Research Article

Awareness of factors related to acute appendicitis - A survey

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ABSTRACT

Objective: The objective of the study was to determine the awareness and reliable factors such as pain, symptoms, and genetic factors related to acute appendicitis. **Materials and Methods:** In this study, a questionnaire was prepared and circulated among the subjects to determine the reliable factors related to appendicitis and familial inheritance of acute appendicitis. The study sample consists of 50 subjects. **Results:** According to this survey, 88% of individuals were aware of acute appendicitis. 56% of them stated that the pain first occurs in the lower right abdomen and the pain is not continuous. The most common cause of appendicitis believed by subjects in this survey was consuming more outside food. The most commonly affected one were children and adolescents. Almost 92% of individuals prefer surgery for appendicitis in an emergency situation and are not aware of any medical management. **Conclusion:** In the current scenario, understanding the symptoms and establishing a diagnosis of appendicitis is of outmost importance. The current survey also highlights the other factors such as pain, symptoms, and familial inheritance of acute appendicitis.

KEY WORDS: Abdomen, Appendicitis, Appendix, Familial predisposition, Iliac fossa

INTRODUCTION

Acute appendicitis (AA) is the most common cause of the lower right abdominal pain requiring surgical intervention.[1] The different clinical signs and symptoms always limit the diagnosis of AA, because there are various other reasons leading to pain in this anatomic location particularly in female patients.[2,3] Hence, it is often difficult to reach a proper diagnosis for appendicitis. The initial event of the pathogenesis of AA is the obstruction of the lumen by foreign bodies, fecaliths, intestinal parasites, tumors, or lymphoid follicular enlargement due to a viral infection. Nowadays, different diagnostic aids such as scoring system, ultrasonography, computed tomography (CT), and magnetic resonance imaging have made the diagnosis of appendicitis easier and also helps the surgeon to decide on the operative management for appendicitis.[4-6] Apart from this diagnostic aids many other factors such as white blood cell count (WBC count), C-reactive protein (CRP), and bilirubin levels are elevated and these factors also serve diagnostic markers of AA.[7,8] AA is also genetically inherited. Hence, factors related to appendicitis and familial inheritance of appendicitis was determined using questionnaire which were circulated among the people.

In this study, we aim to determine the awareness of reliable factors such as pain, symptoms and genetic factors related to AA among the general population.

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MATERIALS AND METHODS

In this study, a questionnaire was formulated which mainly focuses on factors related to AA. The sample included 50 subjects both male and female between the age group of 15 and 55 years. The questionnaire [Figure 1] has general patient information and questions based on symptoms of appendicitis, causes of appendicitis, frequency of appendicitis, and genetic inheritance of AA.[9,10] The questionnaire was circulated among 50 subjects and the results were tabulated.

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QUESTIONNAIRE

AGE : SEX :
HEIGHT : WEIGHT :

1) Are you aware of appendicitis ?
   a. Yes b. No

2) Will the pain be
   a. Continuous b. Interrupted

3) Where does the pain occurs first in case of acute appendicitis ?
   a. Right abdomen
   b. Left abdomen
   c. In stomach

4) Is there any other clinical condition that are mismatched with the diagnosis of acute appendicitis?
   a. Kidney stones
   b. Indigestion
   c. None

5) In case of emergency situation, what can be done for acute appendicitis?
   a. Surgery
   b. Antibiotic treatment
   c. None

6) Have you undergone any surgery before for appendicitis ?
   a. Yes
   b. No

7) Does the appendicitis reccur after the surgery ?
   a. Yes
   b. No

8) What are the other symptoms experienced other than abdominal pain during appendicitis?
   a. Nausea and vomiting
   b. Stomach pain
   c. Loss of appetite
   d. All of the above

9) Is there any other treatment, other than surgery for acute appendicitis?
   a. Yes
   b. No

10) According to you, which is the most common cause of acute appendicitis ?
   a. Eating more outside food
   b. Genetic inheritance
   c. Non vegetarian food
   d. Both A & B

11) Do you think surgery is the best option for acute appendicitis ?
   a. Yes
   b. No

12) Can acute appendicitis be prevented ?
   a. Yes
   b. No

13) Do you think consuming more non veg food can lead to appendicitis ?
   a. Yes
   b. No

14) Is appendicitis inherited genetically ?
   a. Yes
   b. No

Figure 1: questionairre on factors related to acute appendicitis

RESULTS

The results obtained from the survey [Figure 1] were tabulated [Table 1].

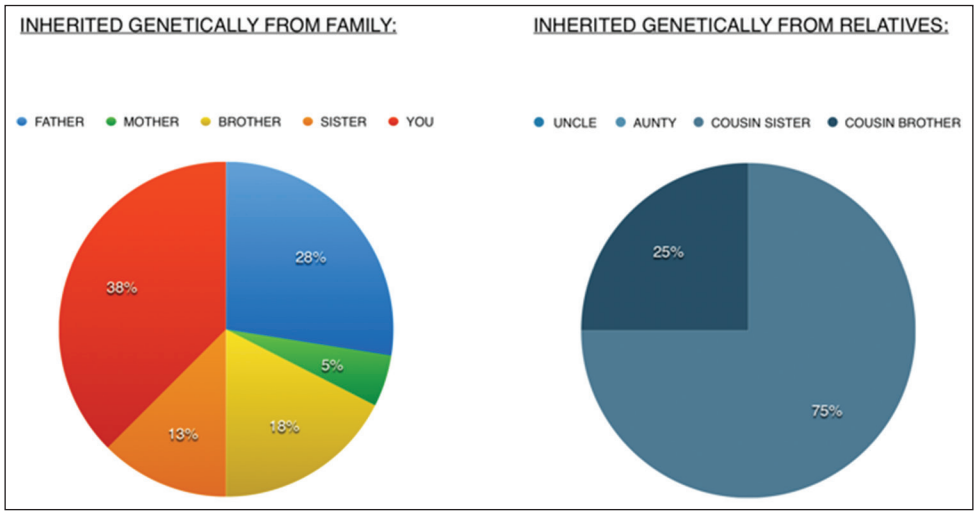
From the survey, it was observed that nearly 88% of people were aware of AA. 56% of subjects feel that the pain of appendicitis will be interrupted while the rest 44% feel that the pain will be continuous.[11,12] Moreover, 34% of subjects feel that very often the diagnosis of AA is misdiagnosed as kidney stones and 28% feel its misdiagnosed as indigestion. 48% of subjects feel that that the major cause of appendicitis is consuming more outside foods. Nearly, around 92% of subjects prefer surgery is the only treatment which can be done in emergency cases of appendicitis and around 94% of subjects prefer that surgery is the best option for curing appendicitis. Around 32% of people also feel that AA can be inherited genetically.

DISCUSSION

Appendix is a tube like an organ located at the junction of the small intestine and large intestine. It is a thin tube about four inches long. Normally, the appendix sits in the lower right abdomen. Appendix was believed to play a role in maintaining gut flora and a part in immunity. As the position of the appendix can vary, the initial pain may be poorly defined and tenderness poorly localized. This is especially true in the young, the elderly, women of childbearing age, and pregnant women. However, the surgical removal of the organ had not resulted in any undue side effects. Therefore, it is considered vestigial. AA is one of the most frequent reasons for an acute abdominal operation.[13] Appendicitis may mimic other clinical conditions. Inflammatory and infectious disorders such as gastroenteritis and respiratory infections may cause lymphoid follicle hyperplasia, which results in luminal obstruction and appendiceal inflammation. The diagnosis of AA remains mostly on the basis of clinical manifestations.[14] The problem in making a clinical diagnosis of appendicitis is that in addition to appendicitis, there are possible surgical and non surgical causes of lower abdominal pain.[15] In general, the disease prevalence of appendicitis is high in surgical ward but low in emergency departments which may explain why emergency physicians and surgeons misdiagnose appendicitis in opposite directions.

Table 1: Mean score, Cronbach's alpha, and intraclass correlation coefficient

Question no.	Option A	Total %	Option B	Total %	Option C	Total %	Option D	Total %
1.	44	88	6	12	NA	0	NA	0
2.	22	44	28	56	NA	0	NA	0
3.	29	58	19	38	2	4	NA	0
4.	17	34	14	28	19	38	NA	0
5.	46	92	1	2	3	6	NA	0
6.	24	48	26	52	NA	0	NA	0
7.	43	86	7	14	NA	0	NA	0
9.	6	12	13	56	5	10	26	52
10.	40	80	10	20	NA	0	NA	0
11.	14	28	5	10	7	14	24	48
12.	47	94	3	6	NA	0	NA	0
13.	20	40	30	60	NA	0	NA	0
14.	24	48	26	52	NA	0	NA	0
15.	16	32	34	68	NA	0	NA	0



Graph 1: Genetic transfer of appendicitis

Hence, certain factors peculiar to appendicitis such as severity of pain, site of pain, symptoms such as vomiting, nausea, and loss of appetite can help in the proper diagnosis of AA.[16] The classic physical finding such as right lower quadrant pain and band cells is significant predictors for AA.

The most useful clinical tools in assessing AA are still a good history and physical examination, serial abdominal examinations, and a high index of suspicion. Migrating pain from the epigastric or periumbilical area to the right lower quadrant is the classical and most discriminating historical feature, which has high sensitivity and specificity. Fusobacteria (mainly *Fusobacterium nucleatum* and necrophorum) were a specific component of epithelial and submucosal infiltrates of patients with proven appendicitis. The presence of Fusobacteria in mucosal lesions correlated positively with the severity of appendicitis. Patients have to be aware of the signs and symptoms of AA so that they can seek therapy at the earliest. This can help avoid them going through the pain as a result of the disease. In addition to signs and symptoms, certain markers such as high white blood cell count, CRP, and elevated serum bilirubin levels helps in diagnosing AA. In recent studies, several serum markers have been analyzed to predict the severity of AA including interleukin-6 and lipopolysaccharide binding protein. There are studies that report the presence of elevated serum total bilirubin (STB) in AA. Estrada *et al*. have formulated the hypothesis that jaundice can be associated with perforation of the appendix, serving as a severity marker. They explain the elevated STB by the invasion of the Gram-negative bacteria through the muscularis propria of the appendix, leading to direct invasion or translocation of the germs in the portal system and the liver, interfering with bilirubin excretion through bile ducts by endotoxin action. Emmanuel *et al*. have also found that STB has a specificity of 88% and a positive predictive value of 91% for perforated AA.

Hyperbilirubinemia in AA has been related mostly to severe septic complications such as septic thrombophlebitis of mesenteric and porta veins. Recently, some researchers have proposed that hyperbilirubinemia has been used to support the diagnosis of perforated appendicitis. The cause of elevated bilirubin is directly related to the pathogenesis of appendicitis and the invasion of Gram-negative bacteria into muscularispropria of the appendix, leading to direct invasion or translocation into the portal venous system and the hepatic parenchyma interfering with the excretion of bilirubin into the bile canaliculi by a mechanism caused by the bacterial endotoxin.

Chaudhary *et al*. have found that for gangrenous/perforated appendicitis, the *P* value of serum bilirubin (SB) was <0.001, specificity 92.9%, sensitivity 100%, positive predictive value 72.7%, and negative predictive value was 100%. Hence, the level of SB was higher than 3 mg/dL in cases of gangrenous/perforated appendicitis while in cases with AA it was <3 mg/dL ($P < 0.05$). Broadly, we can say that it was predominantly isolated hyperbilirubinemia in the majority of cases. These findings are almost similar to another reported study. Since these findings were documented at the time of admission, it is unlikely that liver injury due to anesthetic agents, blood transfusion, or medication was the cause of elevated bilirubin levels.

Plain abdominal radiography, ultrasonography, CT, and even radionuclide scanning may be helpful. Other ancillary diagnostic tools include computer-aided diagnosis and clinical diagnostic scores such as the MANTRELS (migrating pain, anorexia, nausea/vomiting, tenderness, rebound tenderness, elevated temperature, leukocytosis, and shift of leukocytes) score. Recently, Alvarado score can be used in the diagnosis of AA. The Alvarado score is simple to use and easy to apply since it relies only on history, clinical examination, and a basic laboratory investigation. Many studies illustrated that this simple scoring system in patients suspected of having AA works extremely well in children and men. However, in women particularly those of childbearing age, it falls disappointingly short of expectations. Hence, diagnostic laparoscopy is advised to minimize the unacceptably high false negative rate in women.

Misdiagnosis of AA is more common. Gastroenteritis is the most common misdiagnosis in cases of misdiagnosed appendicitis. Initial misdiagnosis was associated with a shorter duration of symptoms, fewer pertinent physical findings, fewer laboratory examinations, a shorter hospital stay, and presentation late at night. To decrease the rate of misdiagnosis, physicians should be aware of the characteristic symptoms and should order appropriate laboratory tests to corroborate their suspicions. A high level of clinical suspicion, combined with an awareness of the significance of misdiagnosis, may aid the clinician in establishing the correct diagnosis at the initial visit to the emergency department.

In the present study, it was observed that nearly 88% of subjects were aware of AA and its symptoms. The previous studies based on clinical diagnosis of appendicitis have reported that patients admitted for appendicitis presented with right iliac fossa pain and interrupted pain.[16] Similarly in our study around 56% of subjects reported that there will be interrupted pain during the appendicitis while rest of them reported that there will be continuous pain.

Lifestyle changes are debated to play a role in the etiology of appendicitis. Consumption of excess of non-vegetarian food has been show to increase the incidence of appendicitis.[17] The geographical distribution of appendicitis in the developed western countries has been cited in support to this.[18]

AA may have a familial predisposition.[19,20] The subjects in our study also are aware of the familial predisposition because around 32% of subjects reported that AA is inherited genetically [Graph 1]. Among this 32%, 28% revealed that their parents had suffered with AA. In fewer cases, the relatives of the subjects were involved. Thus, the results of the study demonstrate the possibility of familial inheritance of AA.

In our study, around 94% of subjects believe that surgery is the best option for appendicitis in case of emergency and also in other situations. Surgical treatment includes removal of the appendix, called as appendicectomy. The vestigiality of the organ also favors surgical treatment. The surgical approaches for appendicectomy can be through a laparoscopic approach or open surgical approach. Laparoscopic appendicectomy was introduced as an exclusive method for appendicectomy for appendicitis. Over the past decade, laparoscopic appendicectomies have gained more popularity due to the minimal post-operative complications, shorter hospitalization, and cosmesis. Recently, laparoscopic procedures have also been done using smaller ports. Delay in treatment is regarded as the main cause of perforation and complications. To reduce patient delay and thus improve the outcome, health education to increase public awareness especially in parents of young children and the elderly of the symptoms and risks of appendicitis may be helpful.

However, recent studies have reported successful results of nonsurgical treatment for appendicitis.[21]

The most prevalent method to prevent peripheral sensitization include administration of various modalities which include:

a) Nonsteroidal anti-inflammatory drugs (NSAIDs), which prevent peripheral sensitization by reducing prostaglandin synthesis at the site of surgery
b) Regional anesthetics, which block afferent nociceptive impulses prior to incision
c) Opioids, which modulate afferent input by blocking the postsynaptic receptors and decreasing neurotransmitter release or by activating inhibitory pathways
d) N-methyl-Daspartate (NMDA)- receptor antagonists, which inhibit activation of NMDA receptors in the human spinal cord, thus preventing the main mechanism of central sensitization.

The basis of pain in appendicitis is tissue damage as a result of obstruction and resultant ischemia. This tissue damage will induce the production of COX-2, which, in turn, leads to the synthesis of the prostaglandins that sensitize pain fibres and promote inflammation. NSAIDs block these inflammatory mediators and bring about symptomatic relief of pain. Mast cells have been shown to be higher in surgical excised appendices operated for appendicitis, causing immunological, and non-immunological damage resulting in inflammation. They have been attributed to be responsible for nerve proliferation and hypertrophy of appendices. Therefore, medical management aimed at controlling the production of mast cells can provide benefits in treating appendicitis.

CONCLUSION

Factors such as pain, the frequency of pain, symptoms, causes and genetic factors is important in the apt diagnosis of AA. Hence, in our study, these factors were determined using a survey. These factors help guiding in early diagnosis of AA. Awareness of the signs and symptoms of AA and its early diagnosis helps in avoiding patients going through a debilitating, painful experience of the disease.

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