



IDENTIFYING THE REASONS OF POSTPONING ELECTIVE SURGERIES IN SULAYMANIYAH CITY

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Abstract

Background: The cancellation of elective surgeries on the intended day is a significant issue, causing resource wastage and patient distress. This study aimed to identify the most common factors for postponing elective surgeries in Sulaymaniyah City and to describe related patient, system, and operative factors.

Patients and Methods: A prospective, hospital-based, cross-sectional study was conducted on 952 patients scheduled for elective surgeries from November 1, 2023, to February 25, 2025. Data were collected from seven hospitals in Sulaymaniyah City (four public, three private). Parameters recorded included patient demographics, operation date, type and complexity, specialty, hospital sector, and postponement reasons.

Results: Out of 952 scheduled cases, 58 surgeries were postponed (6.1% cancellation rate). Medical factors were the primary cause (53.4%), with uncontrolled hypertension being the most frequent reason (36.2%). A significant association was found between surgical specialty and postponement ($P=0.001$), with General Surgery accounting for the highest proportion (31.0%). Furthermore, operative complexity was a significant predictor ($P=0.003$). While Minor, Medium, and Major surgeries had low cancellation rates (approx. 5.5–5.8%), Supermajor surgeries exhibited a markedly higher rate of 22.5%. The hospital service sector was not statistically significant ($P=0.217$).

Conclusion: Most cancellations are attributed to preventable medical factors, particularly uncontrolled hypertension. However, surgical complexity is also a critical association, with Supermajor surgeries being disproportionately vulnerable. Early detection through improved preoperative screening and targeted resource planning for complex procedures is essential to minimize delays.

Keywords: [Elective Surgical Procedures](#), [Operation Cancellation](#), [Uncontrolled Hypertension](#), [supermajor surgeries](#), [Sulaymaniyah city](#).

Main Subjects [Anaesthesia and Intensive Care](#)

Introduction

The heart of a hospital is the operation room, and surgery is the primary treatment for several types of diseases. Cancellation of elective operations on the intended day of surgery (DOS) is considered when a patient's name has appeared on the list for surgical operation but the operation was not done on the intended scheduled date ^{1,10}.

To prepare, a good operation room requires highly organized human and material resources, significant financial investment is required to maintain a well-organized operating theater (OTs). A streamlined surgical service should aim for minimal operation cancellations to prevent the underutilization of OT, maintain efficiency, reduce waiting lists, and minimize costs. Surely, the operating program is the key factor in the organization of the OT. Despite all of this, various factors can prevent the normal execution of the set operating program ².

These postponements have psychological and medical consequences for the patients and lead to the waste of resources for the hospitals ^{3,4}. When resources aren't optimally utilized, it disproportionately affects lower-income individuals relying on

public healthcare services. The expenses associated with underused facilities and equipment are eventually borne by patients. Therefore, preventing cancellations is crucial to alleviate these issues.

Cancellation is a worldwide problem, and several studies have been conducted to identify the causes. In developed countries, postponement is rare because of better organization of services ^{5,6}. Compared to 11% to 44% in developing countries, cancellation ranges between 0.37% to 28% in developed countries ⁷.

Some of the causes are avoidable, like equipment shortage and scheduling errors, but some of them are unavoidable, like patients' medical status ⁸. According to previous research, most of them are avoidable ⁹.

In surgical literature, cancellation factors are generally classified into four primary operational categories to evaluate theater efficiency: medical, patient-related, personnel-related, and administrative or logistical constraints. Medical factors encompass acute clinical changes, unexpected illnesses, or unstable pre-operative physiological markers—such as

uncontrolled hypertension, infections, or acute hyperglycemia—that fundamentally increase anesthesia or surgical risk. Patient-related factors stem directly from the patient’s actions or choices, including non-compliance with pre-operative instructions, smoking against medical advice, or sudden loss of follow-up (no-shows). Conversely, personnel-related factors involve acute disruptions in staffing workflows or clinical clearance, such as staff shortages, provider boycotts, or cases left unchecked by an anesthesiologist due to operational capacity. Lastly, administrative and logistical factors represent hospital system deficits independent of individual clinical providers, which include operating theater time constraints, equipment or ventilator malfunctions, and the unavailability of critical resources like intensive care unit (ICU) beds or specialized facilities. Understanding how these specific factors interact within local health systems is essential. This research aims to identify the most common causes of cancellation in Sulaymaniyah, Iraq, to establish a robust framework for targeted organizational interventions and minimize the waste of limited public and private healthcare resources.

Patients and Methods

Study design

A prospective analytical hospital-based cross-sectional study.

Sample size and Calculation

The study was conducted on 952 patients scheduled to undergo elective surgeries from November 1, 2023, to February 25, 2025. Data were collected from seven hospitals, including four public and three private hospitals in Sulaymaniyah city. All elective surgical procedures meeting the inclusion criteria during the study period were included consecutively to prevent selection bias. To minimize inter-hospital variability in reporting, a standardized electronic data entry template was provided to all participating operation theater managers. Weekly data validation audits were performed by the primary investigator to cross-reference theater logbooks with the submitted forms, ensuring definition uniformity and completeness across both public and private sectors. Confidentiality of patient data and hospital information was strictly maintained. An eight-parameter questionnaire were created that includes patient age, gender, date of

operation, type of operation, medical specialty, hospital service sector, complexity of operation and the specific reason for postponement. This allowed us to analyze the relationship between each postponed case and the aforementioned parameters.

Inclusion criteria:

- 1.All patients of any age or gender who were formally scheduled to undergo an elective surgical procedure (major, medium, minor, supermajor) at any of the participating public or private hospitals in Sulaymaniyah city during the Study period (November 1,2023, to February 25,2025
- 2.patients for whom complete preoperative and scheduling data were available allowing for accurate documentation of the postponement reason if applicable.

Exclusion criteria:

- 1.patients scheduled for emergency surgical procedures as the factors leading to cancellation differ significantly from those for elective surgeries.
2. Patients whose surgery was cancelled or rescheduled prior to the intended day of surgery.

3.cases with missing or incomplete records regarding the reason for cancellation or demographic information.

Data interpretation and software

The data were checked, cleared, entered, and analyzed using, Microsoft Excel sheet (V2021), IBM SPSS (V22). Descriptive and basic analytical statistics were employed to summarize the data. Data were presented in the form of proportions, frequency tables, and through the use of pie charts and bar charts. We calculated p-values using (Chi-square test and Binominal test) for the parameters and reasons for the postponement to determine the significance of each reason.

Ethical approval

This study was performed in accordance with the international guidelines. The 2008 Declaration of Helsinki was followed in all steps of the work. Permission was obtained from the Sulaymaniyah Directorate of Health to prospectively collect surgical data from both public and private hospitals in Sulaymaniyah city. Additionally, patient names, the identities of the responsible doctors for the surgeries, and the names of the hospitals from which the data

were collected were concealed to maintain confidentiality. [Ethical approval no.132. January 21, 2024

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Result

This study included a sample of 952 participants. The age of the participants ranged from a minimum of 0.08 years to a maximum of 89 years. The average age (mean) of the participants was 44.41 years, with a standard deviation of 21.37 years.

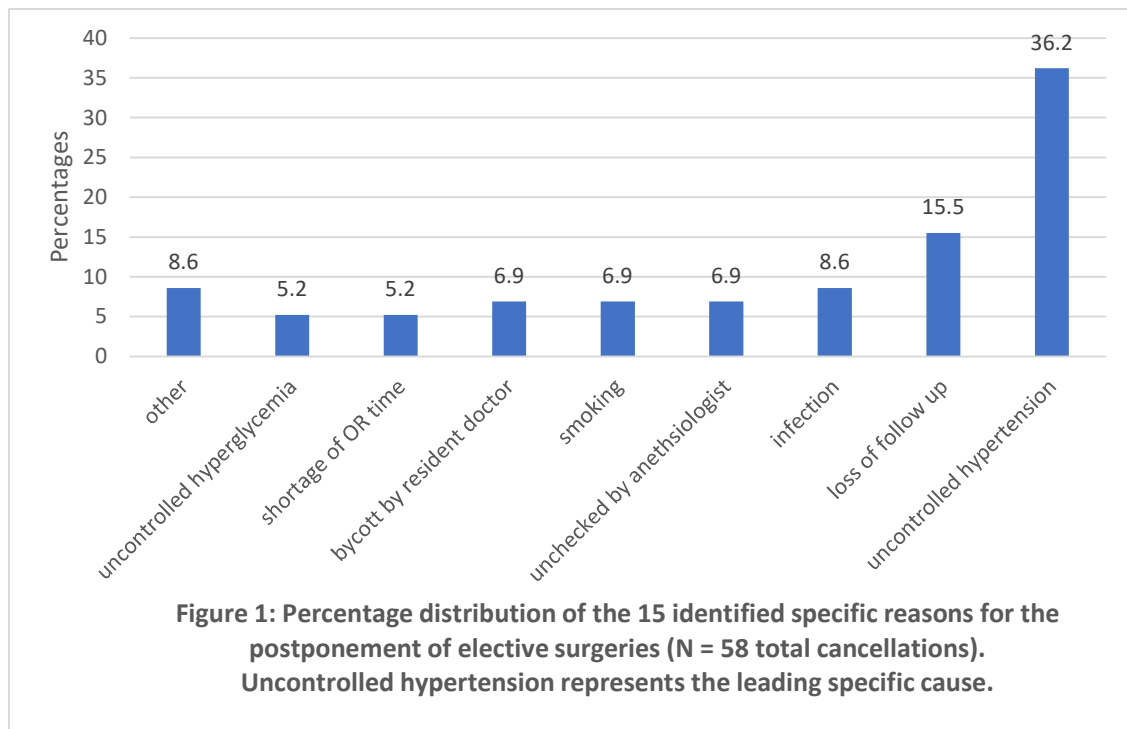
A Diverse Patient Pool: Our study benefitted from a rich tapestry of participants (n=952). While females held a slight majority 53.3%, and a 46.7% were male.

Surgical Spectrum: The procedures performed spanned spectrum of complexity. Medium surgeries comprised the most frequent intervention 34%, followed closely by Major 32.5%, minor procedures 28.4% and supermajor operations account for 5.14% which was the least frequency. Urology department performed the highest number of surgeries 27.8%, followed by General Surgery 25.2% and Ophthalmology 21.5%. The fewest surgeries were performed by the Orthopedic 7.4% and Cardiothoracic 4.6% departments. All participants tested negative for viral markers 100%, This finding serves as a reassuring baseline for further research into this area, As demonstrated in Table I.

Table I: Distribution of patients by different categories

Categories		No.	%
Gender	Female	507	53.3
	Male	445	46.7
Operation type	Major	309	32.5
	Medium	324	34
	Minor	270	28.4
	Super Major	49	5.14
Department			
Cardiothoracic surgery		44	4.6
General		240	25.2
Gynecology		128	13.4
Ophthalmology		205	21.5
Orthopedic		70	7.4
Urology		265	27.8
Viral marker			
Negative		952	100.0

Through the analysis of the collected data, we identified 15 reasons that recurred a total of 58 times within our locality. The data indicates that the most frequent reason for postponement was uncontrolled hypertension, which accounted for 36.2% of postponed cases, followed by loss of follow up which accounted for 15.5%, Infection takes 8.6% of the cases, being uncheck by anesthesiologist, smoking and boycott of resident doctors account same 6.9% proportion. Other reasons, accounting for 8.6% of postponed cases, included unavailability of ICU bed, patient refusal, As demonstrated in figure1.



According to findings on postponement rates according to hospital sector: Public hospitals had the highest number of surgeries (791) and the most postponed cases (52), This gives the public hospital postponement rate 6.6%. Private hospitals had a lower number of surgeries (138) and a lower number of postponed surgeries (4) compared to public hospitals, and gives the private hospital postponement rate 2.9%. Semi-private hospitals had the lowest number of surgeries (23) out of it (2) cases were postponed which gives highest postponement rate 8.7%, As demonstrated in figure 2.

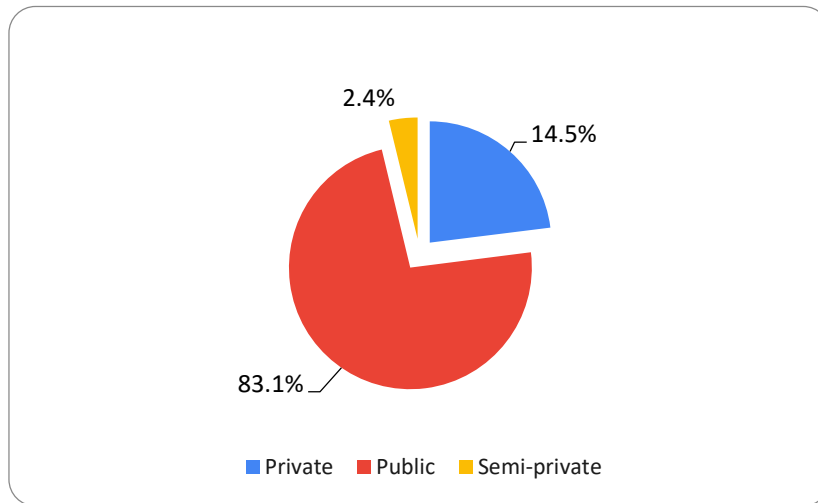


Figure 2: Distribution of the patients according to the hospital service sector (percentage)

Table II, Outlines the distribution of surgical cases categorized by medical reasons and the complexity of operation. When examining the 58 postponed cases, we found that the cancellations were essentially evenly divided between medical and non-medical reasons. Medical factors accounted for just over half of the postponements 53.4%, while non-medical issues made up the remainder 46.6%. This nearly equal split demonstrates that no single category of reasons was the dominant driver for cancellations in this study.

In contrast, the complexity of the planned surgery proved to be a significant predictor of whether a case would proceed. Postponement rates remained consistently low—below 6%—across Minor, Medium, and Major operations. However, "Supermajor" surgeries were a distinct outlier. These highly complex procedures were disproportionately prone to cancellation, with a postponement rate of 22.5%, which is nearly four times higher than that of standard surgeries, As demonstrated in Table II.

Table II: Association between Elective Surgery Postponement and Medical Reasons and Operative Complexity

Categories	Not postponed (no.)	Postponed no. (%)	Total	P-value
Medical vs non-medical reasons				
Medical	894	31(53.4%)	952	0.69
Non-medical		27(46.6%)		
Complexity of operation				
Major	292	17 (5.8%)	309	0.003
Medium	307	17 (5.5%)	324	
Minor	255	15 (5.8%)	270	
Supermajor	40	9 (22.5%)	49	

Note: binomial test used for p-value for medical reasons, chi-square test used for p-value of complexity of operation.

Table III, Illustrates the association between patient characteristics and surgical postponement among 952 cases. The analysis revealed a statistically significant relationship between surgical specialty and postponement ($p=0.001$). Among the 58 postponed cases, General surgery accounted for the highest proportion 31.0%, followed by Ophthalmology 24.1% and Urology 22.4%, while Gynecology notably recorded zero cancellations.

In contrast, no statistically significant association was found for hospital service sector ($p=0.217$) or gender ($p=0.291$). Although Type 1 (Public) hospitals comprised the vast majority of cancellations 89.7%, the difference in postponement rates across hospital sectors was not statistically definitive in this analysis. Similarly, postponement rates were comparable between males 53.4% and females 46.6%, As demonstrated in table 3.

Table III: association between case characteristics and postponements (n= 952)

Characteristic	Category	Not postponed n (%)	Postponed n (%)	Total cases no	p-value*
Hospital service sector	public	739 (93.4)	52 (6.6)	791	0.217
	private	134 (97.1)	4 (2.9)	138	
	Semi-private	21 (91.3)	2 (8.7)	23	
Surgical specialty	Cardiothoracic	36 (81.8)	8 (18.2)	44	0.001
	General	222 (92.5)	18 (7.5)	240	
	Gynecology	128 (100)	0 (0.0)	128	
	Ophthalmology	191 (93.2)	14 (6.8)	205	
	Orthopedic	65 (92.9)	5 (7.1)	70	
	Urology	252 (95.1)	13 (4.9)	265	
Gender	Female	480 (94.7)	27 (5.3)	507	0.291
	Male	414 (93.0)	31 (7.0)	445	

Figure 3: Illustrates the distribution of reasons for the postponement of elective surgical operations, categorized by the responsible party. The data shows that medical factors were the predominant cause, accounting for more than half of all postponements 53.4%. Patient-related reasons were the second most frequent category at 25.9%. Administration-related factors and personnel-related factors each contributed equally to the remaining postponements, with 10.3% respectively.

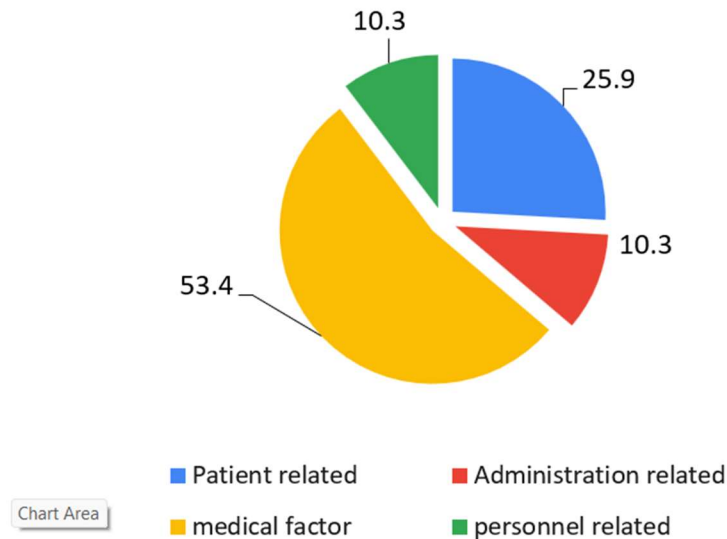


Figure 3: Distribution of postponed operations according to responsible side

Discussion:

The cancellation of elective surgeries is a significant indicator of quality in healthcare management, affecting hospital resources and patient satisfaction. In this study conducted across seven hospitals in Sulaymaniyah City, the overall cancellation rate was 6.1%. This rate is relatively favorable when compared to the wide range of cancellation rates reported in developing countries, which can span from 11% to 44%, and aligns more closely with rates seen in some developed healthcare systems. For instance, Cho et al.²¹ reported a cancellation rate of 8.0% in Korea, and Kaddoum et al.²² reported a

4.4% rate in Beirut. However, despite the reasonable overall rate, the underlying causes in our setting present a distinct profile that requires targeted intervention. The most significant finding of our study is the predominance of medical factors, which accounted for 53.4% of all postponements. This contrasts with findings from several other regions where administrative issues or patient absenteeism were the primary drivers^{13, 16, 17}. For example, Garg et al.¹³ in India found that 63% of cancellations were due to administrative causes, specifically insufficient operating time. Similarly, Abeeleh et al.¹⁶ in Jordan and Mutwali et al.¹⁷ in Sudan identified

patient non-attendance (no-shows) as the leading cause, accounting for 62.5% and 35.5% of cancellations, respectively. In contrast, our results align more closely with studies by Smith et al.¹⁹ in the USA and González-Arévalo et al.²⁰ in Spain, where medical reasons were also the majority cause, accounting for 51% and 50% of cancellations, respectively. This similarity suggests that while our administrative systems (scheduling and theater availability) may be functioning relatively well, our preoperative screening processes are missing critical patient health issues before the day of surgery.

Specifically, uncontrolled hypertension was the single most frequent reason for cancellation in our study, responsible for 36.2% of all postponed cases. This is a remarkably high percentage compared to the literature. While Mutwali et al.¹⁷ noted that chronic diseases (including hypertension and diabetes) were the second most common cause 21.97%, and Tait et al.⁴ found respiratory infections to be a major medical cause in pediatrics, the dominance of hypertension in Sulaymaniyah highlights a specific gap in our local healthcare delivery. It suggests that patients are either not being screened

early enough to manage their blood pressure or are not compliant with preoperative medications.

A key new finding in our analysis is the significant impact of operative complexity on cancellation rates. While standard surgeries (Minor, Medium, Major) maintained low postponement rates of roughly 5-6%, Supermajor surgeries faced a dramatically higher rate of 22.5%. This aligns with the "complexity" factor discussed by Lankoandé et al.¹⁸, who noted that complex cases are often more unpredictable and resource-intensive. Supermajor surgeries often require specific resources like ICU beds, prolonged operative time, and highly specialized staff. If an ICU bed is unavailable on the morning of surgery, or if a preceding case runs overtime, these complex cases are the first to be cancelled for safety reasons.

This factor of complexity likely explains the statistically significant association we found between surgical specialty and postponement. General Surgery was the most affected specialty, contributing 31.0% of all postponed cases, followed by Ophthalmology 24.1% and Urology 22.4%. This finding is consistent with

Lankoandé et al.¹⁸, who also reported General Surgery as having the highest cancellation rate due to the complexity and often unpredictable nature of the cases. Conversely, Gynecology departments reported zero cancellations in our sample, indicating highly effective preoperative preparation or patient compliance in this department.

Regarding hospital sectors, while public hospitals accounted for the majority of cancellations (89.7% of the postponed group) Regarding hospital sectors, while public hospitals accounted for the majority of cancellations (89.7% of the postponed group), , our statistical analysis revealed that the association between hospital service sector and postponement was not statistically significant. This suggests that the higher number of cancellations in public hospitals is likely proportional to their higher patient volume rather than a systemic failure unique to the public sector. Similarly, gender was not a significant predictor of cancellation.

Administrative and personnel factors played a smaller but notable role. Shortage of OT time caused only 10.3% of cancellations in our study. This is a positive finding when compared to Garg

et al.¹³ 63% and González-Arévalo et al.²⁰ 23%, suggesting that surgical time estimation in Sulaymaniyah's hospitals is generally accurate. However, the boycott by resident doctors 6.9% is a unique socioeconomic factor specific to our current local context, which does not appear in the international comparison studies. Additionally, the finding that 6.9% of cases were postponed due to being "unchecked by an anesthesiologist" corroborates the findings of Hussain et al.¹⁵, who noted anesthesia-related issues in 8% of cases. This points to a logistical bottleneck where the anesthesia team is not sufficiently integrated into the early preoperative phase, particularly for the complex "Supermajor" cases that require the most rigorous clearance.

Conclusions and Recommendation.

In conclusion, this study identifies that the majority of elective surgery cancellations in Sulaymaniyah City are attributable to medical and patient-related factors, specifically uncontrolled hypertension, rather than administrative or infrastructural deficiencies. This distinction is critical because medical cancellations are largely preventable through better preparation.

However, a key insight from our analysis is that **operative complexity** is also a statistically significant association of postponement. While standard surgeries proceed with high reliability, **Supermajor** procedures are disproportionately prone to cancellation 22.5%, likely due to their intensive resource requirements and unpredictability. This parallels the significant variation observed across specialties, with General Surgery being the most affected, highlighting the need for targeted interventions in high-complexity departments.

To reduce these delays, we recommend implementing robust Pre-Anesthesia Clinics weeks before the scheduled surgery date, rather than assessing patients only on the day before. This strategy would serve a dual purpose: providing sufficient time to stabilize patients with chronic conditions like hypertension, and allowing for better logistical planning for complex, Supermajor cases. Furthermore, enhancing communication between patients, doctors, and nurses regarding preoperative instructions—such as medication compliance—can significantly decrease the risk of

postponements, ultimately conserving hospital resources and improving patient care.

Study strengths:

This prospective multicenter study provides robust local evidence on elective surgery postponements in Sulaymaniyah City, based on a large and diverse sample. Its key strengths include prospective data collection across multiple hospital sectors, clear identification of preventable medical causes—particularly uncontrolled hypertension—and a detailed analysis by surgical specialty and operative complexity. The demonstration that supermajor procedures carry a markedly higher postponement risk adds novel insight. Overall, the study offers practical, context-specific recommendations and makes a meaningful contribution to understanding and reducing avoidable surgical delays in resource-limited settings.

Limitations

The cross-sectional design and the relatively small number of postponed cases limit the ability to draw causal conclusions and may restrict the scope of adjusted statistical analyses. Variations in documentation practices across

centers, along with the lack of fully standardized definitions for reasons for postponement, may have affected data consistency. Moreover, our local hospitals' registration of patient data in surgical theaters is flawed, with very few parameters available for utilization, necessitating prospective data collection.

Conflict of publication

Not applicable

Acknowledgement: We are grateful for all surgical theater managers who are played important role in sharing their surgical data on daily basis.

Conflict of Interest Statement:

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. No competing interests exist regarding the publication of this manuscript.

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The authors' contributions:

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Concept and Design: 2, 3

Data Collection and Analysis: 2, 3, 4

Responsibility for Statistical Analysis: 2, 3

Writing the Article: 2, 3

Critical Review: 1, 2, 3, 4

Final Approval of the Article: 2

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.

Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

Abbreviations

DOS, day of surgery; OR, operation room; OT, operation theater; SPSS, Statistical Package for the Social Sciences; N. No. n, number; STD.DEVIATION, Standard deviation; ENT, Otorhinolaryngology; F, female; M, male; ICU, intensive care unit; KBTH, Khartoum Bahri Teaching Hospital.

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