SRANF
JAIM ...depuis 2002!
Journal Africain d'Imagerie Médicale
p-ISSN: 1810-4959 / e-ISSN: 2790-9840
Member of AJOL AFRICAN JOURNALS ONLINE

ARTICLE ORIGINAL / RESEARCH ARTICLE

Clinical and imaging concordance of non-traumatic abdominal emergencies in children in two secondary level hospitals in Cameroon.

Concordance clinique-imagerie des urgences abdominales non traumatiques de l'enfant dans deux hôpitaux de deuxième catégorie au Cameroun

DONGMO FOMEKONG Sylviane[1*], MOULION TAPOUH Jean-Roger[2], ETOMA Estelle[1], Joshua TAMBE[1], NGWANE Ntongwetape[3], LAAH NJOYO Sylvain[4], BELOBO EYEBE Anne Marie Grace[5], MOIFO Boniface[6]

[1]: Department of Internal Medicine and Pediatrics, Faculty of Health Sciences, University of Buea (Buea, CAMEROON)
[2]: Department of Radiology, Biophysics and Medical Imaging, Faculty of Medicine and Pharmaceutical Sciences, University of Dschang (Dschang, CAMEROON)
[3]: Department of Surgery and Specialties, Faculty of Health Sciences, University of Buea (Buea, CAMEROON)
[4]: Department of Clinical Sciences, Faculty of Health Sciences, University of Bamenda (Bamenda, CAMEROON)
[5]: Department of Clinical Sciences, Faculty of Medicine and Pharmaceutical Sciences, University of Douala (Douala, CAMEROON)
[6]: Department of Radiology, Faculty of Medicine and Biomedical Sciences, University of Yaounde 1 (Yaounde, CAMEROON)

Mots-clés :
Urgences abdominales non traumatiques, Pédiatrie, Échographie, Concordance diagnostique, Cameroun

Keywords:
Non‑ traumatic abdominal emergencies, Pediatrics, Ultrasound, Diagnostic concordance, Cameroon

Auteur correspondant
DONGMO FOMEKONG Sylviane
Department of Internal Medicine and Pediatrics, Faculty of Health Sciences, University of Buea, Cameroon, P.O Box 32, Buea-Cameroon
Email:dongfosyl@yahoo.fr
Tel: 00 237 699077121

RÉSUMÉ

Contexte : Les urgences abdominales non traumatiques (UANT) représentent un challenge diagnostique en pédiatrie, du fait de leur présentation clinique atypique, notamment dans les contextes à ressources limitées où les pratiques d'imagerie varient.
Objectif : Cette étude a évalué le profil des UANT pédiatriques et la concordance radio-clinique dans deux hôpitaux régionaux du Cameroun.
Matériels et Méthodes : Etude rétrospective menée dans les hôpitaux régionaux de Buea et Limbe entre janvier 2022 et avril 2024. Les dossiers des enfants de 0 à 15 ans présentant des symptômes abdominaux aigus et ayant bénéficié d'un examen d'imagerie ont été analysés. Les dossiers incomplets ont été exclus. Les données comprenaient les caractéristiques sociodémographiques, la présentation clinique, les modalités d'imagerie et les diagnostics. La concordance entre les diagnostics cliniques et radiologiques a été évaluée par pourcentages et par le coefficient kappa de Cohen.
Résultats : Sur 116 enfants inclus (âge moyen 7,1 ± 4,8 ans ; 55,2 % de garçons), les enfants d'âge scolaire (6–12 ans) étaient les plus représentés (44,0 %). Les symptômes les plus fréquents étaient la douleur abdominale (63,8 %), les vomissements (46,6 %) et la fièvre (28,4 %). L'échographie était l'imagerie la plus utilisée (79,3 %). Le recours au scanner était rare (0,9%). Les principales étiologies confirmées étaient l'invagination intestinale (15,5 %), la péritonite (14,7 %) et la hernie (10,3 %). La concordance radio-clinique globale était de 52 %, avec un accord substantiel pour la hernie (κ=0,776) et l'invagination (κ=0,656), et modéré pour l'appendicite (κ=0,543).
Conclusion : Les UANT pédiatriques sont fréquentes au Cameroun. L'échographie reste essentielle, mais la concordance radio-clinique modérée souligne la nécessité de renforcer les

Reçu le : 30 novembre 2025
Accepté le : 21 février 2026

capacités d'imagerie et les protocoles standardisés pour améliorer la précision diagnostique en milieu à ressources limitées.

ABSTRACT

Background: Non-traumatic abdominal emergencies (NTAEs) are a major cause of pediatric consultations in emergency departments. Their atypical presentation complicates diagnosis, especially in resource-limited settings where imaging practices vary.
Objective: This study evaluated the profile of pediatric NTAEs and the concordance between clinical and imaging diagnoses in two regional hospitals in Cameroon.
Material and Methods: A retrospective review was conducted at Buea and Limbe Regional Hospitals from January 2022 to April 2024. Records of children aged 0–15 years presenting with acute abdominal symptoms and who underwent imaging were analyzed. Incomplete records were excluded. Data included socio-demographics, clinical presentation, imaging modalities, and diagnoses. Concordance between clinical and imaging diagnoses was assessed using percentages and Cohen's kappa coefficient.
Results: Among 116 children (mean age 7.1 ± 4.8 years; 55.2% male), school-aged children (6–12 years) were most represented (44.0%). Common symptoms included abdominal pain (63.8%), vomiting (46.6%), and fever (28.4%). Ultrasound was the primary imaging modality (79.3%); CT was rarely used (0.9%). Leading imaging-confirmed etiologies were intussusception (15.5%), peritonitis (14.7%), and hernia (10.3%). Overall concordance between clinical and imaging diagnoses was 52%. Substantial agreement was found for hernia (κ=0.776) and intussusception (κ=0.656), while appendicitis showed moderate agreement (κ=0.543).
Conclusion: Pediatric NTAEs are prevalent in Cameroon, with intussusception and peritonitis as leading causes. Ultrasound remains central to diagnosis due to its accessibility, diagnosis accuracy and innocuity. Moderate clinical and imaging concordance highlights the need to strengthen imaging capacity and standardize pediatric abdominal ultrasound protocols to improve diagnostic accuracy and outcomes in low-resource settings.

1. Introduction

Non-traumatic abdominal emergencies (NTAEs) refer to the sudden onset of acute abdominal pain or related symptoms, not caused by trauma, that require medical or surgical intervention within a short period (typically 48 hours) [1]. They represent one of the most frequent reasons for pediatric consultation in emergency departments (EDs) [2]. Etiologies range from self-limiting conditions to life-threatening pathologies such as acute appendicitis, intussusception, mesenteric lymphadenitis, intestinal obstruction, necrotizing enterocolitis, renal disease, and organ perforation [3].
Clinical presentation and physical examination alone are rarely sufficient for diagnosis. Imaging modalities therefore play a pivotal role in the evaluation and management of children with NTAEs. In France, Lambot et al. reported that approximately 20% of daily imaging requests were for pediatric patients presenting with NTAEs [4]. In the United States, He et al. (2016) estimated that imaging requests for children with NTAEs included ultrasonography (53.6%), computed tomography (28.5%), plain radiography (7.3%), fluoroscopy (5.6%), and magnetic resonance imaging (5.0%) [5].
In sub-Saharan Africa, imaging practices vary widely depending on availability. In Uganda, Sibanda et al. (2020) found ultrasound to be highly sensitive and appropriate for investigating pediatric NTAEs [6]. In Togo, Essobiyou et al. (2023) reported plain abdominal radiography as the most frequently used modality (77.2%), with CT scans unavailable in their setting [7]. In Cameroon, Tambe et al. (2021) showed that ultrasonography and plain radiography were the main modalities used for adults with NTAEs, with ultrasound being the most frequently requested [8].
Despite these findings, best practices for pediatric imaging remain unclear, with ongoing debate regarding the relative roles of ultrasound, plain radiography, CT, and MRI. Each modality differs in accuracy, safety, and cost-effectiveness, with CT scans raising particular concerns due to radiation exposure. Implementing appropriate imaging strategies in children with NTAEs is critical to reducing complications and mortality associated with misdiagnosis.
The aim of this study was to assess the profile of non-traumatic abdominal emergencies in children at Limbe and Buea Regional Hospitals.

2. Material et Methods

2.1 Study area, design and period

This was a retrospective review of records conducted at Buea and Limbe Regional Hospitals between January 2022 and April 2024. These are 02 secondary level hospitals, situated in the south-west region of Cameroon, at about 75 kilometers each from the economic capital Douala. These are reference hospitals in the region, each having a medical imaging center offering services in radiography, ultrasonography and ct-scan, under the

supervision of 02 radiologists in each hospital. Both hospitals have a pediatric unit with 02 pediatricians. They also have each a surgery unit with many surgeons. In Limbe there is a pediatrician surgeon, but no specific pediatric surgery unit.
Data were collected from files of children admitted between January 2022 and April 2024 using a structured, pre-tested data collection form.

2.2 Study population, inclusion, and exclusion criteria

The study included children aged 0–15 years admitted with abdominal pain or related symptoms to the pediatric and surgical units of the two hospitals, provided an imaging diagnosis was available. Each file was reviewed once. Files with incomplete data were excluded.

2.3 Sample size and sampling technique

A minimum sample size of 116 participants was calculated using Cochran's formula:
n = \frac{z^2 p (1-p)}{d^2}
with a 5% margin of error at a 95% confidence level. The proportion of pediatric non-traumatic acute abdomen was estimated from Balachangran et al. (2013) [9]. Sampling was exhaustive and non-probabilistic.

2.4 Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea (Ref: 2023/2181-11/UB/SG/IRB/FHS). Administrative authorization was also obtained from the South-West Regional Delegation of Public Health and the directors of the different hospitals.

2.5 Data collection

Data were collected by the principal investigator using a structured data collection form to capture socio-demographic, clinical, imaging informations. Records of children aged 0–15 years presenting with acute abdominal symptoms managed within 48 hours were reviewed. Only files with an imaging diagnosis were retained, regardless of whether surgery was performed or not. Imaging tests were requested by physicians and performed by radiologists in the respective hospital units. Each file was assigned a unique study identification number to ensure confidentiality.

2.6 Study variables

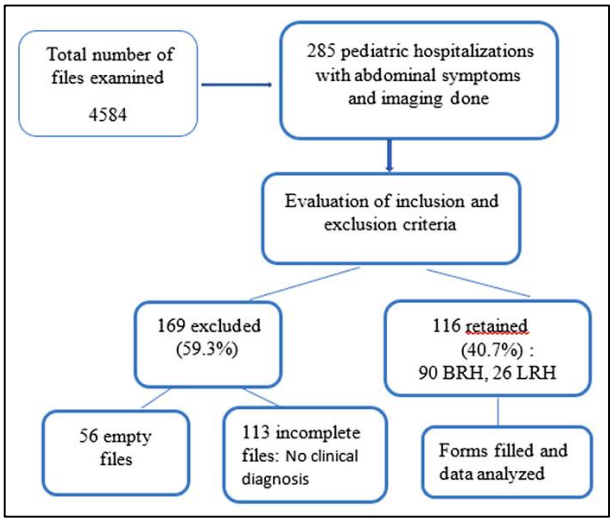
- Independent variables: age, gender.
- Dependent variables: presenting signs and symptoms, clinical diagnosis, type of imaging requested, imaging diagnosis, and concordance between clinical and imaging diagnoses.

2.7 Data management and analysis

Data were entered into Census and Survey Processing System (CSPro) version 7.7, transferred to Microsoft Excel 2016, and analyzed using SPSS version 23. Descriptive statistics (mean, median, frequency, percentage) were computed.
Concordance was calculated as: \text{Concordance (\%)} = \frac{\text{Number of concordant diagnoses}}{\text{Total diagnoses}} \times 100
Cohen's kappa coefficient was used to assess agreement between clinical and imaging diagnoses, ranging from 0 (no agreement) to 1 (perfect agreement).
A 95% confidence interval was applied, and p-values <0.05 were considered statistically significant.

3. Results

A total of 285 files of pediatric hospitalization of children presenting acute abdominal symptoms who had an imaging done, were sort out from 4584 examined files. More than half was excluded for incompleteness **(Figure 1)**.



BRH: Buea Regional Hospital, **LRH**: Limbe Regional Hospital

Figure 1: Flow chart of data collection

3.1 Socio-demographic characteristics

A total of 116 children records were included in this study. The majority were from Buea Regional Hospital (n=90, 77.6%), while 26 (22.4%) were from Limbe Regional Hospital. Males predominated (n=64, 55.2%),

giving a sex ratio of 1.2:1. The mean age was 7.08 ± 4.81 years, with a median of 7 years (IQR: 1.75–11.0). School-aged children (6–12 years) were the most represented group (n=51, 44.0%), followed by toddlers (1–6 years; n=34, 29.3%). Infants and adolescents represented respectively 14.7% and 12.1%. Most caregivers were unemployed (61.2%).

3.2 Clinical characteristics of non-traumatic abdominal emergencies in children

Abdominal pain was the most frequent presenting symptom (n=74, 63.8%). Vomiting was reported in 54 (46.6%), and fever in 33 (28.4%).

On examination, abdominal tenderness was the predominant sign (n=77, 66.4%), Other findings included abdominal distension (25.0%), palpable mass (14.7%), guarding (9.5%), and rigidity (5.2%) **(Table I).**

Clinically, acute appendicitis was the most frequently suspected diagnosis (n=17, 14.7%), followed by intussusception (n=16, 13.8%) and hernia (n=13, 11.2%) **(Table II).**

Table I. Clinical presentation of NTAE in children.

	Categories	Frequency	(%)
Abdominal symptoms	Abdominal pain	74	63.8
	Vomiting	54	46.6
	Fever	33	28.4
	Swollen abdomen	9	7.8
	Constipation	7	6.0
	Currant jelly stools	6	5.2
	Diarrhea	6	5.2
Abdominal signs	Abdominal tenderness	77	66.4
	Abdominal distension	29	25.0
	Palpable abdominal mass	17	14.7
	Abdominal guarding	11	9.5
	Abdominal rigidity	6	5.2

Table II. Commom clinical diagnosis.

Variables	Modalities	Frequency	(%)
Clinical diagnosis	Acute appendicitis	17	14.7
	Intussusception	16	13.8
	Hernia	13	11.2
	Peritonitis	10	8.6
	Acute abdomen	7	6.0
	Others	53	45.7
	Total	116	100

3.3 Imaging requested in non-traumatic abdominal emergencies in children

Ultrasound was the most frequently requested imaging modality (n=92, 79.3%). A combination of ultrasound and plain abdominal radiography was used in 12 cases (10.3%), while plain radiography alone was performed in 11 (9.5%). Only one patient underwent computed tomography (0.9%).

3.4 Etiologies of non-traumatic abdominal emergencies on imaging

Imaging revealed intussusception as the most common etiology (n=18, 15.5%), followed by peritonitis (n=17, 14.7%) and hernia (n=12, 10.3%) **(Figure 2).**

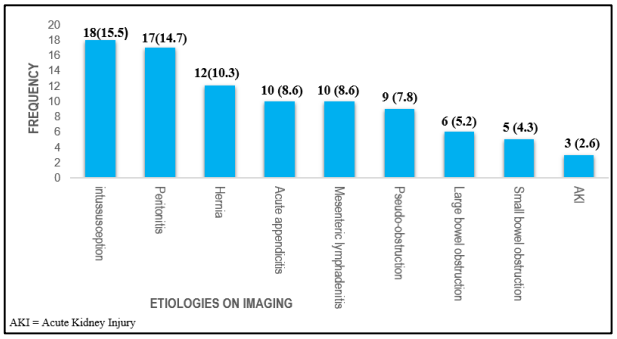


Figure 2: Common etiologies of non-traumatic abdominal emergencies on imaging

Table III. Concordance between clinical and imaging diagnoses

Category	Clinical diagnosis	Imaging diagnosis	Matching diagnosis
Peritonitis	10	17	10
Intussusception	16	18	16
Hernia	13	12	12
Acute appendicitis	17	10	10
Large bowel obstruction	3	3	3
Small bowel obstruction	3	3	3
Mesenteric lymphadenitis	0	10	0
Pyloric stenosis	3	2	2
Pseudo-obstruction	2	9	2
Acute kidney injury	2	2	2
Total (n=116)			52% (60)

3.5 Concordance between clinical and imaging diagnoses

Overall concordance between clinical and imaging diagnoses was 52% (n=60/116). Intussusception showed the highest concordance, with 16 of 18 imaging-confirmed cases correctly suspected clinically. For acute appendicitis, 10 of 17 clinical suspicions were confirmed by imaging. Hernia also demonstrated strong concordance, with 12 of 13 clinical diagnoses confirmed **(Table III).**

3.6 Agreement between clinical and imaging diagnosis using Cohen kappa

Cohen's kappa analysis demonstrated moderate to substantial agreement between clinical and imaging diagnoses for several conditions. Substantial agreement was observed for hernia (κ=0.776, p<0.0001) and intussusception (κ=0.656, p<0.0001). Peritonitis also showed strong agreement (κ=0.709, p<0.0001).

Conversely, small bowel obstruction showed poor agreement (κ=–0.033, p=0.710). Very high agreement was observed for acute kidney injury (κ=0.796, p<0.0001), pyloric stenosis (κ=0.796, p<0.0001), and chronic kidney injury (κ=1.000, p<0.0001) **(Table IV).**

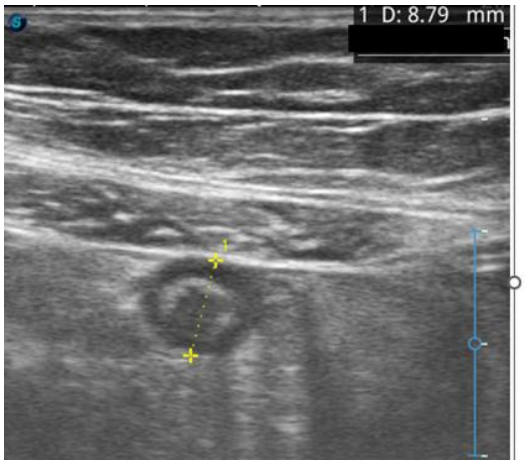


Figure 3: Enlarged and non-compressible appendix in a 12 year-old male on axial plane on abdominal ultrasound

Table IV. Concordance between clinical and imaging diagnoses

Variables		Imaging diagnosis		Kappa coefficient	p-value
Peritonitis		No	Yes	0.709	0.0001
Clinical diagnosis	No	99 (100.0%)	7 (41.2%)		
	Yes	0 (0.0%)	10 (58.8%)		
Intussusception		No	Yes	0.656	0.0001
Clinical diagnosis	No	94 (95.9%)	6 (33.3%)		
	Yes	4 (4.1%)	12 (66.7%)		
Hernia		No	Yes	0.776	0.0001
Clinical diagnosis	No	97 (91.5%)	2 (20.0%)		
	Yes	9 (8.5%)	8 (80.0%)		
Acute appendicitis		No	Yes	0.543	0.0001
Clinical diagnosis	No	67 (100.0%)	0 (0.0%)		
	Yes	0 (0.0%)	10 (100.0%)		
Large bowel obstruction		No	Yes	0.194	0.026
Clinical diagnosis	No	113 (100.0%)	1 (33.3%)		
	Yes	0 (0.0%)	1 (16.7%)		
Acute kidney injury		No	Yes	0.796	0.0001
Clinical diagnosis	No	73 (100.0%)	0 (0.0%)		
	Yes	2 (66.7%)	2 (66.7%)		
Small bowel obstruction		No	Yes	-0.033	0.710
Clinical diagnosis	No	108 (97.3%)	5 (100.0%)		
	Yes	3 (2.7%)	0 (00.0%)		
Pyloric stenosis		No	Yes	0.796	0.0001
Clinical diagnosis	No	113 (99.1%)	0 (0.0%)		
	Yes	1 (0.9%)	2 (100.0%)		
Intraabdominal abscess		No	Yes	0.661	0.0001
Clinical diagnosis	No	75 (100.0%)	1 (50.0%)		
	Yes	0 (00.0%)	1 (50.0%)		
Chronic kidney injury		No	Yes	1.000	0.0001
Clinical diagnosis	No	115 (100.0%)	0 (00.0%)		
	Yes	0 (00.0%)	1 (100.0%)		

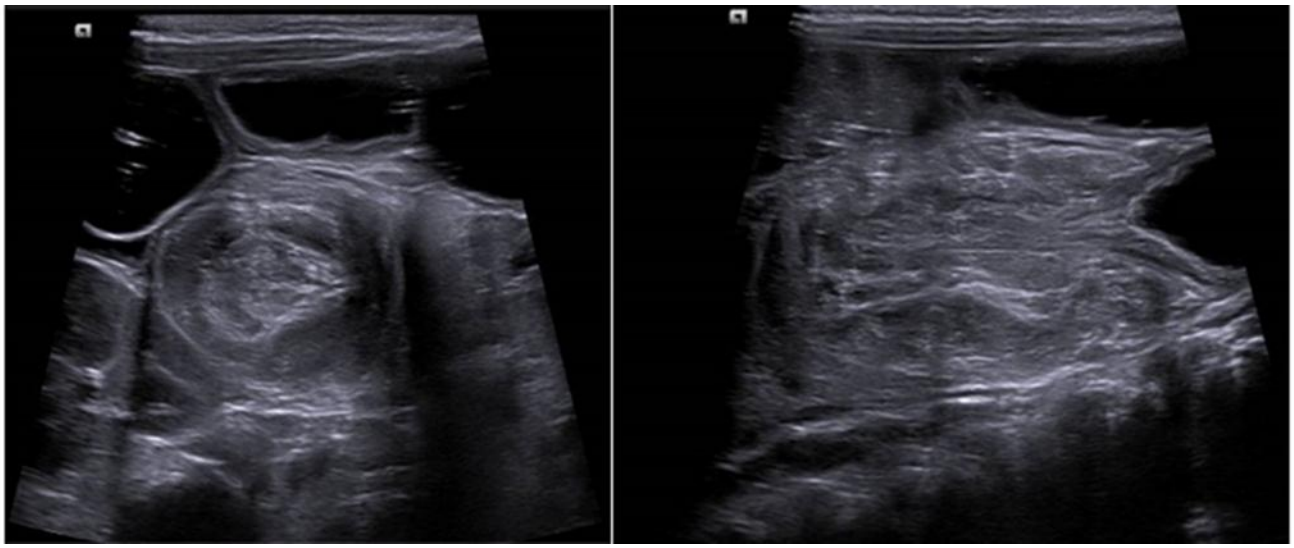


Figure 4: Intussusception in a 3 year-old female presenting with irritability and bloody stools. Abdominal ultrasound in axial plane (target sign) and in longitudinal plane (pseudo-kidney sign)

4. Discussion

This study assessed the profile of non-traumatic abdominal emergencies (NTAEs) in children at two regional hospitals in Cameroon, highlighting the predominance of ultrasound as the imaging modality, the leading etiologies identified, and the moderate concordance between clinical and imaging diagnoses. Our findings underscore the central role of imaging in improving diagnostic accuracy and guiding management in resource-limited settings.

4.1 Socio-demographic characteristics

In our study, males predominated (57.9%) with a sex ratio of 1.4:1. This finding is consistent with Khalid et al. in India, who reported a similar male predominance (57%, sex ratio 1.3) [10]. Conversely, Asse et al. in Côte d'Ivoire observed a female predominance in their cohort, suggesting that sex distribution may vary across populations and could be influenced by genetic, environmental, or healthcare-seeking factors [11].

The median age of 7 years in our cohort was comparable to Sibanda et al. in Uganda (6 years) [6] and slightly lower than Kouadio et al. in Côte d'Ivoire (9 years) [12]. School-aged children (6–12 years) were the most represented group, consistent with Bobossi et al. in the Central African Republic, who reported a mean age of 8.6 years [13]. This predominance of older children may reflect their greater ability to complain about abdominal symptoms, leading to earlier presentation and diagnosis compared to infants and toddlers.Xx

4.2 Clinical presentation

Abdominal pain was the most common presenting symptom, generalized in 31.1% and localized in 24.0% of cases. This aligns with Kouadio et al., who also reported a predominance of generalized abdominal pain (77.6%) [12]. The diffuse nature of pain in children may be explained by their limited ability to localize discomfort, especially in younger age groups. Vomiting (33.4%) and fever (21.9%) were frequent associated symptoms, though at lower rates than those reported by Asse et al. in Côte d'Ivoire (56% and 86.6%, respectively) [11]. Such variations may reflect differences in case mix, severity at presentation, or referral patterns.

Abdominal tenderness was the most common clinical sign, followed by distension (16.4%) and palpable mass (15.3%). In contrast, Essobiyou et al. in Togo [7] found abdominal guarding to be the most frequent sign, likely because their study population included only surgical NTAEs. This highlights how study design and inclusion criteria can influence the clinical spectrum observed.

4.3 Imaging practices

Imaging was performed in all patients, with ultrasound being the most frequently requested modality (79.3%). Plain abdominal radiography was used in 20.5% of cases, while CT was rarely performed. A combination of ultrasound and plain abdominal radiography was used in 12 cases (10.3%). Several studies have highlighted the relevance of combining radiography and ultrasound for the rapid diagnosis of non-traumatic acute abdominal

pain in both pediatric and adult populations [14–17]. Although these two modalities are less sensitive than CT scanning, they remain complementary in settings with limited resources, lack of CT availability, and concerns about minimizing exposure to ionizing radiation—particularly in children.

The predominance of use of ultrasonography reflects both its accessibility and its advantages in pediatric populations: absence of ionizing radiation, non-invasiveness, and relatively low cost. Similar findings have been reported in Uganda, where ultrasound demonstrated high sensitivity for common pediatric abdominal emergencies [6]. These findings are concordant with literature [18] which describes ultrasonography as the preferred initial imaging in pediatric patient, thus reinforcing the role of ultrasound as the cornerstone of pediatric abdominal imaging especially in resource-limited settings.

4.4 Etiologies and diagnostic concordance

On imaging, intussusception was the most common etiology (15.5%), followed by peritonitis (14.7%) and hernia (10.3%). This pattern is consistent with Mishra et al. in India, and Nyaga et al. in Kenya who also identified intussusception as main diagnosis on ultrasound [19,20]. In their study N'goran et al. found as main etiology of NTAE, appendicitis, peritonitis and intussusception, but all their participants underwent a laparotomy [17].

Clinically, there was no suspicion of mesenteric lymphadenitis. But it was diagnosed on ultrasound with same frequency as acute appendicitis for which it is the main non-surgical differential diagnosis. For Mehrotra et al, ultrasonography is the best tool to rapidly differentiate mesenteric lymphadenitis from acute appendicitis; and thus avoid an unnecessary surgical intervention [21].

Overall concordance between clinical and imaging diagnoses was 52%, comparable to Akanni et al in Benin (52.31%) and Kouadio et al. in Côte d'Ivoire (55%) [12,22]. This is not in accordance with Bah et al. in Guinee who found a clinic-radiological concordance of about 70%, but most of the participants were adults, CT scanning was performed for 20% of the participants and all of them underwent a surgical procedure [16].

Substantial agreement was observed for hernia and intussusception, while appendicitis showed only moderate concordance. This suggests that while clinical suspicion remains valuable, imaging is indispensable for confirming diagnoses and avoiding misclassification. The moderate concordance also reflects the inherent diagnostic challenges in pediatric populations, where overlapping symptoms often obscure the underlying pathology.

4.5 Strengths and limitations

This study provides recent data on pediatric NTAEs in South-West Cameroon, covering two major referral hospitals. However, its retrospective design limited the completeness of data, and the very small number of CT cases precluded meaningful comparisons across modalities. Although our study assessed concordance and agreement between clinical and imaging diagnoses, we were unable to calculate sensitivity and specificity for the different imaging modalities. This limitation is due to the absence of a definitive gold standard, such as surgical or histopathological confirmation, against which imaging findings could be compared. Future prospective studies incorporating surgical outcomes or long‑term follow‑up would be valuable to establish the sensitivity, specificity, and predictive values of ultrasound and other imaging techniques in pediatric non‑traumatic abdominal emergencies. Such data would provide stronger evidence to guide imaging protocols and optimize resource allocation in similar settings.

5. Conclusion

Pediatric non-traumatic abdominal emergencies are common in our setting and remain a diagnostic challenge. Ultrasound is the first-line imaging modality for pediatric NTAEs in resource-limited settings, given its safety, accessibility, and diagnostic yield. Intussusception emerged as the leading etiology, and while clinical suspicion remains important, imaging significantly improves diagnostic accuracy, particularly for conditions such as peritonitis, acute appendicitis and mesenteric lymphadenitis. Strengthening imaging capacity and protocol guidelines could reduce misdiagnosis, improve outcomes, and guide evidence-based policy for pediatric emergency care in Cameroon.

Conflict of interest

The authors declare no conflict of interest

6. Références

1. Carty HML. Paediatric emergencies: non-traumatic abdominal emergencies. Eur Radiol. 2002;12:2835–48. https://doi.org/10.1007/s00330-002-1499-7

2. Dubuisson V, Voïglio EJ, Grenier N, Le Bras Y, Thoma M, Launay-Savary MV. L'imagerie des urgences abdominales non

traumatiques de l'adulte. J Chir Viscérale. 2015;152:S57–64.. https://doi.org/10.1016/j.jchirv.2015.09.011

3. Tawil MI. Pediatric Emergencies: Non-traumatic Abdominal Emergencies. In: Marincek B, Dondelinger RF, editors. Emerg Radiol [Internet]. Berlin, Heidelberg: Springer Berlin Heidelberg; 2007 [cited 2025 Oct 24]. p. 621–45. https://doi.org/10.1007/978-3-540-68908-9_32

4. Lambot K, Lougue-Sorgho L, Gorincour G, Chapuy S, Chaumoitre K, et al. Les urgences abdominales non traumatiques de l'enfant. J Radiol. 2005;86:223–33. https://doi.org/10.1016/S0221-0363(05)81350-2

5. He L, Park E, Vachhani N, Vogelius E, Thupili C, Udayasankar U. Acute abdominal pain in children: usefulness of three-view abdominal radiographs in the emergency department. Emerg Radiol. 2016;23:469–75. https://doi.org/10.1007/s10140-016-1423-0

6. Sibanda T, Byanyima RK, Bugeza S, Sekabira J. Sonographic Findings of Non Traumatic Acute Abdomen in Pediatric Patients at Mulago Hospital. EAS J Radiol Imaging Technol. 2020;2(2):27-31.

7. Essobiyou TB, Kebalo S, Ouedraogo S, Keheou A, Issa M, Gnassingbe K, et al. Non-traumatic abdominal surgical emergencies in children in Dapaong (TOGO). Int J Surg Open. 2023;60:100697. https://doi.org/10.1016/j.ijso.2023.100697

8. Tambe J, Weledji E, Onana Y, Chichom A, Moifo B. Imaging of non-traumatic abdominal emergencies in adults at limbe regional hospital: a qualitative survey of frontline physicians. Rev. Med. Pharm. 2021;11(2):XXX-XXX

9. Balachandran B, Singhi S, Lal S. Emergency management of acute abdomen in children. Indian J Pediatr. 2013;80:226–34. https://doi.org/10.1007/s12098-013-0991-1

10. Khalid M, Redhu N, Nazir B, Khalid S, Chana RS, Jha A. Diagnostic value of ultrasonography in evaluation and management of acute abdominal conditions in the paediatric age group. Afr J Paediatr Surg AJPS. 2012;9:198–201. https://doi.org/10.4103/0189-6725.104719

11. Aka A, Asse K, Plo K, Yao K, Yeboua K, Yenan J. Les étiologies médicales des douleurs abdominales de l'enfant a Bouake (Cote d'ivoire). Rev Int Sci Méd Abidj. 2014;31–6.

12. Bobossi-Séréngbé G, Gaudeuille A, Soumouk A, Gody J.C, Yassibanda S, Mandaba J.L Les douleurs abdominales aiguës chez l'enfant au complexe pédiatrique de Bangui (Centrafrique)Aspects épidémiologiques, cliniques, paracliniques, thérapeutiques et évolutifs. Arch Pédiatrie. Elsevier Masson; 2002;9:136–41. https://doi.org/10.1016/S0929-693X(01)00721-7

13. Kouadio AF, Bravo TAB, Tanoh TKE, Kouassi KPB-fils, Konate I, N'Dri K. Douleurs abdominales non traumatiques de l'enfant : place de l'échographie dans la prise en charge au CHU de Bouake (Côte d'Ivoire). Revue Internationale des Sciences Médicales d'Abidjan. 2022;24(2):168-174.

14. Neossi GM, Alpha ZF, Maffo PG, Bouche L, Tcheliebou JM, Moifo B. Valeur du couple ASP-Echo dans le diagnostic étiologique des abdomens aigus chirurgicaux en l'absence de scanner. J Afr Imag Méd 2018; 10(4):205-211.

15. Keneth NN, Cumber SN, Nancy B, Jaila S, Ndenkeh JJN, Kinyuy MN. Comparative Study Between Plain Abdominal X-Ray and Abdominal Ultrasound in the Diagnosis of Abdominal Pathologies at the Bafoussam Regional Hospital Cameroon. *World Journal of Public Health.* 2017;2(1):8-17. doi: 10.11648/j.wjph.20170201.12.

16. Bah OA, Diallo M, Keita AS, Balde AA, Diallo AT, et al. Concordance clinico-radiologique et radio-chirurgicale dans le diagnostic des urgences abdominales chirurgicales non traumatiques en Guinée. J Afr Imag Méd 2023; 15(3):191-196. DOI 10.55715/jaim.v15i3.522

17. Kouamé N, Dieth AG, Soumma A, Manewa FS, Ngoan-Domoua A-M, Ngbesso RD. Management of Non-Traumatic Acute Abdominal Pain in Children: The Couple Standard Radiography/Ultrasound, Is It Still Relevant? OALib. 2016;03:1–5. https://doi.org/10.4236/oalib.1102084

18. Hijaz N, Friesen C. Managing acute abdominal pain in pediatric patients: current perspectives. Pediatr Health Med Ther. 2017;Volume 8:83–91. https://doi.org/10.2147/PHMT.S120156

19. Mishra DS, Magu S, Sharma N, Rattan KN, Tewari AD, Rohilla S. Imaging in acute abdomen. Indian J Pediatr. 2003;70:15–9. https://doi.org/10.1007/BF02722736

20. Nyaga E, Ndungu J. Acute Non-Traumatic Abdominal Pain in Childhood at Kenyatta National Hospital, Kenya. Ann Afr Surg [Internet]. 2011 [cited 2025 Oct 24];6. https://doi.org/10.4314/aas.v6i1.63231

21. Kela Mehrotra G, Gupta A, Jain P, Mulye S. Study profile of recurrent abdominal pain in children examined by clinical examination and ultrasonography. J Evol Med Dent Sci. 2018;7:860–3. https://doi.org/10.14260/jemds/2018/196

22. Akanni DW, Adjadohoun SB, Agaï Kodjo JB, Lokossou L, Adjanayo AS, Savi De Tové KM. Douleurs abdominales aiguës non traumatiques : analyse de la concordance radio-clinique des causes à Parakou. J Afr Imag Méd. 2025;17:68–74. https://doi.org/10.55715/jaim.v17i2.770