Journal homepage www.jzs.univsul.edu.iq
Journal of Zankoy Sulaimani
Part-A- (Pure and Applied Sciences)
ISSN:1812-4100

Prevalence of Acute Appendicitis Complications in Overweight and Obese Patients: A Cross-Sectional Case Series Study

Bawan Muhamad Jazaa Ahmed [1] & Hiwa Omer Ahmed [2,] *

[1] *Kurdistan Board for Medical Specialties, Ministry of Health, Sulaimani, Kurdistan Region, Iraq*
[2] *Department of Surgery, College of Medicine, University of Sulaimani, Kurdistan Region, Iraq*
**Corresponding author's e. mail: hiwa.ahmed@univsul.edu.iq*

Article info

Original: 10/06/2022
Revised: 15/07/2022
Accepted: 20/07/2022
Published online: 20/12/2022

Keywords:
Appendicitis, early complications, excess weight, hospitalization, prospective cross-sectional study

Abstract

Background: Obesity is known to increase morbidity and mortality in the general population and therefore is perceived as a risk factor for adverse post-surgical results. **Aims:** To find the real impact of extra weight on the course of the early postoperative complications of open appendectomy. **Methods:** A prospective cross-sectional case series study was conducted on 93 patients from a total 100 patients labeled with an acute abdomen with signs and symptoms of acute appendicitis. Early postoperative complications are classified according to the Clavien-Dindo-Classification (CDC) system. **Results:** Seventy-one (76.34%) patients went through a smooth postoperative period without complications, of which the majority belong to group A with normal body weight (n=39, 54.9%). The most common early complications were superficial surgical site infection (n=14, 15.05), deep surgical site infection (n=6, 6.45%) equally in both groups A, and B that required hospital admission and antibiotic therapy and 2 male patients (2.15%) in the group A; average weight group developed deep surgical site infection both of their intraoperative findings were perforated appendicitis. **Conclusions:** There is a significant relationship between the duration of hospital stay and the patient's weight (P-value=0.00541). Albeit, the results showed that patients with excess weight need to stay longer in the hospital compared to average-weight patients.

Introduction

Acute appendicitis (AA) is among the most common causes of lower abdominal pain that make the patient attend the emergency department immediately. The most common diagnosis in young patients admitted to the hospital with acute abdominal pain ***[1]*** as a lifetime risk of AA is 8.6% in males and 6.7% in females ***[2]***. Normal anatomical variations of AA include retrocaecal/retrocolic (75%), subcaecal/pelvic (20%), and preileal and postileal (5%) ***[3]***.

Appendicitis is either non-complicated or may be complicated when it is perforated or gangrenous and/or peri-appendicular abscess ***[4]***. Clinical suspicion of AA is mainly done on the patient's symptoms and physical findings, including the Alvarado score with an accuracy of 98.6% versus computed tomography (CT) scan (99.03% accuracy). Blood/urine investigations, plain erect abdominal radiogram and ultrasonography of abdomen and pelvis, may aid in the accuracy of the diagnosis, however; they are not as helpful as magnetic resonance imaging (MRI) and CT scan, which have the accuracy of 98% in diagnosing AA, and lastly diagnostic laparoscopy ***[5]***.

Appendectomy is the most commonly performed surgery in the emergency department, which makes up 1-2% of all surgical operations with a mortality rate of 0.1%, and up to 0.6% in the gangrenous type. The mortality rate might be higher than 20% in the elderly due to the delayed diagnosis and intervention ***[6,7]***.

Regarding the prevalence of overweight and obesity in Iraqi cities, in the Sulaimaniyah governorate is high (20.6% and 11.3%, respectively) ***[8]***, while in the Erbil governorate is higher (33.4%, and 40.9%, respectively) ***[9]*** and in the Baghdad is highest (61.1% and 76%, respectively) ***[10]***.

Patients with extra weight undergoing appendectomy are a real challenge to the surgeon; in either method open or laparoscopic appendectomy, ***[11]*** need earlier CT scan in patients with extra weight, larger volumes of intra-abdominal/subcutaneous fats can affect the accuracy of physical examination ***[12,13]***. Thus, the current paper aims to find the real impact of extra weight on the early postoperative complications of open appendectomy.

Materials and methods

A. Patients and study setting

This prospective cross-sectional case series study was conducted on 100 patients labeled with an acute abdomen with signs and symptoms of AA who were admitted to Shar Emergency Teaching Hospital, Sulaimaniyah, Northern Iraq, from 13th January 2021 to 12th January 2022 to undergo appendectomy. Patients were divided into two groups: group A with normal body weight and group B with excess weight. Ninety-six patients underwent open appendectomy, and only 4 patients underwent laparoscopic appendectomy.

B. Patient consent

Informed consent was obtained from each patient, who was asked to sign a written consent form.

C. Ethical approval

The Ethics Committee of the Kurdistan Board for Medical Specialties approved the research proposal for Medical Specialties, by document number 104 on 13th January 2021.

D. Inclusion criteria

Patients with normal body weight (BMI=18.5-24.9 kg/m^2), overweight patients (BMI=25-29.9 kg/m^2), and obese patients (BMI > 30 kg/m^2) were included in this study.

E. Exclusion criteria

Underweight patients, those aged <11 years and >60 years were excluded from the study, those who underwent laparoscopic appendectomy and those with previous abdominal surgery. Also, those patients with local/generalized peritonitis and those with normal histopathological appendix were not included.

F. Patient preparation

Each patient was evaluated clinically for weight and height to determine body mass index (BMI) in kg/m^2 before surgery. A trainee from Kurdistan Board for Medical Specialties/Surgery interviewed all the patients personally. An initially designed questionnaire was filled with socio-demographic, medical, surgical, and biological data.

G. Post-operation complication

Early postoperative complications are classified according to the Clavien-Dindo-Classification (CDC) system ***[14]***. Grade I included minor risk events without therapy with exceptions of analgesic, antipyretic, antiemetic, and antidiarrheal drugs or drugs required for lower urinary tract infection. Whereas grade II complications were potentially life-threatening complications with the need for intervention or a hospital stay longer than twice the median hospitalization for the same procedure. Grade II was also divided into 2

subgroups based on the invasiveness of the complication treatment therapy; grade IIA complications required medications only, and grade IIB an invasive procedure. Grade III complications lead to lasting disability or organ resection, and finally, Grade IV complications indicate the death of a patient due to a severe complication.

H. Statistical analysis

All data were collected, organized, and analyzed by Statistical Package for the Social Sciences (SPSS); version 21 and a P<0.05 were accepted as statistically significant.

Results

Majority of the patients were male (56, 60.2%), and 37 patients were female (39.8), with female/male ratio of 6.6/10. The most common age group was 11-20 years (n=34, 36.55%), then followed by 21-30 years (n=32, 34.4%), while only two patients were between 51-60 years (n=2, 2.2%) (Table 1).

Table-1: Age groups and gender of the patients in both groups A, and B, admitted as suspected acute appendicitis.

Age groups (Years) (n=93)	**Group A Average weight (n=44)**		**Group B Excess weight (n= 49)**				**Total (n=93)**
			Overweight (n=20)		**With obesity (n=29)**		
	Female n=14	Male n=30	Female n=10	Male n= 10	Female n=13	Male n=16	
11 - 20	4	7	5	3	6	9	34
21 - 30	6	14	3	2	2	5	32
31 - 40	3	6	1	3	2	1	16
41 - 50	0	2	1	2	3	1	9
51 - 60	1	1	0	0	0	0	2

The patients were divided into two groups, group A with average weight (n=44, 47.3%) and group B with excess weight (n=49, 62.71%), consisting of 20 overweight patients (21.5%) and 29 obese patients (31.2%). The majority of the patients were young without comorbidity (n=54, 58.1%), but 28 patients had a history of COVID-19 infection (30.1%), six patients had hypertension (6.45%), and 4 patients had type 2 diabetes mellitus (T2DM). Additionally, a 25 years old overweight female patient with rheumatoid arthritis was on steroids. Her Alvarado score was 7 with intraoperatively gangrenous appendicitis and developed surgical site infection (SSI). Regarding the Alvarado scoring at the time of presentation, most of the patients had ≥ 6 (n=85, 91.39%), and only eight patients were scored ≤5 (8.6%), but all underwent open appendectomy (P=0.028) (Table 2).

Table-2: Alvarado scored in both groups of patients.

Alvarado scoring	**Group A Average weight (n=44)**		**Group B Excess weight (n= 49)**				**P-value**
			Overweight (n=20)		**Obesity (n=29)**		0.028
	Female	Male	Female	Male	Female	Male	
≤ 5	1	1	2	1	2	1	
≥ 6	13	29	8	9	11	15	

Regarding intraoperative finding the position of the tip of the appendix, the majority were retrocecal (n=59, 63.4%), followed by pelvic (n=27, 29%) and 3 patients were subcecal (3.2%), while both paracolic and postileal were total 4 patients, two for each of them (n=2, 2.2%) (Table 3).

Table-3: The position of appendix tips during the operations in patients of both groups.

Position of the tip	**Frequency (No., %)**
Retrocecal appendix	59 (63.4%)
Subcecal appendix	3.0 (3.2%)
Pelvic appendix	27.0 (29%)
Paracolic appendix	2.0 (2.2%)
Postileal appendix	2.0 (2.2%)

Moreover, major patients went through a smooth postoperative period without complications (n=71, 76.34%), especially most of the patients in group A (n=39, 54.9%). While the most common early complications were superficial SSI (n=3, 3.22%), (n=11, 11.82%) in group A, and B respectively, and 6 patients developed deep SSI (6.45%) (Equally in both groups) and required hospital admission and antibiotic therapy. Additionally, 2 male patients in the average weight group developed deep SSI with perforated appendicitis (2.15%). One patient developed postoperative bleeding in group B (1.07%) on the day of the operation and required re-operation under general anaesthesia for bleeding control. Another patient in group B (1.07%) developed a pelvic abscess that was treated surgically under general anaesthesia. No mortality was recorded (Table 4).

Table-4: Early complications in the first 30 days after surgery in both groups of patients.

Complication	**Group A**		**Group B**			
	Average weight (n=44)		**Excess weight (n= 49)**			
			Overweight (n=20)		**Obese (n=29)**	
	Female	Male	Female	Male	Female	Male
Superficial SSI	3 (3.22%)	0.0 (0.0%)	2 (2.15%)	2 (2.15%)	2(2.15)	5(5.37%)
Deep SSI	0.0 (0.0%)	2 (2.15%)	1 (1.07%)	0.0 (0.0%)	2(2.15%)	1(1.07%)
Intra-abdominal abscess	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	1(1.07%)	0.0 (0.0%)
Bleeding	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	1(1.07)
Total	3.0	2.0	3.0	2.0	5.0	7.0

SSI: Surgical Site Infection

Most patients went through uneventful recovery, while patients with grade I complications, mostly in group B, were most common (n=14, 15.05%). Eight patients (8.6%) with grade II complications were recorded, 6 of them were grade IIA, and the rest were grade IIB which required intervention. One patient from group IIB was an obese female with an intraoperative finding of perforated appendicitis in the pelvic region. After ten days of operation, she returned to the hospital with abdominal pain and fever, and her ultrasound showed a pelvic abscess treated with drainage under anaesthesia (Table 5 and 6).

Table-5: Classification of complication severity in patients.

Grade of complication	**Group A Average weight (n=44)**		**Group B Excess weight (n= 49)**			
			Overweight (n=20)		**Obese (n=29)**	
	Female	**Male**	**Female**	**Male**	**Female**	**Male**
Grade I	3.0 (3.22%)	0.0 (0.00%)	2.0 (2.15%)	2.0 (2.15%)	2.0 (2.15%)	5.0 (5.37%)
Grade IIA	0.0 (0.0%)	2 (2.15%)	1.0 (1.07%)	0.0 (0.0%)	2.0 (2.15%)	1.0 (1.07%)
Grade IIB	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (1.07%)	1.0 (1.07%)
Grade III	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)
Grade IV	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)

The second one was 24 years old obese male patient with an Alvarado score of 8 without past medical history, and intraoperatively pelvic suppurative appendicitis was found. After 2 hours of surgery, he developed abdominal pain, abdominal swelling, and tachycardia. Ultrasound (FAST) examination showed hematoma collection. After resuscitation, a second look was performed and found a large hematoma. Bleeding was from mesoappendix hemostasis secured drain left. The patient was stayed at the hospital for 3 days, and then discharged with good general health.

Table-6: Macro-pathological type of appendicitis in both groups of the patients.

Variable	**Group A Average weight (n=44)**		**Group B Excess weight (n= 49)**				**Complication**
			Overweight (n=20)		**Obese (n=29)**		
	Female	**Male**	**Female**	**Male**	**Female**	**Male**	
Normal appendix	2	2	2	2	3	3	2
Catarrhal appendicitis	5	6	2	3	3	3	3
Suppurative appendicitis	3	14	3	4	4	6	7
Gangrenous appendicitis	3	6	2	0	1	2	5
Perforated appendicitis	1	2	1	1	2	2	5

Most of the patients in all groups (n=65, 69.89%) stayed in the hospital for up to 24 hours, and those who stayed >24 hours were due to pain or vomiting, and some were living in a rural area far away from the hospital (Table 7).

Table-7: Postoperative hospital stays for patients.

Group	**Body weight**	**BMI/kg/m^2**	**Hospitalization time**			**P-value**
			<23 hours	**24 - 48 hours**	**>48 hours**	
A	Average weight	18.5 - 24.9	36 (38.7%)	6.0 (6.45%)	2.0 (2.15%)	0.00541
B	Over weight	25 - 29.9	10 (10.75%)	7.0 (7.52%)	3.0 (3.22%)	
	Obese	≥ 30	19 (20.43%)	5.0 (5.37%)	5.0 (5.37%)	

BMI: Body Mass Index

Discussion

The most common age groups for suspected AA were 11-20 years (n=34, 36.56 %), and 21-30 years (n=32, 34.40%). This is parallel with other studies ***[15,16]*** and does not go with studies from Fashina et al., 2009 who found most cases (42.8%) to occur in the third decade of life ***[17]*** and Sarla, 2019 who claimed that the highest incidence occurs in the age group of 20-30 years for AA ***[18]***.

On the other hand, 44 (47.31%) patients were of average weight, and the rest were overweight (n=20, 21.50%) or obese (n=29, 31.18%), which is in contrast to Timmerman et al., 2016 who stated that normal weight was found in 346 patients (82.18%), overweight in 59 patients (14.01%), and 16 patients were obese (3.80%) ***[19]***. At the same time, this finding is close to Sauvain et al., 2016 who reported that most of their patients (52.4%) were on average weight ***[11]***.

Moreover, we found that 2 patients with an average weight in group A had Alvarado scores 5 and 4 versus six patients from group B, while the rest were classified as scoring 6 and more in both groups A and B. This might be because excess weight masks some abdominal features of AA. ***[11]***.

Furthermore, the most common position of the tip of appendixes in our study was retrocaecal (n=59, 63.40%), followed by pelvic (n=27, 29.0%), which is not agreed with another study that stated the most common position of the tip of appendices was retrocaecal (74%) and pelvic (21%) ***[11]***. However, it was closely parallel to a study that reported the prevalence of appendicitis among patients to be retrocaecal (n=95; 35.98%), pelvic (n=67; 25.37%), post-ileal (n=61; 23.10%), pre-ileal (n=11; 4.16%) and subcaecal (n=30; 11.36%) ***[20]***. Whereas another study states that retrocaecal position was the most common (67.3%) and the pelvic was (21.6%) ***[21]***. Additionally, according to world literature, over 65% of the appendix's anatomical positions are retrocaecal, followed by para-caecal and then the other positions of the appendix in different percentages ***[22]***. We don't find any relation regarding the tip location of the appendix with the type and number of the early postoperative complications.

The naked eye findings of the appendices in the operations were 4 normal in group A and 8 in group B (n=12, 12.90%) with 2 grade I complications, while the overall normal appendices were 15 (16.13%) as proved by histopathological examination, these includes 711 of the appendices which were looked normal by naked eye and 8 appendices that labelled catarrhal on naked eye examination includes. Catarrhal appendicitis comprises 11 patients in each group's A and B, with 3 grade I and IIB complications. While gangrenous or perforated appendices were found in 12 patients of group A and 11 patients of group B, with 10 different grades of complications I, IIA, and IIB. Three patients in group A developed grade I complications, like SSI, which were treated conservatively. Otherwise, 6 (6.45%) patients from overweight and obesity groups were in grade IIA complication, treated surgically under local anaesthesia, and 2 (2.15%) patients were in grade IIB who needed surgery under general anaesthesia.

In this study, the negative appendectomy, confirmed by histopathology was 15% which is higher than that found in a meta-analyses study (6–8%) and a single-institution study (1.7–7%) which coincided with the increased use of CT and laparoscopy ***[23]***.

Similarly, in small children and the elderly, perforated appendicitis occurred at a high rate (19%) ***[25]*** but still lower than current results, which might be explained by the fact that excess weight may mask some features of AA, so it needs extensive observation before the decision of surgery, which may increase the risk of advancing the pathology in the form of perforation or gangrene.

It is clear now that delay in diagnosis and treatment of AA increases the rate of perforation. In a study, the perforation rate was 28.8% on the first day of the pain, which increased to 33.3% on hospital day 2 and to 78.8% on hospital day 8 ***[26]***. In the present work all suspected acute appendicitis underwent open appendectomy within 12 hours from the start of the pain still the perforation rate (n=23 , 24.73%) was comparable to that found by Drinković et al., 1991 (24%) ***[15]*** and Aji and Aliyu, 2012 (23.47%) ***[24]***, while Assefa et al., 2014 found perforated appendices in 4.1%, 10.2%, and 45.3% in <24 hours, 24-48 hours, and >48 hours, respectively in patients ***[25]***.

In the present study, the postoperative complications, such as superficial/deep SSI, intra-abdominal sepsis, and bleeding, were lower in average-weight patients compared to overweight and patients with obesity. Although statistically non-significance difference was observed declaring lower deep SSI in average weight, in other words in 2 average weight patients (2.15%) versus 4 patients with excess weight (4.29%). These findings are going with Thelwall et al., 2015 ***[27]***, Wilson et al., 2018 ***[28]***, and Meijs, A. et al., 2019 ***[26]***. Obviously, obesity was associated with a 1.1 to 4.4 folds increase in the adjusted odds of developing SSI as compared with average weight, depending on the type of surgery ***[28]***, as 22 patients (2.6%) with obesity developed superficial SSI and 13 (1.5%) had deep SSI ***[26]***. In the chest and abdominal surgeries, the impact was larger for superficial SSI than deep SSI ***[29]***. Also, excess weight plays a role in surgical trauma of the abdominal wall at the incision site and may increase the chance of contamination of the surgical wounds. The location, type of surgery, and approach to the abdominal cavity affect the surgical field's contamination rate and the rate of infectious complications ***[30]***. Collectively, the findings of the current work may guide the necessity of further, more extended studies in a broader population. The findings might have the impact of raising awareness of difficulty and surgery for acute appendicitis in patients and more infectious early postoperative complications.

Conclusions

There was no significant relationship between excess weights with the rate of early postoperative complications after open appendectomies. However, there was a significant relationship (P-value=0.00541) between the duration of hospital stay and the patient's weight and close relation between excess weight with comorbidity, especially T2DM, and major intra-abdominal conditions that need reoperation.

Recommendations

The data from the current work may mean that the controversy is continuing regarding the location of the appendix tip; we may need wider and more future research on a larger number of patients to rectify and unify the incidence of its location. More studies are needed, especially with a larger number of patients for a longer duration, albeit multicenter work may be better.

Strength and limits of the study

The present study is the first prospective work that examined the relationship between excess weight and early postoperative complications of open appendectomy, which can be considered one of its strengths. However, there were some limitations in that this study's cross-sectional design makes the result not to find out the casualty. Also, the small number of patients decreased its generalizability.

Acknowledgements

We would like to thank our cooperative patients and sincere paramedics, our thanks to Assistant Professor, Dr. Abdulfatah Hawrami at the Department of Community Medicine, University of Sulaimani, Iraq, for the statistical analysis of the work.

References

[1] Di Saverio S., Podda M., De Simone B., Ceresoli M., Augustin G., Gori A., et al. (2020). Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World Journal of Emergency Surgery.* 15(1), 1-42.

[2] Snyder M.J., Guthrie M., & Cagle S.D. (2018). Acute appendicitis: efficient Diagnosis and management. *American Family Physician.* 98(1), 25-33.

[3] Kadhem A.H., Muhsin A.A., & Al-Sewadi W.H. (2020). Acute Appendicitis And Associated Pathologies In Females. *Basrah Journal of Surgery.* 26(1), 69-73.

[4] Ahmed H.O., Muhedin R., Boujan A., Aziz A.H., Hardi R.A., Abdulla A.A., et al. (2020). A five-year longitudinal observational study in morbidity and mortality of negative appendectomy in Sulaimani Teaching Hospital/Kurdistan Region/Iraq. *Scientific Reports.* 10(1), 1-7.

[5] Yaseen T., Qais Z., & Abass Z. (2018). Impact of Family History on Acute Appendicitis–An Iraqi Study at Baghdad Teaching Hospital. *International Journal of Medical Students.* 6(2), 47-51.

[6] Mällinen J., Vaarala S., Mäkinen M., Lietzén E., Grönroos J., Ohtonen P., et al. (2019). Appendicolith appendicitis is clinically complicated acute appendicitis—is it histopathologically different from uncomplicated acute appendicitis. *International Journal of Colorectal Disease.* 34(8), 1393-1400.

[7] Ahmed H.O. & Muhialdeen A. (2021). Link of Helicobacter Pylori (H. pylori) to Overweight Patients and Patients with Obesity in two Obesity Centers-Sulaimani Governorate-Kurdistan-Iraq, Prospective Case Study Series. *Technium BioChemMed.* 2(3), 25-34.

[8] Sulaiman S.J. & AlAni M.H. (2020). Prevalence of obesity and physical activity among primary school children in Erbil City/Iraq. *Mosul Journal of Nursing.* 8(1), 1-13.

[9] Shabu S.A. (2019). Prevalence of overweight/obesity and associated factors in adults in Erbil, Iraq: A household survey. *Zanco Journal of Medical Sciences.* 23(1), 128-134.

[10] Jasim H.M., Hussein H.M.A., & Al-Kaseer E.A. (2018). Obesity among females in Al-Sader city Baghdad, Iraq. *Journal of the Faculty of Medicine Baghdad.* 60(2), 105-107.

[11] Sauvain M.O., Tschirky S., Patak M.A., Clavien P.A., Hahnloser D., & Muller M.K. (2016). Acute appendicitis in overweight patients: the role of preoperative imaging. *Patient Safety in Surgery.* 10(1):1-5.

[12] Bom W., Scheijmans J., Salminen P., & Boermeester M. (2021). Diagnosis of uncomplicated and complicated appendicitis in adults. *Scandinavian Journal of Surgery.* 110(2), 170-179.

[13] Delgado-Miguel C., Muñoz-Serrano A., Barrena D.S., Nunez C.V., Velayos M., Estefanía K., et al. (2020). Influence of overweight and obesity on acute appendicitis in children. A cohort study. *Circle Pediatrics.* 33(1), 20-24.

[14] Kim S.H., Hwang H.K., Lee W.J., & Kang C.M. (2021). Comprehensive Complication Index or Clavien–Dindo classification: which is better for evaluating the severity of postoperative complications following pancreatectomy? *World Journal of Surgery.* 45(3), 849-856.

[15] Drinković N. (1999). Age distribution and clinical characteristics in acute appendicitis. *Vojnosanitetski Pregled.* 48(2), 115-119.

[16] Ashdown H.F., D'Souza N., Karim D., Stevens R.J., Huang A., & Harnden A. (2012). Pain over speed bumps in Diagnosis of acute appendicitis: diagnostic accuracy study. *BMJ.* 345, e8012.

[17] Fashina I., Adesanya A., Atoyebi O., Osinowo O., & Atimomo C. (2009). Acute appendicitis in Lagos: a review of 250 cases. *The Nigerian Postgraduate Medical Journal.* 16(4), 268-273.

[18] Sarla G. (2019). Epidemiology of Acute Appendicitis. *Journal of Clinical Medical Research.* 1(3), 1-6.

[19] Timmerman M.E., Groen H., Heineman E., & Broens P. (2016). The influence of underweight and obesity on the Diagnosis and treatment of appendicitis in children. *International Journal of Colorectal Disease.* 31(8), 1467-1473.

[20] Clegg-Lamptey J., Armah H., Naaeder S., & Adu-Aryee N. (2006). Position and susceptibility to inflammation of vermiform appendix in Accra, Ghana. *East African Medical Journal.* 83(12), 670-678.

[21] Oruc M., Muminagic S., Denjalic A., Tandir S., & Hodzic H. (2012). Retrocaecal Appendix Position-Findings During the Classic Appendectomy. *Medical Archives.* 66(3), 190-193.

[22] Mariadason J., Wang W., Wallack M., Belmonte A., & Matari H. (2012). Negative appendicectomy rate as a quality metric in the management of appendicitis: impact of computed tomography, Alvarado score and the definition of negative appendicectomy. *The Annals of The Royal College of Surgeons of England.* 94(6), 395-401.

[23] Körner H., Söndenaa K., Söreide J.A., Andersen E., Nysted A., Lende T.H., et al. (1997). Incidence of acute nonperforated and perforated appendicitis: age-specific and sex-specific analysis. *World Journal of Surgery*. 21(3), 313-317.

[24] Aji N. & Aliyu S. (2012). Appendicitis and its surgical management experience at the University of Maiduguri Teaching Hospital Nigeria. *Nigerian Journal of Medicine.* 21(2), 223-226.

[25] Assefa Z. (2014). Acute appendicitis in children admitted to zewditu memorial hospital. *Ethiopian Medical Journal*. 52(4), 189-195.

[26] Meijs A.P., Koek M.B., Vos M.C., Geerlings S.E., Vogely H.C., & de Greeff S.C. (2019). The effect of body mass index on the risk of surgical site infection. *Infection Control & Hospital Epidemiology*. 40(9), 991-996.

[27] Thelwall S., Harrington P., Sheridan E., & Lamagni T. (2015). Impact of obesity on the risk of wound infection following surgery: results from a nationwide prospective multicentre cohort study in England. *Clinical Microbiology and Infection.* 21(11), 1008. e1-1008. e8.

[28] Wilson C.J., Georgiou K.R., Oburu E., Theodoulou A., Deakin A.H., & Krishnan J. (2018). Surgical site infection in overweight and obese total knee arthroplasty patients. *Journal of Orthopaedics.* 15(2), 328-332.

[29] Plassmeier L., Hankir M.K., & Seyfried F. (2021). Impact of excess body weight on postsurgical complications. *Visceral Medicine*. 37(4), 287-297.

[30] López-Cano M., Teresa Quiles M., Antonio Pereira J., Armengol-Carrasco M., & ArbÓ M.A. (2017). Complex abdominal wall hernia repair in contaminated surgical fields: factors affecting the choice of prosthesis. *The American Surgeon.* 83(6), 583-590.