



**Research Article**

**ASSESSMENT OF CLINICAL PRESENTATION OF MECKELS DIVERTICULUM IN A TERTIARY CARE HOSPITAL**

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**ABSTRACT**

**Background:** Meckels diverticulum is the most common congenital malformation of the gastrointestinal tract and occurs secondary to persistence of congenital vitellointestinal duct. The present study was conducted to assess the clinical presentation of Meckel's diverticulum among pediatric and adult cases in a tertiary healthcare institute.

**Materials and methods:** It was an observational study conducted among 54 cases of Meckels diverticulum were reviewed retrospectively, under department of general surgery in KIMS, Karad.

**Results:** 54 pediatric patients and 21 adult patients became symptomatic because of complication of MD. The complications of symptomatic MD (n = 75) included intestinal hemorrhage (n = 21), inflammation (n = 29), and intestinal obstruction (n = 25). The causes of intestinal obstruction were adhesion ileus (n = 8), bowel torsion (n = 6), and intussusceptions (n = 12).

**Conclusions:** Intestinal hemorrhage occurred more frequently in the pediatric population and in cases of MD that contained ectopic gastric mucosa.

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**INTRODUCTION**

Meckel's diverticulum (MD) was first reported by Meckel in 1809, by describing its embryological origin as remnant of omphalomesenteric duct. Although Fabricus Hildanus pictured ileal diverticulum much earlier in 1650 but he fails to describe its embryological origin. It was named after Meckel, who was first to publish the detailed description.<sup>[1]</sup> Meckel's diverticulum is the most common congenital malformation of the gastrointestinal tract and occurs secondary to persistence of congenital vitellointestinal duct.<sup>[2]</sup>

During fetal period yolk sac and primitive gut are connected by the omphalomesenteric duct. Embryologically failure of closure of vitelline duct at 5th week of fetal growth gives rise to various malformations such as omphalomesenteric fistula, enterocyst, umbilical sinus, fibrous cord and MD. Of these, MD is the most common anomaly in which proximal part of omphalomesenteric remains patent with equal incidence in male and female.<sup>[3][4]</sup>

This may lead to complications like perforation, obstruction, intussusception. If diagnosed early and properly treated it is curable in children. Anatomically it contains all layers of small intestine arises from anti-mesenteric border of ileum, it receives blood supply from vitelline artery.<sup>[5]</sup> Meckel's diverticulum occurs in about 2% of population, it is about 2 inch in length,

located 2 feet from ileocaecal junction, presents before 2 years of age. The present study was conducted to assess the clinical presentation of Meckel's diverticulum among pediatric and adult cases in a tertiary healthcare institute.

**MATERIALS AND METHODS**

It was an observational study conducted among 54 pediatric and 21 adult cases of Meckel's diverticulum were reviewed retrospectively, under department of general surgery in KIMS, Karad. Demographic data (Age, gender) of the study subjects was noted. Past medical history, clinical presentations was also noted with the help of pre-validated, semi-structured case record proforma after institutional ethical committee clearance.

**Clinical Parameters:** Clinical examination findings, method of definitive diagnosis (clinical or non clinical) i.e radiologically or at laproscopic/laprotomy, pathological findings, operative details and complications were also recorded. The diagnosis of Meckel's diverticulum is made according to surgical and pathologic findings.

**Statistical Analysis:** The clinical features and pathologic findings of MD were analysed according to different age groups and gender. The logistic regression and adjusted odds were used for statistical analysis. For logistic regression models all adjusted odds ratios are significant if 95% confidence interval do not include 1.00

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## RESULTS

### Demographic Data

According to age at presentation these patients were divided into two groups: pediatric group (<18 yr) and adult group (>18 yr). Out of total 126 patients, 90 were males and 36 were females. including 82 pediatric patients and 44 adult patients. 75 patients were symptomatic (56 males and 19 females). 51 MD were found incidentally during surgery for other diseases, including appendicitis, hernia, meconium peritonitis, intestinal perforation, malrotation with midgut volvulus, trauma, congenital gastrointestinal tract anomalies and cancer. Among the asymptomatic patients, 34 were males and 17 were females.

### Clinical Manifestations of Symptomatic Patients

54 pediatric patients and 21 adult patients became symptomatic because of complication of MD. The complications of symptomatic MD (n = 75) included intestinal hemorrhage (n = 22), inflammation (n = 29), and intestinal obstruction (n = 26). The causes of intestinal obstruction were adhesion ileus (n = 8), bowel torsion (n = 6), and intussusceptions (n = 12). Among the patients with intestinal hemorrhage, two males did not receive a surgical intervention initially. One patient had rectal bleeding when he was 11 years old and received surgery because of an intussusception 3 years later. The other one presented with an intestinal hemorrhage when the patient was 3 years old and then had diverticulitis two years later. The youngest symptomatic patient was diagnosed because of an intestinal hemorrhage when he was 17 days old, and the oldest patient had diverticulitis when he was 76 years old.

### Comparison of Clinical Manifestations According to age group

Among 75 symptomatic MD, the patient numbers of different clinical manifestations were recorded and compared according to different age groups. In the pediatric group, intestinal hemorrhage (39%) and intestinal obstruction (37%) are more common than inflammation (28%). But in the adult group, two thirds of MD presented as inflammation. Besides, intestinal hemorrhage is rare in the adult group and only one MD was found due to rectal bleeding. When comparing between different age groups, intestinal hemorrhage occurred more common in the pediatric group than in the adult group. Conversely, the adult patients had higher chance to have inflammation of MD than the pediatric patients did. The prevalence of intestinal obstruction was not statistically significant between the adult group and pediatric group.

### Comparison of Clinical Manifestations According to gender

Among 75 symptomatic MD, the patient numbers of different clinical manifestations were also recorded and compared according to gender. Among male patients, the most common complication was inflammation of MD (46%), which was followed by intestinal hemorrhage (37.03%) and intestinal obstruction (27.77%) (Table 1). Of female patients, intestinal obstruction (58%) was the main clinical manifestation, and 26% had intestinal hemorrhage and 16% had inflammation. When comparing between different genders, inflammation of MD occurred more common in males than in females, and females were at higher risk to have intestinal obstruction than males were. But gender did not affect the prevalence of intestinal hemorrhage.

### Pathology Findings

Pathologically, among total 126 cases of MD, 35 contained ectopic tissues, including gastric mucosa (n = 24), ectopic pancreas (n = 5), or both (n = 6). One patient with a gastric mucosa containing MD initially presented with an intestinal hemorrhage and subsequently had complication with diverticulitis later. One young male had rectal bleeding when he was 11 years old and received surgery because of an intussusception 3 years later, but no ectopic gastric mucosa was found pathologically in his MD. Among 30 gastric mucosa containing MD, 25 (83.33%) were found in the pediatric group and 5 (16.66%) were found in the adult group (n = 0.017). The prevalence of gastric mucosa containing MD is similar between males and females (30% and 33% resp.). Besides, 26 of 30 (86.66%) gastric mucosa containing MD were symptomatic, and 59 of 96 (61.45%) MD that did not contain gastric mucosa were found when becoming symptomatic. Gastric mucosa containing MD had higher chance to become symptomatic than those without gastric mucosa, and this was statistically significant (OR 6.24; 95%CI 2.02–19.23; n = 0.001). Among 4 asymptomatic gastric mucosa containing MD, only one was not found until the patient was an adult when surgery was performed for other diseases.

Among 75 symptomatic MD, clinical manifestations were summarized according to pathologic findings. Gastric mucosa containing MD had higher chance to bleed than those without gastric mucosa, and it was statistically significant. Conversely, MD that did not contain gastric mucosa tended to be complicated with inflammation and intestinal obstruction. Out of 5 MD that contained an ectopic pancreas without gastric mucosa, 2 had intestinal hemorrhage, one was complicated with intestinal obstruction, and 2 were asymptomatic.

The clinical manifestations were categorized into intestinal hemorrhage, inflammation, and intestinal obstruction. Intestinal hemorrhage was diagnosed when patients had gross or microscopic rectal bleeding. The diagnosis of inflammation was made by clinical manifestations with local abdominal pain or signs of peritonitis and surgical findings, including gross erythematous change, pus formation, or perforation, and pathologic findings. Intestinal obstruction was defined when MD was presented with abdominal pain with bilious vomiting, and intussusception, adhesion ileus, hernia, torsion, or other mechanical intestinal obstructions were found during surgery.

**Table 1** Clinical manifestations by age, among symptomatic patients with Meckels diverticulum

Clinical presentation	Paediatric group n = 54 (%)	Adult group n = 21 (%)	Odds ratio (95% CI)	P value
Intestinal hemorrhage	20 (37.03%)	1 (4.76%)	12.72 (1.59-102.3)	0.017
Inflammation	15 (27.77%)	14 (66.66%)	0.19 (0.07-0.57)	0.003
Intestinal obstruction	19 (35.18%)	6 (28.57%)	1.47 (0.49-4.4)	0.49

**Table 2** Clinical manifestations by pathology, among symptomatic patients with Meckels diverticulum

Clinical presentation	Gastric mucosa + n = 26 (%)	Gastric mucosa - n = 49 (%)	Odds ratio (95% CI)	P value
Intestinal hemorrhage	14 (53.84%)	8 (16.32%)	5.98 (2.03-17.62)	0.001

Inflammation	7(26.92%)	22(44.89%)	0.42(0.16-1.27)	0.132
Intestinal obstruction	6(23.07%)	20(40.81%)	0.44(0.15-1.28)	0.129

## DISCUSSION

Meckels diverticulum is the most common anatomic variant of alimentary tract. The diverticulum is on the antimesenteric side of ileum and the arterial blood supply and venous drainage are through remnants of embryologic omphalomesenteric vessels. The estimated prevalence is 2-4% but there is no difference in prevalence between male and female. The total life time risk of complications is around 4% the incidence of symptoms are more in children than adults and risk of complications are nearly zero in old age.<sup>[6]</sup> The youngest patient who was diagnosed symptomatically was 17 days old and the oldest one was 76 years old. Among the complications intestinal hemorrhage and obstruction were the most common clinical complications and inflammation was the most common clinical presentation. The clinical presentation were analysed according to different age groups and genders.

### Intestinal Hemorrhage

MD is lined by ileal mucosa, it may contain ectopic tissue including ectopic gastric, duodenal, colonic, pancreatic, endometrial mucosa, brunners glands, and hepatobiliary tissue. The incidence of ectopic gastric tissue is approximately ranges from 20-80%, intestinal hemorrhage occurs due to ileal mucosa ulceration adjacent to acid producing ectopic gastric mucosa. In children incidence is 27-56%, where as in adults it is 8-38%. When gastric mucosa containing MD became symptomatic, it tended to present as intestinal hemorrhage rather than inflammation or intestinal obstruction.<sup>[7]</sup> Conversely, when MD did not contain gastric mucosa, it tended to be complicated with inflammation and intestinal obstruction but not intestinal hemorrhage. Besides, gastric mucosa-containing MD were found more frequently in the pediatric group than in the adult group. It seems that gastric mucosa-containing MD tended to bleed easily. Therefore, it became symptomatic and complicated with intestinal hemorrhage when the patient is young. In pediatric population, lower gastrointestinal hemorrhage can be caused by numerous diseases such as necrotizing enterocolitis, malrotation with volvulus, anal fissure, intussusceptions, infectious colitis, and Meckel's diverticulum. Proper history taking and physical examination help differentiate the possible diagnoses. When infants or children had rectal bleeding without other symptoms such as fever, diarrhea, or abdominal pain, MD should be considered and further studies that detect ectopic gastric mucosa are indicated.

### Inflammation

MD can become symptomatic when inflamed, which results in diverticulitis, perforation, and even peritonitis. Inflamed MD and appendicitis share similar clinical symptoms and signs, including fever, nausea, vomiting, tenderness to palpation, and rebound pain. The mechanism of inflammation of MD was also thought to be similar to appendicitis, which is caused by obstruction of the lumen leading to inflammation and even perforation and peritonitis.<sup>[8]</sup>

In this study, the odds of inflammation of MD in males were 4.6 times than in females. Similar to appendicitis,

inflammation of MD has a male predominance. Inflammation of MD also occurred more frequently in adults than in children. The odds of inflammation of MD in adult were 5.2 times more than the pediatric population. Inflammation of MD was the main clinical presentation in adults. Because of the similar location within the abdomen, clinical manifestation, the male tendency, and age of onset (mainly in the teenagers and adults), inflammation of MD was undistinguishable from acute appendicitis clinically. Pre-operative diagnoses of 16 patients in this study were appendicitis. If the pre-operation diagnosis is appendicitis, but the appendix was found to be normal when surgery took place, exploration for MD should be performed

### Intestinal Obstruction

MD can cause intestinal obstruction, which presents with abdominal pain, nausea, vomiting, and distension. Intestinal obstruction can be secondary to:

1. Volvulus around the vitellolumbical cord,
2. Intussusception,
3. Inflammation with adhesion,
4. Band between MD and mesenterium, and
5. Internal hernia or Littre hernia.

The incidence differs according to different studies and articles. Obstruction is the most common presenting symptom in the adult population, occurring in almost 40% of patients. But thought that intestinal obstruction occurred mainly in patients under the age of 10. In this study, among symptomatic patients, 37% of children and 28% of adults presented with intestinal obstruction. The difference with regard to incidence was not statistically significant.<sup>[9][10]</sup>

In this study, females had a higher incidence of intestinal obstruction than males (58% versus 27%;  $P = 0.017$ ). Even though the reason is unclear, the gender trend maybe important to female patients. Unlike males, females can be pregnant. And intestinal obstruction is a rare complication of pregnancy with significant maternal and fetal mortality. The presence of MD as the cause of obstruction during pregnancy is extremely rare. It requires the extirpation of the diverticulum and bowel resection in 23% of cases and fetal mortality rate may be around 20%. A high index of suspicion is required so that timely surgical intervention can be performed to minimize the risks to the mother and fetus.<sup>[11]</sup>

## CONCLUSIONS

The clinical presentations of MD differed by age and gender. Intestinal hemorrhage occurred more frequently in the pediatric population and in cases of MD that contained ectopic gastric mucosa. When a pediatric patient presents with rectal bleeding without other symptoms or signs of infection or bowel obstruction, further studies that detect ectopic gastric mucosa of MD should be considered. Conversely, inflammation of MD was found more often in males and adults. Inflammation of MD and acute appendicitis had similar clinical presentations, and they were undistinguishable clinically. Intestinal obstructions occurred more frequently in females than in males. Early diagnosis of complicated MD in pregnant women is very important because it can cause maternal and fetal mortality.

**Conflict of Interest:** None to declare

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