Iraqi JMS

Published by Al-Nahrain College of Medicine
P-ISSN 1681-6579
E-ISSN 2224-4719
Email: iraqijms@colmed-alnahrain.edu.iq
http://www.colmed-alnahrain.edu.iq
http://www.iraqijms.net
Iraqi JMS 2017; Vol. 15(3)

Evaluation of Intussusception in Children: Our Experience in 47 Cases

Mohammed M.M. Al-Ani[1] *CABP*, **Sadek H. Ghani**[2] *CABP*, **Omar k. Maklef**[3] *FIBMS*

[1]Dept. of Pediatrics, College of Medicine, Anbar University, Iraq, [2]Child's Central Teaching Hospital, Baghdad, Iraq, [3]Al-Ramadi Teaching Hospital for Maternity and Children, Al-Ramadi, Iraq

Abstract

Background Intussusception is the most common cause of intestinal obstruction in infants and young children.

Objective To review the clinical, epidemiological, management pattern and outcome of intussusception.

Methods A retrospective descriptive review of 47 patients who were diagnosed and managed for intussusception during the period from January 2012 to October 2014 in Al-Ramadi Teaching Hospital for Maternity and Children. Data were collected from the Pediatric Surgery Unit records, which include demographic characteristics of the patients, history of preceding gastroenteritis or respiratory infection, clinical signs and symptoms, imaging studies, type of management, operative finding, outcome and mortality. Data were analyzed by Epi Info7TM, using chi-square to obtain p value which regarded significant when it was < 0.05.

Results Records of 47 patients were reviewed; (68.4%) were under one year of age. Peak incidence between 6-12 months of age (55.3%). Male: female ratio was 2.35:1. 27 patients (57.4%) were from rural area, peak seasonal incidence occurred in summer and winter, 41 patients (87.2%) presented with abdominal pain, a palpable abdominal mass was detected in 24 patients (51%), red currant jelly stool reported in (74.5%). Ultrasonography were done for 39 patients and showed an abdominal mass suggestive intussusception (as a target sign or pseudo kidney mass) in 34 patients (87.1%). (95.7%) of patients treated by surgical reduction, while only two patient reduced by hydrostatic enema, Meckle's diverticulum were the commonest pathological lead point (44.4%). No intussusception- associated death was recorded.

Conclusion Colicky abdominal pain was the most presenting symptoms and red currant stool was a significant sign especially in children ≤ 12 months. Majority of cases presented after 24 hours were from rural area, seasonal peaks occurred in summer and winter months and surgery remain the mode of management.

Keywords Intussusception, clinical, epidemiological, management pattern and outcome.

Citation Al-Ani MMM, Ghani SH, Maklef OK. Evaluation of intussusception in children: our experience in 47 cases. Iraqi JMS. 2017; Vol. 15(3): 250-261. doi: 10.22578/IJMS.15.3.6

List of abbreviation: No abbreviations

Introduction

Intussusception is the commonest cause of intestinal obstruction in infant and young children [1,2]. It occurs when proximal segment of bowel invaginates into another just distal to it, resulting in venous congestion, bowel wall edema leading to an out pouring of mucous and blood from the engorged intussusceptum, and later leading to an obstruction, if left untreated is a potentially lethal condition [1-3].

More than 60% of children are younger than one-year old and accurate estimates of the incidence are not available for most of the developing countries, intussusception rates reported from various parts of the world ranged from 24 to 230 cases per 100,000 children annually and the male to female ratio range from1.4:1 to 4:1 [2]. The peak incidence is between 5 and 7 months of age [4], with no distinct seasonality were observed [4,5].

In children, the cause of intussusception is idiopathic in majority of cases [1,2,4]. However, a strong association with viral (adenovirus) and bacterial infection has been observed [6-8]. Susceptible individuals may have an altered anatomic or immune status that, when they are infected with adenovirus, predisposes them to intussusception [9].

In 2-8%, Intussusception is secondary to a pathological lead points especially in children >2 years of age [1], such as Meckel's diverticulum, polyps and small bowel lymphomas, etc. [10,11]. Intussusception has been also reported to occur post operatively [12] and after abdominal trauma [13].

Intussusception may be ileo-colic (80%), ileoileal, cecocolic, colocolic, ileoileocolic and jejunojejunal in type [1,2,14].

Classically, colicky abdominal pain and vomiting (milk then bile) will be the presenting symptoms in a previously healthy infant. Between episodes child initially appears well. Later on, they may pass a red currant jelly stool [1,2].

Lethargy or alterations of consciousness can be the sole presenting symptom of intussusception, which makes the condition's diagnosis challenging [15].

Clinical signs include dehydration, abdominal distension and a palpable sausage shaped mass in the right upper quadrant. Rectal examination may reveal blood or rarely the apex of an intussusception. Prolapse of the intussusceptum through the anus is a grave sign, particularly when the intussusceptum is ischemic [16]. The classic triad of abdominal pain, palpable abdominal mass and red currant jelly stool occurs only in one third of cases [17].

Diagnosis of intussusception can be confirmed by X-ray of the abdomen, which may show signs of intestinal obstruction and in 25-60%, abdominal plain films demonstrate a right upper quadrant soft tissue density that displaces air-filled loops of bowel. Diagnosis can also be confirmed by an ultrasound scan (noninvasive, sensitive and specific method for the diagnosis). Intussusception has a characteristic sonographic appearance, this is described as an abdominal mass with a target sign on transverse section and a pseudo kidney or sandwich sign on longitudinal section [2,16].

Contrast enema, it's both diagnostic and therapeutic and the classic signs of intussusception on contrast enema are the meniscus sign where the apex of the intussusception project into the contrast material and the coiled spring sign, which produced when small amount of contrast accumulate between the intussusceptum and intussuscepients.

After resuscitation with intravenous fluids, broad spectrum antibiotics and nasogastric drainage, non-operative reduction of the intussusception can be attempted in early and uncomplicated cases [2,16].

Non-operative reduction techniques using enemas may be hydrostatic (using barium, water soluble contrast) [1,2,4,16,18], or pneumatic (using either air or carbon dioxide) [18-20]. Both of these procedures can be performed under fluoroscopic or ultrasound guidance [18].

Operative reduction indicated when there are signs of peritonitis, a pathological lead point or in the presence of profound shock and when facilities for non-operative reduction are limited [2,4,16].

In general, the longer the duration of symptoms (particularly if >24 hours) the lower the likelihood of successful non-operative reduction [18].

The aim of this study was to evaluate the management and outcome of intussusception.

Methods

Study design

A retrospective descriptive study was conducted at Al-Ramadi Teaching Hospital for Maternity and Children over a period from January 2012 to October 2014.

Study sample

Records of forty-seven patients who were diagnosed on the basis of history and clinical examination, radiological investigations and further confirmed on surgical exploration and managed for intussusception were reviewed.

Data collection

Data were collected from the Pediatric Surgery Unit records and the patient case files.

These data include demographic characteristics of the patients (age, gender, residence). History of preceding medical illnesses, time of presentation (season) and duration of symptoms before presentation (when the time interval between the onset of first symptom and presentation of patient is more than 24 hours it is considered as delayed presentation and time period less than 24 hours is called as early presentation.

Clinical signs and symptoms, which include abdominal pain (screaming attacks), vomiting, presence of bloody stool, fever, lethargy, abdominal tenderness, distension, mass, finding on per rectal examination and presence of prolapsing mass or not. Imaging studies (erect abdominal x-ray and contrast study) and ultrasonography. Type of management (barium reduction or surgical reduction) as well as operative finding (type of intussusception and presence of pathological point and its type), and outcome among the sample study.

Statistical analysis

These data were analyzed by Epi Info7TM using chi-square to obtain the difference between variables (p value) and p value was regarded significant when it was <0.05. Percentages were calculated Manually.

Results

Records of forty-seven patients who were diagnosed and managed for intussusception were retrospectively reviewed. In this study, age of patients ranged from 4months to 5 years with a mean age of(13 months ± 10.9 STD).

Thirty-two patients (68.08%) were under one year of age. Twenty-six of them (55.3%) were between 6-12 months of age. And fifteen patients (31.92%) were older than one year.

Thirty three patients (70.2%) were males and fourteen patients (29.8%) were females with a male:female ratio of 2.35:1 as shown in figure (1).

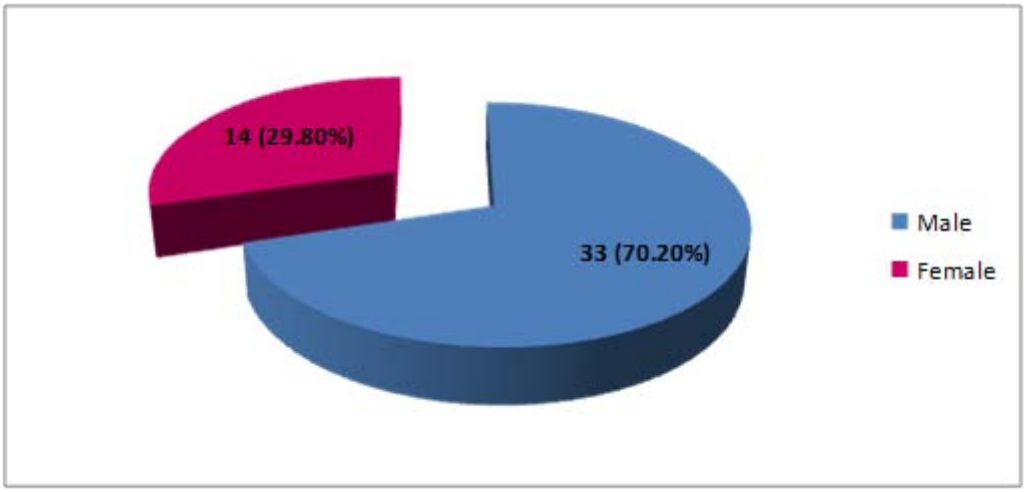

Figure 1. Frequency distribution of intussusception by gender

Twenty-seven of patients (57.4%) came from rural area while twenty patients (42.6%) were from urban society. Thirty-one patients were presented after 24 hours of the onset of symptoms while sixteen patients were presented within first 24 hours, and there was statistical difference between rural and urban residence in relation to duration of symptoms (whether ≤ 24 hours or > 24 hours) at time of presentation (p. value was highly significant< 0.001) as shown in table (1).

Peak incidence occurred in summer and winter months as shown in figure (2).

Table 2. Relation between residence of children with intussusception and duration of symptoms on presentation

Residence	Duration of symptoms in hours				Total	p. value
	≤ 24 hours		> 24 hours			
	No.	%	No.	%		
Rural	5	18.5%	22	81.5%	27	< 0.001
Urban	11	55.0%	9	45.0%	20	
Total	16	34.04%	31	65.96%	47	

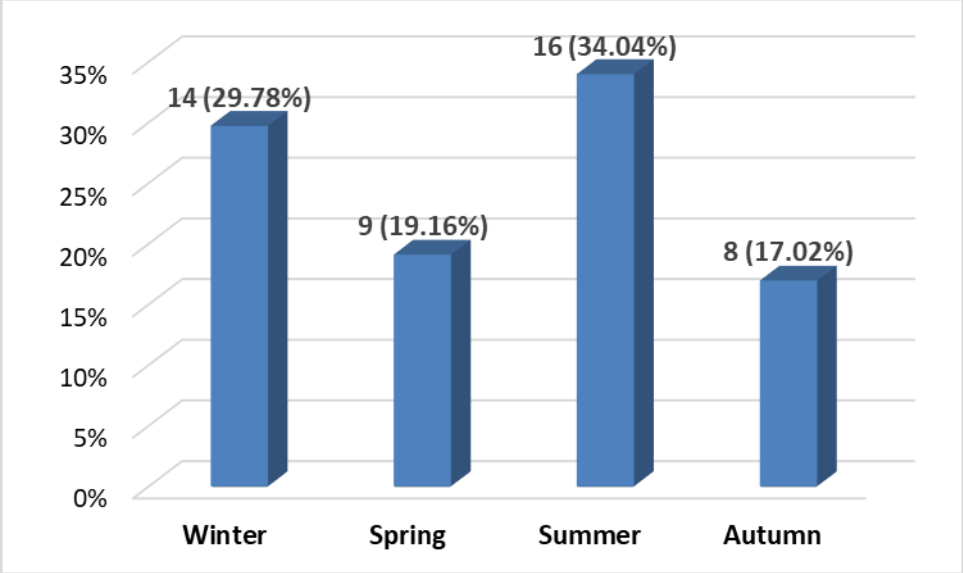

Figure 2. Seasonal distribution of children with intussusception

History of preceding medical condition was reported in about 75% of children, (34 %)of them with respiratory tract infection, eleven patients (23.40%) with gastroenteritis, five patients (10.64%) with tonsillitis and three patients (6.39%) with urinary tract infection, however, in twelve patients (25.53% of cases) there was no preceding illnesses in as shown in figure (3).

In the underlying table, we compared between the clinical features of two age groups (below and above one year) and the finding showed the that patients whom age was less than 1 year were presented more frequently with abdominal pain and bleeding per rectum, while vomiting and lethargy were approximately presented equally in both groups. Regarding clinical signs, red currant jelly stool on per

rectal examination were reported more frequently in children whom age less than 1 year (significant P value 0.024), while abdominal mass and prolapsing mass were reported more in children older than 1 year and abdominal tenderness and distension were reported equally in both groups as shown in table 2.

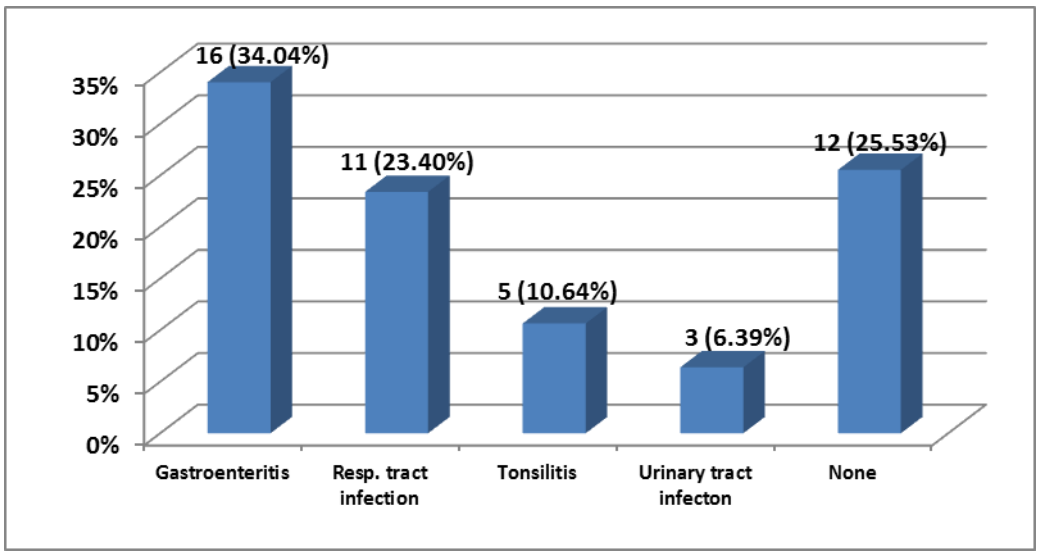

Figure 3. The preceding medical conditions

Table 2. The clinical features in relation to age of patients

Clinical features		Total no.	Age in months				X^2	P. value
			≤12 months		>12 months			
			NO.	%	NO.	%		
Abdominal pain	Present	41	29	90.6%	12	80.0%	1.013	0.314
	Not	6	3	9.4%	3	20.0%		
Vomiting	Present	30	21	65.6%	9	60.0%	0.137	0.711
	Not	17	11	34.4%	6	40.0%		
Bleeding per rectum	Present	30	23	71.8%	7	46.6%	2.751	0.097
	Not	17	9	24.2%	8	53.4%		
Fever	Present	16	13	40.6%	3	20.0%	1.894	0.168
	Not	31	19	59.4%	12	80.0%		
Lethargy	Present	23	16	50.0%	7	46.6%	0.044	0.833
	Not	24	16	50.0%	8	53.4%		
Abdominal tenderness	Present	38	26	81.2%	12	80.0%	0.010	0.920
	Not	9	6	18.8%	3	20.0%		
Abdominal distension	Present	15	10	31.2%	5	33.3%	0.020	0.888
	Not	32	22	68.8%	10	66.7%		
Abdominal mass	Present	24	14	43.7%	10	66.7%	2.107	0.147
	Not	23	18	56.3%	5	33.3%		
Red currant jelly stool	Present	35	27	84.38%	8	53.3%	5.066	0.024
	Not	12	5	15.63%	7	46.7%		
Prolapsing mass	Present	1	----	0.0%	1	6.6%	2.133	0.144
	Not	46	32	100%	14	93.4%		

Erect abdominal x-rays were done in in forty-two patients and which were conclusive in nineteen (45.2%) patients only, showing multiple fluid level, distended bowel loops or soft tissue density mass in the upper abdominal quadrant.

Ultrasonography were done for thirty-nine patients and showed an abdominal mass suggestive intussusception (as a target sign or pseudo kidney mass) in thirty-four patients (87.1%). Diagnostic barium enema done for seven patients (14.8%) only and were diagnostic in five patients (71.5%) as shown in table (3).

Table 3. Frequency of results by the diagnostic modalities

Diagnostic modality	Finding	No. of patients	Percentage
Erect x-ray of abdomen	Conclusive	19	45.2%
	inconclusive	23	54.8%
Ultrasound of abdomen	Diagnostic	34	87.0%
	Not diagnostic	4	13.0%
Barium study	Diagnostic	5	71.5%
	Not diagnostic	2	28.5%

Two patients (4.25%) achieved reduction during diagnostic enema and forty-five of patients underwent surgical treatment (95.75%). In thirty-two patients, the intussusception reduced manually (71.2%) while surgical resection with end to end anastomosis performed in thirteen patients (28.8%) because of ischemic bowel or failure of manual reduction and presence of pathological lead points and all of them were presented after 24 hours as shown in figure (4).

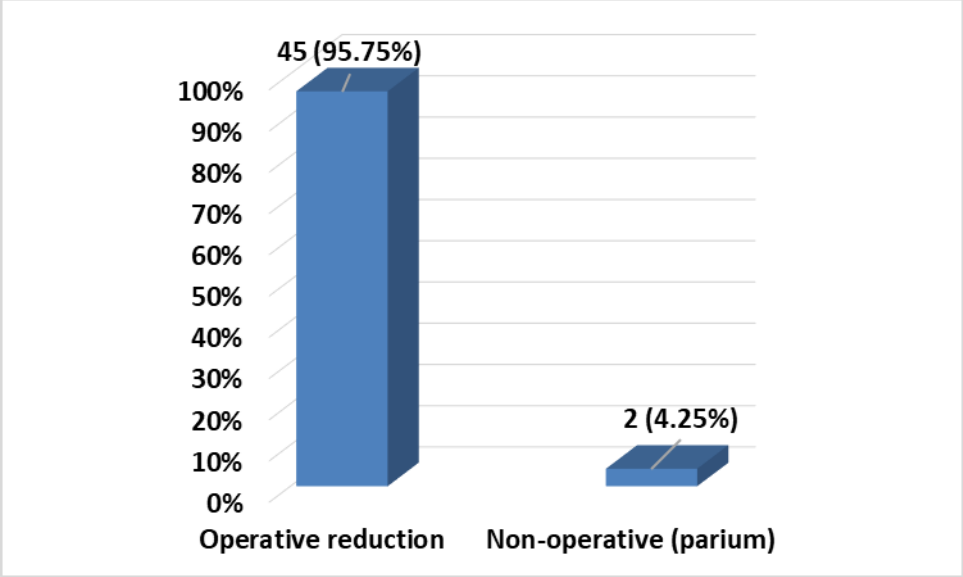

Figure 4. The mode of management

The most common type of intussusception was ileocolic type in thirty-five patients (77.8%) followed by ileoileocolic in seven patients (15.5%) then ileoilial and jejunojejunal types with (4.5%) and (2.2%) respectively as shown in figure (5).

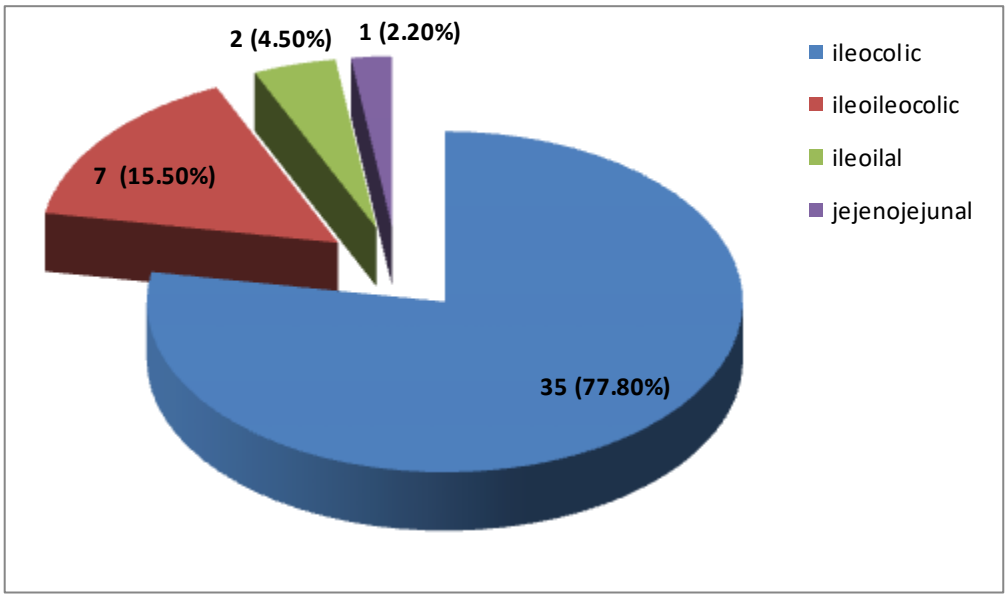

Figure 5. Types of intussusception.

Of the forty-five patients who underwent operative reduction, idiopathic (primary) intussusception were reported in thirty-six patients (80%), and pathological lead points (secondary) were identified in nine patients (20%) as shown in figure (6).

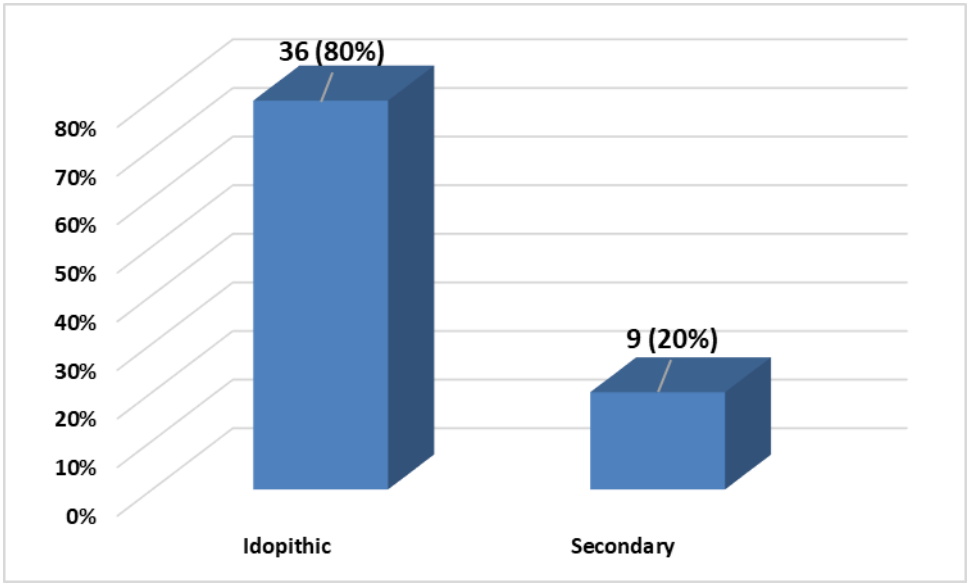

Figure 6. The underlying pathology for intussusception in patients underwent operative reduction

Regarding the pathological lead points, meckle's diverticulum were the commonest lead point, identified in four patients (44.4%). Three patients have lymphomas (33.3%), one patient had polyps (11.1%) and one patient has hemangioma (11.1%), as shown in table (4).

Recurrent intussusception was reported in one patient (2.1%) after four days of primary surgery and only four patients (8.4%)

developed complications, one patient had superficial wound infection and two had pneumonia and one patient had skin excoriation, length of hospitalization ranges from 3-5 days for patient managed by manual reduction to 5-7 days for those managed by surgical resection, no surgical complications were recorded.

All patients improved and discharged and no intussusception associated mortality were reported in this study as shown in table 5.

Table 4. Distribution of the pathological lead points

	Underlying pathology	No. of patients	% of patients
Secondary intussusception (pathological lead points)	Meckel's diverticulum	4	44.4%
	lymphomas	3	33.3%
	polyps	1	11.1%
	hemangioma	1	11.1%

Table 5. The duration of symptoms, complications, length of hospitalization and outcome

Duration of symptoms	No. of patients	% of patients	Complication	No.	Length of hospitalization and outcome
≤ 24 hours	16	34.04%	Pneumonia	1	3 -5 days postoperatively
> 24 hours	31	65.96%	Wound infection	1	5-7days postoperatively
			Pneumonia	1	
			Skin excoriation	1	
Total	47	100%	4		All survived (No death)

Discussion

This descriptive retrospective study showed the majority of cases were under one year (68.4%) and the commonest affected age group was between 6-12 months (57.4%), similar result was approximately encountered by Hanoudi and Hameed [23] (63%) and Khalaf [24] (61%). The possible explanation that this is the time of weaning and introduction of new food protein (solid food), which may result in change in normal flora and in swollen Payer Patches in mesentery of the terminal ileum that act as a lead point for intussusception [1].

In this study, a predominance of male was found with a male-female ratio of (2.35:1), which comparable to finding of Mohammed [25] (2.3:1) and Kella et al. [26] (2.5:1), but higher than that were found by Al-Sawafet al. [27] (1.5:1).

Twenty-seven patients (57.4%) were from rural area and twenty patients (42.6%) from urban society. In contrast, Khalaf [24] and Al-Sawaf et al. [27] found majority of their patients were from urban area. Regarding residence, the higher percentage of those from rural area might be explained by limited accessibility to health care facilities and awareness of the disease in the rural society. Bines et al. [28] suggested possible environmental and cultural exposures including exposure to enteric pathogens and child nutritional practices might had a role.

In this study, sixteen patients (34.04%) were presented within the first 24 hours from the onset of symptoms. Furthermore, most of patients (65.96%) were presented after 24 hours. Similar findings were encountered by Khaleel and AL-Alwan [29] and Hashim [30], in

contrast, Crankson et al. [21] and Al-Sawaf et al. [27] were found the majority of their patients presented within the first 24 hours. This delay in presentation may be due to lack of awareness or misdiagnosis of the condition by first treating health professionals or delay in arrival to hospital due to socio-economic problems including security situation in our governorate (Al-Anbar). In this study, there was a high statistical difference between rural and urban areas (p. value <0.001) in regard to duration of presentation of intussusception, (Table 1), a result that might be explained by what mentioned earlier regarding our society.

Regarding seasonal incidence, two peaks identified, first one occurred in summer months and the second occurred in winter months. Similar finding encountered by Đorđević et al. [31]. This finding differs from that of Khaleel and AL-Alwan [29] who found peak seasonal occurrence in spring. In other studies [32-34], no distinct seasonality of intussusception was detected. The seasonal distribution in this study might be explained by increased occurrence of gastroenteritis and upper respiratory tract infections during these seasons.

In this study, preceding gastroenteritis and respiratory tract infection was reported in twenty patients (34.4%) and thirteen patients (23.4%) respectively, approximately similar results were reported by Alamdaran et al. [35].

The most common clinical presenting symptoms in this study was abdominal pain, which reported in 87.2% followed by vomiting and bleeding per rectum 63.8% for both, comparable results were found by Mohsen and Hashim [36] (89%, 62%, 63.3%), other studies [21,37] found that the vomiting, rectal bleeding were most common presenting features.

Lethargy were found in 23 patients (48.9%), this is lower than the result (66%) encountered by Hashim [30] and Dominques-Carral et al. [38], this can be explained by dehydration and electrolyte imbalance as a result of vomiting and bowel obstruction. The absorption of toxic metabolic product from a strangulated bowel and the releases of neuropeptide were suggested by Kaiser et al. [22].

The red currant jelly stool on per rectal digital examination recorded in 35 patients (74.5%), the majority of them 27 (3/4) were under 1 year when compared with older children this indicate that with the younger patient, it is more likely to find red currant jelly stool as our study showed significant relation with age, on the other hand, Tareen et al. [39] found 36% of his cases presented with red stool and this might be due to a lot of his cases presented early within 24 hours (63% of cases), while in this study, approximately 66% of cases presented after 24 hours.

In this study, a palpable abdominal mass had been detected in 24 patients (51%), William [18] reported palpable mass in 69% and 84% of cases respectively; this might be due to the majority of our cases presented after 24 hours with the presence of abdominal distention which make the abdominal muscles more rigid and in turn make the palpation of the mass difficult.

Prolapsing mass was reported in 1 patient only (2.1%) who presented after 48 hours of the onset. Keïta et al. [40] and Nasar [41] reported 4 cases (10.8%) and 10 cases (20.08%) with anal prolapse respectively, this might be explained by the longer duration of symptoms before presentation the more likely the prolapse occur.

In this study, the classic triad of abdominal pain, current-jelly stool and palpable mass were documented in 17 patients (36.1%), which is comparable to results encountered by Huppertz et al. [17].

Generally, none of the clinical features mentioned above was of statistical difference in relation to age of the child (whether ≤ 12 months or > 12 months) except for red currant jelly stool, which was statistically significant in children ≤ 12 months (p. value 0.024) (Table 3).

Ultrasonography were done for 39 patients of total and showed an abdominal mass suggesting an intussusception as a target sign or pseudo kidney mass in 34 patients (87.1%),

same results gained by Mohsen and Hashim [36]. However, Stanley et al. [42] and Naseem et al. [43] found that the ultrasound was highly sensitive in 95-100% of cases.

Regarding missed cases to be diagnosed by abdominal x-ray or ultrasound, it might be due to technical or personal causes as both depend mainly on the person interpreting them in addition to the technique and the type and model of device used. Furthermore, Barium enema done for 7 patients only (14.8%) and it was diagnostic in six patients showed a coil spring sign, this finding was comparable to results of Khalaf [24].

Regarding management, 2 patients (4.2%) achieved reduction during diagnostic enema and the 45 patients underwent laparotomy, out of them 32 patients (71.2%), the intussusception reduced manually while surgical resection with end to end anastomosis performed in 13 patients (28.8%), because of ischemic bowel in 4 cases (8.8%) or due to presence of pathological lead point in 9 cases (20%). These findings were comparable to what reported by Khaleel and AL-Alwan [29] and Abdur-Rahman et al. [44]. Other studies like Al-Sawaf et al. [27] reported 25% of his patients treated by air enema. Moreover, Takeuchi et al. [45] reported the 93% of patients treated by an enema and only few cases managed by surgery. In this center, operative reduction was still the main mode of management because lack of facilities and trained radiologist who is familiar with the non-operative reduction by using hydrostatic or pneumatic reduction especially under ultrasonic or fluoroscopic guidance, additionally, delayed presentation might be a reason.

The most common type of intussusception was ileo-colic type in thirty-five patients (77.8%), Similar results approximately encountered by Crankson et al. [21] and Hanoudi [23].

Intussusception was idiopathic in 36 patients (80%), the pathological lead points were identified in 9 patients (20%) of total Meckel's diverticulum was the commonest pathological lead point, identified in 4 patients (44.4%) and lymphomas in 3 patients (33.3%) a result Which is comparable to what was found by Zain [10].

Recurrent intussusception was reported in one patient (2.1%) after four days of primary surgery, which closer to what shown by Hanoudi [23]. Best explanation for this finding was the surgical management done for vast majority of the cases.

Mortality rate was zero in this study similar to what reported by Al-Maliki [46] and Jehangir et al. [47], in contrast, Al-Sawaf [27] and Talabi et al. [48] reported 3.1%, 15.4% mortality in their study respectively.

In conclusion, colicky abdominal pain was the most presenting symptoms and red currant stool jelly was a significant sign especially in children ≤ 12 months while palpable abdominal mass occurred with a higher percentage in children > 12 months than those ≤ 12 months, majority of patients who presented after 24 hours were from rural area, a significant percentage of patients were presented with coexisting medical illnesses, seasonal peaks occurred in summer and winter months, pathological lead points were identified in about fifth of the patients and in this group the management was more radical (resection), delayed presentation(> 24 hours) was the main factor of morbidity and no mortality were reported.

The authors recommend that the varying age of children with intussusception and its variable presenting features should be kept in mind of the first treating health professionals to insure early diagnosis and referral to a specialized center for timely definitive treatment to decrease morbidity and mortality, despite the advance in the management of intussusception by non-operative techniques, surgery remained the main stay of treatment in authors' center because of limited facilities for the non-operative reduction in this center, the authors recommend that the facilities for non-operative reduction like ultrasonic guided barium or hydrostatic reduction and pneumatic reduction should be available and used especially for those presenting early to reduce

the risk of surgery and its impact on the patient and the hospital.

Acknowledgments

Authors thank staff members of Pediatric Surgery Unit and Radiology Unit in Al-Ramadi Teaching Hospital for Maternity and Children for their help in data collection.

Author contributions:

Dr. Maklef collected the patient data, Dr. Al-Ani and Dr. Ghani performed the statistical analysis and all together shared in writing the article.

Conflict of interest

None.

Funding

None.

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Correspondence to Dr. Mohammed M. Al-Ani
E-mail: dr.mohameed.m@gmail.com

Received Dec. 6th 2016
Accepted Feb. 23th 2017