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Clinical follow-up of pediatric patients with abdominal pain and intraperitoneal fluid detected by ultrasound.

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Pediatrics

Abstract

Introduction: This study aimed to determine the relationship between free intraperitoneal fluid and clinical-surgical evolution in children with abdominal pain treated in the emergency room of the Alcivar Hospital from January 2022 to July 2023.

Methods: Descriptive, retrospective study. Age, sex, presence, amount, and location of free intraperitoneal fluid and its relationship with clinical and surgical resolution were evaluated using Pearson's correlation coefficient and the Chi-square test.

Results: An inverse correlation was found between free fluid and the surgical resolution of abdominal pain (Pearson's correlation coefficient of -0.18, $P = 0.0000018$). The age group between 11 and 15 years was the group that underwent surgery the least, with a Pearson's correlation coefficient of -0.186, p 0.03. There was no statistically significant relationship between sex, quantity, or location of free fluid in the peritoneal cavity and the need for surgery.

Conclusions: The patients who least needed surgery did not present free fluid in the abdominal cavity during the ultrasound examination, and children between 11 and 15 years old.

Keywords:

MeSH: Ascitic Fluid; Ultrasonics; Peritoneal Lavage; Abdominal Pain; Abdomen, Acute; Child.

Abbreviations

Not declared.

Supplementary information

No supplementary materials are declared.

Acknowledgments

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Authors' contributions

Carlos Jacinto Valle Ochoa: Conceptualization, data curation, formal analysis, acquisition of funds, research, writing - original draft.
Yoel Enrique Pinto Mejía: Conceptualization, Data curation, Formal analysis, Methodology, Resources, Supervision, Validation, Visualization, Drafting - revision and edition.
Paola González: Acquisition of funds, Research, writing - original draft.
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Availability of data and materials

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Introduction

Intraperitoneal fluid found by ultrasound in a child with nontraumatic abdominal pain may be related to an acute inflammatory process [1]. In most cases, it is difficult to differentiate whether the cause is physiological or pathological [2]. It is usually found in a small amount of children with abdominal pain and is considered normal [3]. The reported incidence ranges from 2% to 22% in asymptomatic children [3]. The routine use of high-frequency linear transducers could justify increasing their frequency [4]. It is found mainly in the pelvis, behind the bladder, and to a lesser extent in the Morrison sac and the interase space [4].

A study carried out on children who came to the emergency room due to trauma, without abdominal pain, found that it is expected to observe less than 1 cc of free fluid in the pelvic cavity. There were no differences regarding gender; however, there was a higher prevalence in the prepubertal stage [2]. In 1989, a study showed that it was customary to find free fluid in 1.5 to 2% of the pediatric population of the emergency, without a sex difference.

Although moderate intraperitoneal fluid is usually physiological, a large amount of free fluid should never be considered normal [5]. An evaluation of 250 children with acute abdominal pain found that 29% of symptomatic children had free intraperitoneal fluid, compared with 6% of the asymptomatic control group. The presence of free intraperitoneal fluid was an uncertain finding. Ultrasound diagnosed 74% of the cases [6].

Although the ultrasound finding of free intraperitoneal fluid is essential when defining the differential diagnosis, the studies carried out thus far do not apply to Latin Americans [1]. This study aimed to determine the incidence, quantity, and location of free intraperitoneal fluid and its correlation with the clinical and surgical evolution of pediatric patients with abdominal pain.

Materials and methods

Study design

The present study is cross-sectional. The source is retrospective.

Stage

The study was conducted in the Alcívar Hospital emergency service in Guayaquil, Ecuador. The study period was from January 1, 2022, to July 31, 2023.

Participants

Pediatric patients from 0 to 15 years of age with nontraumatic abdominal or acute abdominal pain were included. Patients with a history of bleeding disorders, acute or chronic renal failure, chronic liver disease, heart failure, patients with missing medical records, and patients whose parents requested discharge were excluded.

Variables

The variables were:

- 1. Age was divided into three groups: 0 to 5 years old, 6 to 10 years old, and 11 to 15 years old (Group 1, Group 2, and Group 3, respectively).
- 2. Sex was divided into two groups: women and men (Groups 1 and 2, respectively).
- 3. The presence of free intraperitoneal fluid. It was divided into three groups. The first had the presence of free intraperitoneal fluid without ultrasound signs of acute surgical abdomen. The second had no free intraperitoneal fluid or ultrasound signs of acute surgical abdomen, and the third had free intraperitoneal fluid and ultrasound signs of appendicitis.
- 4. The amount of intraperitoneal fluid was distributed into three groups: minimal (less than or equal to 2 cc), moderate (greater than 2 cc), and indeterminate (when the radiologist did not specify the amount). (Groups 1, 2, and 3, respectively)
- 5. The location of free fluid was divided into 8 groups: right iliac fossa, pelvis, Douglas cul-de-sac, abdomen and pelvis, abdomen, periodical, right flank, and indeterminate. Groups 1, 2, 3, 4, 5, 6, 7 and 0, respectively.
- 6. For the patient's clinical and surgical evolution, whether the resolution of the clinical picture was surgical or nonsurgical was considered. (Groups 1 and 2, respectively).

Data sources/measurements

The source was direct; an electronic form was completed from the institutional medical history data of the patients who entered the hospitalization period. The information was treated confidentially; no personal data were included to identify the study subjects. Abdominal ultrasounds were performed in the emergency department of the institution by professionals on call.

Biases

To avoid possible interviewer, information, and memory biases, the principal investigator always maintained the data with a guide and records approved in the research protocol. Observation and selection bias was avoided by applying the participant selection criteria. Two researchers independently

analyzed each record in duplicate, and the variables were recorded in the database once their agreement was verified.

Study size

The sample was probabilistic. Guayas-Ecuador has 4,391,923 inhabitants, with 25.7% of children ranging from zero to 14 years old, corresponding to 1,128,724 children. The prevalence of appendicitis of 140 cases per 100 thousand inhabitants would determine 1580 cases in the province annually. Using the EPI info ™ program (Version 7.2.5, CDC, Atlanta, USA, September 2022.) With an expected frequency of 15.6%, a confidence limit of 5%, and a confidence interval of 90%, the sample size was 131 cases.

Quantitative variables

Descriptive and inferential statistics were used. The results of categorical variables are expressed as frequencies and percentages. The scale variables are defined as the mean and standard deviation.

Statistical analysis

Noninferential statistics are used for descriptive analysis. The nonparametric correlation was used with Spearman's R coefficient and Chi-square for the inferential analysis.

Results

Participants

The study included 133 patients.

Description of the study group

There were 133 cases. The sample included 75 women (56%) and 58 men (44%). The mean age of the pediatric patients with abdominal pain was 8 years. The maximum age was 15, and the minimum age was 0 years. The average age of the patients with surgical evolution was 9 years. The group of patients between 0 and 5 years was 40 (30%), between 6 and 10 years was 49 (37%), and between 11 and 15 years was 44 patients (33%) (Table 1).

A total of 20.3% (27) of the patients presented free fluid in the abdominal cavity. A total of 13.5% (18) had a minimal number, 1.5% (2) moderate, and 5.3% (7) indeterminate. A total of 68.4% (91) did not show free intraperitoneal fluid, and 11.3% (15) showed ultrasound signs of appendicitis.

A total of 8.27% (11) presented free fluid in the right iliac fossa, 3.76% (5) in the pelvis, 1.5% (2) in the Douglas cul-de-sac, 0.75% (1) in the abdomen and pelvis, 0.75% (1) in the pelvis, 1.5% (2) pericecal, 0.75% (1) in the right flank and 3% (4) indeterminate.

A total of 36.84% (49) of the patients proceeded to appendicular surgery, hernioraphy, cholecystectomy or enterolysis. A total of 63.16% (84) of the sample had a clinical resolution.

Table 1 . Description of the age variable.

Range	N=133	F. Accumulated
0-5 años	40 (30.0%)	40 (30.0%)
6-10 años	49 (37.0%)	89 (67.0%)
11-15 años	44 (33.0%)	133 (100%)

F: frequency and percentage.

Correlation analysis

Pearson's correlation coefficient and the Chi-square test were analyzed to determine if there was a statistically significant relationship between the variables sex, age, presence, quantity, location of free fluid, and surgical resolution of abdominal pain. An inverse relationship was found between the presence of free fluid and the need for surgical resolution (Pearson's correlation index of -0.18, P <0.0001). The age group between 11 and 15 years was the least operated, with a Pearson's correlation index of -0.18, P = 0.03 (Table 2).

There was no statistically significant relationship between sex, quantity, or location of free fluid in the peritoneal cavity and the need for surgery (Table 2).

Table 2. Spearman's correlation coefficient between the clinical course to surgery and the descriptive variables.

Clinical evolution	R	*P*
Gender	-0.043	0.61987
Age groups	-0.187	0.03425
Free liquid	-0.180	<0.00001
Quantity	-0.086	0.57766
Location	0.008	0.63488

Discussion

The present study analyzed the presence of free fluid in the abdominal cavity associated with the need to require surgery in a group of children with acute abdomen.

Analysis of the data shows that there is an inverse relationship between the presence of free fluid in the abdominal cavity and the need for surgical resolution in pediatric patients with

abdominal pain. This means that patients with free fluid in the abdominal cavity are less likely to require surgery than patients without free fluid. No statistically significant relationship was found between sex, amount or location of free fluid in the peritoneal cavity, and the need for surgery.

Overall, the results of this study suggest that the presence of free fluid in the abdominal cavity is an essential factor to consider when evaluating pediatric patients with abdominal pain. Patients with free fluid in the abdominal cavity are less likely to require surgery than patients without free fluid.

Despite these limitations, the results of this study provide essential information that can open a line of research regarding whether this observation is repeatable with the slightest probability that a child with abdominal pain will be operated on for an acute abdomen. has visualized free fluid in the abdominopelvic cavity. In this regard, a study that evaluated 250 pediatric patients found that the prevalence of free fluid in children with acute abdominal pain was higher than that in asymptomatic children, 29% and 6%, respectively. However, he classified this finding as uncertain in the resolution of the clinical picture [6]. From the statistical point of view, although the negative association is low between 0 and 0.40, it is not given by chance. Hence, it draws attention to the presence of this association that does not explain causality.

The incidence of free fluid in the abdominal cavity of asymptomatic pediatric patients ranges from 2% to 22% [3]. The incidence of free liquid in the patients of the analyzed sample, all symptomatic, was 20.3%. This result is within the parameters observed in the literature.

A study carried out in children with traumatic antecedents did not show differences in the incidence of free fluid concerning sex. In this study, no statistically significant differences were observed regarding sex. Patients between 11 and 15 years of age were the ones who least needed surgical resolution. There are no studies that refer to this finding.

The present study has areas for improvement, such as the relatively small study sample, so more studies are needed to confirm the results. Additionally, the study was conducted in a single center, so the results may not be generalizable to other populations, and the study did not include data on the cause of abdominal pain, so it cannot be determined if the presence of free fluid is a problem. causal factor or simply a marker of disease severity. New studies should address these questions.

Conclusions

In this study group, there was an inverse association between free fluid in the abdominal cavity and the need for surgical resolution in pediatric patients with abdominal pain. New studies should confirm these clinical findings.

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Declarations

Ethics committee approval and consent to participate

The ethics committee of the Alcívar Hospital approved the study.

Publication consent

It is unnecessary when images, radiographs, and specific patient studies are not published.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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