



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

**PREVALENCE AND RISK FACTORS OF PERFORATED APPENDICITIS AMONG
CHILDREN ADMITTED TO SPHMMC SURGICAL WARD: A THREE YEARS
RETROSPECTIVE ANALYSIS (2013-2015G.C)**

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**A RESEARCH REPORT TO BE SUBMITTED TO DEPARTMENT OF PUBLIC
HEALTH OF SPHMMC AS A PARTIAL REQUIREMENT OF FOR FULFILLMENT
OF DEGREE OF DOCTOR OF MEDICINE**

Sept, 2017

ADDIS ABABA, ETHIOPIA



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LIST OF ACRONYMS AND ABBREVIATION

CBC-Complete Blood Count

CT-Computed Tomography

PR- Pulse rate

RLQ-Right Lower Quadrant

SPHMMC-St Paul's Hospital Millennium Medical College

SPSS-Software Program for Social Science

TAH-Tikur Anbessa Hospital

WBC-White Blood Cell

ABSTRACT

Background: Appendicitis is the most common indication for abdominal surgery in children presenting to the emergency department. Because of the frequently atypical presentation of appendicitis in children, delayed diagnosis is common. Although the risk decreases with age, perforation has been reported in more than three quarters of children in the first 4 years of life at the time of surgery. The special diagnostic challenges of appendicitis in children, along with the greater dangers of misdiagnosis, delay and perforation, make swift and accurate diagnosis of appendicitis essential for emergency clinicians.

Objective: To assess the prevalence and risk factors for perforation of appendix among pediatric patients with acute abdomen admitted to SPHMMC surgical ward in the years 2013-2015 G.C.

Methods and materials: This study was a retrospective analysis of children ages 2-16 years with the diagnosis of acute appendicitis and admitted to SPHMMC in 2013-2015. 246 patient's charts were selected. Data was collected from charts of patients in the study population using data collection instrument. Data from charts was entered to SPSS 21.0 analyzed for different socio-demographic variables were done.

Result and conclusion: Among 246 study subjects the range was from 5 to 16 with mean of 10.7 ± 2.9 years. 100% of the total study subjects had abdominal pain. Of the total patients, 92.7% had vomiting during their presentation. Among the study subjects 43.5% were febrile. 60.6% of the study subjects had tachycardia. RLQ tenderness was present in all 246 of the study subjects while rebound tenderness was detected in 90.7%. Bowel sound was active in 82.5% while decreased/absent in 17.5% of the study subjects. Among these children 53.2% and 2.8% had leukocytosis and leukopenia respectively. 62.2% had neutrophilia. Among the patients operated for acute appendicitis 61.3% were initially assessed and operated for simple acute appendicitis. 4.5% were admitted with assessment of perforated appendix. Intraoperative findings of the study subjects show that 62.6% had simple appendicitis while 25.2% had perforated appendix found intraoperatively. The post-operative course of 87% was uneventful and children were discharged improved. 3.3% of children in this study died. The duration of hospital stay ranged from 2 to 28 days. Presence of tachycardia, duration of symptoms, presence of absence/decreased bowel sound and neutrophilia has statistically significant association with perforation of appendix.

Recommendation: It is recommended that the hospital administrator should use allocated resources based on this result. Clinicians are recommended to have early diagnosis to avoid

perforation of appendix. Other researchers are recommended to perform similar researches on the area.

Key words: acute appendicitis, perforation, SPHMMC, children

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1. INTRODUCTION

Background:

Acute appendicitis is acute inflammation and infection of the vermiform appendix. The vermiform appendix is generally 5-10 cm in length. It blind-ending structure arising from the cecum, which in most children is located in the right lower quadrant of the abdomen. Although the base of the appendix is fixed to the cecum, the tip can be located in the pelvis, retro cecum, or extra peritoneum. The anatomic position of the appendix determines the symptoms and the site of tenderness when the appendix becomes inflamed (1).

The appendix is lined by typical colonic epithelium. The sub mucosa contains lymphoid follicles, which are very few at birth. This number gradually increases to a peak of about 200 follicles at age 10-20 years and then subsequently declines. In persons older than 30 years, less than half that number is present, and the number continues to decrease throughout adulthood(1).

The main cause of acute appendicitis is obstruction of the blind ending appendix, resulting in a closed loop. In children, obstruction usually results from lymphoid hyperplasia of the submucosal follicles. Another common cause of obstruction of the appendix is a fecalith(hard stool). Rare causes include foreign bodies, parasitic infections (eg, nematodes) and inflammatory strictures(1).

Once the appendix becomes obstructed, bacteria trapped within the appendiceal lumen begin to multiply, and the appendix becomes distended. The increased intraluminal pressure obstructs venous drainage, and the appendix becomes congested and ischemic. The combination of bacterial infection and ischemia produce inflammation, which progresses to necrosis and gangrene. When the appendix becomes gangrenous, it may perforate. The progression from obstruction to perforation usually takes place over 72 hours (2).

Appendiceal perforation is more common in children, specifically younger children, than in adults. A substantial risk of perforation within 24 hours of onset was noted (7.7%) and was found to increase with duration of symptoms. While perforation was directly related to the duration of symptoms before surgery, the risk was associated more with prehospital delay than with in-hospital delay (2).

During the initial stage of appendicitis, the patient may feel only periumbilical pain due to the T10 innervation of the appendix. As the inflammation worsens, an exudate forms on the appendiceal serosal surface. When the exudate touches the parietal peritoneum, a more intense and localized pain develops (2).

Perforation results in the release of inflammatory fluid and bacteria into the abdominal cavity. This further inflames the peritoneal surface, and peritonitis develops. The location and extent of peritonitis (diffuse or localized) depends on the degree to which the omentum and adjacent bowel loops can contain the spillage of luminal contents (2).

Common symptoms of acute appendicitis include abdominal pain, fever, and vomiting. The diagnosis of appendicitis can be difficult in children because the classic symptoms are often not present. A delay in the diagnosis of appendicitis is associated with rupture and associated complications, especially in young children. Improvements in rupture rates have been made with advanced radiologic imaging. Appendicitis is a clinical diagnosis with imaging used to confirm equivocal cases. The main modality of investigation for suspected appendicitis is CT scan followed by ultrasonography. Ultrasonographic examination of the right lower quadrant reveals a greater than 6-mm noncompressible tubular structure shown in cross section. Probe tenderness and free fluid may also be seen (3).

The definitive treatment for appendicitis is appendectomy. Initiation of antibiotics upon diagnosis is important to slow the infectious process and help prevent progression of a nonperforated appendix. The most widely used antibiotic regimen is the combination of ampicillin, clindamycin (or metronidazole), and gentamicin (3).

Generally, the prognosis is excellent. At the time of diagnosis, the rate of appendiceal perforation is 20-35% (1). The rate of perforation is 80-100% for children younger than 3 years, compared with 10-20% in children 10-17 years old (1). Children with ruptured appendicitis are at risk for intra-abdominal abscess formation and small bowel obstruction, and they can have a prolonged hospital stay (several weeks or more). The mortality rate for children with appendicitis is 0.1-1%. Death from appendicitis is most common in neonates and infants because appendicitis isn't in physician top differential leading to easy miss and infants who can't communicate can't locate the pain they only become irritable or inconsolable (2).

1.1. Statement of the problem

Perforated appendix is the commonest surgical emergency in children admitted to SPHMMC but prevalence of perforated appendicitis and risk factor of perforation was not studied in this hospital. The strength of association of different socio-demographic variables with prevalence of perforated appendix will be discussed. Post op complications of patients with perforated appendix will also be determined.

1.2. Significance of the study.

The study addresses an important public health problem in SPHMMC: the prevalence and risk factors of perforation of acute appendicitis in children admitted to surgical ward. After the aims of the proposal are achieved, the scientific community will gain a better understanding the prevalence of acute appendicitis, especially surgical and pediatrics departments, professional working in respective departments, SPHMMC as well as the identification of potential factors that could be delaying the diagnosis of appendicitis in children and lead to perforation . It is an innovative study that has not been reported in SPHMMC.

This research is conducted to have clear prevalence of the prevalence of perforated appendicitis among children in SPHMMC. This will help the hospital administrator and the department in future management of children with resource allocation. The health care practitioners will also get information on the possible factors associated with perforated appendicitis.

2. LITERATURE REVIEW

2.1. Worldwide

On magnitude and factors study was done in Norway to investigate sociodemographic characteristics of appendicitis in terms of the age and gender among 1486 consecutive patients who underwent appendectomy for suspected acute appendicitis between 1989 and 1993 were analyzed with regard to pre-hospitalization duration of symptoms and in-hospital observation time. The crude prevalence of acute appendicitis was 86 per 100,000 per year. The prevalence of non-perforated appendicitis was highest among adolescents and young adults (13–40 years of age), perforated appendicitis occurred at almost the same prevalence in all sex and age groups. The diagnostic accuracy was 76%. Perforated appendicitis occurred in 19%, with higher rates in small children and the elderly, irrespective of gender. Among children aging between 0-4 years the prevalence of perforated appendicitis is 67% while 13% of appendicitis cases in patients aged between 5 and 13 is perforated. The overall perforation rate was 19%, being significantly ($p < 0.0001$) higher in elderly patients (44%) and small children (36%). No differences between genders were found in the various age groups. The perforation rate was low in age groups with a

high DA (children, adolescents, young adults) and high in the groups with a low DA (i.e., elderly and small children). Patients with perforation had a significantly longer duration of symptoms as well as in-hospital observation time than did patients with non-perforated appendicitis. Perforated appendicitis showed a different prevalence pattern than non-perforated appendicitis and was associated with a significantly longer duration of symptoms and in-hospital observation time, probably due to patient related factors(5).

2.2. Ethiopia

In Ethiopia study which was done in Tibur Anbesse Hospital (TAH) to describe the clinical profile and determine the risk factors associated with perforation in children. Despite the researchers effort to find similar research another research couldn't be found. In this research 147 children aged less than 13 who were admitted to TAH with diagnosis of acute appendicitis were included. Ninety three (63.2%) male and 54(36.8%) were involved in the study. In this study 57.8% of the study participants were aged between 5-10 years. This research shows that abdominal pain (99.3%), fever (91.2%), and vomiting (90.5%). On physical findings direct abdominal tenderness (98%), rebound tenderness/rigidity (72.1%) and RLQ mass (7.5%) were found. The site of the pain were initially peri-umbilical in 78.6% with radiation to RLQ in 13.1% of the cases. Bowel sound was normoactive in 40.8% and absent/hypoactive in 17.9%. Intraoperative 54.4% have perforated appendix while the remaining 45.6% have phlegmonous appendicitis. The laboratory results of the study subjects shows that 90.2% have WBC>10000 with neutrophilia. Pyuria and hematuria was found in 25% of the cases. Postoperatively wound infection (8.1%), intra-abdominal abscess (9.5%), intestinal obstruction (2.7%) and entero-cutaneous fistula (1.3%) were found as a complication. There was one death (0.8%). Twenty three percent of the study subjects visited other health institution prior to TAH. According to this research independent factors found to be predictors of perforation in children were age <10 years, duration of illness more than 24hours, history of treatment elsewhere before arrival to TAH, generalized abdominal tenderness, rebound tenderness and /or rigidity, hypoactive/absent bowel sound, RLQ mass, leukocyte with neutrophilia and presence of complications in univariate analysis. But this factors didn't have significant association with perforation (6).

3. OBJECTIVE OF THE STUDY

3.1. General objective

- To assess the prevalence and risk factors for perforation among pediatric patients with acute appendicitis admitted to SPHMMC surgical ward

3.2. Specific objective

- To assess the prevalence of perforated appendicitis among patients with acute appendicitis
- To determine risk factors for perforation of acute appendicitis among pediatric patients with acute appendicitis admitted to SPHMMC surgical ward
- To determine the post-op complications among patients who were operated for perforated appendicitis

4. RESEARCH METHODS AND MATERIALS

4.1. Study area

The study was conducted in SPHMMC, especially at pediatrics surgical ward, SPHMMC is referral hospital found in Addis Ababa Capital city of Ethiopia under the Ethiopian federal ministry of health. It is the second largest public hospital in the nation built by the Emperor Haile Selassie in 1961. In 2007 it became a medical college and its core services including the provision of medical care, teaching and research.

4.2. Study design

A retrospective chart review was conducted.

4.3. Study period

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4.4. Source population

All children admitted to SPHMMC, with an assessment of acute appendicitis during the study period.

4.5. Study population

Children who selected based on the methods used was the study population.

4.6. Inclusion and exclusion criteria

Inclusion criteria

Charts of patients with diagnosis of acute appendicitis with vital variables (246 charts)

Exclusion criteria

Charts of children with missing vital variable (was only one chart)

4.7. Sample size determination

Source population of this study subjects are less than 10000 (538), three years chart numbers, adjustment was made to get sample size by correctional formula.

$$n_f = \frac{n_{381}}{[1 + n/N]} = \frac{\quad}{[1 + 381/538]} = 224.$$

Adding 10% non-response rater the final sample size will be 247.

4.8. Sampling methods

Simple random sampling technique was used. Sample frame was made from logbook ,then numerical code was given for their card number then computer generated random sample selection were done to get a total sample size of 246, because one chart was not included in the study . The researcher retrieved files of the randomly selected patients with acute appendicitis from record unit of SPHMMC

4.9. Data collection

Data was collected from charts of patients selected from the study population. Data was collected by the primary investigator.

4.10. Data entry and analysis

Completeness and accuracy of raw data from charts was checked every day before entry. Data from charts entered to SPSS 21.0. Descriptive analysis was done for different socio-demographic variables was done. Cross tabulation and COR, AOR analysis was done for possible association for different possible risk factors with perforation. A p-value less than 0.05 was considered statistically significant.

4.11 Study variables

Independent variables

Sociodemographic information

Symptoms and signs

Investigations

Dependent variables

Perforated appendix

4.11. Operational definition

Acute appendicitis: Inflammation/infection of the appendix

Intraop finding: A diagnosis made by the surgeon during the operation by grossly seeing the appendix

Leukocytosis: WBC level greater than 14,000/dl

Neutrophilia: neutrophil percentage greater than 80%

Perforated appendix: Intraoperative diagnosis where the appendix is perforated

Post-op complications: different health problems that arise after the operation was done like surgical site infection, wound dehiscence, intra-abdominal fluid collection

Preop diagnosis: An assessment given to the patient prior to the operation

4.12. Ethical consideration

The data collection of this research was started after it get permission from SPHMMC department of public health. Data was, then, be collected from the record office by showing the letter of permission. Only limited number of charts was retrieved each day to limit loss of chart. The charts was returned to record office immediately after data entry. The data was seen only by the researcher and collaborators which are also medical professionals. The charts will be used only for the purpose of this research and not for any other use.

4.13. Dissemination of result

The result of this research will be presented to SPHMMC department of public health. After the result is approved, the paper will be sent to department of surgery, pediatrics department and medical service provost of the college. After this the researcher will try to publish the research in different journals of pediatrics and surgery.

5. Result

5.1. Socio-demographic characteristics of the study subjects

In this study a total of 247 patient cards were retrieved from the record office children who were operated with assessment of acute appendicitis. However 1 patient card were excluded from the study due to incompleteness. So 246 of the study subjects were included in the study. The age range of the study subjects ranges from 5 to 16 with mean of 10.7 ± 2.9 years. With regard to the gender of the study subjects 170(69.1%) of them were male, male to female ratio was 2.2:1. With regard to the educational status of the study subjects were, illiterate (6.5%), primary education (85.4%) and secondary education (7.7%). Among the study subjects 115(46.7%) were from AA while the remaining 131(53.3%) are from outside AA (table 1).

Table 1: Socio-demographic variables of the study subjects among children admitted with assessment of Appendicitis to surgical ward of SPHMMC in 2013- 2015(n=246) ,divide age more????

Variables		Frequency	Percent
Age	< 10 years	82	33.3
	≥ 10 years	164	66.7
	Total	246	100
Gender	Male	170	69.1
	Female	76	30.9
	Total	246	100
Residency	A.A	115	46.7
	non A.A	131	53.3
	Total	246	100

All (246) of the total study subjects had abdominal pain as compliant to the hospital. Of the total patients, 92.7% had vomiting during their presentation. Other common historical findings in the study subjects were fever (74%) and anorexia (65.4%). Less common findings were Frequency (12.2%) and urgency (6.9%). The duration of symptoms ranges from 1-7 days with mean of 2.65 ± 1.72 days (table 2, figure 1).

Figure 1: Symptoms of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)

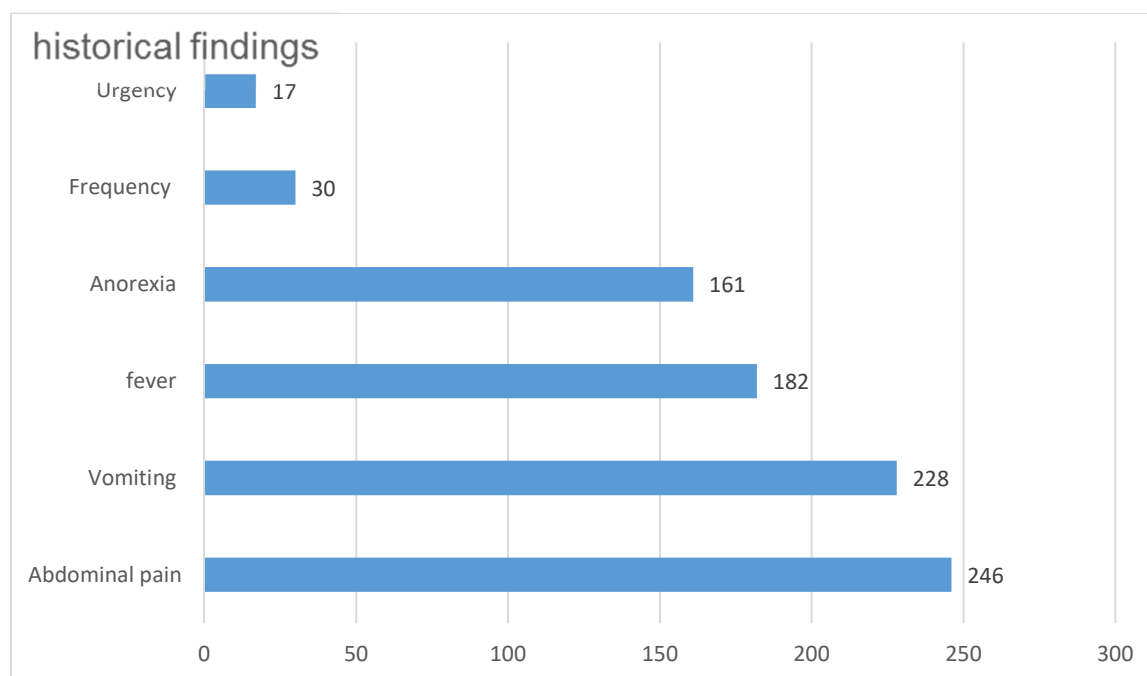


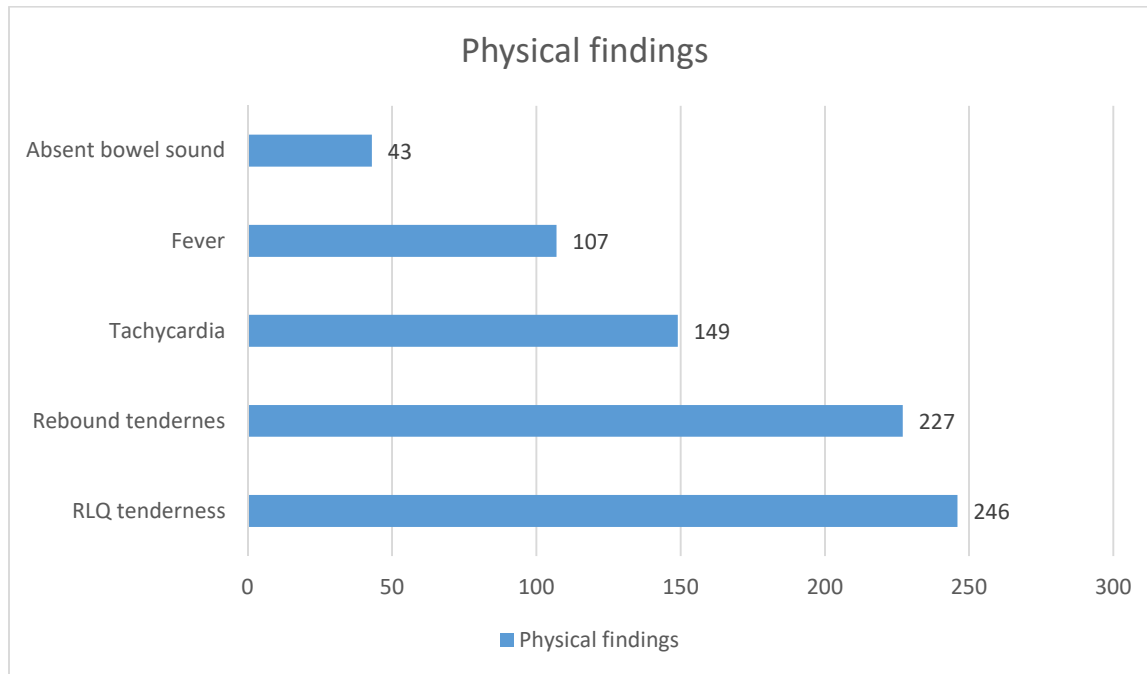
Table 2: duration of symptoms of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)

Duration of symptoms	Frequency	Percent
One day duration	78	31.7
More than one day	168	68.3

5.2. Physical findings of the study subjects

With regard to the physical finding of children who was operated with assessment of acute appendicitis, the presence of fever, pulse rate, RLQ tenderness, rebound tenderness and bowel sound were assessed. Temperature was recorded for 216(87.7%) of the study subjects. Among them the temperature ranges from 35.5-39.1 with mean of 37.6 ± 0.8 . Among the study subjects 107(43.5%) were febrile. Among the total study the pulse rate ranges from 64-158 with mean of 108 ± 16 . One hundred and forty nine (60.6%) of the study subjects were tachycardia (PR>100/min). RLQ tenderness was present in all 246 of the study subjects while rebound tenderness was detected in 223(90.7%). Bowel sound was active in 203(82.5%) while decreased/absent in 17.5% of the study subjects.

Figure 2: Physical findings of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)



5.3. Investigations done of the study subjects

In patients who were included in this study all of them have CBC done while majority have urinalysis. Ultrasound was also done for few of the study subjects. But CT scan of the abdomen was not done for any of the study subjects. According to the CBC profile of the children in this study the WBC count ranges from 3000-31000 with mean of 14500+5590. Among this children 132(53.2%) and 7(2.8%) has leukocytosis and leukopenia respectively according to the operational definition used. One hundred and fifty three (62.2%) have neutrophilia. Among the children involved in this study 156(65.2%) have ultrasound done prior to their surgery. The finding were positive with appendicitis or abscess/mass seen. Appendix were not visualized in 6(2.4%) of the study subjects.

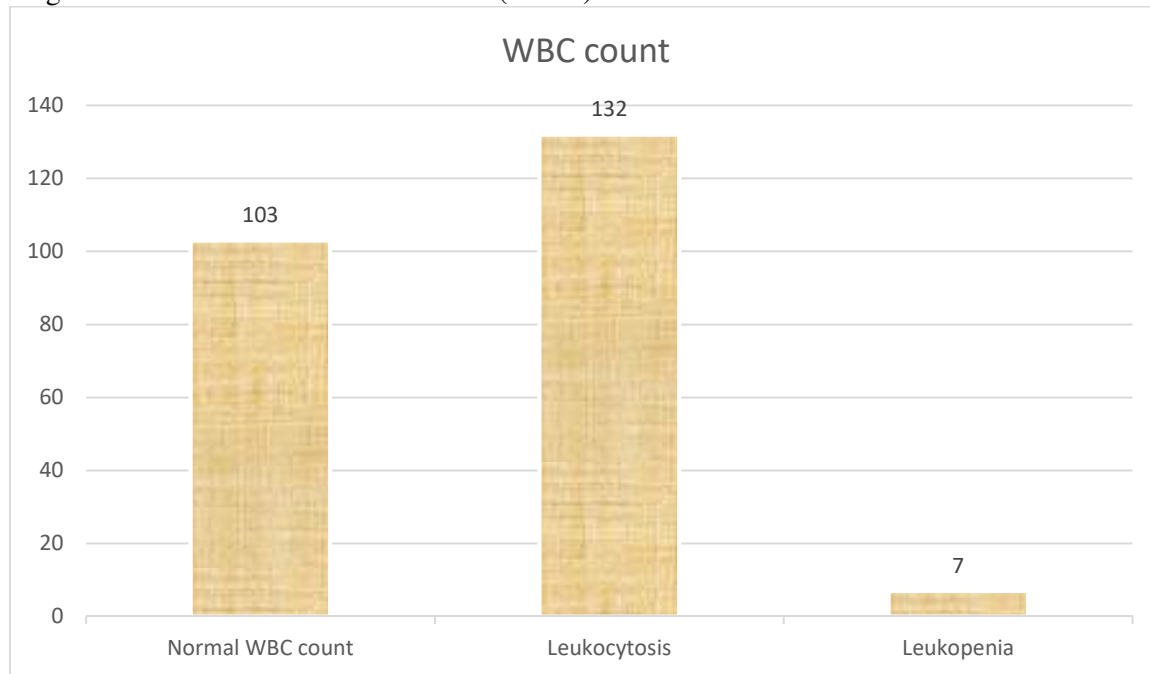
Table 3: blood investigation summary of children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246) **say low, normal, high??????**

Variables	Mean	SD	Range
Hematocrit (in percent)	42.2	5.84	30.7-59.3
Hemoglobin (in mg/dl)	14.2	1.97	9.6-20.4
WBC(in 1000/ml)	14552.571	5590	3000-31100
Neutrophil (in percent)	79.4	10.52	43.5-92.5
Platelet (in 1000/ml)	361265	137863	97000-710000

Table 3: Ultrasound finding of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)

Variables		Frequency	Percent
Ultrasound finding	Not done	90	36.6
	Acute appendicitis	90	36.6
	perforated appendix	20	8.1
	Pelvic peritonitis	10	4.1
	generalized peritonitis	5	2.0
	Appendicealabscess	15	6.1
	Appendiceal mass	10	4.1
	Appendix not visualized	6	2.4

Figure 3: WBC finding of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)



5.4. Preoperative, intraoperative finding and post-operative course of the study subjects

In this part the pre-op assessment of children in the study will be analyzed. Among the patients operated for acute appendicitis 152(61.3%) were initially assessed and operated for simple acute appendicitis. Eleven (4.5%) were admitted with assessment of perforated appendix. Intraoperative finding of the study subjects show that 155(62.6%) have simple appendicitis while 62(25.2%) have perforated appendix found intraoperative.

Table 5: Preoperative and intraoperative finding of the study subjects among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246)

Variables	Preoperative assessment		Intra-operative finding	
	Frequency	Percent	Frequency	Percent
Acute Appendicitis	152	61.8	155	63
Perforated appendix	11	4.5	62	25.2
Pelvic peritonitis	28	11.4		
Generalized peritonitis	38	15.4	11	4.5
Appendiceal Abscess	8	3.3	1	.4
Gangrenous appendix			9	3.7
Appendiceal mass	9	3.7	8	3.3
Total	246	100	246	100

Among the total study subjects 214(87%) of children, symptoms were improved and discharged without complication. Twenty four (9.8%) of them have complications of wound infection and postop abdominal collection. Eight (3.3%) children in this study died. The duration of hospital stay ranged from 2 days to 28 days.

5.5. Risk factors associated with perforation of appendix

Different socio-demographic characteristics of the study subjects were assessed using chi-square method to determine association with perforation of appendix intraoperatively. Accordingly age, gender and residency didn't have statistically significant association with perforated appendix in this study subjects. Among the historical evidences duration of symptoms has statistically significant association with perforation with duration more than one day has four times risk of perforation than duration less than one day. Presence of fever, leukocytosis and presence of rebound tenderness did not have statistically significant association with perforation of appendix while presence of tachycardia, presence of absence/decreased bowel sound and neutrophilia has statistically significant association with perforation of appendix (table 6).

Table 6: risk factors association with perforation among children admitted with assessment of appendicitis to surgical ward of SPHMMC in 2013-2015(n=246) **add CI?????**

Independent variables		Perforated appendix		p-value	COR	AOR	CI
		Yes	No				
Age	<10 years	25	57	0.117			
	≥10 years	37	127				
Gender	Male	37	133	0.080			
	Female	62	184				
Residency	AA	35	96	0.332			
	Outside AA	62	184				
Fever	Yes	30	77	0.226			
	No	32	107				
Tachycardia	Yes	49	100	0.001	3.166	2.821	
	No	13	84				
Leukocytosis	Yes	31	101	0.301			
	No	31	83				
Neutrophilia	Yes	11	60	0.034	2.061	2.329	
	No	42	111				
Duration of symptoms	More than one day	49	119	0.024	2.057	2.304	
	One day	13	65				
Bowel sound	Absent/hypoactive	23	20	0.001	4.836	1.646	
	Normal	39	164				
Rebound tenderness	Yes	58	165	0.264			
	No	4	19				

6. Discussion

In this study it is found that all of the total study subjects had abdominal pain as compliant to the hospital while 92.7% had vomiting in their history. Other common historical findings in the study subjects were fever (74%), anorexia (65.4%), frequency (12.2%) and urgency (6.9%). Similar result is reported from Tikur Anbessa Hospital reporting abdominal pain (99%), fever (91.2%) and vomiting (90.5%) (6).

RLQ tenderness was present in all 246 of the study subjects while rebound tenderness was detected in 90.7%. This is similar to the study done in Iran in which all patients experience pain and tenderness in the right lower quadrant of the abdomen (10). In TAH 98% of the study subjects had RLQ tenderness which is similar to this study. A lower rate of rebound tenderness 72.1% was reported in TAH (6). The reason for this may be explained by difference in recording of the two institutions.

Bowel sound was active in 82.5% while decreased/absent in 17.5% of the study subjects. Similar report is seen in TAH showing 17.9% have decreased/absent bowel sound (6). Intraoperative finding of the study subjects show that 62.6% have simple appendicitis while 25.2% have perforated appendix found intraoperative. A lower result is reported from rural area of Andhara Pradesh which reports the prevalence of perforated appendix is 17.8% among children of less than 10 years of age (11). A lower result is also reported from Iran reporting prevalence of perforated appendix among patients with appendicitis is 10% (10,12). A 13 percent perforation rate was also reported from Norway among children 5-12 years. A higher result is reported in TAH indicating 54.4% of the children have perforated appendix.

Accordingly age, gender and residency didn't have statistically significant association with perforated appendix in this study subjects. Among the historical evidences duration of symptoms has statistically significant association with perforation. Presence of fever, leukocytosis and presence of rebound tenderness did not have statistically significant association with perforation of appendix while presence of tachycardia, presence of absence/decreased bowel sound and neutrophilia has statistically significant association with perforation of appendix. Similarly neutrophilia and presence of hypoactive/absent are also found to have statistically significant association with perforation ($p < 0.05$). But age and presence of rebound tenderness was found not

to have statistically significant with perforation of appendix which is different from the research done at TAH (6).

7. Conclusion

In this study the 246 children aged less than 16 were included who were admitted to SPHMMC with an assessment of acute appendicitis. The age range of the study subjects ranges from 5 to 16 with mean of 10.7 ± 2.9 years. Majority of the study subjects were male in primary education. More than half of the study subjects come from outside AA.

Historically all of the total study subjects had abdominal pain as compliant to the hospital. And majority had vomiting, fever or anorexia. The duration of symptoms ranges from 1-7 days with mean of 2.65 ± 1.72 days. Majority of the study subjects stay more than one day prior to the presentation. With regard to the physical examination findings of the study subjects nearly half of them were febrile while more than half were tachycardic. RLQ tenderness was present in all and rebound tenderness was detected in majority of the study subjects. Bowel sound was decreased/absent in less than quarter of the study subjects.

Investigation done among the study subjects showed that more than half of study subjects has leukocytosis and more than sixty percent have neutrophilia. More than sixty percent of the study subjects have ultrasound done prior to their showing appendicitis or abscess/mass prior to the surgery.

Among the study subjects, acute appendicitis were diagnosed preoperatively in more than sixty percent of the study subjects. Less than five percent were admitted with assessment of perforated appendix. Intraoperatively more than sixty percent have simple appendicitis while nearly quarter of the total study subjects have perforated appendix. Nearly ninety percent of the study subjects were discharged improved without complication post-op period. Eight patients died in post-op period.

In determining association between risk factors with perforation none of the socio-demographic variables have statistically significant association. On the other hand duration of symptoms, presence of tachycardia, presence of absence/decreased bowel sound and neutrophilia has statistically significant association with perforation of appendix. Presence of fever, leukocytosis and presence of rebound tenderness did not have statistically significant association with perforation of appendix.

8. Recommendation

After concluding this study it is recommended that

- Physicians treating children with suspected appendicitis should have high index of suspicion for perforation and operate as quickly as it could be possible.
- Family members should have considered this illness as emergency and brought children to the health facility as early as possible.
- Other researchers are recommended to have similar researches in this or other hospital to find-out other risk factors for perforation.
- Researchers are also recommended to do a cross-sectional or prospective study assessing children with acute appendicitis to find-out additional risk factors for perforation
- Hospital administrators are recommended to allocate resources to cover for this prevalence of perforated appendix per total cases of appendicitis in children.

9. Limitation of the study

As this research was done from secondary resource the data was not intended for this research and this may make it biased. Similarly some of the basic data were not fulfilled as the treating physicians in emergency room usually focus on medically-relevant history and physical examination of the study subjects which may make assessment of others factors difficult

REFERENCE

1. Townsends,R. Daniel Beauchamp, B. Mark Evers, and Kenneth L. Mattox: Sabiston Textbook of Surgery, 17th ed. 2004, Elsevier
2. F. Charles Brunickardi ,Dana K Anderson, Timothy R Billiar, David L Dunn, John J Hunter and Raphael E Pollock:Schwartz's Principles of Surgery,8th edition. McGraw Hills
3. Robert K Minkes and Carmen Cuffari: Pediatric Appendicitis: Am J Emerg Med. Oct 2011;29(8):890-893.
4. Claire L. Temple, , Shirley A. Huchcroft, and Walley J.: The Natural History of Appendicitis in Adults: A Prospective Study. ANNALS OF SURGERY:Vol. 221, No. 3, 278-281
5. Hartwig Koerner et al: Prevalence of Acute Nonperforated and Perforated Appendicitis: Age-specific and Sex-specific Analysis, World J. Surg. 21, 313–317, 1997
6. A Bekele and A Mekasha: Clinical profile and risk factors for perforation of acute appendicitis in children. East African medical journal august 2006,vol 83 no 8,434-439
7. Mohammed Al-Omran, Muhammad M. Mamdani, and Robin S. McLeod :Epidemiologic features of acute appendicitis in Ontario, Canada. Can J Surg, August 2003Vol. 46, No. 4, 263-268
8. Michelle T. Buckius, Brian McGrath, John Monk, Rod Grim, Theodore Bell, and Vanita Ahuja:Changing Epidemiology of Acute Appendicitis in the United States:Study Period 1993–2008 Journal of Surgical Research 175, 185–190 (2012)doi:10.1016/j.jss.2011.07.017
9. ZENEBE NIGUSSIE: MANAGEMENT OUTCOME AND ASSOCIATED FACTORS OF ACUTE APPENDICITIS AT GELEMSO GENERAL HOSPITAL, WEST HARERGAE, OROMIA REGIONAL STATE, EASTERN ETHIOPIA. A Thesis submitted to thecollege of health and medical Science School of Graduate Studies, Haramaya University for partial fulfilment to the requirement for master's degree in Integrated Emergency of Obs./Gyn.and General Surgery.

10. Tanveer Ahmad, Zulfiqar Ali, Azfar Ali and Shakeel Anjum: PERFORATED APPENDIX: CONTRIBUTING FACTORS. JUMDC, Vol. 1, No. 2, Jul-Dec 2010 11,10-16
11. Anil Kumar, K. Sri Charan, V. Harikrishna. "Incidence, Risk Factors and Complications of Acute Perforated and Non-Perforated Appendicitis in a Rural Setup of Andhra Pradesh". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 39, May 14; Page: 6713-6718, DOI: 10.14260/jemds/2015/975.
12. Saeed Nouri¹, Davood Kheirkhah and Zahra Soleimani: The risk factors for infected and perforated appendicitis: Journal of Research in Medical and Dental Sciences: Volume 5, Issue 1, Page No: 23-26; DOI: 10.5455/jrmds.2017515
13. Tanveer Ahmad, Zulfiqar Ali, Azfar Ali and Shakeel Anjum: PERFORATED APPENDIX: CONTRIBUTING FACTORS: JUMDC, Vol. 1, No. 2, Jul-Dec 2010
14. Rajesh Poudel,Tika Ram Bhandari: Risk Factors for Complications in Acute Appendicitis among Paediatric Population: JNMA VOL/56/NO. 3ISSUE 205/JAN-MAR 2017
15. Adeyanju M. A. and Adebisi A: An audit of appendicitis at a tertiary centre in Lagos, Nigeria: Journal of Scientific Research and Studies Vol. 2(5), pp. 126-134, July, 2015
16. Ching-Lun Chen, Hsun-Chin Chao ,Man-Shan Kong and Shih-Yen Chen : Risk Factors for Prolonged Hospitalization in Pediatric Appendicitis Patients with Medical Treatment: Pediatrics and Neonatology (2017) 58, 223e228

ANNEX: DATA COLLECTION INSTRUMENT

S.no		Variable s	Alternatives
1.	Socio-demographic variables	Age (in years)	
2.		Gender	1. Male 2. Female
3.		Ethnicity	1. Oromo 2.
4.		Residency	1. AA 2. Outside AA
5.		Educational status	1. Illiterate 2. Primary education 3. Secondary education
6.	Clinical presentation	Fever	1. Yes 2. No
7.		Abdominal pain	1. Yes 2. No
8.		Urgency	1. Yes 2. No
9.		Frequency	1. Yes 2. No
10.		Anorexia	1. Yes 2. No
11.		Vomiting	1. Yes 2. No
12.		Duration of symptoms	
13.	Physical examination findings	Fever record(in centigrade)	
14.		Pulse rate (per minute)	
15.		RLQ direct tenderness	1. Yes 2. No
16.		Rebound tenderness	1. Yes 2. No
17.		Bowel sound	1. Absent/decreased 2. Normoactive 3. Hyperactive
18.	Investigations done	WBC(in 1000/dl)	
19.		Neutrophil (percentage)	
20.		Hemoglobin(in mg/dl)	
21.		Hematocrit (in	

		percentage)	
22.		Platelet (1000/dl)	
23.		Urine leukocyte	1. Yes 2. No
24.		Hematuria	1. Yes 2. No
25.		Ultrasound findings	1. Ultrasound was not done 2. Acute appendicitis 3. Perforated appendix 4. Pelvic peritonitis 5. Generalized peritonitis 6. Appendiceal abscess 7. Appendiceal mass 8. Appendix not visualized
26.		CT findings	1. CT was not done 2. Acute appendicitis 3. Perforated appendix 4. Pelvic peritonitis 5. Generalized peritonitis 6. Appendiceal abscess 7. Appendiceal mass 8. Appendix not visualized
27.		Preop diagnosis	1. Acute appendicitis 2. Perforated appendix 3. Pelvic peritonitis 4. Generalized peritonitis 5. Appendiceal abscess 6. Appendiceal mass
28.		Intra-op diagnosis	1. Inflamed appendix 2. Phlegmonous appendix 3. Appendiceal abscess 4. Gangrenous appendix 5. Perforated appendicitis 6. Pelvic Peritonitis 7. Generalized peritonitis 8. Appendiceal mass 9. Normal appendix

29.		Post-op course	1. Discharged improved 2. Complicated 3. Died
30.		Post op complications	1. Wound infection 2. Abdominal collection
31.		Duration of hospital stay(in days)	