

## Management of Complicated Appendicitis in Al-Thawra Modern General Hospital Sana'a -Yemen from November 2019 to November 2020

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**Abstract:** Background: Complicated appendicitis causes morbidity and mortality more than simple appendicitis. Complicated appendicitis includes appendicular mass, appendicular abscess, perforated appendicitis.

Objective: To study presentation of complicated appendicitis regarding to age, sex and complain duration, also to study management of complicated appendicitis and his response to conservative management.

Methods: A prospective, observational study was conducted in the department of general surgery at AL-Thawra hospital during the period from Nov 2019 to Nov2020. The data was collected using clinical examination and follow up, and was analyzed using SPSS 24.

Results: A total of 57 patients diagnosed as complicated appendicitis, aged from 6 to 60 years were admitted, mean age was 28 years. Male to female ratio was 1.6:1. The complaint duration was more than 3 days in 34 cases (59%), total leucocytes count was  $>18 \times 10^3$  in 28 cases (49.1%). Twenty patients (35.1%) diagnosed as generalized peritonitis, 18 cases (31.6%) diagnosed as localized peritonitis, 14 patients (24.6%) diagnosed as appendicular mass, and 5 cases (8.8%) diagnosed as appendicular abscess. Forty cases (70.2%) underwent surgical intervention, whereas 17 cases (29.8%) improved with conservative management. Fifteen cases (37.5%) of operated patients underwent simple appendectomy and 13 cases (32.5%) underwent appendectomy with drain, and 12 cases (30%) underwent midline laparotomy. Most appendicular mass cases 12 (85.7%) were managed conservatively and 2 cases (14.3%) were operated. Three cases (60%) of appendicular abscess were aspirated, 2 cases (40%) were drained. Surgical site infection was 27.5% of operated cases.

Conclusions: Complicated appendicitis can be suspected through clinical presentation, duration of complains and inflammatory response. Management of complicated appendicitis varies accordingly from conservative conventional to midline laparotomy.

**Keywords:** Complicated appendicitis, appendicular abscess, Appendicular Mass.

### علاج التهاب الزائدة الدودية المعقد

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**المستخلص:** الخلفية: يسبب التهاب الزائدة الدودية المعقد المراضة والوفيات أكثر من التهاب الزائدة الدودية البسيط. يشمل التهاب الزائدة الدودية المعقد كتلة زائدية، خراج زائدي، التهاب الزائدة الدودية المنقوبة.

**الهدف:** دراسة عرض التهاب الزائدة الدودية المعقد فيما يتعلق بالعمر والجنس ومدة الشكوى، وكذلك دراسة إدارة التهاب الزائدة الدودية المعقد واستجابته للتدبير التحفظي.

**الطرق:** تم إجراء دراسة استطلاعية قائمة على الملاحظة في قسم الجراحة العامة بمستشفى الثورة خلال الفترة من نوفمبر 2019 إلى نوفمبر 2020. تم جمع البيانات باستخدام الفحص السريري والمتابعة، وتم تحليلها باستخدام SPSS 24.

**النتائج:** تم قبول ما مجموعه 57 مريضاً تم تشخيصهم على أنهم التهاب الزائدة الدودية المعقد. تتراوح أعمارهم بين 6 إلى 60 عامًا، وكان متوسط العمر 28 عامًا. كانت نسبة الذكور إلى الإناث 1.6:1. كانت مدة الشكوى أكثر من 3 أيام في 34 حالة (59%)، وكان إجمالي عدد كريات الدم البيضاء  $18 \times 103$  في 28 حالة (49.1%). تم تشخيص عشرين مريضاً (35.1%) على أنهم التهاب صفاق معمم، و18 حالة (31.6%) تم تشخيصهم على أنهم التهاب صفاق موضعي، و14 مريضاً (24.6%) تم تشخيصهم على أنهم كتلة زائدية، و5 حالات (8.8%) تم تشخيصهم على أنهم خراج زائدي. وخضعت 40 حالة (70.2%) لتدخل جراحي، بينما تحسنت 17 حالة (29.8%) بالعلاجات التحفظية. خمس عشرة حالة (37.5%) من المرضى خضعوا لعملية استئصال الزائدة الدودية و13 حالة (32.5%) خضعوا لاستئصال الزائدة الدودية مع التصريف، و12 حالة (30%) خضعوا لعملية استكشافية للبطن. تمت معالجة معظم حالات الكتلة الزائدة الدودية 12 (85.7%) بشكل تحفظي وتم التدخل الجراحي لحالتين (14.3%). تم إجراء سحب لثلاث حالات (60%) من حالات الخراج الزائدي، وتركيب انبوب نزحي لحالتان (40%). بلغت نسبة الإصابة بالعدوى الجراحية 27.5% من حالات الجراحة.

**الاستنتاجات:** يمكن الاشتباه في التهاب الزائدة الدودية المعقد من خلال العرض السريري ومدة الشكوى والاستجابة الالتهابية. تختلف معالجة التهاب الزائدة الدودية المعقد وفقًا لذلك من الجراحة التقليدية إلى إجراء عملية استكشافية للبطن.

**الكلمات المفتاحية:** التهاب الزائدة الدودية المعقد، خراج زائدي، كتلة زائدية.

## Introduction

Acute appendicitis is the most common cause of acute abdomen worldwide and should be included in differential diagnosis for every patient presenting with acute abdominal pain. One in 15 persons develops appendicitis during his or her lifetime [1]. The disease occurs at all ages but is most frequent in the 2nd and 3rd decades of life. [2]

Appendicitis was recognized as a clinical and pathological entity in 1886 AD [3], when Reginald Fitz, Professor of Pathologic Anatomy at Harvard presented a paper at the meeting of association of American physicians' entitled "perforating inflammation of the vermiform appendix with special reference to its early diagnosis and treatment. The people of the developed countries being educated are aware of the consequences of the appendicitis; hence attend clinics/ hospitals immediately as soon as they develop abdominal pain. But the situation is different in our area; people are poor and illiterate, they present late. Therefore complication rate may be higher, understanding the complications of acute appendicitis, will help to manage these patients properly and decrease the morbidity and mortality. The complications of appendicitis include; appendicular perforation, appendicular mass, appendicular abscess, gangrene of the appendix, portal pyemia leading to liver abscess and intestinal obstruction. [3].

Based on different conducted surveys, the incidence rate of the acute appendicitis range of 7-8% has been reported.

A study was conducted in Pakistan in 2009 to study management of complicated appendicitis male to female 3:1 [1]. The patients presented with right iliac pain 40.9% on examination RIF tenderness was present in (40.9%), tender mass in (35.4%). We found increase in total leucocytes count in (40%). Most of cases presented with perforated appendix (20%), appendicular abscess (4.5%), and appendicular mass (18%), Peritonitis (18%) [1]. In another study was conducted in Pakistan 2015 mean age was  $34.6 \pm 14$  years, duration before pretension  $2 \pm 1.2$  days, management of mass 81% conservative 19% operated [4], In another study was conducted in Saudi Arabia in 2007 males to females ratio was 2:1. Average age was 29 years and duration before the pretension was 6.3 days, WBC increase in 83% of the cases [5]. In another study was conducted in Nigeria in 2019 males to females ratio of 2.5–1, the mean age was  $29.98 \pm 2.08$  years and median age was 26 years. The mean duration before presentation was  $4.5 \pm 3.42$  days leukocytosis of  $>10,000/\text{mm}^3$  was present in 64.2% of patients. [6]

Another study was conducted in Egypt 2010 regarding management of appendicular mass. The mean age was  $31.75 \pm 9.29$  years, male to female ratio was (62.3%) males and (37.7%) were females, the white blood cell count was  $14.123 \pm 3568/\text{mm}^3$ . managed conservative in (75.5%) cases. [7]

### Complicated appendicitis

Perforation is the most concerning complication of acute appendicitis and may lead to mass, abscesses, peritonitis, bowel obstruction, fertility issues, and sepsis. Perforation rates among adults range from 17% to 32% [20, 21, 22] even with increased use of imaging, and may lead to an increased length of hospital stay, extended antibiotic administration, and more severe postoperative complications. Patient-related risk factors for perforation include older age, comorbid conditions.

Predicative for perforation included fever, vomiting, longer duration of symptoms, RIF mass, elevated CRP level or WBC count, and ultrasound findings of free abdominal fluid, visualized perforation, or a mean appendix diameter of 11 mm or more. [21]

### Appendicular mass

This could represent a phlegmon, which consists of matted loops of bowel adherent to the adjacent inflamed appendix or a periappendiceal abscess. Patients who present with a mass have experienced symptoms for a longer duration, usually 5 to 7 days. Distinguishing acute, uncomplicated appendicitis from acute appendicitis with perforation based on clinical findings is often difficult, but it is important to make the distinction because the treatments may differ. CT scan may be beneficial in establishing a diagnosis and guiding therapy.. Between 2% and 6% of patients with acute appendicitis present appendiceal mass [33]

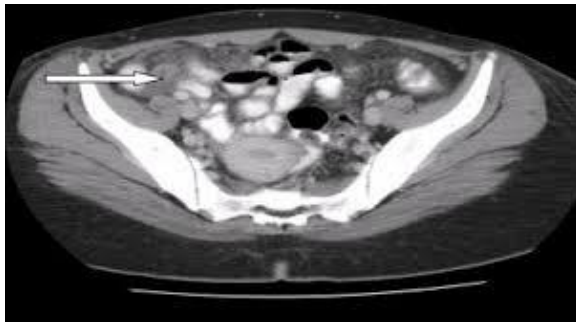


Figure (1) CT scan show appendicular mass      Figure (2) US show Appendicular mass

### Appendicular abscesses

Appendicular abscess is a condition in which pus is formed around the appendix as a result of appendicular perforation or extension of inflammation to the adjacent tissues due to aggravation of appendicitis. It is observed in 2-7% of population presenting with acute appendicitis. [23]

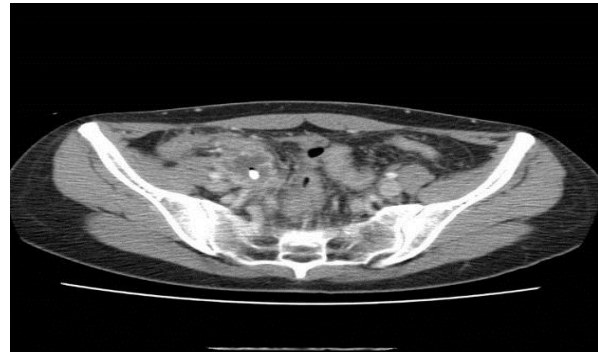


Figure (3) U S Show Appendicular abscesses      Figure 4: CT scan show appendicular abscesses

### Peritonitis

Life-threatening complication of acute appendicitis. The main reason is late diagnosis or treatment leading to the rupture of pus into the peritoneal cavity, resulting general intra-abdominal infection, septic shock with complex, costly treatment and eventually death. [24] Open surgery and treatment more complicated. [25]

### Portal pyaemia (Pylephlebitis)

A rare but very serious complication of appendicitis associated with high fever, rigors and jaundice. It is due to septicemia in the portal venous system and may leads to the development of intrahepatic abscesses. Despite this rarity, mortality remains high and the number of case reports dealing with this entity seems to have increased over the past years [26]

### Management of Complicated Appendicitis

Patients who present with signs of sepsis and generalized peritonitis should be taken to the operating room immediately with concurrent resuscitation. The surgical approach is based on the surgeon

's level of comfort; however, open appendectomy through a lower midline incision may be necessary to treat these complicated cases. In patients with complicated appendicitis and a contained abscess or phlegmon but limited peritonitis (focal right lower quadrant pain), the treatment options become more complicated.

Often, these patients will require a challenging procedure with a high risk for development of a postoperative intra-abdominal abscess. Options include operative management versus non operative management. [27]

**Table (1) Advantages and Disadvantages of Emergency Surgery and Non operative approach**

	Advantages	Disadvantages
<b>Non operative approach</b>	Safe	Failure rate and recurrent symptoms
	Allows acute episode to settle	Delayed emergency surgery in non-responders is hazardous
	Good response in >91%	Costly (long HS, intravenous antibiotics, analgesia, etc.) Appendectomy may be needed; this requires second admission
<b>Emergency Surgery</b>	Safe, feasible and cost-effective	May be difficult especially if delayed
	Acceptable operative time	Differentiation between inflammatory and malignant masses may be difficult
	No need for another admission	Unnecessary ileo-cecal resection may be performed.
	Deals with pathology and other unexpected pathology rapidly No need for close follow-up and investigations	

### Non operative management

#### 1- Ochsner—Sherren regimen

Is present when the condition of the patient is satisfactory, the standard treatment is the conservative this strategy is based on the principle that the inflammatory process is already localized and that inadvertent surgery is difficult and may be dangerous. It may be impossible to find the appendix and, occasionally, a faecal fistula may form. For these reasons it is wise to observe a non-operative programed, but to be prepared to operate should clinical deterioration occur. It is helpful to mark the limits of mass on

the abdominal wall using a skin pencil. A nasogastric tube should be passed and intravenous fluid and antibiotic therapy started [34]. Temperature and pulse rate should be recorded 4-hourly and a fluid balance record maintained. [27] Clinical improvement is usually evident within 24-48 hours at which time the nasogastric tube can be removed and oral fluids introduced. Failure of the mass to resolve should raise suspicion of tumor. Using this regime approximately 90 per cent of cases resolve without incident. Clinical deterioration or evidence of peritonitis is indication for early laparotomy. [28] , Although the advantages of conservative approach it is importance to do detailed investigations even after relive of the attack to be sure that there is no hidden pathology in the conservative groups. CT, MRI, and colonoscopy may be beneficial.

## 2- Aspiration or Drainage

In recent years, it has also been employed for appendicular abscesses in adults to avoid extended surgery or to prevent postoperative complications, Is present when the condition of the patient is satisfactory, the standard treatment is the conservative, This strategy is based on the principle that the inflammatory process is already localized. [29]Abdominal ultrasonography and CT scanning greatly facilitate diagnosis and allow percutaneous drainage Contained appendicular abscess more than 4 cm.



Figure (5) Aspiration of appendicular abscess under US guide

## Operative management

The incision planning depends on the preoperative diagnosis and should be adjusted accordingly.

- McBurney's incision
- Lanz crease incision
- Rutherford Morrison's muscle cutting incision
- Right paramedian or lower midline incision [35]

## Post-operative complications

Wound infection  
Intra-abdominal abscesses  
Postoperative ileus  
Reactionary hemorrhage

Postoperative leak  
Adhesion obstruction,  
Fecal fistula  
Incisional hernia  
Postoperative pneumonia [35]

### General objective

To study management of complicated appendicitis patient admitted in the AL-Thawra Modern General Hospital (AMGH) from Nov 2019 to Nov 2020.

### Minor objective

To identify the risk factor of complicated appendicitis.  
To identify distribution of complicated appendicitis regarding to age, sex.  
To determine relation of complication with complain duration before presentation.  
To study response of complicated appendicitis to conservative management.

## METHODOLOGY

### Type of study and sitting

Descriptive prospective, analytic study of patients with complicated appendicitis of all age group and gender admitted to surgical ward in AL-Thawra Modern General Hospital (AMGH) from Nov 2019 to Nov 2020.

### Study population and sample size

A total number of 57 patients were studied with various symptoms of complicated appendicitis; all patients were admitted through emergency department in surgical ward. After having detailed history and thorough clinical examination every patient was subjected to routine investigations including CBC, CRP, and Urine, all the patients were also advised to imaging investigations.

### Method of data collection and study tools

Data was collected by questionnaire and history, physical examination from the patients diagnosed as complicated appendicitis.

### Inclusion criteria

Based on the following criteria:

- 1- The preoperative diagnosis was acute complicated appendicitis according to preoperative clinical manifestations, laboratory tests and imaging examination.

2- The patients and their families agreed and provided a signed informed consent.

### Exclusion criteria

- 1- Patients operated in another hospital.
- 2- Pregnant women.
- 3- Patients diagnosed as simple appendicitis.
- 4- Patients with incomplete information.

### Statistical methods

The Collected data were analyzed using SPSS VERSION V.24 by applying the following statistical tests:

### Results

Total of 57 patients were analyzed to assess complicated appendicitis.

Thirty-five male patients (61.4 %) were diagnosed as complicated appendicitis and 22 female patients (38.6 %) out of 57 total cases, with male to female ratio 1.6:1

**Table (2) Frequency of patient according to sex**

Gender	No	%
Male	35	61.4
Female	22	38.6
Total	57	100%

The mean age of patients was 28 years with a standard deviation of 15.06 years. The youngest patient was 6 years and oldest was 60 years.

Twenty-two (38.6%) patients belonged to the age group 26-45 years, followed by 16 (28.1%) cases in the age group of 11- 25 years, then 9 (15.8%) cases less than 10 years of age.

**Table (3) Frequency of complicated appendicitis in Various age groups**

Age group (years)	No	%	Minimum	Maximum	Mean	Std. Deviation
Less than 10 years	9	15.8	6	60	28.0	15.066
11-25	16	28.1				
26-45	22	38.6				
46-55	7	12.3				
56-65	3	5.2				
More than 65 years	0	0.0				
Total	57	100%				

In 23 cases (40.3%) chief complaint was localized pain in RIF, followed by diffuse abdominal pain in the 15 cases (26.3%) followed by mass in RIF in 14cases (24, 6%) then abdominal distention in 5 cases (8.8%).



**Table (4) Distribution of Clinical presentation in patients**

Clinical presentation	№	%
Localized pain in RIF	23	40.3
Diffuse abdominal pain	15	26.3
Tender mass in RIF	14	24.6
Abdominal Distention	5	8.8
Total	57	100%

The complaint duration was more than 3 days in 34 cases (59.6%), 1-3 days in 18 cases (31.6%) and less than 1 day in 5 cases (8.8%).

**Table (5) The frequency of complain duration in patients**

complain duration	№	%
Less than 1 day	5	8.8
1-3 days	18	31.6
More than 3 days	34	59.6
Total	57	100%

WBC was  $>18 \times 10^3$  in 28 cases (49.1%), WBC  $10-18 \times 10^3$  in the 18 cases (31.6%), WBC was  $<10 \times 10^3$  in 11(19.3%) cases

**Table (6) The frequency of WBC Count in patients**

WBC	№	%
$<10 \times 10^3$	11	19.3%
$10-18 \times 10^3$	18	31.6%
$>18 \times 10^3$	28	49.1%
Total	57	100%

The patient diagnosed as diffuse peritonitis was 20(35.1%) followed by perforated appendicitis 18(31.6%) case than 14 cases diagnosed as appendicular mass, lastly 5(8.8%) cases diagnosed as appendicular abscess.

**Table (7) Distribution of patients according to diagnosis**

Diagnosis	№	%
Perforated Appendicitis	18	31.6
Appendicular Abscess	5	8.8
Appendicular mass	14	24.6
peritonitis	20	35.1
Portal pyemia	0	0.0
Total	57	100%

Forty cases (70.2%) underwent operation, whereas 17 (29.8%) cases improved by conservative management.

**Table (8) Distribution of patients according to management.**

Management	No	%
operated	40	70.2%
Non operated	17	29.8%
Total	57	100%

Fifteen cases (37.5%) underwent simple appendectomy, 13case (32.5%) underwent appendectomy with drain and 12cases (30%) underwent midline laparotomy.

**Table (9) Distribution of patients according to type of operation**

Type of operation	No	%
Simple appendectomy	15	37.5%
Appendectomy with drain	13	32.5%
Midline Laparotomy	12	30.0%
Total	40	100%

Regarding to appendicular masses patients, 12cases (85.7%) were managed conservatively. whereas 2 cases (14.3%) operated.

**Table (10) Distribution of management of appendicular mass**

management of appendicular mass	No	%
Non operated	12	85.7
Operated	2	14.3
Interval	0	0.0
Total	14	100%

All appendicular abscesses managed conservatively, 3cases (60%) were managed by aspiration. whereas 2 cases (40%) managed by insertion drain.

**Table (11) Distribution of appendicular abscesses management**

Appendicular abscess management	No	%
Aspiration	3	60.0
Drainage	2	40.0
Operated	0	0.0
Total	5	100%

The surgical site infection was the common complication; there is 11 (27.5%) cases, despite the use antibiotic with regular dressing. Intra-abdominal abscess occurred in 2 (5%) patients, 2 cases (5%)

had faecal fistula, pneumonias was seen in 5 patients (12.5 %), adhesive obstruction occur in 1 case (2.5%), lastly postoperative ileus occur in 1 case (2.5%).

**Table (12) Distribution of patients according to postoperative complication**

postoperative complication	No	%
Surgical site infection	11	27.5%
Intra-abdominal abscess	2	5%
Faecal fistula	2	5%
Pneumonias	5	12.5%
Adhesive obstruction	1	2.5%
Reactionary hemorrhage	0	0
Postoperative ileus	1	2.5%

## Discussion

Acute appendicitis is commonest cause of acute abdomen requiring surgery. The lifetime probability for the development of appendicitis is 8.6 % in males & 6.7 % in females. [14] In our study male to female ratio was 1.6:1 this is similar to other study ratio was 2:1 [1]. The complicated appendicitis is more common in males, may be related to increase incidence of appendicitis in male patients as documented in most series.

The mean age for complication appendicitis in this study was 28 years and the peak age at presentation was found between 26-45 years in 38.6%.

Documented risk factors for complicated appendicitis are higher in the extreme of ages, fever  $\geq 38^{\circ}\text{C}$ , immune compromised and duration of abdominal pain before presentation [30]. In children, nonspecific nature of abdominal pain of acute appendicitis leads to delayed presentation. In addition, there is a higher rate of progression of appendicitis in children due to lack of well-developed omentum and abdominal fat to contain inflammatory process [31].

Delay in surgical intervention has been associated with increased rate of complicated appendicitis and increase rate of perforation from 3% in patients operated within 24 h of presentation to 31% in patients operated at 36 h. [32]

Localized pain in RIF was present in 23 (40.3%) patients was classical abdominal pain but in 15 patient (26.3%) abdominal pain was diffuse, five (8.8%) cases present with abdominal distention.

Complain duration before presentation consider important factor in increase rate of complicated appendicitis, about 34(59.6%) cases complain duration was more than 3 days, the people are poor and illiterate, they present late. Therefore, complication rate may be higher understanding the complications of acute appendicitis, will help to manage these patients properly and decrease the morbidity and mortality.

Leukocytosis with polymorphonuclear predominance is helpful in the diagnosis of acute appendicitis and can be suspect complicated appendicitis. In this study WBC was more than 18000 cells/mm<sup>3</sup> in 49.1%, in another study we found leukocytosis of >10, 000/ mm<sup>3</sup> in (55.9%) patients reviewed. [6]

However, the incidence of perforation in acute appendicitis varies widely; a perforation rate between 4.4 and 39% has been reported in the West African [6], in our study rate of perforation was 31.6 % this similarity due symmetrical factor related to patients and health system in developing country.

Appendicular mass was present in 14 (24.6%) cases especially with development of strong antibiotic. This usually occurs after 48-72 hours of the first symptoms of acute appendicitis. There are no universal standard or clear-cut guidelines in the management of the appendicular mass with extreme modalities of treatment but in our study most the patient managed conservative 85.7% which consider practiced approach in the absence of abscess formation. It is trusted & favored widely all over the world because of; its efficacy & safety, with avoidance of the potential hazards of intestinal injuries. The success rate ranges from 88-95 % [33], with substantially low rate of complications.

Entirely conservative treatment without routine interval appendectomy. It is argued that interval appendectomy is unnecessary after successful conservative management of an appendicular mass because of low rate of recurrence. They recommend the interval appendectomy only in patients exhibiting recurrent attacks.

Appendicular peritonitis was present in 20(35.1%) cases, the cases present as diffuse abdominal pain or abdominal distention with manifestation of intestinal obstruction, all cases underwent laparotomy.

The surgical site infection consider the most complication post-operative, in spite administer broad-spectrum antibiotics for about 5 days after surgery, SSIs (27.5 %), Pneumonias (12.5%), intra-abdominal abscess (5%), faecal fistula (5%) were the common complications we encountered in this study.

## Conclusion

Complicated appendicitis causes more morbidity than simple acute appendicitis.

Long duration complains increase risk for complicated appendicitis.

Inflammatory response gives us suspicious of complicated appendicitis.

Appendicular mass treated conservatively, except for those cases who do not respond to medical treatment.

Appendicular abscess treated non operative with good response.

## Recommendations

Early diagnosis of appendicitis can be minimizing complicated appendicitis.

Identification of patient with high risk is necessary for decision making.

Strict follow up for acute appendicitis patients treated conservatively.

Appendicular mass should be treated conservatively, except for those cases who do not respond to medical treatment.

Future studies including management assess with large sample sizes are recommended to evaluate the real size of disease and its management.

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