

## **Family history of acute appendicitis**

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### **Abstract**

**Objectives:** To evaluate the association of acute appendicitis with age, sex, Alvarado score (AS) and family history.

**Methods:** Medical records of 2670 patients, who were admitted to our hospital's emergency department between January 2005 and June 2007, were reviewed. These patients were referred as acute abdominal pain by general practitioners. The data of patients were divided into sub-groups according to their age, sex, operative status, AS status and having a pathologically confirmed postoperative diagnose of acute appendicitis or not. Logistic regression analysis was performed to find out relationships among the sub-groups.

**Results:** Male gender (1.37), age <50 (2.4), positive family history (3.16), AS 5-6 (13) and AS ≥7 (31) increased the risk of acute appendicitis. The sensitivity and specificity of AS was 91.5% and 60.5% respectively. The sensitivity and specificity of family history was 68.9% and 75.4% respectively.

**Conclusion:** Family history is an important parameter while predicting acute appendicitis (JPMA 58:635; 2008).

### **Introduction**

Appendectomy is the most commonly performed emergency surgical procedure. Acute appendicitis occurs 1/7 to 1/17 people, mostly adolescents and young adults and has a life-time risk of 7%.<sup>1</sup> In the century since its recognition, no progress has been made in elucidating its etiology and pathogenesis. According to the leading theory, the initial event in the pathogenesis of acute appendicitis is obstruction of the lumen by factors like faecoliths, foreign bodies, intestinal parasites, tumours, or lymphoid follicular enlargement due to viral infections. However, obstructive elements have been identified in only 30%-40% of removed

inflamed appendixes.<sup>1</sup> Currently, the mortality rate is 0.25% if all ages are considered.<sup>2</sup>

The diagnosis of acute appendicitis is made primarily on the basis of history and physical findings, with additional assistance from laboratory and radiographic examinations. Ultrasonographic and computerized tomographic evaluations increase not only cost of treatment but also the health costs. In diagnosing appendicitis, clinicians balance the risk of misdiagnosis — removing a normal appendix in patients whose signs and symptoms may not be typical — against the risk of perforation of the appendix that might occur while waiting to see if typical

findings emerge. Alvarado score (AS), is a simple scoring system that can be instituted easily.<sup>3</sup> It is purely based on history, clinical examination, and routine laboratory tests (Table). Patients with a score of 1-4 are considered very

**Table: Alvarado scoring system.**

Sign/Symptom	Score
Migratory right iliac fossa pain	1
Anorexia	1
Vomiting/nausea	1
Temperature $\geq 37.3^{\circ}\text{C}$	1
Tenderness right lower quadrant	2
Percussion tenderness right iliac fossa	1
White cell count $\geq 10 \times 10^9/\text{L}$	2
Neutrophils $\geq 75\%$ or left shift	1
Total	10

unlikely to have appendicitis; those with a score of 5-6 are considered to have a diagnosis compatible with acute appendicitis, but not convincing enough to warrant appendectomy; those with a score of 7 or higher are considered to have probable acute appendicitis. It is shown to have a sensitivity of 72% and specificity of 81%.<sup>4</sup>

In 1937 Baker described a family pedigree in which 50% of the members were operated on for appendicitis.<sup>5</sup> Gauderer et al. suggested that children who have appendicitis are twice more likely to have a positive family history than are those with right lower quadrant pain (but no appendicitis) and almost three times as likely to have a positive family history than are surgical controls (without abdominal pain).<sup>6</sup> The complex segregation analysis supported a polygenic or multifactorial model with a total heritability of 56%.<sup>7</sup> Basta et al suggested, at their case-control study, there was no evidence to support a major gene.<sup>7</sup>

The aim of this retrospective study was primarily to assess the association between family history and the occurrence of acute appendicitis. The association with age, sex, and Alvarado scoring system, was also evaluated.

## Patients and Methods

This retrospective study included medical records of 2670 patients who were referred as acute abdominal pain by general practitioners. The data was retrieved from patients' records who were admitted to our hospital's emergency department between January 2005 and June 2007.

The records which did not have enough information to calculate AS were excluded. In those with no information regarding family history of acute appendicitis, an attempt was made to gather the required information by phone, mail or e-mail. The patients, who could not be reached to

question about the family history, were excluded.

Patients were divided into three subgroups according to their Alvarado scores. Group-A (Alvarado 1-4), Group-B (Alvarado 5-6) and Group-C (Alvarado  $\geq 7$ ).

Any history of appendectomy due to acute appendicitis in first-, second-, and third-degree relatives was accepted as positive family history. Appendectomies due to other causes and no family history of appendectomy were recorded as negative.

Data was analyzed descriptively to determine demographic characteristics of the sample. Logistic regression analysis was performed to find out relationships among age, sex, family history, Alvarado score and acute appendicitis. Data was analyzed with SPSS 11.5 package programme.

## Results

The demography of the patients in the three subgroups was, Group A had 1340 patients, 670 males (mean age  $38.45 \pm 17.73$  years) and 670 females (mean age  $38.26 \pm 19.14$  years). Group B consisted of 703 patients, 268 men (mean age  $38.15 \pm 17.04$  years) and 435 women (mean age  $36.44 \pm 17.94$  years). Group C had 627 patients with 306 males (mean age  $42.55 \pm 18.82$  years) and 321 females (mean age  $45.52 \pm 23.17$  years). A total of 969 (36.29%) (507 [52.32%] females) patients from 2670 were operated due to a diagnosis of acute abdomen. Acute appendicitis was the diagnosis for 616 (63.57%) cases of which 530 (86%) were later confirmed by pathological examination. In this group 306 (57.74%) patients had a family history of acute appendicitis. The negative appendectomy rate was 14%.

The potential risks associated with age, sex, positive family history and Alvarado score on diagnosis of acute appendicitis were analyzed by using logistic regression analysis (Table 2).

**Table 2: The potential risks of the features on being acute appendicitis for the sample.**

	ODDS RATIO	95% CI
ALVARADO 5-6	13.011	9.195 - 18.413
ALVARADO $\geq 7$	30.998	21.718 - 44.244
(+) FAMILY HISTORY	3.158	2.519 - 3.959
MALE GENDER	1.371	1.095 - 1.717
< 50 YEARS AGE	2.403	1.882 - 3.068

A positive family history of acute appendicitis increased the risk of acute appendicitis by 3.158 times (95% CI: 2.519 - 3.959) in a patient with acute abdominal pain. Those patients with an AS of 5-6, and a family history of

acute appendicitis were three times more likely to have appendicitis than the ones who had a negative family history.

If 7 is the cut off degree at AS, a positive predictive value of Alvarado score was 43.9% and negative predictive value was 87.5%. A sensitivity of 51.9% and specificity of 83.5% at the same condition was determined. With 5 as the cut off degree at AS, a positive predictive value of Alvarado score was 36.5% and negative predictive value was 96.6%. The sensitivity was 91.5% and specificity 60.5%.

If only family history was used as a diagnostic test, the positive predictive value and negative predictive value were 68.9% and 75.4% respectively. The sensitivity was 68.9% and specificity 75.4%.

### Discussion

In this study the family history of acute appendicitis was evaluated in patients who suffered from acute abdominal pain. Previous studies did not include all of the patients who were admitted to the emergency departments with a main complaint of acute abdominal pain. The three times increased risk by family history has been suggested as a risk factor by Gauderer et al.<sup>6</sup> Many authors studied the familial predisposition to appendicitis in childhood.<sup>7-9</sup> Basta et al.<sup>7</sup> demonstrated a familial aggregation and polygenic transmission pattern in a retrospective analysis of families of 80 patients with appendicitis when compared to families of matched controls. They found that the relative risk was 10.0 (4.7 - 21.4): with the chance of appendicitis being 10 times greater in a child with at least one relative with reported appendectomy, compared with a child with no affected relatives. Basta et al. have further supported the hypothesis of familiarity of acute appendicitis and a possible polygenic mode of inheritance by demonstrating the association between appendicitis and ABO blood group,<sup>10</sup> and a probable linkage with the HLA system. They also found that CcD-Ee Rh phenotype was significantly more frequent in patients with appendicitis.<sup>9</sup> We did not have the required equipment to study genetics. Rivera-Chavez et al. suggested that the human response to a local infection, such as acute appendicitis, is influenced by inherited differences in innate immunity genes, such as IL-6.<sup>11</sup>

The increased risk of male versus female (1.37:1) and age <50 versus age  $\geq$  50 (2.4:1), is quite compatible with the recent literature.<sup>2</sup> The specificity and sensitivity of Alvarado score was reported as 72% and 81% respectively.<sup>4</sup> Our results are not compatible with this report.

In the presented study if a patient was admitted to an emergency department with a chief complaint of acute abdominal pain, and an AS of 5-6, his risk of being acute appendicitis was 13 times greater than the one who had an AS of 1-4 with the same condition. Also, the patient with an AS of  $\geq$ 7 has a risk of being acute appendicitis nearly 31 times greater than the one with a score of 1-4.

The advantages of ultrasonography (no radiation risk, relatively low price and 24-hour accessibility) make it the method of choice to help diagnosing acute appendicitis. However, strict criteria must be used by skilled sonologists to avoid operator-dependent differences. Also, quick accessibility of ultrasound examination must be assured to avoid delays in surgical treatment. Some studies found that in-hospital observation time was longer in perforated appendicitis.<sup>12</sup> As the presented study had the objective of correlating the family history of appendicitis with the presenting symptoms, the ultrasound reports were not included.

### Conclusion

The study concluded that a positive family history of acute appendicitis increased the potential risk in a patient even in the absence of the typical signs and symptoms.

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