

Research Article

Non-Operative Management of Uncomplicated Acute Appendicitis during COVID-19 Pandemic: A Single Institution Based Prospective Study

Bhawani Khanal^{1*}, Sunit Agrawal¹, Suresh Sah¹, Raj Kumar Sangroula² and Rakesh Kumar Gupta¹

¹Department of General Surgery and MIS Unit, BPKIHS, Nepal

²Department of Public Health, Little Buddha College of Health Sciences, Nepal

Abstract

Background: Acute appendicitis is the most common surgical emergency all over the world and counts for high disease burden in an emergency setting. Non-operative management for uncomplicated acute appendicitis could be one of the effective treatment modalities to curtail the risk of exposure for both patients and doctors alike in this COVID-19 crisis. The aim of this study was to evaluate the outcomes of the patients treated conservatively for uncomplicated acute appendicitis and formulate a definite protocol for the same.

Methods: All the patients with the diagnosis of uncomplicated acute appendicitis and those who gave consent were included in our study. The patients were kept Nil Per Oral (NPO) and antibiotics, analgesics were started after the admission. Vitals and symptoms were monitored regularly until symptoms resolved or otherwise. Finally patients were allowed orally and discharged as per the protocol. Patients were not called for follow up.

Results: Out of total 60 patients in this study, 54 (88.90%) patients were managed successfully with non-operative management. Three (5%) patients developed appendicular lump, 1 (1.67%) patient developed appendicular abscess whereas 2 (3.45%) patients underwent emergency appendectomy.

Conclusion: COVID-19 still remains unsolved mystery till now and there is uncertainty over the definitive treatment. Till then it is very important to adopt a suitable modality to avoid unnecessary exposure to health professionals and patients. Non-operative management of uncomplicated acute appendicitis could be the answer to deal with the burden of surgeries amidst this crisis.

Keywords: Acute appendicitis; COVID-19; Non-operative management

Abbreviations

NPO: Nil Per Oral; INR: International Normalised Ratio; NOM: Non Operative Management; PPE: Personal Protective Equipment; PT: Prothrombin time; RIF: Right Iliac Fossa; USG: Ultrasonography

Introduction

Acute appendicitis remains the most common of all surgical emergencies all over the world and it is no different to our institute as well [1]. Emergency appendectomy thus remains the most commonly performed surgery all over the world and it remains such in our institute also [2]. As our institute is a tertiary referral centre and a level three COVID -19 hospital as declared by Nepal Government [2], large number of suspected as well as diagnosed cases are referred to our institute, increasing the risk of exposure to COVID-19 cases proportionally. As Nepal is a developing country with weak health

system infrastructure, there is inadequate financial capability to facilitate optimum personal protective equipment for health care workers and surgical instruments needed for management of such patients. Owing to lack of vaccine, definite cure of COVID-19 as of now and high transmission rates, the future of this pandemic remains uncertain at this moment.

Evidence that support concentration of COVID -19 viruses is more in peritoneal fluid compared to respiratory tract has discouraged surgeons to enter the peritoneal cavity [3]. Thus, conservative management remains the favorable treatment option for uncomplicated acute appendicitis. This modality of treatment requires relatively less number of health workers including surgeons, nurses, anesthesia team and operation theatre staffs thereby greatly reducing risk of transmission.

Uncomplicated appendicitis is defined as acute appendicitis in the absence of perforation, abscess or with early lump formation [4]. Conservative approach for uncomplicated acute appendicitis not only provides special benefits to those health personnel working in the peripheries despite poor operating facilities, it also helps in managing busy emergency setup and avoiding unnecessary surgery and associated morbidity and mortality [5]. Those patient managed conservatively can be followed up without need of interval appendectomy [6].

Patients with suspected acute appendicitis need high diagnostic accuracy as negative appendectomy carries a significant morbidity. Whichever be the type of surgery either open or laparoscopy, none remain free from postoperative complications [7]. Appendix can also

Citation: Khanal B, Agrawal S, Suresh S, Sangroula RK, Gupta RK. Non-Operative Management of Uncomplicated Acute Appendicitis during COVID-19 Pandemic: A Single Institution Based Prospective Study. *J Surg Surgic Case Rep.* 2020;1(2):1007.

Copyright: © 2020 Bhawani Khanal

Publisher Name: Medtext Publications LLC

Manuscript compiled: Sep 18th, 2020

***Corresponding author:** Bhawani Khanal, Department of General Surgery and MIS Unit, BPKIHS, Dharan, Nepal, Tel: +9779860191228; E-mail: itsmebhawanikhanal@gmail.com

serve as an useful conduit for reconstructive surgery (e.g. epaticoporto appendicostomy or uretero plasty). To add, post-operative risk of adhesions is greater after laparotomy for healthy appendices than those in cases with acute appendicitis [5]. The aim of the study was to evaluate the outcomes of the patients treated conservatively for uncomplicated acute appendicitis and formulate a definite protocol for management of the same.

Materials and Methods

Study design, sampling and sample size

This study is a single institution based prospective study. The study was done in Department of General surgery at B. P. Koirala Institute of Health Sciences, Dharan, Nepal. The study duration was from 1 July 2020 to 31 July, 2020. The study consider 95% CI and 80% power to estimate the sample size. According to literature review the successful NOM was found to be around 80% [8]. The calculated sample size was 60. The total number patients presented in the month of June with the diagnosis of acute appendicitis were 73. All patients with the diagnosis of acute appendicitis and fulfilling the inclusion criteria and those who gave consent were included in this study.

Inclusion and exclusion criteria

Inclusion criteria for this study were 1. Age more than 18 years 2. Lower abdominal pain/ right iliac fossa pain, clinical diagnosis and suspicion made by attending general surgeon with modified Alvarado score greater than or equal to 4. Exclusion criteria in this study were 1. Diffuse peritonitis 2. Presence of appendicular lump 3. Positive pregnancy test 4. History of inflammatory bowel disease 5. USG abdomen showing evidence of fecolith or abscess 6. Patients with Diabetes Mellitus, on steroid therapy.

Outcomes of the Study

The primary outcomes of the study was successful non operative management of patients with uncomplicated acute appendicitis. The secondary outcomes were minor complications (appendicular lump, abscess), length of hospital stay, patient satisfaction and cost analysis.

Procedure

Patients were included in this study irrespective of COVID-19 status without doing any tests. Attending surgeons assessed the patient with the use of mask and gloves as the only protective devices. All patients were made to wear mask during the examination process and during their stay in the ward. After admission to emergency they underwent clinical, laboratory and radiological investigations such as random blood sugar, complete blood count, sodium, potassium, chest x-ray, PT/INR, Blood Grouping and ultrasound abdomen and pelvis.

Among 73 patients, 4 patients had features of generalized peritonitis, 3 patients showed appendicitis with fecolith and 2 patients had features of gangrenous appendix in USG. The number of patients who didn't give consent were 4. So, total 60 patients were included in this study. Each patients on conservative management was kept NPO with maintenance fluid, antibiotics and analgesics as follows.

1. Inj. Ceftriaxone 1 gm twice a day
2. Inj. Metronidazole 500 mg thrice a day
3. Inj. Omeprazole 40 mg twice a day
4. Inj. Paracetamol 1 gm four times a day
5. Inj. Diclofenac sodium 75 mg sos

6. Patients were monitored regularly twice a day for vitals along with fever, pain, tenderness and rebound tenderness. Patients those with improved symptoms were allowed orally initially sips than liquid followed by soft diet. Patients meeting following criteria were ordered to discharge.

Discharge criteria

1. Pain controlled with oral analgesics
2. Absence of fever
3. Absence of appendicular lump
4. Patient taking normal diet

Patient with criteria for discharge after conservative management were labeled as those having successful non operative management.

Patients fulfilling the discharge criteria were discharged with following advice.

1. Tab. Sulbacin 1.5 mg twice a day for 7 days
2. Tab. Ornidazole 500 mg twice a day for 5 days
3. Tab. Rabeprazole 20 mg twice a day for 7 days
4. Tab. Diclofenac Sodium 50 mg thrice a day and sos.

Once the patients were discharged from ward they were not followed in this study.

During the management, 1 patient developed appendicular abscess for which pig tail drainage was done. 3 patients developed appendicular lump and were managed with Ochsner Sherren regimen. 2 patients underwent emergency appendectomy. During surgery, surgeons, anesthesia team, nurse and helpers were provided HIV kit as a means of Personal Protective Equipment (PPE). Though, there was no protocol for follow up for those patients who were successfully managed conservatively and discharged, not even a single case of recurrence was noticed during the study period. The methodology is shown in (Figure 1) as a consort chart.

Results

Clincio-demographic profiles

The age of the patients ranged from 18 years to 60 years with the average of 27 years (Table 1). The male to female ratio was 3:2 (60% and 40% respectively). Regarding duration of pain at the time of presentation, 46 (76.7%) of patients were presented within 48 hours of onset of pain whereas 14 (23.3%) patients presented after 48 hours. More than two-third (70%) patients presented with typical migratory pain of acute appendicitis whereas only 30% patients presented with right iliac fossa pain. Anorexia was found in 40 (66.7%) patients and 44 (73.3%) patients presented with the history of nausea/vomiting. There was evidence of tenderness and rebound tenderness in right iliac fossa in 56 (93.3%) and 50 (83.3%) patients respectively. There were 36 (60%) patients who presented with fever at the time of presentation. Regarding leucocyte count, there was evidence of leukocytosis in 37 (61.7%) patients whereas it was within normal range in 23 (38.3%) patients. The mean leucocyte count was 11,723/mm³ with standard deviation of 4339/mm³. Evidence of neutrophil was greater than 80% in 39 (65%) patients whereas it was less than 80% in 21 (35%) patients. Regarding Alvarado score, 28 (46.67%) patients had Alvarado score of more than 6, 24 (40%) had score between 5 to 6 and 8 (13.33%) patients had score of less than 5. Majority of the patients i.e., 54 (90%) had

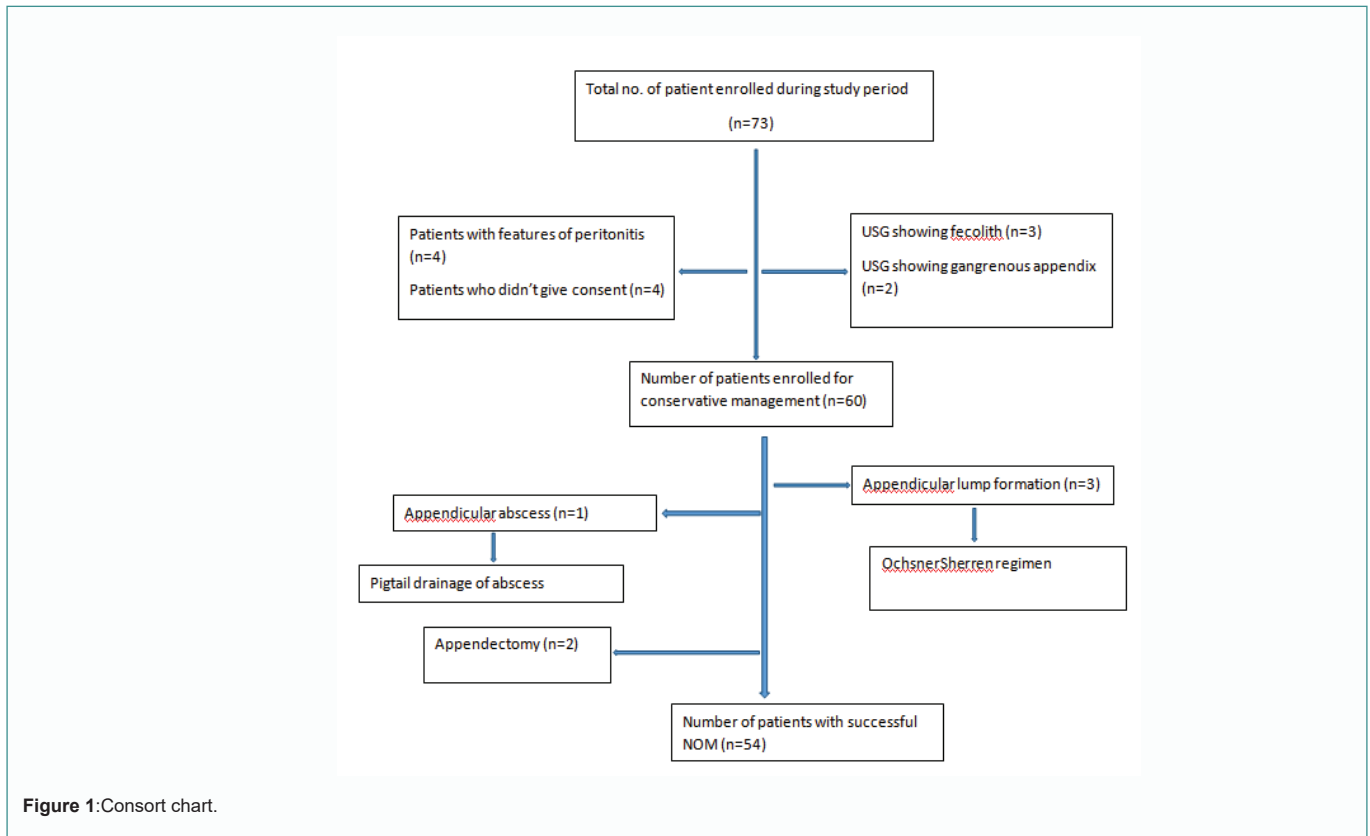


Figure 1: Consort chart.

diameter of more than 6 mm whereas 2 (3.33%) patients had appendix with diameter of less than 6 mm. Appendix was not visualized in 4 (6.67%) cases. Out of the total 60 patients, only 4 (6.67%) patients had abnormal liver function test and only abnormality was increased total bilirubin level of >2 mg/dl. Regarding International Normalized Ratio (INR), there were 2 (3.33%) patients having deranged INR.

Outcomes

Among 60 patients, 54 (88.90%) patients were managed successfully with non-operative management without any sequela. Appendicular lump formation was seen in 3 (5%) patients. There was a single (1.67%) patient with appendicular abscess formation. Of the total patients, only 2 (3.45%) of them underwent appendectomy. Half of the patients i.e., 30 (50%) patients had hospital stay of less than 3 days (Table 2).

More than two-third i.e., 42 (70%) patients were completely satisfied with the treatment. Only 6 (10%) patients were somewhat satisfied with the treatment and 7 (11.7%) of patients were neither satisfied nor dissatisfied whereas 5 (8.3%) patients were completely dissatisfied with the treatment. Regarding cost, those patients who underwent successful non operative management had cost benefit of approximately \$100.

Discussion

Conservative management of acute appendicitis was started in 1959 by Coldrey using antibiotics [9]. Since then it has been established as the effective modality of treatment in case of uncomplicated acute appendicitis. This form of treatment is shown to be equally effective as open/laparoscopic appendectomy but is also devoid of postoperative complications such as postoperative ileus, adhesive bowel obstruction and residual abscess [10].

As COVID-19 pandemic continues to spread and we are yet to find a definitive treatment for now, we as health care workers are responsible for not only protecting ourselves from unnecessary exposure but also those patients who come to hospital for the treatment. On the basis of literature research [5] and on our own experience we firmly believe that conservative management of uncomplicated acute appendicitis will help us to decrease surgical loads and also prevent us from unnecessary exposure of COVID-19. The result from our research was also very encouraging during this crisis.

Acute appendicitis is still the most common surgical emergency all over the world and is common in population in their second and third decades [11]. Similar findings were there in this study.

Alvarado score along with the radiological findings were used to diagnose acute appendicitis in this study. In a study done by Tyler J Loftus, those patients with lower Alvarado score (<4) had successful NOM, which was in contrast to this study [12]. In this study, no matter what is the score either low or high, every patient was managed successfully with non-operative management with few exceptions. Those patients having appendix diameter <13 mm were successfully managed conservatively, which was also same in this study. This is in accordance with the Laplace law which says that greater the diameter of appendix, greater is the chance of perforation [12]. In the same study, it showed that outcomes of successful NOM is greater with delayed presentation. But in this study, 76% of the study population presented within less than 48 hours after onset of pain and were successfully managed conservatively which was in contrast to the study done by Tyler J Loftus [12]. This could be attributed to early use of antibiotics which limits the progression of inflammation.

In the study done by Iftikhar M, hyperbilirubinemia is shown as a predictor of complicated acute appendicitis [13]. Among 60

patients liver function test was abnormal in only 4 patients but all of them were managed conservatively. Increased INR has also been regarded as a predictor of complicated acute appendicitis [14]. In this study only 2 patients had raised INR and both of them had failed conservative management and underwent emergency appendectomy. Intra operative findings in both the patient had perforated tips. Before considering INR as a strong predictor of complicated acute appendicitis more study is needed.

The average hospital stay in this study was 4 days. Comparing the cost benefit in those patients with successful non-operative management to those patients managed operatively in the past, there was benefit of approximately \$100 while managing conservatively which is also beneficial at the time of ongoing crisis. More than 80% of the patients were satisfied with the management.

This study has limitation of small sample size (60) and absence of follow up care. More sample size is needed to find the strength between the predictors with the successful NOM. However, the aim of our study is to find the way to lessen the burden of surgical cases in emergency so that those cases which needed priority could be managed efficiently without unnecessary exposure to COVID-19. To save ourselves and those patients visiting hospital is the most important thing in our medical field right now. We have to find out the way to deal with this crisis without hampering patient's health. With this study results we have made the protocol to manage uncomplicated acute appendicitis in our institute and since then we are getting satisfactory results. This protocol (Figure 2) may help those institutes like us and those in peripheries dealing the same.

Conclusion

Uncomplicated acute appendicitis can be managed conservatively. Factors such as Alvarado score, time of presentation to the hospital, appendicular diameter, elevated temperature may not be a decisive factors in selection of patients for successful non-operative management and may need further studies. It requires meticulous selection and monitoring of the patients clinically. Non operative management for uncomplicated acute appendicitis now could be the best possible modality to reduce the surgical burden in the tertiary hospitals as well those in the peripheries during COVID 19 crisis.

Ethical Clearance

The ethical approval was obtained from the Institutional Review Committee (IRC) of B. P. Koirala Institute of Health Sciences, Dharan, Nepal. The reference number is IRC/1790/020.

Conflict of Interest Statement

The authors declare that they have no conflict of interest. Informed consent was obtained from all individual participants included in the study.

References

1. Alnaser MK, Hassan QA, Hindosh LN. Effectiveness of conservative management of uncomplicated acute appendicitis: A single hospital based prospective study. *Int J Surg Open*. 2018;10:1-4.
2. Yadav P, Shah SP, Gupta RK. Randomized controlled trial comparing clinical outcome and cost analysis between laparoscopic and open appendectomy for acute appendicitis at Dharan, Sunsari, Nepal. *Int Surg J*. 2018;5(4):1205.

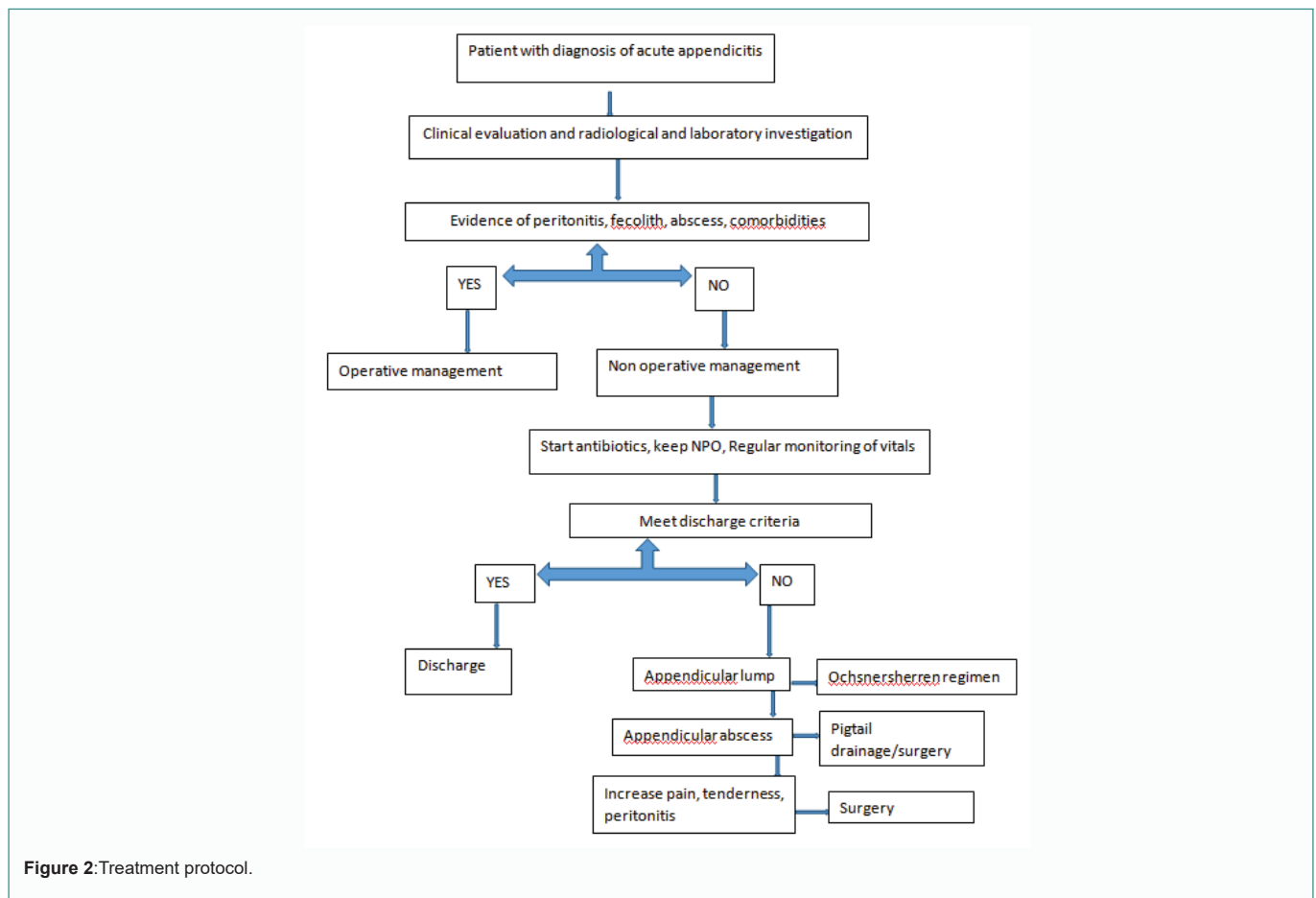


Figure 2: Treatment protocol.

Table 1: Clinico-demographic profile of the patients.

Age (years)	Range: 18 years - 60 years Average age: 27 years
Sex	Male: 60%, female: 40%
Duration of pain at the time of presentation (hours)	<48 hours: 46 (76.7%) >48 hours: 14 (23.3%)
Migratory pain	Yes: 42 (70%) No: 18 (30%)
Anorexia	Yes: 40 (76.7%) No: 20 (23.3%)
Nausea/Vomiting	Yes: 44 (73.3%) No: 60 (26.7%)
Tenderness	Yes: 56 (93.3%) No: 4 (6.7%)
Rebound tenderness	Yes: 50 (83.3%) No: 10 (16.7%)
Elevated temperature	Yes: 36 (60%) No: 24 (40%)
Leukocytosis(mm ³)	<11000: 23 (38.3%) >11000: 37 (61.7%)
Neutrophil (>80%)	39 (65%)
Alvarado score	<5: 13.3% 5-6: 40% >6: 46.67%
Diameter of appendix(mm)	<6: 3.3% >6: 90% Appendix not visualized : 6.7%
Liver function test	Abnormal: 6.67%
International Normalized Ratio (INR)	Abnormal: 3.33%

Table 2: Outcomes of the study.

Appendicular lump formation	3 (5%)
Appendicular abscess formation	1 (1.67%)
Emergency appendectomy	2 (3.45%)
Successful non operative management	54 (88.90%)
Hospital stay(days)	<3: 50% >3: 50%
Patient satisfaction	Completely satisfied: 70% Somewhat satisfied: 10% Neither satisfied nor dissatisfied: 11.7% Completely dissatisfied: 8.3%
Cost analysis	Cost benefit of around \$100

- Coccolini F, Tartaglia D, Puglisi A, Giordano C, Pistello M, Lodato M, et al. SARS-CoV-2 is present in peritoneal fluid in COVID-19 patients. *Ann Surg.* 2020;1-5.
- Coccolini F, Fugazzola P, Sartelli M, Cicuttin E, Grazia MS, Leandro G, et al. Conservative treatment of acute appendicitis. *Acta Biomed.* 2018;89(9):119-34.
- Malik AA, Bari SU. Conservative management of acute appendicitis. *J Gastrointest Surg.* 2009;13(5):966-70.
- Sasikumar MN, Mammen SC, Das S. A retrospective study on patients with appendicular mass after successful conservative treatment and to assess the need for interval appendicectomy. *Int Surg J.* 2018;5(2):513.
- Klingler A, Henle KP, Beller S, Rechner J, Zerz A, Wetscher GJ, et al. Laparoscopic appendectomy does not change the incidence of postoperative infectious complications. *Am J Surg.* 1998;175(3):232-35.
- Allan Z, Al HY. Non-operative management of acute appendicitis-evidence versus practice in eastern health, Victoria, Australia. *J Surg Oper Care.* 2018;3(2).
- Kim TH, Cho BS, Jung JH, Lee MS, Jang JH, Kim CN. Predictive factors to distinguish between patients with noncomplicated appendicitis and those with complicated appendicitis. *Ann Coloproctol.* 2015;31(5):192-7.
- Tugnoli G, Giorgini E, Biscardi A, Villani S, Clemente N, Senatore G, et al. The nota study: non-operative treatment for acute appendicitis: prospective study on the efficacy and safety of antibiotic treatment (amoxicillin and clavulanic acid) in patients with right sided lower abdominal pain. *BMJ Open.* 2011;1(1).
- Okuş A, Ay S, Karahan Ö, Ali ME, Sevinc B, Aksoy N, et al. Monitoring C-reactive protein levels during medical management of acute appendicitis to predict the need for surgery. *Surg Today.* 2015;45(4):451-6.
- Loftus TJ, Brakenridge SC, Croft CA, Smith RS, Efron PA, Moore FA, et al. Successful nonoperative management of uncomplicated appendicitis: predictors and outcomes. *J Surg Res.* 2018;222:212-8.
- Iftikhar M, Qureshi U, Khan JS, Shafique S. Hyperbilirubinemia as an indicator of complicated appendicitis. *Int J Surg Med.* 2019;5(2):58-65.
- Kim M, Kim SJ, Cho HJ. International normalized ratio and serum C-reactive protein are feasible markers to predict complicated appendicitis. *World J Emerg Surg.* 2016;11(1):1-5.