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Research Article

Pediatric Appendicitis Score in Evaluation of the Diagnosis of Childhood Appendicitis at Children's hospital, Vientiane Laos, PDR

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Abstract

Background: Accurate and timely diagnosis of appendicitis in children remains difficult and challenging for pediatric surgeons and other medical care specialists. Pediatric Appendicitis Score (PAS) is a scoring system which includes Symptoms, Physical Signs and laboratory examination. The aim of this study was to evaluate the diagnostic value of Pediatric Appendicitis Score and to aid early diagnosis of appendicitis in children.
Methods: A prospective study was done in Children's Hospital, Surgery department including children age 3-14 years old with abdominal pain where acute appendicitis was suspected, The patients were admitted during the study period, January 2022 to July 2024, Group 1, 120 patients explored for appendicitis with PAS 5 or above, and Group 2, 30 no operative patients observed for abdominal pain with PAS between 1-5. SPSS 23.0 was used to analyze data.
Result: 120 patients from group 1 with appendicitis, PAS 5: 3.3%, PAS 6: 3.3%, PAS 7: 5%, PAS 8: 20%, PAS 9: 30.8%, PAS 10: 37.5%, PAS mean: 8.84. Post operation diagnosis was acute appendicitis: 97.5%, only 3 case 2.5% was false positive for acute appendicitis; Type of appendicitis 4.3% were inflamed, 59.8% were suppurative, gangrenous were 3.4%, perforate 32.5%. 30 patients Group 2 with nonoperative patients observed for abdominal pain, PAS from 2-5, PAS 2: 20%, PAS 3: 43.3%, PAS 4: 33.3%, PAS 5: 3.3%, PAS mean: 3.2.
Conclusion: Pediatric Appendicitis Score is a simple, relatively valuable diagnostic tool for identifying childhood appendicitis. PAS ≤ 3 suggest it is not appendicitis, PAS 4-6 may be appendicitis, PAS ≥ 7 almost diagnostic for acute appendicitis, We recommend using this scoring system in heath care centers and provincial hospital so in Laos.

1. Introduction

Acute appendicitis is an inflammatory process involving the appendix. It is the surgical emergency and one of the most common causes of abdominal pain, particularly in children [1, 2]. A diagnosis estimated 1 to 8 percent of children evaluated urgently for abdominal pain, at a rate of 4 per 1,000 children under the age 14 years [3, 4], A definitive diagnosis of acute appendicitis is made only 50%-70% of children at the time of initial assessment. A Delayed diagnosis and treatment of acute appendicitis are an increased rate peritonitis due to perforation of

appendix above 20%, prolonged hospital stay, delayed return to the normal activities of children and risk of rate adhesive bowel obstruction [5–7].

The accuracy diagnosis of appendicitis in children is very challenged because many presents of physical symptoms and signs are resembled other common abdominal. They often lack of classic clinical features seen in adults. This poses a challenge for the doctor in making accuracy and timely diagnosis.

The diagnostic accuracy of pediatric appendicitis may be enhanced by the integration of objective clinical feature including, symptoms, signs and laboratory test. A few clinical scoring systems have been developed and used to diagnose appendicitis with variable benefits. The most popular for used in children being Samuel's Pediatric Appendicitis Score (PAS). Improving the clinical doctor permeance.

Children came to doctor with complaints of abdominal pain, it's a doctor's dilemma to confirm if the child is having appendicitis or not, in those cases, PAS score would be helpful. The aim of this study was to evaluate the diagnostic value of Pediatric Appendicitis Score and to aid early diagnosis of appendicitis in children.

2. Methods

2.1. Settings and children

The prospectively collected database of all children admitted in Children's Hospital, Surgery department including children age 3-14 years old with abdominal pain where acute appendicitis was suspected, the patients were admitted during the study period, January 2022 to July 2024. In the studied was divided patient into two groups. Group 1, 120 patients explored for appendicitis with Appendicitis Score (PAS) 5 or above, and Group 2, 30 nonoperative patients observed for abdominal pain with PAS score in between 1 to 5.

2.2. Study design

This study is a retrospective study. All children age 3-14 years who admitted to Surgery department, Children's Hospital between January 2022 to July 2024. Pediatric appendicitis score was used to record patient symptom, physical sign, laboratory investigation including radiology and histopathological. Patient history and characteristic was record with patient recorded by gender, age, living location and abdominal examination. PAS was calculate for each patient, PAS consists of eight parameters: (1) migration of pain, (2) anorexia, (3) Nausea, (4) tenderness, (5) debounce tenderness, (6) fever, (7) WBC more than 10.000 lecocytosis, (8) Neutrophilia more than 75% each parameter is assigned score 1 to 10. PAS score more than 7 is clarify as mostly appendicitis require for surgery criteria. Children who admitted with abdominal pain suspected appendicitis, the history, clinical examination and laboratory investigation was done as per the protocols in department. PAS was applied to all the children. The decision to operate or not was taken by the surgeon based on the PAS (Table 1).

1-3 is classify as a symptom
4-6 is classify as a physical sign
7-8 is classify as a laboratory investigation
PAS 0-3: No appendicitis, can be discharge
PAS: 4-6 Maybe appendicitis, required further imagine/repeated evaluation
PAS$\geq$ 7 Mostly appendicitis, Required Surgery.

Table 1: Pediatric appendicitis score included the following criteria Migration of abdominal pain: it refers to the migration of pain from the peri umbilical to the right lower quadrant

S.No	Clinical feature (Symptoms, sign and Laboratory)	Score
1	Migration of abdomian pain	1
2	Anorexia	1
3	Nausea/vomiting	1
4	Tenderness in right lower quadrant	2
5	Debounce tenderness/Cough/percussion pain at right lower quadrant	2
6	Fever more than 37.8c	1
7	WBC More than: 10,000 (Lecocytosis)	1
8	Neutrophilia more than 75%	1
	Total	**10**

2.3. Statistically consideration

SPSS 23.0 was used to analyze data. Descriptive was used to analyze mean, percentage and Standard deviation.

3. Results

The study group (group 1) 120 patients with appendicitis, average age: 8.78-years, age distribution shows in Figure 1. Male 47 (39.2%), Female 73 (60.8%),.

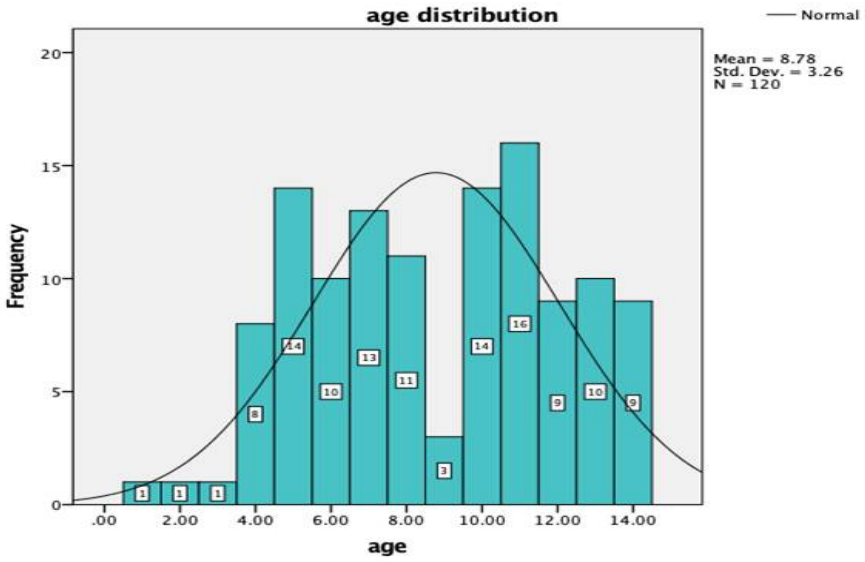

Figure 1: Age distribution

Total number of 120 chidren was report for the PAS score. PAS score 5 was recorded 3.3%, PAS score 6 was recorded 3.3%, PAS score 7 was 5.0%, PAS score 8 was 20.0%, PAS score 9 was 30.8%, PAS score 10 was 37.5%, the PAS score is high is also found that more number of children. And the mean score of PAS was 8.84 which clarify for require urgent surgeon Figure 2.

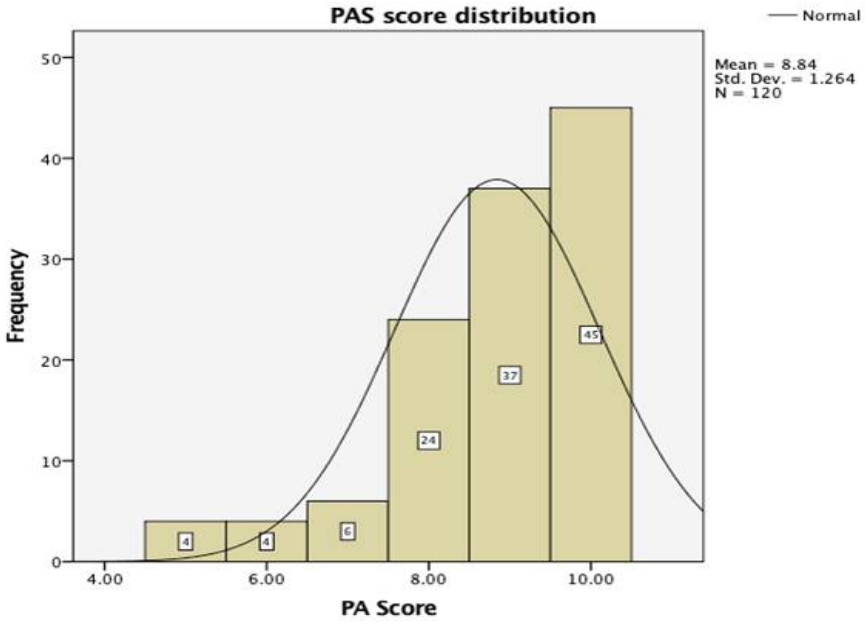

Figure 2: Show the PAS score distribution

Symptoms and Laboratory data shows in table 2 prevalence of symptoms by Migration of abdominal pain was 87.5%, Tenderness in right lower quadrant was 99.2%, Debounce tenderness was 95%, vomiting/nausea was 93.3% and Laboratory found that the WBC more than 10,000 (Lecocytisis) was 90%. All positive sign symptom and laboratory indicate the urgent treatment for children and young adults.

Table 2: Symptoms and signs and laboratory finding for all children

No	Clinical feature (symptoms, signs and laboratory	Present (N=120)	
		N	%
1	Migration of abdominal pain	105	87.5
2	Anorexia	96	80.0
3	Neusea/Vomiting	100	93.3
4	Tenderness in right lower quadrant	119	99.2
5	Debounce tenderness/ Cough/Percussion pain at right lower quadrant	114	95.0
6	Fever more than 37.8°c	84	70.0
7	WBC more than: 10.000 (Lecocytosis)	108	90.0
8	Neutrophilia more than 75%	105	87.5

Table 3. In the appendicitis group, PAS 7-10: with the Tendderness at RLQ was 112 (93.33%), PAS 4-6: 6 (5.0%) with Neutrophilia more than 75%, No PAS ≤ 3, only 3 cases of PAS 4-6 was negative of appendicitis.

Table 3: Summaries of Group 1, PAS score with the clinical feature of appendicitis score

Clinical feature		PAS 0-3	PAS 4-6 (8 cases)	PAS 7-10 (112 cases)
Migration of abdominal pain	Present	NA	4 (3.33%)	101(84.1%)
	No	NA	4(3.33%)	11(9.16%)
Anorexia	Present	NA	3(2.5%)	94(78.33)
	No	NA	5(4.16%)	18(15%)
Nausea/Vomiting	Present	NA	3(2.5%)	97(80.83)
	No	NA	5(4.16%)	15(12.5%)
Tenderness at RLQ	Present	NA	5(4.16%)	112(93.33)
	No	NA	3(2.5%)	0
Rebounce tenderness/Cough/ percussion pain at RLQ	Present	NA	5(4.16%)	109(90.8%)
	No	NA	3(2.5%)	3(2.5%)
Fever more than 37,8°C	Present	NA	1(0.83%)	83(69.1%)
	No	NA	7(5.83%)	29(24.1%)
WBC More than: 10,000 (Lecocytosis)	present	NA	5(4.16)	97(80.83%)
	No	NA	3(2.5%)	15(12.5%)
Neutrophilia more than 75%	Present	NA	6(5.0%)	100 (83.33%)
	No	NA	2(1.67%)	12(10%)

Diagnosis was acute appendicitis: 97.5%, only 3 case 2.5% was false positive for acute appendicitis; Type of appendicitis 4.3% were inflamed, 59.8% were suppurative, gangrenous were 3.4%, perforate 32.5%. 30 patients Group 2 with nonoperative patients observed for abdominal pain, PAS from 2-5, PAS 2: 20%, PAS 3: 43.3%, PAS 4: 33.3%, PAS 5: 3.3%, PAS mean: 3.2. most of patients was reported for Anorexia 86.7%, Neusea/Vomiting 63.3%, WBC more than 10.000 (Lecocytosis) was 53.3% and Neutrophilai more than 75% was 43.3%.

Table 4: Symptoms and signs and laboratory finding for non-operative (Group 2) patients observed (30 cases)

No	Clinical feature (symptoms, signs and laboratory	Present		Not present	
		N	%	N	%
1	Migration of abdominal pain	5	16.7	25	83.3
2	Anorexia	26	86.7	4	13.3
3	Neusea/Vomiting	19	63.3	11	36.7
4	Tenderness in right lower quadrant	7	23.3	23	76.7
5	Debounce tenderness/ Cough/Percussion pain at right lower quadrant	1	3.3	29	96.7
6	Fever more than 37.8°C	9	30.0	21	70.0
7	WBC more than: 10.000 (Lecocytosis)	16	53.3	14	46.7
8	Neutrophilia more than 75%	13	43.3	17	56.7

4. Discussion

Our prospective validation study of the PAS using a sample of children aged 3-14 years presenting with abdominal pain suggestive of appendicitis and have operation at our department. we had done reproduce the PAS reported by history charge and operation note of the patients. PAS is a scoring system which included symptomatology, physical signs and laboratory investigation in children where acute appendicitis is suspected. This scoring system was first reported by Madan Samuel, after doing a study on 1170 children in London for a period of 5 years. Based on his study, PAS ≤ 5 indicated no appendicitis, PAS: 6 meant appendicitis, and PAS ≥ 7 meant there were more possibility of appendicitis [8, 9].

Our study, Migration pain, anorexia, nausea/vomiting, tenderness at right lower quadrant, rebounded tenderness/cough pain at right lower quadrant, fever, high white blood cell with Neutrophilia were the most clinical feature presented in appendicitis which is consistently

to other study. But in our study, we found that pain or tenderness at the right lower quadrant especially over the McBurney's point had a good diagnostic (93.3%) in all 120 cases of appendicitis.

In the appendicitis group, PAS 7-10: 112 (93.33%), PAS 4-6: 8 (6.66%), No PAS $\leq$ 3, only 3 cases of PAS 4-6 was negative of appendicitis. We have found that the peritonitis rate is 35.7% (gangrenous 3.4%, perforate 32.5%), which is comparable to other reported. In Nonacute appendicitis group PAS mean: 3.2, most of the case are anorexia (86.7%), nausea (63.3%), leukocytosis (53.3%), neutrophilia (43.3%) which may present in other disease.

When highly suspected appendicitis but the PAS 4-6, imagine of ultrasound may be helping to confirm the diagnosis of children appendicitis. Our study in appendicitis group, only 44(36.7%) has perform ultrasound to help diagnosis of appendicitis. Elahi far MA reported that positive ultrasound is indicative of appendicitis, but a negative ultrasound does not rule out appendicitis [10, 11].

5. Conclusion

Pediatric Appendicitis Score is a simple, relatively valuable diagnostic tool for identifying childhood appendicitis. PAS $\leq$ 3 suggest it is not appendicitis, PAS 4-6 may be appendicitis, ultrasound maybe need to perform to help diagnosis of appendicitis. PAS $\geq$ 7 almost diagnostic for acute appendicitis, we recommend using this scoring system in heath care centers and provincial hospitals in Laos.

Article Information

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Author Contributions: Vongphet Soulithone - Conceptualization, Writing – original draft, Writing – review & editing, Supervision; Virasack Rajpho - Methodology, Phutthasone Zathnam - Data curation; Souksavanh Sithanonxay - Formal analysis.

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Competing Interests: Authors have declared that no competing interests exist.

Ethical Approval: Required for human or animal studies.

- Name of Ethics Committee/IRB: University of Health Sciences
- Approval number: 144
- Date of approval: 23/07/2024

The study was approved by the Medical Ethics Committee of the University of Health Sciences (Approval No. IEC/2024/144). Parent was given a consent form in plain language, which was allowed them to assess the benefits and risks of letting their children to participate in the study. Only children with signed consent forms were participated. The clinical examination was assessed sign symptom, ultrasound, blood test to evaluated the level of abdominal pain.

Information obtained from the clinical examination and the questionnaire were kept confidential and no report or publication was allowed the reader to identify the study participants.

Informed Consent: Written informed consent was obtained from all participants. Parent or caretaker was asked to sign the consent from for the participant of the study and clinical treatment. The Information was published without my name/child's name/relatives name attached and every attempt was made to ensure anonymity. This study was recoded the information for sign symptoms. The researcher has informed the patient of the contact information in case problem. Researcher had advised the patient (or legal representative) that he/she may withdraw from the study at any time during the study period without any reason.

Data Availability Statement: Data available on reasonable request. This is the real history of children appendicitis who had sign symptom and abdominal pain only parental who can approve for data used.

Clinical Trial Registration: This study was the Routine to research. This data will be database for continue of Clinical Trial or case comparison with surgeon and non-surgeon by using PAS score to evaluate the severity of children appendicitis.

Reporting Guidelines Statement: STROBE (observational studies).

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

References

[1] Samuel M. Pediatric appendicitis score. *Journal of Pediatric Surgery. This original study established the 8-parameter scoring system. J Pediatr Surg*, 37(6):877–881, 2002. doi: 10.1053/jpsu.2002.32893.

[2] R. D. Goldman, S. Carter, and Antoon Stephens D. Prospective validation of the pediatric appendicitis score. *The Journal of Pediatrics*, 153(2):278–282, 2008. doi: 10.1016/j.jpeds.2008.01.033.

[3] M. Bhatt, L. Joseph, M. F. Ducharme, G. Dougherty, and D. McGillivray. Prospective validation of the pediatric appendicitis score in a Canadian pediatric emergency department. *Acad Emerg Med*, 16(7):591–596, 2009. doi: 10.1111/j.1553-2712.2009.00445.

[4] M. Bhatt, L. Joseph, M. F. Ducharme, and G. Dougherty. Prospective study of the pediatric appendicitis score in a Canadian pediatric emergency department. *Academic Emergency Medicine*, 16(7):591–596, 2009. doi: 10.1111/j.1553-2712.2009.

[5] D. Badebarin and Aslanabadi Parsay S. Alvarado vs. Pediatric Appendicitis Score (PAS) in Acute Appendicitis of Children. *Iranian Journal of Pediatric Surgery*, 6(1):1–9, 2020. URL https://doi.org/10.22037/irjps.v6i1.31696.

[6] A. B. Kharbanda, G. V. Benitez, D. W. Ballard, D. R. Vinson, U. K. Chettipally, M. V. Kene, S. P. Dehmer, R. G. Bachur, et al. Development and Validation of a Novel Pediatric Appendicitis Risk Calculator (pARC). *Pediatrics*, 141(4):e20172699, 2018. doi: 10.1542/peds.2017-2699. PMC5869337 PMID: 29535251.

[7] R. Raeisi, M. Azizi, J. Amiri, M. Ghorbanpour, and Esna-Ashari F. Accuracy Evaluation of Pediatric Appendicitis Scoring (PAS) Method in Differentiating Nonspecific Abdominal Pain from Appendicitis. *Int J Prev Med*, 14:40, 2023. doi: 10.4103/ijpvm.ijpvm_539_21.

[8] M. Prada Arias, A. Salgado Barreira, M. Montero Sánchez, et al. Appendicitis versus non-specific acute abdominal pain: Evaluation of the Pediatric Appendicitis Score. *Anales de Pediatría. An Pediatr (Engl Ed)*, 88(1):32–38, 2018. doi: 10.1016/j.anpedi.2017. PMID: 28254168.

[9] M. Salö, G. Friman, P. Stenström, B. Ohlsson, and E. Arnbjörnsson. Appendicitis in Children: Evaluation of the Pediatric Appendicitis Score in Younger and Older Children. *Surg Res Pract*, page 438076, 2014. doi: 10.1155/2014/438076. PMID: 25574500. PMC4276704.

[10] O. A. Sayed, S. N. Zeidan, N. D. Fahmy, and A. H. Ibrahim. Diagnostic reliability of pediatric appendicitis score, ultrasound and low-dose computed tomography scan in children with suspected acute appendicitis. *Ther Clin Risk Manag*, 13:847–854, 2017. doi: 10.2147/TCRM.S134153. PMID: 28740395,PMC5505679.

[11] J. Salim, F. Agustina, and J. J. Roberth-Maker. Pre-Coronavirus Disease 2019 Pediatric Acute Appendicitis: A Multicenter Study in Indonesia" Pediatric Gastroenterology, Hepatology & Nutrition. This study analyzes PAS usage in children under 5 years of age within the Indonesian healthcare system. *Pediatr Gastroenterol Hepatol Nutr*, 25(1):30–40, 2022. doi: 10.5223/pghn.2022.25.1.30. PMID: 35087731. PMC8762600.