	DUODENAL ATRESIA	DUODENODUODENOSTOMY	½-1	NO
92	B/O Chitra	20/ F	98973	2.5	YES	R	14/12/09	MALROTATION	LADDS	½-1	WC,S,M
93	B/O Chandra	10/ M	99107	2.3	NO	NO	23/12/09	DUODENAL ATRESIA	DUODENODUODENOSTOMY	½-1	NO
94	B/O Seetha	14/ F	99508	2.2	YES	NO	25/12/09	ILEAL ATRESIA	ILEAL R&A	1-1 1/2	NO

KEYS TO MASTER CHART

Age in days

WT-Weight in kgs

R – Renal anomaly.

D – Downs syndrome.

R&A – Resection and anastomosis.

PM – Prematurity

T – opertive time in hours

RO – Reoperation

WC – wound complication

S - sepsis

M - mortality