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Application of povidone Iodine for open appendectomy wound as a preventive measure for postoperative wound infection

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Abstract

Background: Common consequences are surgical site infections. Due to topical and systemic antibiotic resistance, antiseptics were used to prevent wound infections. Povidone-iodine killed germs quickly. The aim of study is to compare the effect and safety of povidone iodine 3% and 10% on post-operative infection rates.

Method: A convenient sample of 150 open appendectomy patients in a cross-sectional prospective research. Patients who met qualifying requirements were assigned to three equal-numbered groups. Group **1: controls, Group 2:** 10% Povidone Iodine, and Group 3: 3%. Group associations were assessed using analysis of variance and Chi-square test. Significant P values are 0.05 or less.

Results: The sample had an average age of 29.5±6.8 years. Only 14 (9.3%) of 150 individuals suffered surgical site infections. Five (10%), one (2%), and three (6%) of group1, group2, and group3 patients had superficial infection. Deep infection was detected in 4 (8%) group1 patients and 1 (2%) group3 patient. One surgical site infection occurred in group2, compared to nine in controls and four in group3. No significant connection was found between age, gender, BMI, chronic diseases, study duration, incision length, and SSI infections among the groups (P>0.05). Staphylococci were the most common infection at 8 (57.1%), followed by E. coli 4 (28.6%), *Klebsiella* 1 (7.1%), and Candida 1 (7.1%).

Conclusions: The study concluded a safe and possible application of povidone iodine 10% irrigation pre wound closure with low infection rate.

Keywords: Disinfection, antiseptics, surgical site infection, appendectomy

Introduction

Surgical site infection (SSI) is a common postoperative complication, defined as an infection at the surgical site within 30 days of a procedure, ranging from superficial to deep infections. Gram-positive bacteria such as *Staphylococcus aureus*, *S. epidermidis*, and *Streptococcus pyogenes* are frequent causes, along with gram-negative pathogens like *Escherichia coli* and *Klebsiella pneumoniae* [1]. SSI can delay wound healing or escalate to life-threatening conditions like septicemia [2]. Antiseptic practices, pioneered by Ignaz Semmelweis and Dr. Joseph Lister, reduced surgical infections dramatically, marking a turning point in surgery [3]. Antiseptics, such as povidone-iodine, are microbicidal and effective against a broad spectrum of pathogens, including bacteria, fungi, and viruses. In 2017, WHO and CDC recommended incisional wound irrigation with aqueous povidone-iodine for SSI prevention [4]. However, antimicrobial resistance (AMR) poses a significant global challenge, causing over 1.27 million deaths annually, with Iraq particularly affected due to prolonged conflicts [5]. Povidone-iodine (PI), a complex of iodine, is a potent antiseptic with broad-spectrum activity. Its antimicrobial action peaks at approximately 0.1% concentration and targets microbial cell membranes [6]. Studies highlight its antiviral effects, including efficacy against SARS-CoV-2 [7]. PI's anti-inflammatory properties enhance wound healing by modulating immune responses and inhibiting bacterial toxins [8]. However, its limitations include reduced activity in the presence of organic material (e.g., blood or pus), potential for skin irritation, and risks like thyroid dysfunction with prolonged use [9]. Open appendectomy, a clean-contaminated procedure, has higher SSI rates (11 per 100 procedures) compared to laparoscopy (4.6 per 100) [10]. PI has shown promise in supporting wound healing due to its antimicrobial spectrum, lack of resistance, and efficacy against biofilms, but optimal concentrations for cost-effective outcomes require further study [8].

Aim of study

Compare the effect and safety of povidone iodine 3% and 10% on post-operative infection rates.

Method: This cross-sectional prospective study included 150 patients undergoing open appendectomy at Al Yarmouk Teaching Hospital, Baghdad, from January 2023 to January 2024. A convenient sample of 150 patients was chosen to divide them into three equal groups systematically: Group 1 (control, no irrigation), Group 2 (10% povidone-iodine irrigation), and Group 3 (3% povidone-iodine irrigation). Eligibility criteria included all open appendectomy cases except for patients with povidone-iodine allergy, perforated appendicitis, BMI >40, or intra-abdominal drain insertion. Verbal consent was obtained, and study objectives were explained. The dilution was performed using the following equation: $C_1V_1=C_2V_2$. Where C_1 is the concentration of main solution (10%), V_1 is the volume of the solution used (300 ml). C_2 is the final desired concentration (3%), and V_2 is the final desired volume which is 1000 ml. Thus, 300 ml of 10% PI are added with 700 ml of normal saline 0.9% to get 1000 ml of 3% PI. Postoperative follow-up was conducted on Days 0, 3, 8, and 30 to monitor for surgical site infection (SSI) signs, including erythema, swelling, and pain. A potassium iodide starch strip test was used to detect iodine toxicity, with no cases reported. For patients with SSI, wound swabs were sent for culture and sensitivity. Patient data included demographic details, chronic illnesses, BMI, surgery duration, incision length, appendix location, type of appendicitis, and findings. Statistical analysis was performed using SPSS version 22. Numerical variables were summarized as means ± standard deviations, and categorical variables as frequencies and percentages. ANOVA and Chi-square tests were used for group comparisons, with a significance level of $p \leq 0.05$p \leq 0.05 $p \leq 0.05$. The study was ethically approved, and no loss to follow-up occurred. Results provided insights into the comparative efficacy of different povidone-iodine concentrations in preventing SSI.

Results: A total of 150 patients were recruited for this study. Table (1) illustrates the demographic characteristic of the studied sample according to the grouping. Majority of the sample were in their thirties (67; 44%). The average age of the sample was 29.5±6.8 years. Two-thirds of the sample were males 91 (60.7%), and the remaining 59 (39.3%) were females with a ratio of M:F (1.5: 1)

62 patients (41.3%) were overweight, and 35 (23.3%) patients were obese, while only 13 (8.7%) patients were categorized as underweight only six patients (4%) had history of chronic illnesses, two patients (1.3%) had hypertension and 4 patients (2.7%) had diabetes mellitus. Majority of patients had a grossly inflamed appendicitis 105 (70%), while the remaining cases had a catarrhal appendicitis 45 (30%). As for the location of appendix, pelvic location was the least found 9 (6%), while retrocecal was the commonest location reported in 120 (80%) & sub serosa location was reported in 21(14%). No significant difference was found between the three groups regarding age, gender, BMI, the history of chronic illnesses, type and location of appendicitis. (*P*>0.05).

Table 1: Distribution of the Studied Sample by Demographic Characteristics According to Groups.

Variable	Group 1 (n=50)	Group 2 (n=50)	Group 3 (n=50)	Total (n=150)
Age (years)				
<20	3 (6%)	3 (6%)	8 (16%)	14 (9.3%)
20-29	16 (32%)	28 (56%)	15 (30%)	59 (39.3%)
30-39	26 (52%)	18 (36%)	23 (46%)	67 (44.7%)
40-49	4 (8%)	1 (2%)	3 (6%)	8 (5.3%)
>50	1 (2%)	0 (0%)	1 (2%)	2 (1.3%)
Gender				
Male	30 (60%)	33 (66%)	28 (56%)	91 (60.7%)
Female	20 (40%)	17 (34%)	22 (44%)	59 (39.3%)
BMI				
Underweight	6 (12%)	2 (4%)	5 (10%)	13 (8.7%)
Normal	17 (34%)	10 (20%)	13 (26%)	40 (26.7%)
Overweight	17 (34%)	25 (50%)	20 (40%)	62 (41.3%)
Obese	10 (20%)	13 (26%)	12 (24%)	35 (23.3%)
Chronic Illnesses				
None	48 (96%)	48 (96%)	48 (96%)	144 (96%)
Diabetes Mellitus	1 (2%)	2 (4%)	1 (2%)	4 (2.7%)
Hypertension	1 (2%)	0 (0%)	1 (2%)	2 (1.3%)
Type of Appendicitis				
Catarrhal	14 (28%)	14 (28%)	17 (34%)	45 (30%)
Grossly Inflamed	36 (72%)	36 (72%)	33 (66%)	105 (70%)
Appendix Location				
Pelvic	3 (6%)	2 (4%)	4 (8%)	9 (6%)
Sub-serosal	7 (14%)	8 (16%)	6 (12%)	21 (14%)
Retrocecal	40 (80%)	40 (80%)	40 (80%)	120 (80%)

Table (2) illustrates the average time of surgery in each group. The average duration of appendectomy among controls was 24.8±5.0 minutes, while for group 2 (PI 10%) and Group 3 (PI 3%), the average was 25.2±4.2, and 25.5±4.7 minutes respectively. No significant difference between the groups was found in regard to duration of study (P=0.765). Average length of incision in centimeters in each group. The average length among the controls was 7.74±1.7, while among group 2 and group 3 was 7.88±1.6 and 8.02±2.1 cm respectively. No significant difference between the groups was found in regard to the length of incision (P=0. 759). The distribution of patients according to the additional findings during appendectomy by groups.

Table 2: Distribution of the studied sample by duration of surgery according to the groups. Distribution of the studied sample length of incision according to the groups.

Group	Controls	10% PI	3% PI	Total
Duration of Surgery (in minutes)	24.8±5.0	25.2±4.2	25.5±4.7	25.2±4.6
Length of Incision (in centimeters)	7.74±1.7	7.88±1.6	8.02±2.1	7.88±1.8
Additional Findings				
None	42 (84%)	43 (86%)	44 (88%)	129 (86%)
Serous	6 (12%)	3 (6%)	5 (10%)	14 (9.3%)
Blood	2 (4%)	4 (8%)	1 (2%)	7 (4.7%)

Table (3) shows the association of surgical site infection with demographic characteristics. Although SSI occurred in one patient in PI 10% group, compared to nine patients in controls, and four patients in PI 3% group. Yet this association was not statistically significant, also no significant association was reported between age, gender, BMI, chronic illnesses, additional findings intra-operatively, type and appendicitis location and SSI infections among the groups (*P*>0.05)

Table 3: Distribution of the sample by demographic characteristics according to SSI.

Variables	Group 1		Group 2		Group 3	
	Controls		10% PI		3% PI	
	No SSI	SSI	No SSI	SSI	No SSI	SSI
	N=41	N=9	N=49	N=1	N=46	N=4
Age						
<20	2(4.9%)	1(11.1%)	3(6.1%)	0	7(15.2%)	1(25.0%)
20-29	11(26.8%)	5(55.6%)	28(57.1%)	0	13(28.3%)	2(50.0%)
30-39	24(58.5%)	2(22.2%)	17(34.7%)	1(100.0%)	22(47.8%)	1(25.0%)
40-49	4(9.8%)	0	1(2.0%)	0	3(6.5%)	0
>50	0	1(11.1%)	0	0	1(2.2%)	0
Gender						
Male	22(53.7%)	8(88.9%)	32(65.3%)	1(100.0%)	25(54.3%)	3(75.0%)
Female	19(46.3%)	1(11.1%)	17(34.7%)	0	21(45.7%)	1(25.0%)
BMI						
Underweight	5(12.2%)	1(11.1%)	2(4.1%)	0	5(10.9%)	0
Normal	15(36.6%)	2(22.2%)	9(18.4%)	1(100.0%)	9(19.6%)	4(100.0%)
Overweight	14(34.1%)	3(33.3%)	25(51.0%)	0	20(43.5%)	0
Obese	7(17.1%)	3(33.3%)	13(26.5%)	0	12(26.1%)	0
Chronic illnesses						
No	40(97.6%)	8(88.9%)	47(96%)	0	45(97.8%)	4(100.0%)
DM	1(2.4%)	0	1(2%)	1(100.0%)	1(2.2%)	0
HTN	0	1(11.1%)	1(2%)	0	0	0
Type of appendicitis						
Catarrhal	10(24.4%)	4(44.4%)	14(28.6%)	0	16(34.8%)	1(25.0%)
Grossly inflamed	31(75.6%)	5(55.6%)	35(71.4%)	1(100.0%)	30(65.2%)	3(75.0%)
Location of appendix						
Pelvic	3(7.3%)	1(11.1%)	1(2.0%)	1(100.0%)	3(6.5%)	0
Sub-serosal	6(14.6%)	1(11.1%)	5(10.2%)	0	8(17.4%)	1(25.0%)
Retrocecal	32(78.0%)	7(77.8%)	43(87.8%)	0	35(76.1%)	3(75.0%)
Intra operative findings						
None	36(87.8%)	6(66.7%)	42(85.7%)	1(100.0%)	42(91.3%)	2(50.0%)
Serous	4(9.8%)	2(22.2%)	3(6.1%)	0	3(6.5%)	2(50.0%)
Blood	1(2.4%)	1(11.1%)	4(8.2%)	0	1(2.2%)	0

Table (4) shows the association between the duration of surgery, and length of incision with SSI among groups. No significant difference was found between the duration of surgery in minutes and developing surgical site infection across all the three studied groups (*P*>0.05)

Similarly, for the length of incision, no significant difference was found between the length of incision and having surgical site infection among the 3 groups (*P*>0.05).

Table 4: Association between duration of surgery, and length of incision with SSI among groups.

Variables	Group 1 (Controls)	Group 2 (10% PI)	Group 3 (3% PI)
	No SSI SSI	No SSI SSI	No SSI
N	N=41 N=9	N=49 N=1	N=46 N=4
Duration of surgery (minutes)	25.1±5.3 23.5±3.3	25.3±4.2 21.0±0.0	25.5±4.8 25.5±3.6
p-value	0.397	0.309	0.986
Length of incision (cm)	7.7±1.6 7.8±2.14	7.9±1.6 6.0±0.0	7.9±2.2 9.2±1.5
p-value	0.778	0.268	0.245

Table (5) illustrates the comparison of surgical site infection among the studied groups through the days of follow up. On day 0, no patient reported any signs or symptoms of infection across the three groups. Day 3 post operatively, 5(10%) of controls, 1(2%) of group 2 (PI 10%), and 3 (6%) of group 3 (PI 3%) had signs and symptoms of surgical site infection. Although only one patient in group 2 developed a superficial infection, yet this association was not statistically significant. (*P*>0.05). Upon day 8 of follow-up, another 4 (8%) patients in control group, and one patient in group3 (PI 3%) developed surgical site infection, the association was not statistically significant. On day 30 of follow-up (which was done by phone calls) all patients were clear of signs and symptoms of infection.

Table 5: Comparison of surgical site infection among the studied groups through the days of follow up.

Follow-Up Day	Group 1 (Controls)	Group 2 (10% PI)	Group 3 (3% PI)	P Value*
Day 0 (No SSI)	50 (100.0%)	50 (100.0%)	50 (100.0%)	1.000
Day 0 (SSI)	0	0	0	
Day 3 (No SSI)	45 (90.0%)	49 (98.0%)	47 (94.0%)	0.242
Day 3 (SSI)	5 (10.0%)	1 (2.0%)	3 (6.0%)	
Day 8 (No SSI)	46 (92.0%)	50 (100.0%)	49 (98.0%)	0.068
Day 8 (SSI)	4 (8.0%)	0	1 (2.0%)	
Day 30 (No SSI)	50 (100.0%)	50 (100.0%)	50 (100.0%)	1.000
Day 30 (SSI)	0	0	0	

The types of pathogenic bacterial isolates from the 14 patients with SSI were illustrated in figure (1) below. *Staphylococci* were found among 8 (57.2%) and it was the most prevalent infection followed by *E. coli* (4; 28.6%), while one patient had *Klebsiella* (1; 7.1%) and another had Candida spp (1; 7.1%)

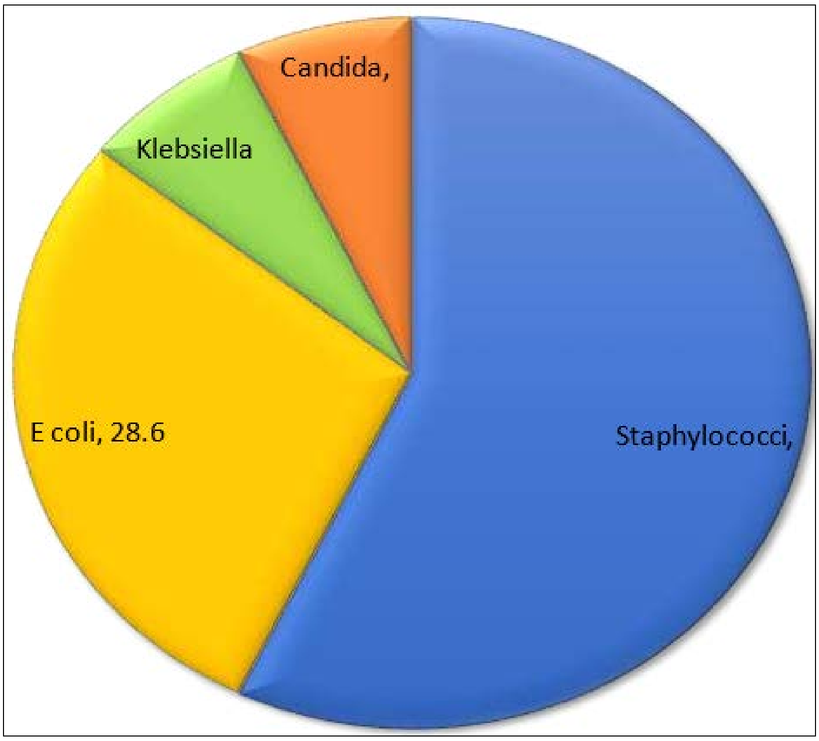

Fig 1: bacteria isolated from patients investigated for surgical site infection

Table (6) illustrates the type of bacteria isolated from patients by groups. Staphylococci are the predominate pathogenic bacteria among surgical site infections.

Table 6: distribution of the studied sample by groups according to the surgical site pathogen.

Pathogen	Group 1 (Controls)	Group 2 (10% PI)	Group 3 (3% PI)
Staphylococci	4 (44.4%)	1 (100.0%)	3 (75.0%)
E. coli	3 (33.3%)	0	1 (25.0%)
Klebsiella	1 (11.1%)	0	0
Candida	1 (11.1%)	0	0

Discussion

Povidone-iodine (PI) antiseptic irrigation has been utilized in wound management for decades, though its optimal concentration remains debated. In the current study, 14 of 150 patients (9.3%) developed surgical site infections (SSI), aligning with rates reported in Saudi Arabia (7%) [11], India (8.7%) [12], and Yemen (10.2%) [13]. However, this is lower than outcomes from Turkey (15.9%) [14], Iraq (19.17%) [15], and Ethiopia (61.9%) [16]. Variability in SSI rates may be attributed to differences in sanitary practices, patient risk factors, and sampling techniques. Both 10% and 3% povidone-iodine solutions demonstrated safety, with no iodine toxicity or adverse effects reported. This aligns with Wang *et al.*, who found concentrations of 5% or lower to be safe [17]. The study showed the beneficial effect of PI irrigation in reducing superficial SSIs to 10%, 2%, and 6% in the control, PI 10%, and PI 3% groups, respectively. Deep infections were observed only in the control (8%) and PI 3% (2%) groups. These findings are consistent with previous studies highlighting PI's efficacy in reducing SSIs [18]. The superiority of 10% PI irrigation was evident, with only one patient (2%) in this group developing superficial SSI, compared to 8% in the PI 3% group and 18% in the control group. Similar findings were reported by Shohat *et al.*, showing 2.34 times lower infection rates with PI irrigation [19], and Lemans *et al.*, where infection rates were 14.8% in controls versus 10.6% in the PI group [20]. Other studies, including Carballo Cuello *et al.* [21] and Onishi *et al.* [22], also demonstrated reduced SSI rates with PI use. However, some studies, such as those by Norman *et al.* [23] and Hernandez *et al.* [24], found no significant differences in SSI rates with PI irrigation, likely due to low baseline SSI rates. Meta-analyses by Swaminathan *et al.* [25] and Mueller *et al.* [26] confirmed PI irrigation's effectiveness but noted heterogeneity among studies. No significant association was found between demographic or clinical variables (e.g., age, gender, BMI, chronic illnesses, surgery duration, or appendicitis type) and SSI rates in this study. These findings align with Jadoon *et al.* [27] but differ from studies by Bichoff *et al.* [28] and Alemayehu *et al.* [29], which reported associations between SSI and factors like advanced age, surgery duration, and chronic illnesses. Variability in these results may stem from differing patient populations and sample sizes. The most prevalent pathogens were *Staphylococci* (57.1%), followed by *E. coli* (28.6%), consistent with findings by Worku *et al.* [30] and Belew *et al.* [31]. In contrast, Legese *et al.* [32] identified *Klebsiella pneumoniae* and *Klebsiella variicola* as the most common pathogens, highlighting geographic variability in microbial patterns due to nosocomial infections and antimicrobial resistance. Overall, the study confirms PI irrigation's role in reducing SSIs, particularly with 10% concentrations, supporting its continued use as a simple and cost-effective preventive measure. However, larger studies are warranted to validate these findings further and explore optimal PI concentrations for wound management.

Conclusion

Infection rates were lower in group 2 (povidone iodine 10%) than in groups 3 (3% and controls), but there was no significant difference (perhaps owing to small sample size). PI 10% was reported safe for open appendectomy surgical wounds with an average incision length of 7.88±1.8 centimetres, preventing post-operative wound infection without any documented iodine toxicity. Age, gender, BMI, chronic diseases, operation duration, and surgical incision length were not associated with SSI among the groups.

References

1. Arora A, Bharadwaj P, Chaturvedi H, *et al.* A review of prevention of surgical site infections in Indian hospitals based on global guidelines for the prevention of surgical site infection. JPSIC. 2018;6:1-12.
2. Worboys M. The history of surgical wound infection: revolution or evolution? In: Schlich T, editor. The Palgrave Handbook of the History of Surgery. London: Palgrave Macmillan; 2018. p. 215-233.
3. Bednarek RS, Nassereddin A, Ramsey ML. Skin antiseptics. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024. Available from: https://www.ncbi.nlm.nih.gov/books/NBK507853/ (accessed 3rd Feb, 2024).
4. Berríos-Torres SI, Umscheid CA, Bratzler DW. Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg. 2017;152:784.
5. IHME. Antimicrobial resistance (AMR). Iraq. Institute for Health Metrics and Evaluation. [web page]; update 2024. Available at: https://www.healthdata.org/research-analysis/health-risks-issues/antimicrobial-resistance-amr (accessed 4th Feb, 2024).
6. Lepelletier D, Maillard JY, Pozzetto B, Simon A. Povidone iodine: properties, mechanisms of action, and role in infection control and Staphylococcus aureus decolonization. Antimicrob Agents Chemother. 2020 Aug 20;64(9):e00682-20.
7. Bidra AS, Pelletier JS, Westover JB, Frank S, Brown SM, Tessema B. Rapid *in-vitro* inactivation of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) using povidone-iodine oral antiseptic rinse. J Prosthodont. 2020 Jul;29(6):529-533.
8. Bigliardi P, Alsagoff S, El-Kafrawi H, Pyon J, Wa C, Villa M. Povidone iodine in wound healing: A review of current concepts and practices. Int J Surg. 2017;44:260-268.
9. Nair S, Zhu A, Jaffry M, Choudhry H, Dastjerdi MH. Povidone-iodine adverse effects and alternatives for ocular procedures. J Ocul Pharmacol Ther. 2023 Apr;39(3):207-214.
10. Danwang C, Bigna JJ, Tochie JN, Mbonda A, Mbanga CM, Nzalie RNT, Guifo ML, Essomba A. Global incidence of surgical site infection after appendectomy: a systematic review and meta-analysis. BMJ Open. 2020 Feb 18;10(2):e034266.
11. Koumu MI, Jawhari A, Alghamdi SA, Hejazi MS, Alturaif AH, Aldaqal SM. Surgical site infection post-appendectomy in a tertiary hospital, Jeddah, Saudi Arabia. Cureus. 2021 Jul 5;13(7):e16187.
12. Noorit P, Siribumrungwong B, Thakkinstian A. Clinical prediction score for superficial surgical site infection after appendectomy in adults with complicated appendicitis. World J Emerg Surg. 2018 Jun 18;13:23.
13. Fayraq A, Alzahrani SA, Alsayaf Alghamdi AG, Alzhrani SM, Alghamdi AA, Abood HB. Risk factors for post-appendectomy surgical site infection in laparoscopy and laparotomy - retrospective cohort study. Cureus. 2023 Aug 28;15(8):e44237.
14. Güler Y, Karabulut Z, Çaliş H, Şengül S. Comparison of laparoscopic and open appendectomy on wound infection and healing in complicated appendicitis. Int Wound J. 2020 Aug;17(4):957-965.
15. Fuad M, Modher A. Surgery primary closure or delayed primary closure? Assessment of optimum management of surgical wounds for perforated appendicitis. J Med Sci. 2022 Feb 10;10(B):281-285.
16. Habteweld HA, Yimam M, Tsige AW, Wondmkun YT, Endalifer BL, Ayenew KD. Surgical site infection and antimicrobial prophylaxis prescribing profile, and its determinants among hospitalized patients in Northeast Ethiopia: a hospital-based cross-sectional study. Sci Rep. 2023 Sep 6;13(1):14689.
17. Wang D, Huang X, Ly W, Zhou J. The toxicity and antibacterial effects of povidone-iodine irrigation in fracture

surgery. Orthop Surg. 2022;14(9):2286-2297.
18. Chundamala J, Wright JG. The efficacy and risks of using povidone-iodine irrigation to prevent surgical site infection: an evidence-based review. Can J Surg. 2007 Dec;50(6):473-481.
19. Shohat N, Goh GS, Harrer SL, Brown S. Dilute povidone-iodine irrigation reduces the rate of periprosthetic joint infection following hip and knee arthroplasty: An analysis of 31,331 cases. J Arthroplasty. 2022 Feb;37(2):226-31.e1.
20. Lemans JVC, Öner FC, Wijdicks SPJ, Ekkelenkamp MB, Vogely HC, Kruyt MC. The efficacy of intrawound vancomycin powder and povidone-iodine irrigation to prevent surgical site infections in complex instrumented spine surgery. Spine J. 2019 Oct;19(10):1648-1656.
21. Carballo Cuello CM, Fernández-de Thomas RJ, De Jesus O, De Jesús Espinosa A, Pastrana EA. Prevention of surgical site infection in lumbar instrumented fusion using a sterile povidone-iodine solution. World Neurosurg. 2021 Jul;151:e700-e706.
22. Onishi Y, Masuda K, Tozawa K, Karita T. Outcomes of an intraoperative povidone-iodine irrigation protocol in spinal surgery for surgical site infection prevention. Clin Spine Surg. 2019 Dec;32(10):E449-E452.
23. Norman G, Atkinson RA, Smith TA, Rowlands C, Rithalia AD, Crosbie EJ, Dumville JC. Intracavity lavage and wound irrigation for prevention of surgical site infection. Cochrane Database Syst Rev. 2017 Oct 30;10(10):CD012234.
24. Hernandez N, Hart A, Taunton M, Osmon D, Mabry T, Abdel M, Perry K. Use of povidone-iodine irrigation prior to wound closure in primary total hip and knee arthroplasty: An analysis of 11,738 cases. J Bone Joint Surg Am. 2019;101(13):1144-50.
25. Mueller TC, Loos M, Haller B, Mihaljevic AL, Nitsche U, Wilhelm D, *et al.* Intra-operative wound irrigation to reduce surgical site infections after abdominal surgery: A systematic review and meta-analysis. Langenbecks Arch Surg. 2015 Feb;400(2):167-181.
26. Jadoon SK, Khan RMI, Khan TA, Akhtar N, Qayyum Y, Kumar K, *et al.* Comparative study of wound infection between elective and emergency abdominal surgeries: A retrospective cohort study. Ann Med Surg (Lond). 2023 Apr 7;85(5):1490-1495.
27. Bischoff P, Kramer TS, Schröder C, Behnke M, Schwab F, Geffers C, *et al.* Age as a risk factor for surgical site infections: German surveillance data on total hip replacement and total knee replacement procedures 2009 to 2018. Euro Surveill. 2023 Mar;28(9):2200535.
28. Alemayehu MA, Azene AG, Mihretie KM. Time to development of surgical site infection and its predictors among general surgery patients admitted at specialized hospitals in Amhara region, northwest Ethiopia: A prospective follow-up study. BMC Infect Dis. 2023 May 17;23(1):334.
29. Worku S, Abebe T, Alemu A, Seyoum B, Swedberg G, Abdissa A, *et al.* Bacterial profile of surgical site infection and antimicrobial resistance patterns in Ethiopia: A multicentre prospective cross-sectional study. Ann Clin Microbiol Antimicrob. 2023 Nov 7;22(1):96.
30. Belew H, Tamir W, Dilnessa T, Mengist A. Phenotypic bacterial isolates, antimicrobial susceptibility pattern, and associated factors among septicemia suspected patients at a hospital in Northwest Ethiopia: A prospective cross-sectional study. Ann Clin Microbiol Antimicrob. 2023 Jun 22;22(1):47.
31. Legese MH, Asrat D, Swedberg G, Hasan B, Mekasha A, Getahun T, *et al.* Sepsis: Emerging pathogens and antimicrobial resistance in Ethiopian referral hospitals. Antimicrob Resist Infect Control. 2022 Jun 13;11(1):83.

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