

## Plain abdominal radiograph appearance in children with abdominal pain

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### ABSTRACT

**Background** Abdominal pain is a common condition in children. Plain abdominal radiograph is recommended routinely in the evaluation of children with abdominal pain.

**Methods** A retrospective study was done to evaluate radiographic abnormalities in children with abdominal pain at the Department of Child Health Cipto Mangunkusumo Hospital from January 1, 1994 to December 31, 1998.

**Results** Of the 76 patients with abdominal pain, there were 38 females and 38 males. Forty-five patients were in the >5-12 years age group. Thirty-five out of 76 patients showed radiographic abnormalities. The most common radiographic abnormality was stones (found in 13 patients), followed by uneven distribution of bowel air in 8 patients.

**Conclusion** A plain abdominal radiograph is still required as a diagnostic tool for children with abdominal pain, especially in the acute stage [Paediatr Indones 2002;42:212-216].

**Keywords:** plain abdominal radiograph, abdominal pain, children

Abdominal pain is a common cause for children and adolescents to visit a medical service.<sup>1,2</sup> Organic or psychogenic disorders may cause abdominal pain. Abdominal pain in some patients is caused by organic diseases, presents with acute abdomen and requires immediate surgery, while some others suffer from chronic or recurrent abdominal pain.<sup>3</sup>

Despite the variety of imaging modalities that are increasingly available, such as ultrasound, CT scan, magnetic resonance imaging (MRI), a plain abdominal radiograph is still useful in the diagnosis of abdominal pain.<sup>4</sup> Moreover, a plain abdomi-

nal radiograph is inexpensive and non-invasive.<sup>5</sup> Many disorders that may cause abdominal pain in children can be detected by a plain abdominal radiograph, such as appendicitis, renal/ureteral stones, gallstones, peritonitis, bowel obstruction, paralytic ileus, intussusception, constipation, urine retention, and ascaris bolus.<sup>6</sup>

The objective of this study is to describe the clinical manifestations and etiology of abdominal pain in children, and the abnormalities seen in radiographic examination.

### Methods

The study was a retrospective one using data from medical records of all children with symptoms of abdominal pain admitted to the Department of Child Health, Cipto Mangunkusumo Hospital, from January 1, 1994 to December 31, 1998. All patients with abdominal pain between 3-18 years of age and had a plain abdominal radiograph taken were included in this study. We excluded patients with incomplete data.

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Data of medical records were collected to identify age, gender, history and physical examination, clinical symptoms, initial diagnosis, result of the radiographic interpretation, and the final diagnosis. No attempt was made to re-evaluate the results of radiographs.

In some patients, the final diagnosis was made based on further procedural intervention, including surgery, endoscopy, intra-venous pyelography (IVP), barium meal /enema, or ultrasonography.

## Results

### Patients' characteristics

During the period from January 1, 1994 to December 31, 1998, 396 patients with abdominal pain were admitted to the Department of Child Health Cipto Mangunkusumo Hospital. Plain abdominal radiographs were performed in only 160 patients, and only 76 patients (38 males and 38 females) fulfilled the inclusion criteria (Table 1).

**TABLE 1.** DISTRIBUTION OF PATIENTS BY AGE AND GENDER

Age (yr)	Gender		Total
	Male	Female	
3 –	15	12	27
5 –	22	23	45
12 – 18	1	3	4
Total	38	38	76

Thirty-five out of 76 plain abdominal radiographs were abnormal. The most common abnormal radiographic appearance was calculus in 13 patients, uneven distribution of bowel air in 8 patients and air fluid level in 6 patients (Table 2).

### Clinical manifestations

Table 3 shows the most common clinical manifestations of abdominal pain.

### The etiology of the abdominal pain

Table 2 shows that the most common etiology of abdominal pain was urinary tract stone in 15 patients, chronic appendicitis in 13 patients, urinary tract infection in 10 patients, while in 7 patients the etiology was unknown.

**TABLE 3.** DISTRIBUTION OF CLINICAL MANIFESTATIONS ACCOMPANYING ABDOMINAL PAIN

Clinical manifestations *	Total
Fever	25
Vomiting	15
Hematuria	15
Distention	9
Pallor	5
Decreased body weight	5
Diarrhea	5
Constipation	3
Urine retention	2
Hematochezia	1

\*Each patient may have more than one clinical manifestation

**TABLE 2.** THE PLAIN ABDOMINAL RADIOGRAPHS ACCORDING TO FINAL DIAGNOSIS

Final diagnosis	Radiographic abnormality	Normal	Total
Urinary tract stone	13	2	15
Peritonitis	6	-	6
Paralytic ileus	4	-	4
Chronic constipation	3	-	3
Ascaris bolus	3	-	3
Bowel obstruction	2	-	2
Urine retention	2	-	2
Gallstone	1	-	1
Chronic appendicitis	1	12	13
Urinary tract infection	-	10	10
Enterocolitis (infection)	-	3	3
Esophagitis	-	1	1
Gastroduodenitis	-	1	1
Ulcerative colitis	-	1	1
Psychogenic	-	4	4
Unknown etiology	-	7	7
Total	35	41	76

## Discussion

There were some limitations in the present study. Medical records as the source data were sometimes incomplete. This study included 76 patients with abdominal pain, where girls were as many as boys (sex ratio 1:1). Scholer *et al*,<sup>7</sup> reported that acute abdominal pain was found more in girls than in boys with a ratio of 1,2:1. Apley<sup>8</sup> reported that recurrent abdominal pain was found more frequently in females than males. Our figure somewhat differed from the above studies. Actually, the number of girls who visited the hospital with a complaint of abdominal pain were more than boys, but most of the girls did not fulfill the inclusion criteria, so that we had equal boys and girls.

The age distribution in our study showed that 59% of the patients were in the five to twelve years age group (**Table 1**). This was less than the result of the study of Scholer, Sticler *et al* who found 72–76.4% of their patients were in this age group.<sup>7,9</sup> This difference might be related to the sample size.

### Radiographic features

There were 35 out of 76 patients (46%) with plain abdominal radiograph abnormalities (**Table 2**). This result is higher than that of Rothrock (13%),<sup>10</sup> Mirvis (20%)<sup>11</sup> and Eisenberg (10%).<sup>12</sup> The difference might be associated with the difference of age and type of abdominal pain.

In our series 13 out of 15 patients who had abnormal radiograph features were diagnosed as urinary tract stones. In 2 patients, plain abdominal radiograph did not show any abnormalities. This could be due to the less opacity of the stone. Diagnosis of stone was made by IVP investigation. Eisenberg *et al*<sup>12</sup> reported 36% out of 128 patients showed abnormal radiograph appearances. In patients with urinary tract stones, the plain abdominal radiograph has 85% diagnostic accuracy.<sup>12</sup>

Plain abdominal radiographs in gallstones have a low diagnostic value, with only 15% accuracy.<sup>12</sup> In our study we have one patient with gallstones, that was diagnosed by plain abdominal radiograph. Eisenberg *et al*,<sup>12</sup> reported 1 out of 46 patients which was suspected as gallstone showed plain abdominal feature abnormality, but without

any further explanation. According to McIntosh *et al*<sup>13</sup> ultrasound examination is more sensitive than plain abdominal radiographs in detecting a gallstone.

Appendicitis was one of the causes of abdominal pain. The most common abnormal radiographic finding in appendicitis is appendicolith and sentinel loops (mild dilatation and air fluid level appearance in the ileum and caecum).<sup>6</sup> In 13 patients with clinical diagnosis of chronic appendicitis, only one showed radiological abnormalities as appendicolith. Camp-bell and Gum<sup>14</sup> reported 808 patients of acute appendicitis and only 155 (19%) of patients showed radiograph abnormalities. Radiographic diagnosis is difficult if appendicolith appearance is absent, but ultrasound examination can assist the diagnosis of appendicitis.<sup>15</sup>

In tropical countries abdominal pain was commonly caused by ascaris bolus in the bowel, mimicking abdominal mass tumor, causing obstruction.<sup>16</sup> In this study, there were 3 patients with clinical diagnosis as intra-abdominal tumor, but on laparotomy, ascaris bolus was found.

In this series all patients with peritonitis could be diagnosed well (**Table 2**). Rothrock *et al*<sup>10</sup> reported two patients with peritonitis, but only one patient showed abnormal radiographic appearance.

Two patients diagnosed as bowel obstruction revealed abnormal radiographic appearances. Roth-rock *et al*<sup>10</sup> reported six patients, diagnosed as bowel obstruction, all showed abnormal radiographic appearances. Therefore, a plain abdominal X-ray on bowel obstruction has a great diagnostic value with the precision of 100%.<sup>4</sup>

A normal plain abdominal radiograph was found in 41 patients. Normal radiographic appearance was found in children with urinary tract infection, enterocolitis, ulcerative colitis, esophagitis, gastroduodenitis, psychogenic abdominal dysfunction and abdominal pain of unknown origin. Eisenberg *et al*<sup>12</sup> suggest that a plain abdominal radiograph has no diagnostic value in gastritis, peptic ulcer, gastroenteritis and abdominal pain of unknown origin. Finally to assist the diagnosis of gastritis and esophagitis, an endoscopic investigation should be done, whereas colonoscopy is indicated for colitis.

## Clinical manifestations

We found that the most common manifestations following abdominal pain was fever, vomiting and hematuria. This is in accordance with the study of Scholer *et al*, who reported the most common clinical manifestation following acute abdominal pain was fever 64%, vomiting 42.4% and decreased body weight in 36.5% of patients. On the contrary, Sticler and Murphy reported that the most common manifestation was nausea in 44.7%, followed by vomiting in 34.8% and diarrhea in 21.1%. The results of our study are different from Sticler and Murphy's study. This was because the background of the disease in Sticler study was functional disorder, whereas in our study, it was organic disorders. According to Boyle, the most common manifestations found in functional disorders are headache, nausea, pallor and fatigue.<sup>17</sup>

## Etiology of abdominal pain

The most common etiology of the abdominal pain in our series was urinary tract stone in 15 patients, chronic appendicitis in 13 patients, and urinary tract infection in 10 patients (Table 2). These were different from those of Rothrock *et al* who reported that the most common cause of acute abdominal pain was foreign body, acute appendicitis and bowel obstruction (24.6%, 24.6% and 9.8%, respectively). The difference could be caused by different sampling. Rothrock's study consisted only of patients with acute abdominal pain, whereas in this study we also included chronic abdominal pain.

We concluded that radio opaque stones and uneven distribution of bowel air are the most common abnormalities found in abdominal plain radiographs in children with abdominal pain. Abnormal plain radiographs of the abdomen were found in 35 out of 76 patients. Male to female ratio was one, and the highest prevalence was in the >5-12 years age group. Fever, vomiting, and hematuria were the most common clinical symptoms in abdominal pain. Urinary stones, chronic appendicitis and urinary tract infection are the most common causes of abdominal pain. Based on the results of this study, we suggest that a plain ab-

dominal radiograph should be done in children with acute abdominal pain.

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