

PRACE ORYGINALNE • ORIGINAL PAPERS

The most frequent causes of acute abdominal pain in children referred from the Accident and Emergency Department for ultrasound examinations – a retrospective analysis

Najczęstsze przyczyny ostrego bólu brzucha u dzieci kierowanych z Izby Przyjęć do badań ultrasonograficznych – analiza retrospektywna

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Summary Background. Acute abdominal pain is one of the most frequent complaints in children, requiring urgent diagnostics in the Hospital's Accident and Emergency Department (A&E).

Objectives. To identify the most frequent conditions that cause abdominal pain in children who are referred for the ultrasound examination (US) from the A&E. Analysis of the distribution of the causes of acute abdominal pain with reference to the sex and age of the child.

Material and methods. 1645 children with abdominal pain were taken into consideration, all of whom were diagnosed by means of US. The population was divided into four age groups.

Results. It was proved that boys prevail in the youngest age group, while girls prevail in the eldest group. The most frequent initial diagnoses in individual age groups were: urinary tract infection (UTI) among younger children, suspected appendicitis and nephrolithiasis among elder children. Doctors at the A&E were able to give an initial diagnosis in patients with abdominal pain in the youngest. As opposed to that, the initial diagnosis was the least frequently made in children aged 7–8 years.

Conclusions. UTI is the most frequent initial diagnosis in children with abdominal pain, referred from the A&E for US in each age group. The ultrasound examination of the abdomen is currently a routine test, performed in 90% of children who are seen in the A&E with abdominal pain.

Key words: children, abdominal pain, ultrasonography, initial diagnosis, age group.

Streszczenie Wstęp. Ból brzucha jest jedną z najczęstszych dolegliwości występujących u dzieci wymagającej pilnej diagnostyki w Szpitalnym Oddziale Ratunkowym (SOR) bądź też w Pediatrycznych Izbach Przyjęć.

Cel pracy. Wyodrębnienie najczęstszych jednostek chorobowych będących powodem bólu brzucha u dzieci kierowanych na badanie ultrasonograficzne z Pediatrycznej Izby Przyjęć. Analiza rozkładu przyczyn ostrego bólu brzucha w odniesieniu do płci i wieku dziecka.

Materiał i metody. Badaniem objęto 1645 dzieci z ostrym bólem brzucha, diagnozowanych ultrasonograficznie. Populację podzielono na cztery grupy wiekowe: A – do 4. roku życia, B – 5–9 lat, C – 10–14 lat, D – 15–17 lat.

Wyniki. Wykazano, iż w najmłodszej grupie wiekowej przeważają chłopcy, w najstarszej – dziewczynki. Najczęściej stawiane wstępne rozpoznania w poszczególnych grupach wiekowych to: zakażenie układu moczowego (ZUM) wśród dzieci młodszych, wśród dzieci starszych – podejrzenie zapalenia wyrostka robaczkowego oraz kamicy nerkowej. Zauważono, że lekarz Izby Przyjęć u pacjentów z bólem brzucha trafnie precyzował wstępną diagnozę u dzieci najmłodszych. Najrzadziej stawiano wstępną diagnozę wśród dzieci w wieku 7–8 lat.

Wnioski. ZUM jest najczęstszym wstępnym rozpoznaniem u dzieci z bólami brzucha kierowanych z Izby Przyjęć do badania USG w każdej grupie wiekowej. Badanie ultrasonograficzne jamy brzusznej u dzieci jest aktualnie badaniem rutynowym, wykonywanym u 90% dzieci zgłaszających się z bólem brzucha do Izby Przyjęć.

Słowa kluczowe: dzieci, ból brzucha, ultrasonografia, rozpoznanie wstępne, grupa wiekowa.

Background

Abdominal pain is one of the most frequent conditions in children. It often requires urgent diagnostics in the Accident and Emergency Department (A&E) or in Paediatric Admission Rooms [1]. The cause of abdominal pain may be a dysfunction of the gastrointestinal tract in the form of constipation or diarrhoea, and frequently the underlying cause is viral infection [2]. Nevertheless, while performing differential diagnostics, one should not neglect the processes that take place beyond the abdominal cavity, each of which can be manifested as abdominal pain, e.g. inferior lobe pneu-

monia. The complexity of this problem obliges the paediatrician to perform a thorough physical examination as well as to take the patient's medical history. The thorough medical history of the patient enables the physician to arrive at an initial diagnosis and to consider congenital causes that underlie abdominal pain, the psychosomatic and idiopathic causes should be also taken into consideration [1–3]. The task of the doctor at the Admission Room is a skilful clinical evaluation of the patient and making an initial diagnosis in order to identify life-threatening conditions as well as oncologic causes that may determine further diagnostic procedures. Due to the difficulty in performing a physical exami-

nation in the youngest patients, US of the abdominal cavity becomes a very helpful tool in the course of the evaluation of the severity of the patient's condition and making the ultimate diagnosis [4]. One should remember that the causes of the pain may vary, depending on the age of the child.

Objectives

The aim of this paper was to identify the most frequent conditions that cause acute abdominal pain in paediatric patients and their correlation to age. Moreover, the distribution of the causes of abdominal pain with a reference to the child's sex was analysed. The retrospective analysis was performed on the basis of referral-linked data from the A&E to the Department of Pediatric Radiology and the obtained results. The analysis included patients diagnosed in 2012.

Material and methods

The retrospective analysis included 1645 children (823 girls and 822 boys) who in 2012 were referred for US from the A&E. Out of the overall number of 1810 patients with abdominal pain registered in the A&E, 90% were referred for US. The analysed population was divided into four age groups: group A – patients up to 4 years, group B – 5–9, group C – 10–14, group D – 15–17 years of age. In as many as 942 cases (57%) the detailed initial diagnosis was not made and the child was referred for US diagnostics due to abdominal pain. Therefore, on analysis two subgroups of patients were identified: I without a detailed diagnosis (I = IA, IB, IC, ID) and II with a detailed initial diagnosis (II = IIA, IIB, IIC, IID).

Statistica 10 software was used for the statistic analysis. The normality of age distribution in each group was checked by means of K-S test, and due to the lack of normality of data distribution, the Mann-Whitney non-parametric test was employed. In order to compare the groups in the nominal scale, the chi-squared independence test was utilised. All tests assumed $p = 0.05$ as the statistical significance. The obtained results were described and presented in tables and on charts.

Results

The analysed population were children aged between 0 and 17 years of age who were referred for US from the A&E. 1645 patients were divided into four groups, depending on their age: A (0–4 years), B (5–9 years), C (10–14 years), D (15–17 years).

Group	Female	Male	Quantity of patients [n]	Quantity of patients [%]	Age [Average]
A	263	329	592	35.99%	1.98
B	247	224	471	28.63%	6.87
C	168	193	361	21.95%	11.95
D	145	76	221	13.43%	15.87
Total	823	822	1645	100.00%	

The average value for the age was 7 years. The most numerous group were children below 12 months of age ($n = 133$; 8.09%), while on the other end of the scale were the eldest children, aged 17 years, who comprise 3.9% of all subjects ($n = 65$).

Mann-Whitney test confirmed that there was a significant difference between the age and sex of the subjects (Fig. 1).

Apart from that, the analysis included two groups of patients: (I) without an initial diagnosis referred as acute abdominal pain, and (II) with a specified diagnosis (Fig. 2).

Both groups were analysed for the normality of age distribution by means of K-S test, with a negative result. The groups were further compared by means of the Mann-Whitney non-parametric course, which revealed a significant difference in age distribution. Figure 3 presents the age distributions in groups I and II.

The most frequent initial diagnosis are presented on Figure 4.

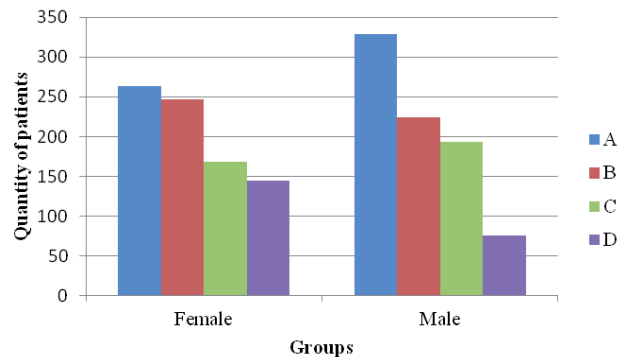


Figure 1. Distribution of sexes in individual groups

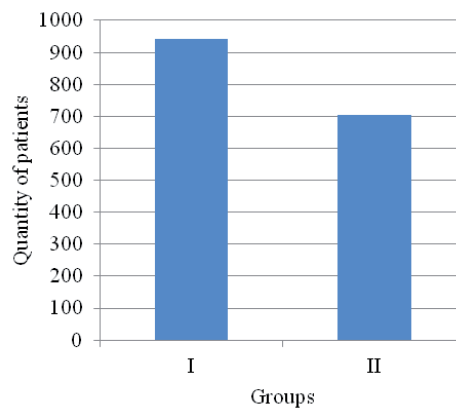


Figure 2. Quantity of patients in groups without (I) and with initial diagnosis (II)

US revealed pathological conditions in 863 children (52.4%). The abnormalities were found in patients with the initial diagnosis of the abdominal tumour, biliary colic, nephritis, pancreatitis. The initial diagnosis was the most frequently confirmed in the case of the urinary tract disorders: hydronephrosis (90.8%), nephrolithiasis (86.2%), renal colic (84%).

On the analysis of the percentage of children with and without an initial diagnosis depending on the age, it was observed that more frequently the initial diagnosis was made in the youngest children (app. 83% out of all patients aged below 1 year of age), the most rarely was made in children aged 7–8 years, where respectively app. 72% of patients were not initially diagnosed. The most common abnormalities on the US in all I subgroups include as follows: enlarged lymph nodes in the mesogastrium, the presence of liquid in the peritoneal cavity, urinary retention in the pyelocalyceal system of the kidneys. Similarly, in all II subgroups, the order of the most common pathologies was the following: urinary retention in the pyelocalyceal system of the kidneys, nephromegaly, enlargement of lymph nodes in the mesogastrium. The chi-squared independence test revealed the correlation between the initial diagnosis confirmed by the ultrasound scan and the sex of the subject.

Urinary tract disorders that cause abdominal pain prevailed in the female population. In contrast, in the male group, more often confirmed were the initial diagnoses associated with acute pain requiring surgical intervention, i.e. intussusception, appendicitis, renal colic.

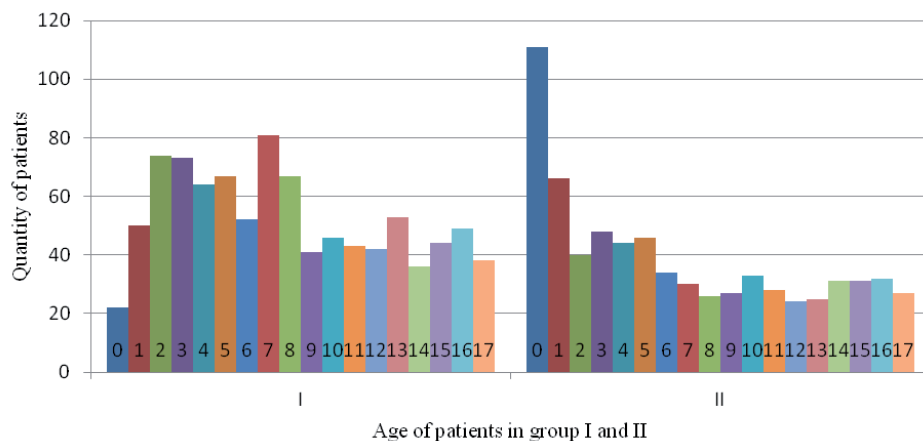


Figure 3. The age distribution in children with and without an initial diagnosis

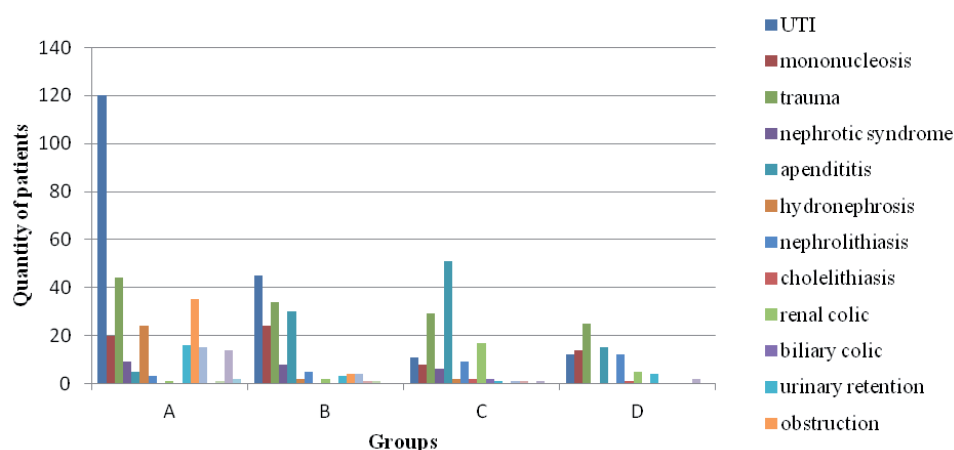


Figure 4. The most frequent initial diagnosis in individual groups

Discussion

Abdominal pain is not a pathognomonic symptom of any pathological condition. The collected data seem to suggest that the diagnostics of acute abdominal pain in children is extremely difficult; in 57% of cases seen in the A&E, the initial diagnosis on the basis of the physical examination and the medical history was not possible to be made. The basic diagnostic methods, apart from the physical examination, are US and X-ray films of the abdominal cavity that either confirm or make it possible to diagnose the cause of pain [4]. In the present material, 90% patients who complained of abdominal pain were referred for US. One should not forget, however, how difficult it is to perform this examination in the youngest patients who are often restless, which is a factor that makes it difficult to complete the diagnostic process. That's why the cooperation of the radiologist and the physician, who is the first person to contact both the patients and their care-takers is so important [5]. Among all the patients, abnormalities in the ultrasound imaging were identified in 54.4% of cases. In the subgroup I, the most commonly identified abnormalities were: enlargement of lymph nodes in the meso- and hypogastrium and fluid in the peritoneal cavity, which may be a sign of an ongoing acute inflammation in non-traumatic paediatric patients [6]. One should not forget that the inflammation of the mesenteric lymph nodes is one of the common causes of acute abdominal pain in children that should be differentiated from appendicitis of enteritis [3, 4, 7–11]. In the subgroup II, the most common pathologies were: urinary retention in the pyelocalyceal system of the kidneys, nephromegaly, enlargement of lymph nodes in the meso- and hypogastrium. In the remaining cases, the lack of abnormalities in the imaging examination of the abdominal cavity may be indicative of

a functional pain, or an extra-abdominal cause [1]. Among the frequent causes of pain, there are also patients with constipation. In Caparello's paper that estimated the causes of acute abdominal pain in children, such patients constituted the most numerous group, nevertheless, in the present material, constipated patients were referred from the A&E mainly for the X-ray exam of the abdominal cavity, instead of US [8]. In the authors' assessment, the confirmation of the presence of retained faecal mass on the X-ray film was non-contributory as far as the causes of constipation are concerned, while exposing patients to ionic radiation at the same time.

For 43% of children, the medical history and the physical examination made it possible to make a specified diagnosis. The analysis of the collected data revealed the most frequent pathological conditions that were subject to diagnostics in the Paediatric Admission Room. In IIA subgroup the most frequent conditions are: UTI, hydronephrosis and ileus. In IIB subgroup: UTI, appendicitis and hepato- and splenomegaly with suspected mononucleosis. In IIC subgroup: appendicitis, suspected nephrolithiasis, and a blunt trauma of the abdomen. Among the eldest children, aged 15–17 years (IID subgroup) the most frequent causes were: nephrolithiasis, UTI, and hepato- and splenomegaly with suspected mononucleosis. The attempt at the correlation of the confirmed initial diagnosis to the patient's sex revealed that girls more often developed UTI than boys. The exception, similarly as for other authors, is the infancy period, when UTIs prevail in boys, which might be due to the fact that the incidence of developmental defects is more common in this sex [11]. Hydronephrosis, on the other hand, is more often diagnosed in boys.

While dealing with a paediatric patient who complains of abdominal pain many possible causes have to be taken into consideration. Considering the patient's age and sex en-

ables the physician to narrow down the field of exploration and facilitates their work. On the basis of the analysis of the collected data, one can conclude that UTI is the most frequent cause in almost each age group, particularly in younger patients. Moreover, attention should be paid to the surgical causes of abdominal pain in older children. Currently, the US has become a routine test in the course of diagnosing abdominal pain in children.

Conclusions

UTI is the most frequent initial diagnosis in children with abdominal pain, referred from the A&E for US in each age group. The ultrasound examination of the abdomen is currently a routine test, performed in 90% of children who are seen in the A&E with abdominal pain.

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