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Knowledge and attitudes towards the WHO surgical safety checklist among healthcare workers in Mogadishu, Somalia

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Abstract

Background The World Health Organization (WHO) surgical safety checklist (SSC) is a crucial tool for improving patient safety in surgical settings. This study aimed to assess the knowledge and attitudes towards WHO SSC among healthcare professionals in Mogadishu, Somalia, and identify factors associated with these outcomes.

Methods This cross-sectional study was conducted from April to July 2024 among 422 healthcare professionals in Mogadishu. Data were collected using a structured questionnaire adapted from the WHO SSC, consisting of sociodemographic information, knowledge assessment (12 items), and attitude assessment (7 items). Descriptive statistics and binary logistic regression were used for the data analysis.

Results The study revealed that 81.04% of participants demonstrated good knowledge of SSC (score > 60%), with a mean knowledge score of 9.59 out of 12 (SD 2.92). However, only 13.51% exhibited a positive attitude towards SSC (score > 60%), despite 87.6% agreeing that SSC improves patient safety. Higher knowledge was significantly associated with professional roles in medicine and surgery ($p < 0.001$), nursing ($p < 0.001$), and having a master's degree ($p = 0.039$). Attitudes were significantly more positive among professionals in medicine and surgery ($p < 0.001$) and nursing ($p = 0.001$), but not significantly influenced by education level or years of experience ($p > 0.05$).

Conclusion While knowledge levels of WHO SSC among healthcare professionals in Mogadishu are generally good, attitudes towards the checklist are mixed, with a low proportion demonstrating positive attitudes. Targeted interventions, including comprehensive training programs and addressing workflow concerns, are recommended to enhance SSC implementation and use in Somali healthcare settings.

Keywords Surgical safety checklist, Patient safety, Healthcare professionals, Somalia, Knowledge and attitudes

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Introduction

Surgical complications remain a significant global health concern, contributing to substantial morbidity, mortality, and healthcare costs worldwide [1]. The World Health Organization (WHO) estimates that surgical adverse events affect up to 25% of patients in high-income countries, with rates potentially higher in resource-limited settings [2]. Approximately 234 million major surgical procedures are performed annually, with nearly 7 million patients experiencing disabling complications and 1 million deaths occurring during or immediately after surgery [1]. Studies suggest that at least half of these adverse events are potentially preventable, underscoring the urgent need for improved patient safety measures in surgical care [1, 3]. Recognizing the critical importance of patient safety in surgical care, c as a cornerstone initiative to reduce surgical complications and improve patient outcomes globally [4]. The WHO Surgical Safety Checklist is a 19-item tool designed to enhance teamwork, communication, and adherence to essential safety practices in the operating room. Divided into three critical phases—Sign In, Time Out, and Sign Out—the SSC aims to ensure that crucial steps are not overlooked during surgical procedures [5]. Its primary objectives are to improve team communication, ensure consistent care, and establish a culture of safety in surgical settings [6].

Since its introduction, numerous studies have demonstrated the efficacy of SSC in reducing surgical complications and mortality rates in diverse healthcare settings. A landmark study published in the New England Journal of Medicine reported decreased death rates from 1.5 to 0.8% and inpatient complications from 11 to 7% following SSC implementation across eight diverse hospitals worldwide [7]. A systematic review and meta-analysis reported a significant reduction in postoperative complications (OR 0.59, 95% CI 0.47–0.74) and mortality (OR 0.77, 95% CI 0.60–0.98) following SSC implementation [8]. Despite the well-documented benefits, global implementation of the SSC has been variable, with adoption rates and compliance levels differing significantly between and within countries [9]. Challenges to effective implementation include resistance to change, lack of leadership support, inadequate training, and resource constraints, particularly in low- and middle-income countries [10, 11]. These barriers underscore the importance of understanding the local context and healthcare workers' perspectives when introducing and sustaining SSC use.

In Somalia, a country grappling with the aftermath of prolonged conflict and political instability, the healthcare system faces numerous challenges [12]. The protracted civil war has severely damaged the country's medical infrastructure, leading to a critical shortage of healthcare professionals and essential medical equipment [13]. Consequently, surgical care in Somalia has been largely neglected, with the majority of studies focusing on infectious diseases, communicable diseases, and humanitarian emergencies [5]. These systemic issues complicate the implementation of standardized safety protocols such as SSC, potentially compromising patient outcomes in surgical settings. The implementation of the SSC in resource-constrained environments like Somalia presents unique challenges and opportunities [5]. Research from other LMICs has shown that contextual factors such as organizational culture, resource availability, and healthcare worker attitudes significantly influence SSC implementation [5, 9]. For instance, a study in Ethiopia found that a multi-agency approach involving local and international stakeholders resulted in high initial SSC completion rates and positive staff attitudes. However, completion rates declined over time, suggesting that inadequate training and lack of sustained institutional support can hinder the checklist's consistent use, even when healthcare workers are initially receptive to it [9]. Similarly, research in Tanzania revealed that successful SSC implementation required tailored strategies addressing local needs, including continuous education, supportive supervision, and adaptation of the checklist to local contexts [14]. Despite these insights from other LMICs, a critical knowledge gap persists regarding healthcare workers' knowledge, attitudes, and perceptions of SSC in Somalia. Understanding these factors is important for developing effective implementation strategies and for ensuring long-term adherence to safety protocols. This study aimed to address this knowledge gap by investigating the knowledge and attitudes towards the WHO Surgical Safety Checklist among healthcare workers in Mogadishu, Somalia. By explaining these critical factors, this study seeks to inform targeted interventions and policy recommendations to enhance SSC implementation and compliance in Somali healthcare facilities.

Methodology

Study design and setting

This cross-sectional study was conducted from April 2024 to July 2024 to assess the knowledge and attitudes regarding WHO SSC among healthcare professionals in Mogadishu, Somalia. This study employed a structured questionnaire adapted from the WHO SSC to collect data from healthcare professionals involved in surgical procedures in various healthcare facilities, including hospitals and health centers in Mogadishu.

Study population and sampling

The study population comprised healthcare professionals directly involved in surgical procedures, including surgeons, anesthesiologists, nurses, and other operating room staff. A combination of convenience and purposive sampling techniques was used to recruit the participants.

The sample size was calculated using a single population proportion formula, assuming a 50% probability of poor knowledge and attitude towards the WHO SSC among healthcare professionals, with a 95% confidence interval and 5% margin of error. The initial sample size was 384. An additional 10% was added to account for potential nonresponses, resulting in a final target sample size of 422 participants.

Data collection tool and procedure

The study used a structured questionnaire adapted from the WHO SSC [2]. The questionnaire consisted of three main sections: sociodemographic information, knowledge assessment (12 items), and attitude assessment (7 items). The knowledge section used a "Yes," "No," or "Not Sure" response format, while the attitude section employed a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Data were collected using two primary methods. First, an online questionnaire was distributed through WhatsApp groups, in which healthcare professionals were members. To ensure that only relevant participants responded, an inclusion criteria statement was included at the beginning of the online form specifying that only individuals working in the surgery department or involved in surgical procedures should complete the questionnaire. This approach helped filter healthcare professionals who were not directly involved in surgical care. Second, two trained data collectors visited hospitals and health centers that agreed to participate in the study. These data collectors approached eligible healthcare professionals, explained the purpose of the study, obtained informed consent, and administered the questionnaire. A pilot study was conducted with 30 participants to ensure the validity and reliability of the questionnaire. The internal consistency of the subscales was assessed using Cronbach's alpha, with values of 0.76 for knowledge and 0.74 for attitude, indicating good reliability.

Data analysis and measurements

Data analysis was performed using R programming software (version 4.4.0). Descriptive statistics were used to summarize the sociodemographic characteristics of the participants and their knowledge and attitude scores. For the knowledge assessment, correct answers were scored as 1, while incorrect or "Not Sure" responses were scored as 0. The total knowledge score was calculated by adding individual item scores. Using Bloom's cut-off point, a widely accepted classification in Knowledge, Attitude, and Practice (KAP) studies, particularly in low- and middle-income countries (LMICs), the scores were dichotomized into 'Poor Knowledge' (≤60%, 0–7 points) and 'Good Knowledge' (>60%, 8–12 points) [15]. The attitude items were scored on a scale of 1–5, with 5 representing the most positive attitude. The total attitude score ranged from 7 to 35. Responses were categorized as "Negative Attitude" (≤60%, 1–21 points) and "Positive Attitude" (>60%, 22–35 points). To analyze the associations between sociodemographic factors, knowledge, and attitude scores, binary logistic regression was conducted. Odds ratios (ORs) with 95% confidence intervals (CIs) were also calculated. In the multivariate analysis, variables with a p-value of <0.25 in the univariate analysis were considered. Subsequently, in the multivariate analysis, variables with a p-value of <0.05 were deemed significant. Additionally, a Pearson correlation analysis was conducted to evaluate the association between knowledge and attitude scores. Given that a large proportion of participants (78.2%) had ≤5 years of experience, a subgroup analysis was also performed by dividing this group into 0–2 years and 3–5 years to explore score variability within the cohort.

Results

Sociodemographic characteristics

A total of 422 healthcare professionals participated in the study. As shown in Table 1, the majority of respondents were male (86.26%), and the mean age was 29.9 years (SD ± 5.66). Nurses constituted the largest professional group (52.37%), followed by medicine and surgery professionals (32.94%), and anesthesiologists (8.29%). Most participants (78.2%) had less than five years of work experience, 16.35% had to 5–9 years, and 5.45% had more than ten years of experience. Regarding educational level, 71.8% held a bachelor's degree, 23.22% had a master's degree, and 4.27% had a PhD (Table 1).

Knowledge about WHO SSC

The overall mean knowledge score was 9.59 (SD ± 2.92), with 81.04% scoring above the 60% threshold. A Pearson correlation analysis revealed a modest but statistically significant positive correlation between knowledge and attitude scores ($r = 0.29$, $p < 0.001$). Among those with ≤5 years of experience, participants in the 0–2year group had a mean score of 9.2, compared to 9.7 among those with 3–5 years of experience, though this difference was not statistically significant ($p = 0.087$). Of the respondents, 89.57% were aware that SSC was applied in three key situations: before induction of anesthesia, before skin incision, and before the patient leaves the operating room. 87.91% of participants knew that patients must confirm their identity, surgery site, procedure name, and consent before induction of anesthesia (Table 2). The participants showed varying levels of knowledge across the different aspects of SSC. For instance, 80.57% knew that a functioning pulse oximeter must be placed on the patient and operational throughout the surgery. However, only 68.01% were aware that surgical teams were

Table 1 Sociodemographic characteristics

Variable	Frequency (N)	Percent (%)
Age		
18–29	203	48.1
29–40	195	46.21
>40	24	5.69
Mean ± SD	29.9 ± 5.66	
Gender		
Male	364	86.26
Female	58	13.74
Marital status		
Married	254	60.19
Single	163	38.63
Divorced/widowed	5	1.18
Level of Education		
Bachelor Degree	303	71.8
Master Degree	98	23.22
PhD	18	4.27
Professional field		
Nursing	221	52.37%
Medicine and Surgery	139	32.94%
Anesthesiology	35	8.29%
Midwifery	27	6.4%
Department		
General Surgery	303	71.8
Obstetrics and Gynecology	50	11.85
Urology	27	6.4
Orthopedics	15	3.55
ENT	15	3.55
Ophthalmology	12	2.84
Years of experience		
≤5 years	330	78.2
5–9 years	69	16.35
≥10 years	23	5.45
Mean ± SD	4.59 ± 3.05	
Monthly income		
≤500$	257	60.9
501–1000$	97	22.99
≥1000$	68	16.11
Mean ± SD	849 ± 915	

required to introduce themselves by name and role to enhance communication.

Attitudes towards WHO Surgical Safety Checklist

This study revealed mixed attitudes towards WHO SSC among healthcare professionals in Mogadishu. As shown in Table 3, the mean attitude score was 25.29 out of 35 (SD ± 4.23), with only 13.51% demonstrating a positive attitude (score > 60%). A significant majority (87.6%) agreed or strongly agreed that using SSC improved patient safety, and 59.24% believed that it enhanced teamwork and communication in the operating room. Despite these positive views, the low percentage of participants with positive attitudes suggests that many healthcare professionals may have reservations regarding the WHO SSC.

Factors associated with Knowledge about WHO SSC

Binary logistic regression analysis revealed several factors significantly associated with knowledge of the WHO SSC (Table 4). Healthcare professionals with more than 10 years of experience were more likely to have good knowledge than those with less than 5 years and 5–9 years of experience (OR: 2.3, 95% CI: 1.4–3.8, $p < 0.001$). Professional roles also significantly influenced knowledge levels. Those in medicine, surgery, and nursing demonstrated significantly higher knowledge levels than midwives (OR: 9.61, 95% CI: 3.83–24.13, $p < 0.001$ and OR: 6.02, 95% CI: 2.61–13.88, $p < 0.001$, respectively). Education level played a significant role in SSC knowledge, with participants with master's degrees being more likely to have good knowledge than those with bachelor's degrees and PhDs (OR: 4.42, 95% CI: 1.08–18.15, $p = 0.039$).

Factors associated with attitudes towards WHO SSC

Table 5 presents the factors significantly associated with attitudes towards the WHO Surgical Safety Checklist. Age was not a significant factor in predicting positive attitudes, with participants over 40 years being no more likely to have positive attitudes than their younger counterparts (OR: 0.15, 95% CI: 0.02–1.16, $p = 0.069$). Similarly, education level was not associated with attitudes towards SSC, with participants with master's degrees being no more likely to have positive attitudes than those with bachelor's degrees and PhDs (OR: 2.21, 95% CI: 0.74–6.62, $p = 0.155$). However, the professional field was significantly associated with attitudes towards SSC. Professionals in medicine and surgery and nurses showed more positive attitudes than midwives (OR: 9.45, 95% CI: 3.15–28.36, $p < 0.001$ and OR: 5.92, 95% CI: 2.1–16.67, $p = 0.001$, respectively).

Discussion

This study aimed to assess the knowledge and attitudes towards WHO SSC among healthcare professionals in Mogadishu, Somalia. The findings revealed a moderate level of knowledge and generally positive attitudes towards SSC among the participants. This study identified several factors associated with knowledge and attitudes, including years of experience, professional roles, and education level. The overall knowledge of the WHO SSC among healthcare professionals in Mogadishu was moderate, with 81.04% of participants demonstrating good knowledge. This finding is encouraging and suggests that the majority of healthcare workers in Mogadishu are familiar with the key components and objectives of the SSC. However, this also indicates that there is room for improvement, particularly in certain

Table 2 Knowledge of WHO SSC

Level of knowledge	**Frequency*N*(%)**		**Mean ± SD**
Poor Knowledge (≤ 60%) (0–7 scores)	80 (18.96)		9.59 ± 2.92
Good Knowledge (> 60%) (8–12 scores)	342 (81.04)		
Knowledge statements	**Yes n (%)**	**No n (%)**	**Not sure n (%)**
There's a WHO Surgical Safety Checklist that ensures the Safety and efficiency of Surgical procedures.	380 (90.05	26 (6.16)	16 (3.79)
The Checklist is applied in three key statuses: before induction of anesthesia, before skin incision, and before patients leaves operating room	378 (89.57)	31 (7.35)	13 (3.08)
Patients must confirm their identity, surgery site, procedure name, and consent before induction anesthesia	371 (87.91)	39 (9.24)	12 (2.84)
Surgical site is marked before surgery to prevent wrong-site surgery	344 (81.52)	59 (13.98)	19 (4.5)
Anesthesia equipment and medication must be checked before surgery	363 (86.02)	46 (10.9)	13 (3.08)
A functioning pulse oximeter must be placed on the patient and operational throughout the surgery.	340 (80.57)	68 (16.11)	14 (3.32)
Patient's risks, including allergies, difficult airway, or significant blood loss are assessed before induction of anesthesia	370 (87.68)	37 (8.77)	15 (3.55)
Surgical teams are required to introduce themselves by name and role to enhance communication.	287 (68.01)	113 (26.78)	22 (5.21)
Antibiotic prophylaxis, if indicated, is administered within the last 60 min before the incision	342 (81.04)	53 (12.56)	27 (6.4)
Sterility including indicator results is confirmed before the skin incision	300 (71.09)	96 (22.75)	26 (6.16)
The surgical team must discuss anticipated critical events and any patient-specific concerns before skin incision	302 (71.56)	82 (19.43)	38 (9)
Nurse's verbal confirmation of instrument, sponge, and needle counts, along with specimen labeling, is required before the patient leaves the operating room.	270 (63.98)	89 (21.09)	63 (14.93)

Table 3 Attitudes towards WHO SSC

Level of Attitude	**Frequency *N* (%)**			**Mean ± SD**	
Negative Attitude (≤ 60%) (1–21 scores)	365 (86.49)			25.29 ± 4.23	
Positive Attitude (> 60%) (22–35 scores)	57 (13.51)				
Attitude statements	**Strongly agree n (%)**	**Agree n (%)**	**Neutral n (%)**	**Disagree n (%)**	**Strongly Disagree n (%)**
The WHO Surgical Safety Checklist significantly improves patient safety during surgical procedures.	281 (66.59)	89 (21.09)	28 (6.64)	18 (4.27	6 (1.42)
Implementing the checklist is practical and enhances the efficiency of surgical procedures.	96 (22.75)	241 (57.11)	73 (17.3)	7 (1.66)	5 (1.18
Using the checklist increases the confidence of the surgical team in managing surgeries safely.	16 (3.79)	131 (31.04)	108 (25.99)	105 (24.88)	62 (14.69)
The checklist is an essential tool for both minor and major surgeries, ensuring a standard level of care.	114 (27.01)	207 (49.05)	77 (18.25)	14 (3.32)	10 (2.37)
The use of the checklist promotes better communication and teamwork among surgical team members.	106 (25.12)	144 (34.12)	139 (32.94)	27 (6.4)	6 (1.42)
The checklist adds value to the existing safety procedures in the theatre.	100 (23.7)	153 (36.26)	129 (30.57)	36 (8.53)	4 (0.95)
The checklist is user-friendly and easy to implement.	64 (15.17)	82 (19.43)	39 (9.24)	76 (18.01)	161 (38.15)

aspects of the checklist. For instance, while 89.57% of the respondents were aware of the three key phases of SSC application, the majority of healthcare workers demonstrated strong familiarity with core checklist procedures. However, only 68.01% were aware that team members must introduce themselves, suggesting a need to address overlooked components during training. Our subgroup analysis within the ≤ 5 years' experience cohort showed slight score differences between 0 and 2 and 3–5 year subgroups, suggesting a potential early-career learning curve that warrants targeted onboarding and mentorship interventions.

Moreover, the statistically significant positive correlation between knowledge and attitude scores implies that improvements in knowledge may foster better perceptions and willingness to use SSC in practice. However, knowledge alone may not suffice, as structural, operational, and behavioral barriers also influence attitudes.

Table 4 Factors associated with knowledge of WHO SSC

Variables	Knowledge Level		OR (95%CI)	*P* Value	AOR (95%CI)	*P* Value
	Poor (%)	Good (%)				
Age (Years)						
18–29	45 (10.66)	158 (37.44)	0.15 (0.02)	0.069*	0.09 (0.01–0.92)	0.042*
29–40	34 (8.06)	161 (38.15)	0.21 (0.03)	0.128*		
>40	1 (0.24)	23 (5.45)	1.00			
Mean ± SD	25.7 ± 4.68					
Gender						
Male	61 (14.45	303 (71.8)	2.42 (1.31–4.47)	0.005*		
Female	19 (4.5)	39 (9.24)	1.00			
Marital status						
Married	40 (9.48)	214 (50.71)	3.57 (0.58–22.03)	0.171*		
Single	38 (9)	125 (29.62)	2.19 (0.35–13.61)	0.399		
Divorced/widowed	2 (0.47)	3 (0.71)	1.00			
Level of Education						
Bachelor's degree	59 (14.08)	244 (58.23)	1.65 (0.62–4.45)	0.318		
Master's degree	15 (3.58)	83 (19.81)	2.21 (0.74–6.62)	0.155*	4.42 (1.08–18.15)	0.039*
PhD	5 (1.19)	13 (3.1)	1.00			
Professional field						
Nursing	38 (9)	183 (43.36)	6.02 (2.61–13.88)	< 0.001*	6.02 (2.52–14.36)	< 0.001*
Medicine and Surgery	16 (3.79)	123 (29.15)	9.61 (3.83–24.13)	< 0.001*	7.54 (2.91–19.53)	< 0.001*
Anesthesiology	24 (5.69)	24 (5.69)	2.73 (0.96–7.73)	0.059*		
Midwifery	12 (2.84)	12 (2.84)	1.00			
Department						
General Surgery	44 (10.43)	259 (61.37)	1.18(0.25–5.55)	0.837		
Obstetrics and Gynecology	17 (4.03)	33 (7.82)	0.39 (0.08–1.98)	0.254		
Urology	8 (1.9)	19 (4.5)	0.48 (0.08–2.68)	0.399		
Orthopedics	5 (1.18)	10 (2.37)	0.4 (0.06–2.57)	0.344		
ENT	4 (0.95)	11 (2.61)	0.55 (0.08–3.68)	0.538		
Ophthalmology	2 (0.47)	10 (2.37)	1.00			
Years of experience						
≤5 years	61 (14.45)	269 (63.74)	0.66 (0.19–2.3)	0.515		
5–9 years	16 (3.79)	53 (12.56)	0.5 (0.13–1.89)	0.305		
>10 years	3 (0.71)	20 (4.74)	1.00			
Monthly income						
≤500$	46 (10.9)	211 (50)	1.3 (0.67-2,5)	0.436		
501–1000$	19 (4.5)	78 (18.48)	1.16 (0.54–2.49)	0.699		
≥1000$	15 (3.55)	53 (12.56)	1.00			

To address potential confounding from the dominance of the ≤ 5 years' experience group, we controlled for years of experience in the multivariate logistic regression model and tested for interaction effects with professional role. These were not significant, but we acknowledge this homogeneity as a limitation and recommend more balanced sampling in future studies.

The mixed attitudes towards SSC observed in this study suggest that further efforts are needed to ensure its successful implementation in Somali healthcare settings. The high percentage of participants (87.6%) who agreed that the SSC improves patient safety aligns with findings from other low- and middle-income countries (LMICs). For example, a study in Ethiopia found that almost 100% of healthcare worker respondents believed that the checklist improved staff communication, patient safety, and overall patient care [9]. That study revealed that only 15.17% of the participants strongly agreed that the checklist was user-friendly and easy to implement, while 38.15% strongly disagreed. This suggests that a considerable portion find it challenging to use, potentially leading to workflow disruptions and perceived delays. This finding underscores the importance of addressing workflow concerns and emphasizing the time-efficiency of the SSC during training and implementation efforts [16].

Our study found that educational level was not significantly associated with attitudes towards SSC, although it influenced knowledge levels. This contrasts with a study in the UK which reported that higher education levels, current SSC use, and completion of SSC-relevant

Table 5 Factors associated with attitudes towards WHO SSC

Variables	Attitude Level		OR (95%CI)	*P* Value	AOR (95%CI)	*P* Value
	Negative (%)	Positive (%)				
Age (Years)						
18–29	29 (6.87)	174 (41.23)	0.15 (0.02–1.16)	0.069		
29–40	28(6.64)	167 (39.57)	0.21 (0.03–1.58)	0.128		
>40	0	24 (5.69)	1.00			
Gender						
Male	47 (11.14)	317 (75.12)	2.42 (1.31–4.47)	0.005*		
Female	10 (2.37)	48 (11.37)	1.00			
Marital status						
Married	29 (6.87)	225 (53.32)	3.57 (0.58–22.03)	0.171		
Single	27 (6.4)	136 (32.23)	2.19 (0.35–13.61)	0.399		
Divorced/widowed	1 (0.24)	4 (0.95)	1.00			
Level of Education						
Bachelor's degree	45 (10.74)	258 (61.58)	1.65 (0.62–4.45)	0.318		
Master's degree	11 (2.63)	87 (20.76)	2.21 (0.74–6.62)	0.155		
PhD	1 (0.24)	17 (4.06)	1.00			
Professional field						
Nursing	32 (7.58)	189 (44.79)	6.02 (2.61–13.88)	< 0.001*	5.92 (2.1-16.67)	0.001*
Medicine and Surgery	13 (3.08)	126 (29.86)	9.61 (3.83–24.13)	< 0.001*	9.45 (3.15–28.36)	< 0.001*
Anesthesiology	5 (1.18)	30 (7.11)	2.73 (0.96–7.73)	0.059		
Midwifery	7 (1.66)	20 (4.74)	1.00			
Department						
General Surgery	40 (9.48)	263(62.32)	1.18 (0.25–5.55)	0.837		
Obstetrics and Gynecology	7 (1.66)	43 (10.19)	0.39 (0.08–1.98)	0.254		
Urology	3 (0.71)	24 (5.69)	0.48 (0.08–2.68)	0.399		
Orthopedics	3 (0.71)	12 (2.84)	0.4 (0.06–2.57)	0.334		
ENT	2 (0.47)	13 (3.08)	0.55 (0.08–3.68)	0.538		
Ophthalmology	2 (0.47)	10 (2.37)	1.00			
Years of experience						
≤5 years	49 (11.61)	281 (66.59)	0.66 (0.19–2.3)	0.515		
5–9 years	7 (1.66)	62 (14.69)	0.5 (0.13–1.89)	0.305		
>10 years	1 (0.24)	22 (5.21)	1.00			
Monthly income						
≤500$	39 (9.24)	218 (51.66)	1.3 (0.67–2.5)	0.436		
501–1000$	10 (2.37)	87 (20.62)	1.16 (0.54–2.49)	0.699		
≥1000$	8 (1.9)	60 (14.22)	1.00			

post-qualification continuing professional development were associated with increased positive attitudes towards SSC use [17]. This disparity may be due to differences between high-income countries such as the UK and low-income countries such as Somalia. Factors such as resource constraints, differences in healthcare infrastructure, training opportunities, and organizational culture may contribute to these contrasting findings [18]. The lack of association between education level and attitudes in our study suggests that attitudinal barriers may be more influenced by practical concerns and contextual factors than formal education alone in the Somali context. Our findings align with a recent study on the implementation of the WHO SSC in resource-limited Somalia [5]. This study demonstrated significant improvements in SSC compliance after a targeted intervention program. This study reported an increase in overall SSC compliance from 37 to 98.8% post-intervention. These findings highlight the potential for substantial improvements in surgical safety through structured implementation strategies, even in challenging healthcare settings.

However, our study revealed some areas of concern. For instance, only 62.8% of the respondents felt that SSC did not cause unnecessary delays in surgical procedures. This perception of SSC as potentially disruptive to workflow is a common barrier to its implementation, as noted in other studies. Addressing this concern through education on the time-saving benefits of improved communication and reduced complications could enhance acceptance of SSC. The implementation challenges identified in this study are not unique to Somalia. A study from India reported similar issues with SSC compliance, particularly in the Sign-Out phase [19]. However, this study demonstrated that rigorous awareness programs and training sessions could significantly improve compliance rates. This suggests that similar interventions could be effective in addressing the knowledge gaps and attitudinal barriers identified in our study. These findings are especially relevant given the documented evolution of surgical care complexity in Somali hospitals. Recent evidence from Mogadishu demonstrates that healthcare facilities are increasingly performing advanced surgical procedures, highlighting the critical need for robust safety protocols to improve surgical outcomes and reduce complications in resource-limited settings [20, 21].

Our study had several limitations. First, the use of self-reported data may be subject to recall bias and social desirability bias, potentially leading to the overestimation of knowledge and positive attitudes. Additionally, although our sample size was adequate, the use of convenience and purposive sampling may limit the generalizability of our findings to all healthcare professionals in Mogadishu. Despite these limitations, this study provides valuable insights into the knowledge and attitudes towards WHO SSC among healthcare professionals in Mogadishu, Somalia. The findings suggest several recommendations for improving SSC implementation and use. First, comprehensive training programs should be developed and implemented to address knowledge gaps, particularly focusing on less experienced staff and tailoring content to different professional roles [22]. Second, efforts should be made to address concerns about SSC causing delays, possibly through demonstrating its time-efficiency and long-term benefits in reducing complications [23]. Additionally, leveraging digital health technologies, such as electronic versions of the SSC or mobile applications could significantly enhance awareness, implementation, and compliance with the checklist [24]. These digital solutions could provide interactive, accessible training platforms and real-time monitoring systems to support consistent use of the SSC in Somali healthcare settings [25].

Conclusion

This study highlights that while healthcare professionals in Mogadishu demonstrate a generally good level of knowledge regarding the WHO Surgical Safety Checklist (SSC), with 81.04% scoring above 60%, attitudes toward its consistent use remain varied. Notably, 87.6% agreed that SSC improves patient safety, yet 37.2% perceived it as potentially disruptive to workflow. Furthermore, only 68.01% of participants were aware that the SSC requires all surgical team members to introduce themselves, indicating specific procedural knowledge gaps. Knowledge was significantly associated with higher educational attainment and working in surgical or medical departments, while years of experience did not correlate with either knowledge or attitude. Nursing professionals showed better knowledge but did not exhibit correspondingly positive attitudes.

These findings indicate that while baseline knowledge exists, targeted interventions are needed to transform knowledge into practice. Beyond traditional instruction, effective training should include interactive, scenario-based learning, multidisciplinary simulations, and peer-facilitated workshops that address real-world implementation challenges, such as time constraints and communication barriers. Emphasizing team-based behaviors, leadership engagement, and the use of digital tools to support checklist adherence can further strengthen attitudes and compliance.

improving SSC uptake in Somalia requires more than awareness, it demands role-specific, practical training approaches that integrate technical instruction with behavioral change strategies. By addressing both knowledge gaps and attitudinal barriers, healthcare systems can move toward safer surgical environments and improved patient outcomes.

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Authors' contributions
NID Conceptualized this idea. The study design was developed collaboratively by NID, MMA, MMH and AHE. Material preparation and data collection were performed by AHE and AMA. MMA and OMO analyzed and interpreted the data. The initial draft was composed by MMA and all authors contributed to the writing, reviewing, and editing of the subsequent versions of the manuscript.

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Data availability
The Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval for this study was obtained from the Institutional Review Board (IRB) of SIMAD University, Mogadishu, Somalia, as per the approval letter dated March 30, 2024, with reference number 2024/SU-IRB/FMHS/P063. All procedures followed in this study adhered to the relevant ethical guidelines and regulations, including the principles outlined in the Declaration of Helsinki. Written informed consent was obtained from each participant after clearly explaining the purpose of the study. Participants were assured that their responses would remain confidential and were explicitly informed that their involvement in the study was entirely voluntary.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Santana HT, de Freitas MR, Ferraz EM, Evangelista MSN. WHO safety surgical checklist implementation evaluation in public hospitals in the Brazilian federal district. J Infect Public Health. 2016;9(5):586–99. https://doi.org/10.1016/j.jiph.2015.12.019.
2. WHO. Safe surgery, World Health Organization. Accessed: Oct. 20, 2024. [Online]. Available: https://www.who.int/teams/integrated-health-services/patient-safety/research/safe-surgery
3. Haugen AS, Sevdalis N, Søfteland E. Impact of the World Health Organization surgical safety checklist on patient safety. Anesthesiology. 2019;131(2):420–5. https://doi.org/10.1097/ALN.0000000000002674.
4. WHO. Tool and Resources, World Health Organization. Accessed: Oct. 20, 2024. [Online]. Available: https://www.who.int/teams/integrated-health-services/patient-safety/research/safe-surgery/tool-and-resources
5. Dirie NI, et al. Implementation of the WHO surgical safety checklist in resource-limited Somalia: a new standard in surgical safety. Patient Saf Surg. 2024;18(1): 30. https://doi.org/10.1186/s13037-024-00410-2.
6. Treadwell JR, Lucas S, Tsou AY. Surgical checklists: a systematic review of impacts and implementation. BMJ Qual Saf. 2014;23(4):299–318. https://doi.org/10.1136/bmjqs-2012-001797.
7. Haynes AB, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med. Jan. 2009;360(5):491–9. https://doi.org/10.1056/NEJMSA0810119/SUPPL_FILE/NEJM_HAYNES_491SA1.PDF.
8. Bergs J, et al. Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. Br J Surg. 2014;101(3):150–8. https://doi.org/10.1002/bjs.9381.
9. Bashford T, Reshamwalla S, McAuley J, Allen NH, McNatt Z, Gebremedhen YD. Implementation of the WHO surgical safety checklist in an Ethiopian referral hospital. Patient Saf Surg. 2014;8(1):16. https://doi.org/10.1186/1754-9493-8-16.
10. Wyss M, Kolbe M, Grande B. Make a difference: implementation, quality and effectiveness of the WHO surgical safety checklist—a narrative review. J Thorac Dis. 2023;15(10):5723–35. https://doi.org/10.21037/jtd-22-1807.
11. Aveling E-L, McCulloch P, Dixon-Woods M. A qualitative study comparing experiences of the surgical safety checklist in hospitals in high-income and low-income countries. BMJ Open. 2013;3(8): e003039. https://doi.org/10.1136/bmjopen-2013-003039.
12. Ahmed MM. Explosive violence in Somalia: a threat to health and development. Med Confl Surviv. 2024. https://doi.org/10.1080/13623699.2024.2385337.
13. Hassan MM, et al. Regulation of health professions education and the growth of schools in Somalia. BMC Med Educ. 2024;24(1): 1178. https://doi.org/10.1186/s12909-024-06179-3.
14. Hellar A, et al. A team-based approach to introduce and sustain the use of the WHO surgical safety checklist in Tanzania. World J Surg. 2020;44(3):689–95. https://doi.org/10.1007/s00268-019-05292-5.
15. Mohamud AK, et al. Assessment of healthcare workers' knowledge and attitude on Ebola virus disease in Somalia: a multicenter nationwide survey. BMC Public Health. 2023;23(1): 1650. https://doi.org/10.1186/s12889-023-16562-2.
16. Bergs J, et al. Barriers and facilitators related to the implementation of surgical safety checklists: a systematic review of the qualitative evidence. BMJ Qual Saf. 2015;24(12):776–86. https://doi.org/10.1136/bmjqs-2015-004021.
17. Hill J, Irwin-Porter G, Buckley LA. Surgical safety checklists in UK veterinary practice: current implementation and attitudes towards their use. Vet Rec. 2023. https://doi.org/10.1002/vetr.2484.
18. Schwendimann R, et al. Adherence to the WHO surgical safety checklist: an observational study in a Swiss academic center. Patient Saf Surg. 2019;13(1): 14. https://doi.org/10.1186/s13037-019-0194-4.
19. Sinha AV, Kadam S. WE3.12 a closed loop clinical audit on the implementation of WHO surgical safety checklist at a tertiary level hospital in India: where do we stand? Br J Surg. 2022. https://doi.org/10.1093/bjs/znac248.121.
20. Dirie NI, Garba B, Nur MAS, Dirie AI, Albalulah RA. Transverse testicular ectopia with persistent mullerian duct syndrome: misdiagnosis and surgeon's unexpected discovery: a case report. Urol Case Rep. 2022. https://doi.org/10.1016/j.eucr.2022.102164.
21. Dirie NI, Garba B, Hassan J, Asowe HA, Sh Nur MA. Burning body parts 'guboow' to treat epididymo-orchitis: A traditional Somali healing practice. Urol Case Rep. Jul. 2024;55. https://doi.org/10.1016/j.eucr.2024.102780.
22. Ferorelli D, et al. Improving healthcare workers' adherence to surgical safety checklist: the impact of a short training. Front Public Health. 2022. https://doi.org/10.3389/fpubh.2021.732707.
23. Kim RY, et al. Sustainability and long-term effectiveness of the WHO surgical safety checklist combined with pulse oximetry in a resource-limited setting. JAMA Surg. 2015;150(5):473. https://doi.org/10.1001/jamasurg.2014.3848.
24. Ahmed MM, et al. Advancing digital healthcare in Somalia: a review of modern technologies and their implications. BMC Digit Health. 2024. https://doi.org/10.1186/s44247-024-00111-x.
25. Qoseem IO, et al. Unlocking the potentials of digital twins for optimal healthcare delivery in Africa. Oxf Open Digit Health. 2024. https://doi.org/10.1093/oodh/oqae039.

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