



Knowledge and practice towards prevention of surgical site infection among healthcare professionals in Buraidah city, Saudi Arabia

Elaf Alabdulrazaq¹, Hanadi ALMutairi², Mnahal ALHsaon³, Sultan Alsaigh^{4*}

¹⁻³ A Medical Intern, Qassim University, Saudi Arabia

⁴ Consultant General Surgery, Department of General Surgery, King Fahad Specialist Hospital, MOH, P.O. Box 2265 – Buraidah 52367, Qassim, Saudi Arabia

Abstract

Context: Surgical Site Infections (SSIs) are devastating conditions that affect the patients' lives and health. Limitation of SSIs risks is guided by the preventive measures taken by practitioners of surgical wound care in surgical procedures.

Aims: Evaluating knowledge and practice of healthcare professionals towards prevention of surgical site infection, and measuring the incidence of SSI.

Settings and Design: A cross-sectional descriptive study conducted in Buraidah city. Included 218 healthcare professionals, from 2 public hospitals, were providing care to the surgical patients. However, those who were not dealing with the surgical care were excluded from the study.

Methods and Material: Data attained on a prior used validated questionnaire.

Statistical analysis used: Data were analyzed by using t-test, Chi-squared test and one-way ANOVA at P<0.05 level.

Results: Knowledge regarding SSI prevention was insufficient with only 25.4% and 18.3% knowledgeable King Fahad Specialist Hospital (KFSH) and Buraidah Central Hospital (BCH) participants (mean score 16.01, 14.30 respectively). While the practice level was of a good level with 93.8% and 89.3% of KFSH and BCH participants respectively (mean score 33.72, 32.23). SSI incidence during year of 2017 was underreported with only 0.46% in KFSH and 0.05% in last 6months of the year in BCH.

Conclusions: Knowledge and practice towards prevention of surgical site infection among KFSH and BCH healthcare professionals were measured. Level of knowledge found to be insufficient in both settings. While practice level was observed to be very good in both settings. SSI incidence rate during year of 2017 was underreported in general.

Keywords: surgical site infection, post-surgical infection, knowledge, practice

1. Introduction

Health-Care Associated Infections (HAIs) demonstrates globally devastating conditions which may increase the morbidity and mortality of the affected patients. Surgical Site Infections (SSI) were found to be the most common type of (HAIs) cases [6, 8]. The CDC has classified SSIs into: superficial, involving the skin and/or subcutaneous tissue, Deep, includes the fascia and/or the muscles, and organ/space SSI which involves any part other than the incision itself [10, 11].

Therefore, the study objectives were to evaluate knowledge and practice of healthcare professionals towards prevention of SSI. Moreover, to measure the Incidence rate of SSI and determine accordingly future needs of improvements.

2. Materials and Methods

A cross-sectional study was conducted from that included 218 healthcare professionals recruited from 2 public hospitals in Buraidah city according to the distribution of healthcare services in the kingdom [9]. The inclusion criteria included being a healthcare professional who provides and practices care to the surgical patients during pre-, intra-, and post-operative periods. However, healthcare professionals or

workers that are not considered one of the health practitioners who directly deal with the surgical care were excluded from the study as (CDC) recommendations. With an estimate that 40% of participants have the knowledge and good practice regarding prevention of SSI [6], we calculated the sample size. A power of 90.5%, the margin of error of 9.5%, and confidence interval of 95%, the minimal sample size required was 205. The study protocol was approved by the Medical Ethical Committee in Qassim Region.

The study's purpose and procedures were described to the qualified participants. Once the eligibility was determined, the participants were given the questionnaires to fill. The outcome measures of this project were knowledge (knowledgeable/non-knowledgeable) and practice (good practice/ not good practice), while the independent variables included sociodemographic status and institutional factors. The questions were from validated questionnaire [6] and pre-tested in a similar population sample.

Demographic characteristics of all respondents were presented as frequencies and percentages. Responses to the knowledge and practice related questions by the respondents of KFSH and BCH were presented as frequencies and percentages and compared by one-way ANOVA. Knowledge and practice

score was calculated by assigning 3 points to the correct answer, 2 points to less correct answer, 1 point to nearly incorrect answer and zero points to incorrect answers. The highest possible knowledge and practice score by a participant is $3 \times 8 = 24$ and $3 \times 12 = 36$. Moreover, the lowest possible score for knowledge and practice is zero. The participant with a knowledge score ≥ 19 and a practice score of ≥ 29 (assuming $\geq 80\%$ of the scores) was considered as being 'knowledgeable' and having 'good practice.' The overall score was calculated by adding up knowledge score and practice score. Mean \pm SD knowledge score and practice score by the respondents of KFSH and BCH were compared by independent samples t-test. Relationship of job position, ward and, enrollment in SSI prevention training program to knowledge and practice score were calculated by one-way ANOVA. Chi-squared test was used to see the correlation between knowledge and practice score.

The analysis was performed in 95% confidence interval using Statistical Package for Social Science (SPSS), version 20 (IBM, Armonk, NY, USA).

3. Results

3.1 Demographic Factors

Total 218 healthcare professionals were included in this cross-sectional study to assess the knowledge and practice towards prevention of surgical site infection. Among all respondents, 136 (62.39%) was from KFSH and 82 (37.61%) was from BCH. Most of the respondents (70.2%) was aged between 25 to 39 years. The overall male participant was 46.3%. The majority had a highest educational degree – 'Bachelor' (60.1%). As per the designation, the highest number of respondents were doctors 104 (47.7%), followed by staff nurse 82 (37.5%). More than half (52.8%) of the respondents were from the surgical ward, and the least number of the participant was from the outpatient clinic (1.4%). 40.8% study participants were enrolled in training program regarding SSI prevention. (Table 1)

3.2 Factors Associated with Knowledge

While comparing the answers to the knowledge related questions between the respondents of KFSH and BCH a significant difference was found in the selection of dressing solution. 78.7% respondents from KFSH could give the correct answer to this question whereas only 59.8% respondents from BCH could give the right answer (p-value .017). There were no statistically significant differences in other knowledge related questions between the respondents of two hospitals.

3.3 Factors Associated with Practice

When asked about the practice of washing the hands before and after changing the dressing during wound cleaning, 85.3% respondents of KFSH answered 'always done,' and 75.6% respondents of BCH answered the same (p-value .014). The practice of prophylactic antibiotics always right before surgery was also more frequent in KFSH compared to BCH (71.3% vs. 63.4%, p-value .021). KFSH health professionals advised patients of preoperative showering by antimicrobial agents more than BCH health professionals (94.0% vs. 36.6%, p-value .003). A significant difference was found between the

answers of KFSH and BCH regarding the Utilization of sterilized dressing material for cleaning surgical site (P-value 0.023). Utilization of aseptic technique during dressing application was significantly higher for KFSH respondents than their counterparts (p-value .006). Similarly, more practice of separating the infected from non-infected dressing was observed in KFSH respondents compared to BCH respondents (p-value .026). The other practice-related responses and their comparison were given in

Knowledge score between respondents has shown that the female (n=28) have more knowledge than males (n=21).

Surgical ward had the majority of knowledgeable respondents (n=32). (Table 2)

The practice among participants has shown that the females have more good practice than male (96 and 77) respectively. KFSH have more good practice than BCH (106 and 67). Surgical ward has the most significant number of respondents (n=1). (Table 3)

Respondents with age (60-69) have the best knowledge and practice then (40-49) age group, then (25-39) and finally the least age group in knowledge and practice was (50-59). (Figure 1)

Respondents who have bachelor degree have the highest practice and knowledge (58.8%, 13%) respectively (Figure 2)

Charge nurses have the highest practice and knowledge (Figure 3)

Incidence percentage of SSIs was measured in both hospital settings during the period of 2017 and excluding the big toe and amputations the results recorded found to be 0.46% in KFSH 2017 (Table 4), and BCH hospital results of the last 6 months of 2017 year found to be underreported though having a percentage of 0.05%, while the 1st 6 months of SSIs cases were unreported in the hospital.

4. Discussion

Prevention of SSIs is one of the main challenges in delivering the optimum care. All healthcare professionals are involved in the prevention process including physicians, nurses, and hospital in which to yield ideal results in the process of HAIs prevention^[12]. The Joint Commission's Implementation Guide in phase two of practices improvement ensure, based on experiences, that not only physicians who need to obtain the knowledge regarding SSI also the patients themselves, their families and hospital staff^[13]. The prevention of SSIs by the practitioners is based upon assessment of two main points; knowledge and practice of the infection preventive measures^[6].

In this study which is conducted on healthcare professionals, we concluded that 47.7% out of 218 healthcare professionals collected from the two settings are doctors, and 50.8% are nurses which 29 of them are charge nurses and the others are a staff nurse. Coming to the proportion of charge and staff nurses who were knowledgeable about prevention of surgical site infection (SSI) at their position, found to be 24.10% out of 29 and 21.30% out of 80 respectively. This finding indicates that most of the nurses in both settings are having inadequate knowledge, and this finding is in line with many similar studies^[4, 6, 8]. Furthermore, the proportion of doctors who were knowledgeable about the prevention of SSI is 22.10% out of 104, which also indicates that knowledge about SSI

prevention is inadequate among doctors and physicians.

This study has also revealed that the gender is significantly associated with knowledge of SSI prevention. Females are more likely to be knowledgeable (24.3%) than males (21.8%), but this may be explained by the higher numbers of female respondents 115 than males 101. On the contrary to a study which found that the male participants are three times more likely to be knowledgeable than females, which this finding is explained by the higher degree that male participants have acquired B.S or M.S than diploma holders ^[6].

The knowledgeable participants that had undergone through SSI prevention program were higher, 28.2% out of 78, than the knowledgeable participants who have not gone through SSI prevention program 18.6% out of 129.

Overall knowledge questions which were answered by KFSH health care providers are at higher percentage than BCH practitioners' answers. Nevertheless, the level of knowledge about prevention of SSI among the respondents in both hospital settings is insufficient. Other studies recommend the healthcare providers to obtain preventive educational programs and signify the importance of that to raise the level of knowledge ^[1, 4].

Although a study has mentioned that antibiotics become a usual standard in each operating room, both KFSH and BCH practitioners do not sufficiently know the protocol regarding administration of antibiotics before surgeries ^[7]. A different study has found, in 54,552 patients, that antibiotics should be administered within 120 minute before or after incision and administration of antibiotics out of this period is associated with a higher risk of SSI ^[15].

Most of KFSH practitioners, 72.8% out of 136, agree that using clipper removal method is the best way of pre-operative hair removal while BCH is more likely, 46.3% out of 82, to use razor shaving method which this may increase the rate of SSI according to the guidelines ^[16]. Another study found that trimmers have lower incidence to get SSI than razors, (11.2%-20%) respectively ^[14].

Both hospitals are most likely to do hair removal on the night of the operation as well.

The level of practice towards prevention of SSI has been measured among the participants. It is found that the proportion of Charge and Staff nurses who were applying a good practice to the prevention of SSI is 100% out of 28 and 91.20% out of 68 respectively. In which this indicates a perfect practical level of preventive measures towards prevention of SSI. Moreover, the proportion of doctors who were practicing proper preventive measures towards SSI is 90.0% out of 90, thus the level of practice towards SSI prevention is outstanding among healthcare professionals. Unlike a study which has concluded that surgeons' practices towards prevention of SSI were inadequate and not in compliance with the CDC's guidelines ^[1].

Another socio-demographic factor which is the gender, was measured in the functional proportion area which is found that female respondents 95.0% out of 101 are practicing proper preventive measures towards SSI prevention than males 88.50% out of 87.

Additionally, the age of the participants was measured concerning the knowledge and practice score which showed that participants aging 60-69 years old having the best

knowledge and practice score among other participants age groups, and this may be explained by the experience period which has improved their practice from month to month and year to year. Moreover, this finding is also in agreement with another study which also has found that nurses aging > or equal 30 years are of a better practice when compared with other respondents ^[6].

Furthermore, the proportion of KFSH and BCH respondents who practice washing hands before and after changing the dressing during wound cleaning found to be, 85.3% and 75.6% respectively (p-value .014). Additionally, the practice of prophylactic antibiotic administration was observed to be higher in KFSH participants than BCH's. A similar study has also found that using a brief course of antimicrobial agents before the operation is significantly associated with good practice of surgical site infection prevention activities and the result showed decrease tendency of SSI dramatically ^[6].

Utilization of sterilized material for cleaning surgical site is found to be significantly higher in KFSH respondents than their counterparts (p-value .006). Similarly, more practice of separating the infected from non-infected dressing was observed in KFSH respondents compared to BCH respondents (p-value .026).

The results overall are higher than the result from a study was done in Ethiopia in which 48.7% of health-care workers were found to practice proper surgical site infection prevention activities ^[6]. Likewise, a study was done in the Bangladesh, showed the findings of total practice regarding prevention of SSI was at high level, and this is due to many factors that influence the high level of practice: as sufficient use of water, gloves, disposal boxes and antiseptic solution, enough staff nurses to provide care ^[8]. While in another study, It's found that some types of GI surgeries as colon operations be in need of application and practicing more preventive measures in order to prevent or avoid the occurrence of SSIs, which include; pre-operative: cleansing of the surgical site, hair removal and placement of plastic adherent drape at the site of incision. As long as using hand and forearm antiseptics by wearing sterile gloves which act as primary barrier. And the post-operative measures also include; Dressings which to avoid potential contamination ^[2, 3]. Moreover, a project has concluded that the percentage of SSI incidence is influenced by the dressing type, and the use of dialkylcarbamoyl chloride-impregnated (DACC) dressing is suggested specially in caesarean section (CS) surgeries ^[5].

No significant relationship was found between job position, ward, enrolment in SSI prevention program and practice score. Conversely, another study has showed that the nurses who work in the surgical ward have reasonable level of practice ^[6].

Therefore, effective enforcement is more important than educational programs in the development of prevention guidelines of SSI.

Besides to the measurement of knowledge and practice levels, the incidence rate of SSI in both hospital settings during the period of 2017 was measured, and it's observed that the recorded results of SSI in KFSH is 0.46% and BCH results of the last 6 months of 2017 year is 0.05%, and this very low percentages indicate underreporting of the SSI cases.

5. Tables and Figures

5.1 Tables

Table 1: Demographic characteristics of all respondents (n = 218)

Characteristics	N	%
Age (years)		
25-39	153	70.2
40-49	32	14.7
50-59	25	11.5
60-69	8	3.7
Sex		
Male	101	46.3
Female	117	53.7
Highest educational qualification		
Master	29	13.3
Bachelor	131	60.1
Diploma	17	7.8
Board	31	14.2
Others (MD, PhD, FRCS, MRCS etc.)	10	4.6
Designation		
Doctor	104	47.7
Charge nurse	29	13.3
Staff nurse	82	37.5
Healthcare assistant	1	0.5
Medical support worker	2	1.0
Ward		
Surgical	115	52.8
Medical	51	23.4
Outpatient clinic	3	1.4
OR	17	7.8
Other	32	14.7
Period of experience (years)		
< 5 years	99	45.4
5 – 10 years	49	22.5
> 10 years	70	32.1
Enrolled in training program regarding SSI prevention		
Yes	89	40.8
No	129	59.2

Table 2: Cross-Tabulation between socio-demographic data variables and the knowledge score

Variables	Knowledgeable N (%)	Not Knowledgeable N (%)	Total N (%)	95% CI	P-value
Sex					
Male	21 (20.8%)	80 (79.2%)	101 (100.0%)		
Female	28 (24.3%)	87 (75.7%)	115 (100.0%)		
Hospital					
KFSH	35 (25.4%)	101 (74.6%)	136 (100.0%)	2.704	0.001
BCH	15 (18.3%)	67 (81.7%)	82 (100.0%)	0.715	
Ward					
Surgical	32 (28.3%)	81 (71.7%)	113 (100.0%)		
Medical	9 (17.6%)	42 (82.4%)	51 (100.0%)		
Outpatient Clinic	0 (0.0%)	3 (100.0%)	3 (100.0%)		
OR	4 (23.5%)	13 (76.5%)	17 (100.0%)		
SSI program					
Yes	22 (28.2%)	56 (71.8%)	78 (100.0%)		
No	24 (18.6%)	105 (81.4%)	129 (100.0%)		

Table 3: Cross-Tabulation between socio-demographic data variables and the practice score

Variables	Good practice	Bad practice	Total	95% CI	P-value
Sex					
Male	77 (88.50%)	10 (11.5%)	87 (100.0%)		
Female	96 (95.0%)	5 (5.0%)	101 (100.0%)		
Hospital					0.005
KFSH	106 (93.8%)	7 (6.2%)	113 (100.0%)	2.535	
BCH	67 (89.3%)	8 (10.7%)	75 (100.0%)	0.445	
Ward					
Surgical	91 (90.1%)	10 (9.9%)	101 (100.0%)		
Medical	46 (90.2%)	5 (9.8%)	51 (100.0%)		
Outpatient Clinic	2 (100.0%)	0 (0.0%)	2 (100.0%)		
OR	10 (100.0%)	0 (0.0%)	10 (100.0%)		
SSI_program					
Yes	65 (92.9%)	5 (7.1%)	70 (100.0%)		
No	102 (91.1%)	10 (8.9%)	112 (100.0%)		

Table 4: Incidence of SSI in KFSH during the year of 2017

Month	Site	HAI	No. of surgeries	Overall rate/100 surgeries
January	Laparotomy incision	2	222	0.9%
February	Laparotomy incision	2	274	0.7%
March	Big toe	1	265	0.38%
April	Colostomy	1	234	0.42%
May	-	-	-	-
June	-	-	182	-
July	-	-	-	-
August	Laparotomy incision Amputation Amputation Laparotomy incision Laparotomy incision Laparotomy incision	6	281	2.1%
September	Sternotomy incision Rt. leg	2	222	0.9%
October	Appendectomy incision	1	346	0.3%
November	Pyelotomy	1	301	1%
December	Amputation	1	301	1%

5.2 Figures

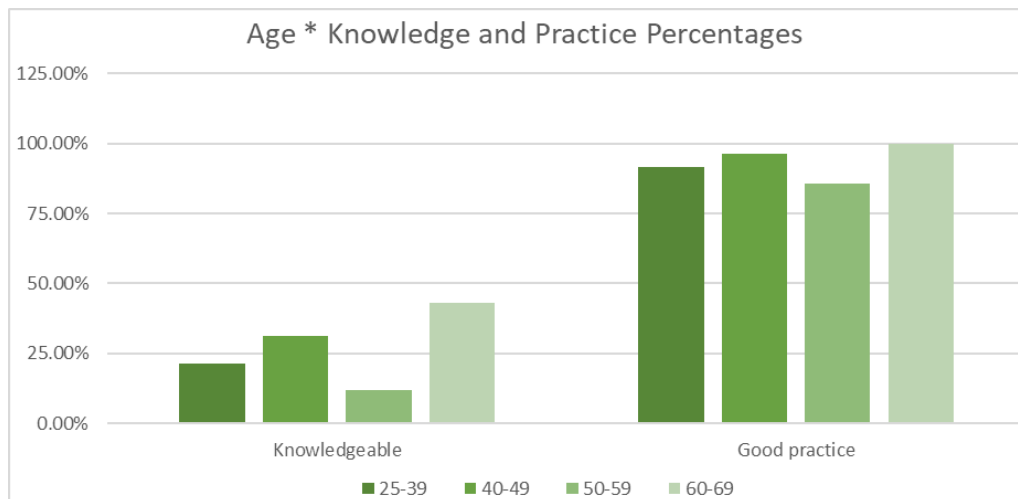


Fig 1: Percentages of knowledge and practice concerning Age variable

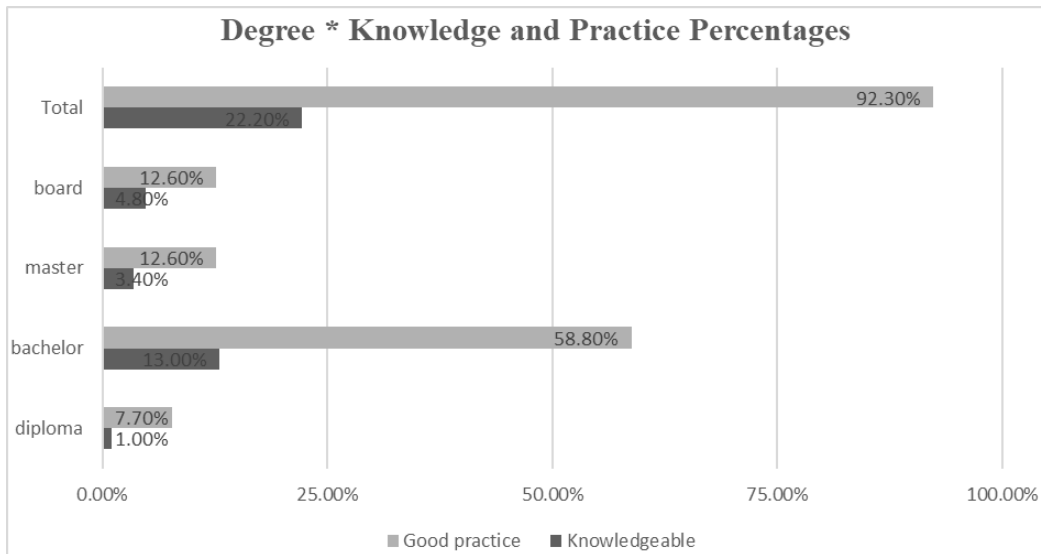


Fig 2: Percentages of knowledge and practice concerning Degree variable

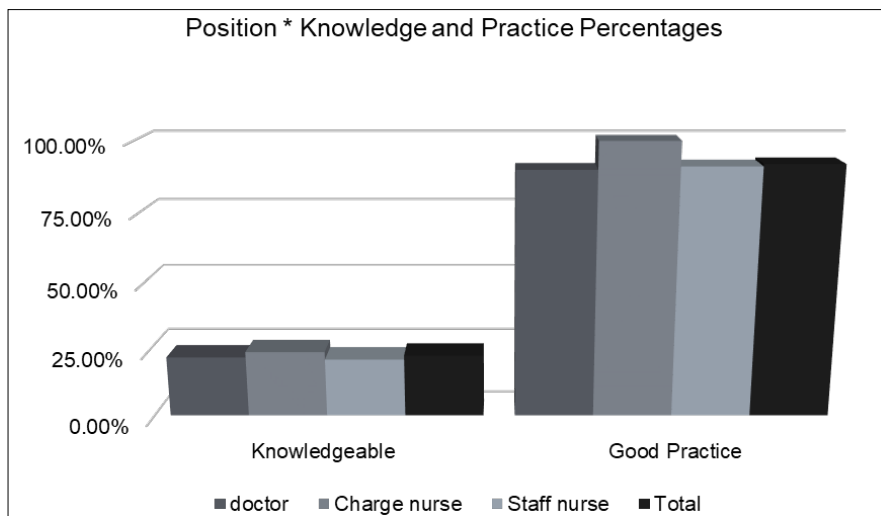


Fig 3: Percentages of knowledge and practice concerning the Position variable

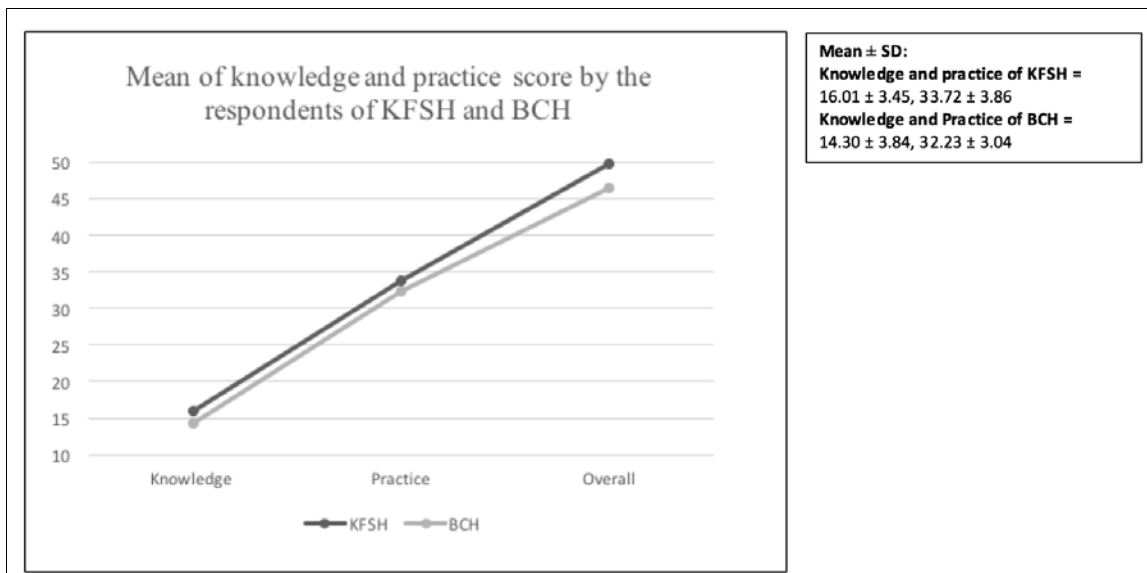


Fig 4: Mean ± SD knowledge score, practice score and overall score by the respondents of KFSH and BCH

6. Conclusions

Knowledge and practice towards prevention of surgical site infection among KFSH and BCH healthcare professionals were measured. Observing level of knowledge among the participants, found to be low and insufficient in both settings. Being a KFSH provider, surgical ward member, having a master or board degree, and aging 60-69 years were factors which were significantly associated with an excellent knowledge. On the other hand, Practice level was observed to be of a perfect level among the providers in both settings. In which was linked to the enrolment of SSI prevention program and age of 60-69 years. Rate of SSI incidence during year of 2017 was found to be underreported with only 0.46% in KFSH and 0.05% in last six months of the year in BCH.

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