https://www.eejournals.org Open Access
Eurasian Experiment Journal of Scientific and Applied Research (EEJSAR) ISSN: 2992-4146
EEJSAR Publications Volume 4 Issue 3, 2023

Factors Contributing to Postoperative Wound Sepsis in Postoperative Patients at Hoima Regional Referral Hospital in Western Uganda's Hoima District

Dickson Nuwahereza

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda.

ABSTRACT

Infections at the surgical site, commonly referred to as postoperative wound infections, frequently make it more difficult for patients to recuperate. Surgical site infections are defined by the Centers for Disease Control and Prevention as infections connected to the surgical operation that develop at the site of the incision within 30 days of the procedure or up to 90 days after the procedure when an implant is involved. According to several research, the prevalence of postoperative sepsis varies from 2.9% to 30% worldwide. This study at Hoima Regional Referral Hospital set out to identify the risk variables for postoperative wound sepsis in postoperative patients. In the Hoima Regional Referral Hospital, it was a hospital-based cross-sectional study conducted among postoperative patients. SPSS 20 was used to gather and analyze the data. Tables and descriptive statistics were utilized to describe the data. To evaluate the relationship between the dependent and independent variables, bivariate and multivariate logistic regression analyses were carried out. A prevalence of 12.4% was achieved among the 210 patients in this trial, 26 of whom experienced postoperative sepsis. Age and chronic diseases with surgical sepsis were found to be associated, although there was no correlation between gender and postoperative sepsis. According to the study, preoperative antibiotic use, preoperative hospital stay, and surgical time all contributed to postoperative sepsis. In patients recovering from surgery, postoperative sepsis is still very common. Age, comorbidities, the length of the patient's hospital stay before surgery, the length of the procedure itself, and the use of preoperative antibiotics are all predictors of postoperative sepsis.

Keywords: Surgical site infections, Postoperative wound infections, postoperative sepsis, Hospital acquired Infections

INTRODUCTION

Postoperative wound infections, also known as surgical site infections (SSIs), tend to complicate the recovery course of many patients. The Centers for Disease Control and Prevention define surgical site infections as infections related to the surgical procedure that occur at the incision site within 30 days following surgery or up to 90 days following surgery when an implant is involved. Across the globe, the burden of postoperative sepsis varies from 2.9% to 30% in various studies [1]. In the United States, it is estimated that SSIs develop in 2 to 5% of patients undergoing inpatient surgical procedures each year [2–4]. The incidence of Surgical Site Infections has decreased over time, mainly attributed to widespread preventive efforts. While advances have been made in infection control practices, SSIs remain a substantial cause of morbidity, prolonged hospitalization, and death [5]. It accounts for 20% of all Hospital Acquired Infections (HAI) with a 2- to 11-fold increase in the risk of mortality. Surgical Site Infection (SSI) is the most common healthcare-associated infection following surgery and is associated with significant morbidity and mortality, transfer to an Intensive Care Unit (ICU), prolonged hospitalizations, and hospital readmission. SSI poses a significant challenge in sub-Saharan African countries, including Uganda, where the prevalence ranges from 7% to 48% [6–8]. The word "Sepsis" is derived from the

Greek word "sips," meaning 'make rotten.' Sina (979-1037 BC) observed the frequent coincidence of fever and putrefaction, both common consequences of surgery [9]. Semmelweis (1818-1865) reduced the mortality rate from Puerperal sepsis to about 2.5% by introducing hand washing with a chlorinated lime solution. Louis Pasteur (1822-1895) discovered that putrefaction was caused by single-cell organisms which he named bacteria. The development of antisepsis and the evolution of modern surgery is owed to Joseph Lister, who drew the correlation between Semmelweis' and Pasteur's observations and the deaths in his hospital. Schottmuller paved the way for a modern definition of sepsis in 1914: 'Sepsis is present if a focus has developed from which pathogenic bacteria, constantly or periodically invade the bloodstream in such a way that this causes objective symptoms. The pathophysiology of Surgical infections is complex and triggered by primed host immune-inflammatory response to pathogens, predisposed by genetic factors, location, load, and virulence of the invading pathogen in surgical patients [10–12]. Surgical procedures evoke the innate immune system, and within hours of surgical injury, a Systemic Inflammatory Response Syndrome (SIRS) is initiated. This is a sterile inflammatory response to tissue damage and blood loss triggered by endogenous danger signals massively released from the damaged tissues.

Postoperative wound infections, also known as surgical site infections (SSIs), tend to complicate the recovery course of many patients. Sepsis is a life-threatening organ dysfunction due to a dysregulated host response to infection. It causes considerable morbidity globally. In 2017, an estimated 48.9 million incident cases of sepsis were recorded globally, and 11.0 million sepsis-related deaths were reported, representing 19.7% of all global deaths [13]. The major form of sepsis is postoperative sepsis, which accounts for one-third of all sepsis [14]. Postoperative sepsis results in significant morbidity and mortality and is the leading cause of multiple organ dysfunction and death for hospital inpatients. The risk of Surgical site infection is higher in developing countries compared to procedures done in developed countries, according to WHO. This is the case in sub-Saharan Africa. Though in sub-Saharan Africa, there are few evidence-based studies regarding the magnitude of SSI and its associated factors. A review in sub-Saharan Africa showed a surgical site infection rate of 15.6% [15]. In Lafia, Nasarawa state, Nigeria, the prevalence of postoperative infection was 3.7% [16]. According to a study in Rwanda, the prevalence of SSIs was 8.2% [17]. According to a study, the prevalence of postoperative wound sepsis in Western Uganda was reported to be 25.3% [18]. Postoperative sepsis can be prevented through basic and advanced nursing procedures of wound care. To provide effective infection prevention care, healthcare professionals should stay updated with the knowledge and skills to provide the best possible practice. There is a high turnover of patients for surgery in Hoima Regional Referral Hospital. This study determined the prevalence and factors associated with postoperative sepsis in Hoima Regional Referral Hospital.

Methodology

Study Design

This was a hospital-based cross-sectional study among postoperative patients at Hoima Regional Referral Hospital.

Area of Study

Hoima district is located in mid-Western Uganda, approximately 200 km from Kampala, the capital city of Uganda. It shares borders with Buliisa and Masindi districts in the North, Kyankwanzi in the East, Kikuube, Ntoroko, Kakumiro, and Kagadi districts in the South. It stretches to the national boundary of the Democratic Republic of Congo in the West. Hoima district covers a total area of 5735.3 square kilometers.

Study Population

The study population included all postoperative patients at Hoima Regional Referral Hospital.

Inclusion Criteria

- All postoperative patients who consented to the study.

Exclusion Criteria

- Postoperative patients referred from peripheral health centers.
- Patients who did not consent to the study.

Sample Size Determination

The researcher used the Kish-Leslie formula to determine the required sample size[19]:

n = Z^2 * P * (1-P) / E^2

Where:

n = Estimated minimum sample size required

P = 15.5 (Isanga et al., 2020)

Z = 1.96 (For 95% confidence interval)

E = Margin of error set at 5%

n = 1.96^2 * 0.155 * (1-0.155) / 0.05^2

n = 201

Therefore, the minimum sample size required was 201. However, the researcher used a sample of 210 participants.

Sampling Procedures

A systematic sampling technique was used to determine the sample size. The sampling interval was obtained by dividing the estimated total number of patients who underwent surgery in the past year by the required sample size. The starting point was randomly selected using the lottery method.

Data Collection Tools

Respondents were interviewed using in-house structured questionnaires. The researcher administered the questionnaires to eligible consenting individuals to generate the data.

Data Analysis and Management

Data was collected and analyzed using SPSS version 20. Descriptive statistics, including tables, were used to describe the data. Bivariate and Multivariate logistic regression analysis was performed to determine the association between dependent and independent variables.

Quality Control

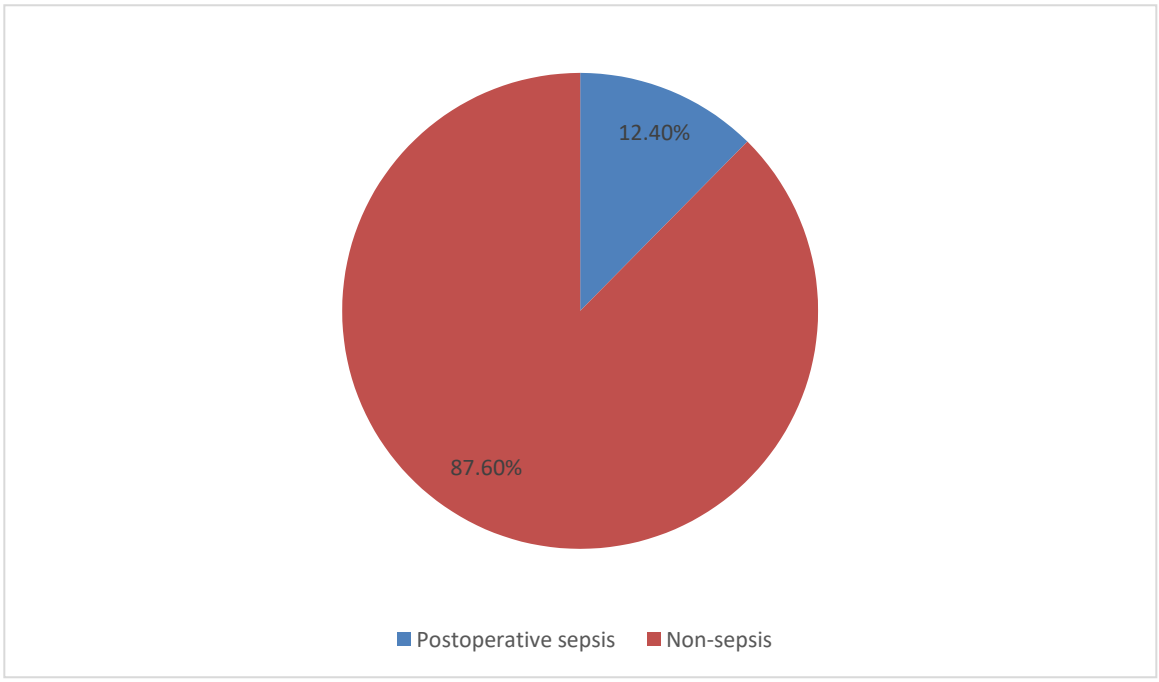
The research assistants were trained before data collection. These tools were pre-tested outside the study area to ensure accuracy and consistency without altering the meaning of the questions. Data collection tools were checked for completeness and accuracy and stored safely after each field day.

RESULTS

Prevalence of postoperative sepsis

Among 210 participants in this study, 26 developed postoperative sepsis giving a prevalence of12.4% as shown in the figure below.

Figure 1: Prevalence of Postoperative Sepsis



Patient related factors

The majority of the participants were aged ≥ 40 years (54.3%), male (70.0%) and had no chronicillnesses (85.2%) as shown in the table below.

Table 1: Patient-Related Factors

Variable	Category	Frequency(N)	Percentage (%)
Age(Years)	≤20	09	4.3
	21-29	13	6.2
	30-39	74	35.2
	≥40	114	54.3
Gender	Male	147	70.0
	Female	63	30.0
Any chronic illnesses	Yes	31	14.8
	No	179	85.2

Association between Patient factors and Postoperative sepsis

There was an observed association between age and chronic illnesses with postoperative sepsis however no association was found between gender and postoperative sepsis as shown in the table below.

Table 2: Association Between Patient Factors and Postoperative Sepsis

Variable	Category	Frequency(N)	Postoperative sepsis		P-Value
			Frequency	Percentage (%)	
Age(Years)	≤20	09	00	0.0	
	21-29	13	01	7.7	0.004
	30-39	74	09	12.2	
	≥40	114	16	14.0	
Gender	Male	147	17	11.6	0.064
	Female	63	09	14.3	
Any chronic illnesses	Yes	31	16	51.6	0.000
	No	179	10	5.6	

Note: P-Value<0.05 was considered significant

Healthcare-related factors

The majority of the respondents had a duration of surgery of 1-2 hours (49.0%), a preoperativehospital stays of 3-6 days (38.6%) and were given preoperative antibiotics (87.1%) as shown in the table below.

Table 3: Health Care Related Factors

Variable	Category	Frequency (N)	Percentage (%)
Duration of	1-2	103	49.0
surgery(Hours)	3-4	89	42.4
	≥5	18	8.6
Preoperative	1-2	51	24.3
hospital stay(Days)	3-6	81	38.6
	≥7	78	37.1
Pre-operative	Yes	183	87.1
antibiotics	No	27	12.9

Relationship between Health care factors and Postoperative sepsis

According to the study, duration of surgery, preoperative Hospital stay and pre-operativeantibiotics were associated with postoperative sepsis as shown in the table below.

Table 4: Relationship Between Health Care Factors and Postoperative Sepsis

Variable	Category	Frequency (N)	Postoperative sepsis		P-Value
			Frequency	Percentage (%)	
Duration of	1-2	103	08	7.8	
surgery(Hours)	3-4	89	11	12.4	0.001
	≥5	18	07	38.9	
Preoperative	1-2	51	04	7.8	
hospital	3-6	81	10	12.4	0.021
stay(Days)	≥7	78	12	15.4	
Pre-operative	Yes	183	11	6.0	0.003
antibiotics	No	27	15	55.6	

Note: P-Value<0.05 was considered significant

DISCUSSION

Prevalence of Post-Operative Sepsis

Among 210 participants in this study, 26 developed postoperative sepsis, giving a prevalence of 12.4%. This was different from the study conducted in Ethiopia, which revealed a prevalence of 24.6% [20]. However, this is similar to a review that reported a prevalence of 12.3% [21]. Furthermore, this is higher compared to a study in Rwanda which reported a prevalence of 8.2%[17]. The difference may be due to population characteristics and methodological differences.

Patient Factors Influencing Occurrence of Postoperative Sepsis

There was an observed association between age and chronic illnesses with postoperative sepsis; however, no

association was found between gender and postoperative sepsis. Higher chances of developing postoperative sepsis were observed among those aged ≥40 years and those with chronic illnesses. This is in line with Peng et al. [22], which reported a high rate of occurrence of postoperative sepsis among patients with comorbid illnesses. Similarly, a study in the USA reported higher rates of occurrence of postoperative sepsis among the elderly [23, 24] due to reduced immunity associated with age. Additionally, delayed wound healing due to reduced collagen synthesis may contribute to postoperative sepsis. Furthermore, in a related study [21], patients with diabetes mellitus were substantially at a higher risk of developing surgical site infections, which is in line with this study findings. Patients with comorbid illnesses have reduced immunity to infections [25, 26], making them susceptible to surgical site infections.

Healthcare-related Factors Associated with Postoperative Sepsis

According to the study, the duration of surgery, preoperative hospital stay, and pre-operative antibiotics were associated with postoperative sepsis. The current study found that the prevalence of postoperative sepsis was highest among patients whose surgery lasted for ≥ 5 hours (38.9%), had a preoperative hospital stay of ≥ 7 days (15.4%), and did not receive preoperative antibiotics (55.6%). These findings are supported by a study in South Africa [27]. Preoperative antibiotics reduce microbial load, hence reducing the risk of colonization, Shirefaw and colleagues [21] reported that the duration of surgery ≥ 1 hour was two times associated with postoperative sepsis. The longer duration of surgery increases the risk of surgical wound contamination due to increased microbial exposure in the operative field. Additionally, the same study found a 5.76 times increased risk of acquiring postoperative sepsis among patients with a preoperative hospital stay ≥ 7 days. A longer preoperative hospital stays increases exposure to contamination or colonization by pathogens, which increases the risk of postoperative sepsis.

CONCLUSION

The prevalence of postoperative sepsis among post-surgical patients is still high. Predictors of postoperative sepsis include age, comorbidities, duration of preoperative hospital stay, duration of surgery, and the use of preoperative antibiotics. Recognition of frequently associated risk factors to postoperative sepsis is crucial for implementing optimal preventive measures and pre-treatment prior to surgery.

REFERENCES

1. Kizito, O.: Comparative study of proportions of post-operative sepsis _ maternity versus general surgical ward. Cogent Medicine. 8, 1889100 (2021). https://doi.org/10.1080/2331205X.2021.1889100
2. Baker, A.W., Dicks, K.V., Durkin, M.J., Weber, D.J., Lewis, S.S., Moehring, R.W., Chen, L.F., Sexton, D.J., Anderson, D.J.: Epidemiology of Surgical Site Infection in a Community Hospital Network. Infect Control Hosp Epidemiol. 37, 519–526 (2016). https://doi.org/10.1017/ice.2016.13
3. Seidelman, J.L., Baker, A.W., Lewis, S.S., Advani, S.D., Smith, B., Anderson, D., Team, for the D.I.C.O.N.S.: Surgical site infection trends in community hospitals from 2013 to 2018. Infection Control & Hospital Epidemiology. 44, 610–615 (2023). https://doi.org/10.1017/ice.2022.135
4. Global report on the epidemiology and burden of sepsis, https://www.who.int/publications-detail-redirect/9789240010789
5. Hrynyshyn, A., Simões, M., Borges, A.: Biofilms in Surgical Site Infections: Recent Advances and Novel Prevention and Eradication Strategies. Antibiotics (Basel). 11, 69 (2022). https://doi.org/10.3390/antibiotics11010069
6. Chu, K., Maine, R., Trelles, M.: Cesarean section surgical site infections in sub-Saharan Africa: a multi-country study from Medecins Sans Frontieres. World J Surg. 39, 350–355 (2015). https://doi.org/10.1007/s00268-014-2840-4
7. Nkurunziza, T., Kateera, F., Sonderman, K., Gruendl, M., Nihiwacu, E., Ramadhan, B., et al. Prevalence and predictors of surgical-site infection after caesarean section at a rural district hospital in Rwanda. Br J Surg. 106, e121–e128 (2019). https://doi.org/10.1002/bjs.11060
8. Rice, B., Calo, S., Kamugisha, J.B., Kamara, N., Chamberlain, S., Global Emergency Care Investigator Study Group: Emergency care of sepsis in sub-Saharan Africa: Mortality and non-physician clinician management of sepsis in rural Uganda from 2010 to 2019. PLoS One. 17, e0264517 (2022). https://doi.org/10.1371/journal.pone.0264517
9. Macfie, A.L.: Towards a new definition of history. Rethinking History. 17, 401–412 (2013). https://doi.org/10.1080/13642529.2013.774730
10. Cui, P., Fang, X.: Pathogenesis of infection in surgical patients. Curr Opin Crit Care. 21, 343–350 (2015). https://doi.org/10.1097/MCC.0000000000000227
11. Browsing Theses & Dissertations by Subject "Pattern Of Superficial Surgical Site Infection After Elective Orthopaedic Surgery At Kikuyu P.c.e.a Orthopaedic Rehabilitation Center.," http://erepository.uonbi.ac.ke/handle/11295/106485/browse?type=subject&value=Pattern+Of+Superficial Dickson, 2023.

+Surgical+Site+Infection+After+Elective+Orthopaedic+Surgery+At+Kikuyu+P.c.e.a+Orthopaedic+Rehabilitation+Center.
12. Salahuddin, M., Muddebihal, F., Thirunavukkarasu, A., Alanazi, A.A.Z., Alrashdi, A.M.S., Alrashidi, A.M., Alanazi, W.O.H., Alruwaili, A.H.R., Alruwaili, A.F.J., Alruwaili, K.N.: Epidemiology and Risk Factors of Post Operative Site Infections in Surgical Patients: A Systematic Review. Arch. Pharm. Pract. 13, 31–36 (2022). https://doi.org/10.51847/ZOIxqqgVc6
13. Rudd, K.E., Johnson, S.C., Agesa, K.M., Shackelford, K.A., Tsoi, D., Kievlan, D.R., et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. Lancet. 395, 200–211 (2020). https://doi.org/10.1016/S0140-6736(19)32989-7
14. Chen, P.-Y., Luo, C.-W., Chen, M.-H., Yang, M.-L., Kuan, Y.-H.: Epidemiological Characteristics of Postoperative Sepsis. Open Med (Wars). 14, 928–938 (2019). https://doi.org/10.1515/med-2019-0110
15. Sway, A., Nthumba, P., Solomkin, J., Tarchini, G., Gibbs, R., Ren, Y., Wanyoro, A.: Burden of surgical site infection following cesarean section in sub-Saharan Africa: a narrative review. Int J Womens Health. 11, 309–318 (2019). https://doi.org/10.2147/IJWH.S182362
16. Ikrama Hassan, Michael Anazodo, Agbo Christian Agbo, Oga Esa Ochapa, Maryam Hassan, Gonji Thomas, Ayodeji Olorunsogo, Caleb Eselema Odonye, Joseph Babatunde, Francisca Uba, Abdulmumuni Ahmed Lawal, Surajudeen Bello. Prevalence of surgical site infection and antibiotic susceptibility pattern among post-operative patients at a tertiary hospital in Lafia Nasarawa state, Nigeria. J. Med. Res. 7 (4), 117–120 (2021). https://doi.org/10.31254/jmr.2021.7406
17. Mukamuhirwa, D., Lilian, O., Baziga, V., Ingabire, C., Ntakirutimana, C., Mukantwari, J., Nyirasafari, E., Bagweneza, V., Ngerageze, I., Umutesi, M.C.: Prevalence of Surgical site Infection among Adult Patients at a Rural District Hospital in Southern Province, Rwanda. Rwanda Journal of Medicine and Health Sciences. 5, 34 (2022)
18. Lubega, A., Joel, B., Justina Lucy, N.: Incidence and Etiology of Surgical Site Infections among Emergency Postoperative Patients in Mbarara Regional Referral Hospital, South Western Uganda. Surg Res Pract. 2017, 6365172 (2017). https://doi.org/10.1155/2017/6365172
19. Wiegand, H.: Kish, L.: Survey Sampling. John Wiley & Sons, Inc., New York, London 1965, IX + 643 S., 31 Abb., 56 Tab., Preis 83 s. Biometrische Zeitschrift. 10, 88–89 (1968). https://doi.org/10.1002/bimj.19680100122
20. Mulatu, H.A., Bayisa, T., Worku, Y., Lazarus, J.J., Woldeyes, E., Bacha, D., Taye, B., Nigussie, M., Gebeyehu, H., Kebede, A.: Prevalence and outcome of sepsis and septic shock in intensive care units in Addis Ababa, Ethiopia: A prospective observational study. Afr J Emerg Med. 11, 188–195 (2021). https://doi.org/10.1016/j.afjem.2020.10.001
21. Shiferaw, W.S., Aynalem, Y.A., Akalu, T.Y., Petrucka, P.M.: Surgical site infection and its associated factors in Ethiopia: a systematic review and meta-analysis. BMC Surg. 20, 107 (2020). https://doi.org/10.1186/s12893-020-00764-1
22. Peng, X., Chen, C., Chen, J., Wang, Y., Yang, D., Ma, C., Liu, Z., Zhou, S., Hei, Z.: Tree-based, two-stage risk factor analysis for postoperative sepsis based on Sepsis-3 criteria in elderly patients: A retrospective cohort study. Front Public Health. 10, 1006955 (2022). https://doi.org/10.3389/fpubh.2022.1006955
23. Sarría-Santamera, A., Yessimova, D., Viderman, D., Polo-deSantos, M., Glushkova, N., Semenova, Y.: Detection of the Frail Elderly at Risk of Postoperative Sepsis. Int J Environ Res Public Health. 20, 359 (2022). https://doi.org/10.3390/ijerph20010359
24. Martin-Loeches, I., Guia, M.C., Vallecoccia, M.S., Suarez, D., Ibarz, M., Irazabal, M., Ferrer, R., Artigas, A.: Risk factors for mortality in elderly and very elderly critically ill patients with sepsis: a prospective, observational, multicenter cohort study. Ann. Intensive Care. 9, 1–9 (2019). https://doi.org/10.1186/s13613-019-0495-x
25. Alum, E. U., Ibiam, U.A., Ugwuja, E.I., et al. Antioxidant Effect of *Buchholzia coriacea* Ethanol Leaf Extract and Fractions on Freund's Adjuvant-induced Arthritis in Albino Rats: A Comparative Study. *Slovenian Veterinary Research*. 2022; 59 (1): 31–45. doi: 10.26873/svr-1150-2022.
26. Uti, D. E., Ibiam, U. A., Omang, W. A., Udeozor, P. A., Umoru, G. U., Nwadum, S. K., ... & Aja, P. M. (2023). Buchholzia coriacea Leaves Attenuated Dyslipidemia and Oxidative Stress in Hyperlipidemic Rats and Its Potential Targets In Silico. *Pharmaceutical Fronts*. DOI: 10.1055/s-0043-1772607. DOI https://doi.org/10.1055/s-0043-1772607.
27. Kagura, J., Khamisa, N., Matsena Zingoni, Z., Dulaze, N., Awuku-Larbi, Y., Tshuma, N.: Patient satisfaction with chronic disease care and its associated factors in primary health care facilities in Johannesburg, South Africa. Front Health Serv. 3, 967199 (2023). https://doi.org/10.3389/frhs.2023.967199

CITE AS: Dickson Nuwahereza (2023). Factors Contributing to Postoperative Wound Sepsis in Postoperative Patients at Hoima Regional Referral Hospital in Western Uganda's Hoima District. Eurasian Experiment Journal of Scientific and Applied Research, 4(3):105-112.