

## Adherence of surgeons to surgical prophylaxis guidelines

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### Abstract

**Background:** surgical site infections (SSIs) are microbial contamination of the surgical wound during a period of one month that could result in major post-operative morbidity and mortality rates. **Objectives:** this study aimed to identify the adherence of surgeons to antibiotics prophylaxis guidelines at Kingdom of Saudi Arabia (KSA). **Methods:** this study included 180 adult subjects who were scheduled to undergo major surgeries in the hospital. The data of the patients were collected from the surgical wards and day care unit. **Results:** most of the included surgeons showed no error during pre, intra and post operative duration as give the required antibiotics and didn't give the non-require antibiotics. The preoperative adherence of surgeons as most of the surgeons (73.9%) followed the prophylactic measures that included correct choice, indications, dosage and duration. Most of the surgeons (76.1%) followed the prophylactic measures including correct choice, indications, dosage and duration during intra-operative period. The majority of the surgeons (75%) followed the prophylactic measures including correct choice, indications, dosage and duration during post-surgical duration. **Conclusion:** The level of surgeon's adherence to antibiotic prophylactic guidelines was efficient among most of surgeons regarding the proper choice of antibiotic, duration, timing and indication. However, these results differ from other available studies, this study showed a good sign for application of antibiotic prophylactic measures in KSA hospitals. Further studies should be conducted to increase the knowledge and adherence of surgeons all over KSA.

**Keywords:** adherence, prophylactic measures, antibiotic prophylaxis guidelines, surgeons, KSA, 2018.

### Introduction

Surgical site infections (SSIs) are microbial contamination of the surgical wound during a period of one month. SSIs could result in major post-operative morbidity and mortality rates that increases the costs of treatment on populations and health authorities <sup>(1,2)</sup>. The SSI annual prevalence in the United States was about 1.07% resulting in 8000 deaths every year with more than 10 billion dollars for treatment <sup>(3)</sup>. Also, in the United Kingdom, SSI was responsible for increasing the length of the hospital stay from 5-17 days and extra cost for each case by about 3394 dollars <sup>(4,5)</sup>. About 40% of surgical infections were found to be SSIs <sup>(6)</sup> thus prevention and implementing of antibiotic prophylaxis projects could reduce the rates of SSIs which in turn would decrease hospital stay, ICU admission and costs for further treatment <sup>(7-10)</sup>. The antibiotic prophylaxis programs are defined as the administration of antibiotic medications before, during or after the surgery to decrease the risk

of infection and its consequences <sup>(11,12)</sup>. They were recommended for clean, contaminated as well as dirty procedures to avoid specific criteria of risk factors for infection <sup>(12-15)</sup>. At first, the type of surgery must be determined then implanting a protocol for proper prophylactic program. Also, proper time, efficiency, advantages and complications must be taken into consideration before, during and after the surgery. The greater the adherence to the surgical antibiotic prophylaxis would significantly decrease the rates of anaphylactic shock and diarrhea induced by antibiotic usage. Another aspect that necessitates adherence of surgeons to antibiotic prophylaxis programs is to reduce the resistance pattern of microbes to antimicrobial agents. This study aimed to identify the adherence of surgeons to antibiotics prophylaxis guidelines.

### Rational and hypothesis:

The antibiotic prophylaxis guidelines are the most effective programs for prevention of surgical infections during and after surgery. The lack of knowledge, education and adherence to these programs would increase the risks of SSI which would increase the costs of treatment, increase the mortality and morbidity rates as well as admission to ICU and the length of hospital stay. Assessing the practice and adherence pattern will improve the knowledge and practice of surgeons and overcome the increased risks of surgery infections.

**Objectives:**

- **General objectives:**
  - 1- Assessing the adhesion of surgeons to antibiotics prophylaxis guidelines.
- **Specific objective:**
  - 1- Increasing the attention of Saudi surgeons toward the usage of antibiotic prophylaxis guidelines.

**Methods:**

**Study design:**

An observational cross sectional hospital based survey.

**Setting:**

The study was carried out at the Rabigh General Hospital from January 2018 to March 2018.

**Study population:**

This study included adult subjects who were scheduled to undergo major surgeries in the hospital. The exclusion criteria were infant’s surgeries, cancer, refusal of the patients and contaminated surgeries.

**Study population and sample size:**

With regards to the number of surgeries in the department during the last 12 months a

sample of 180 surgeries were chosen to participate in the study during the study period.

**Study tools and data collection:**

The data of the patients were collected from the surgical wards and day care unit. All the data from the patient’s files were collected and divided into three main parts which include pre-operative, intra-operative and post-operative antibiotic prophylactic measure which were compared with the international programs. Also, the main outcome measures will include the suitability of indicted prophylactic antibiotic, the antibiotic choice, dosage of administration, timing and duration.

**Limitation of the study:**

- There is a lack of studies conducted in KSA about this subject. Limitations of time, number of included cases and access to all patient’s files.

**Ethical considerations:**

A written approval was provided from the supervisors regarding the aim of the study. The questionnaire will be validated by 3 supervisors. An informed consent was given by all participants who approved to take part in the study.

**Statistical analysis :**

The data processing was done using SPSS for windows (version 22). The descriptive variables will be shown as frequencies and percentages.

**Results:**

Tables 1 and 2 showed the demographic characteristics of the included patients including distribution of age and gender (Figures 1 &2). The studied patients were distributed according to their hospital stay as shown in table. 3 and figure 3.

**Table 1: distribution of the studied group regarding their age**

	Number	Percent
> 40 yrs.	54	29.9
40-50	44	24.6
> 50 yrs.	82	45.5
Range	26-67	
Mean	48.3	
S.D.	12.6	

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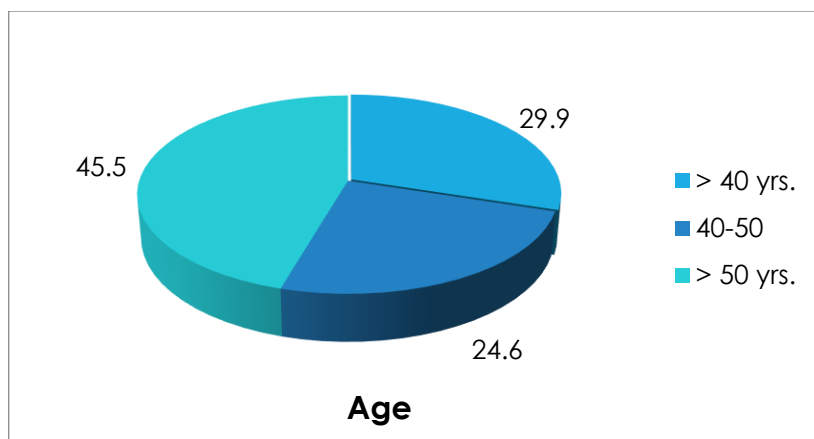


Figure 1: distribution of the studied group regarding their age

Table 2: distribution of the studied group regarding their gender

Gender	Number	Percent
Male	90	50.0
Female	90	50.0
Total	180	100.0

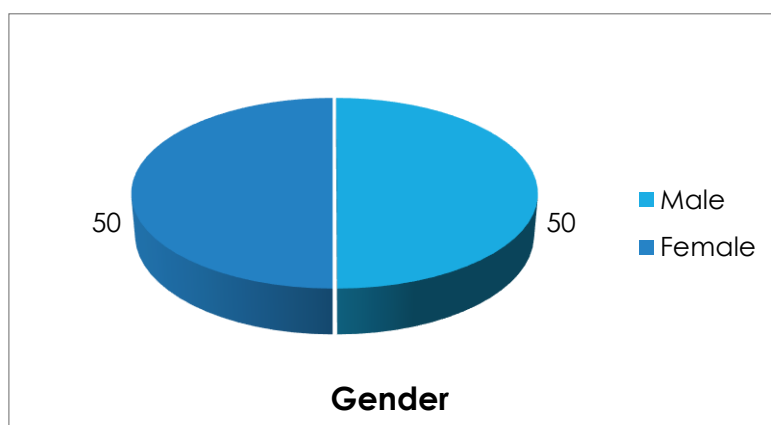
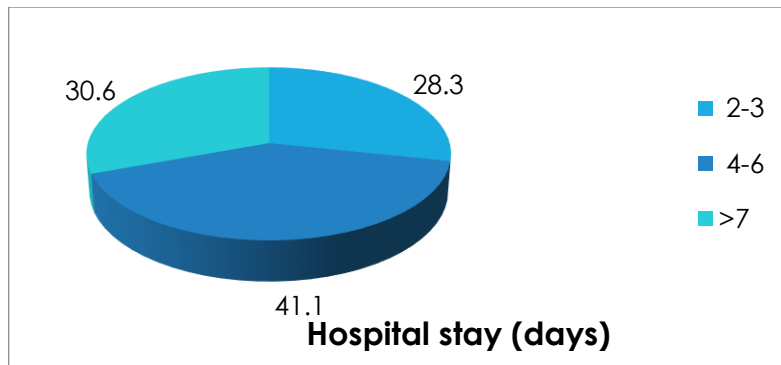


Figure 2: distribution of the studied group regarding their gender

Table 3: distribution of the studied group regarding their hospital stay (days)

	Number	Percent
2-3	51	28.3
4-6	74	41.1
> 7	55	30.6
Total	180	100.0



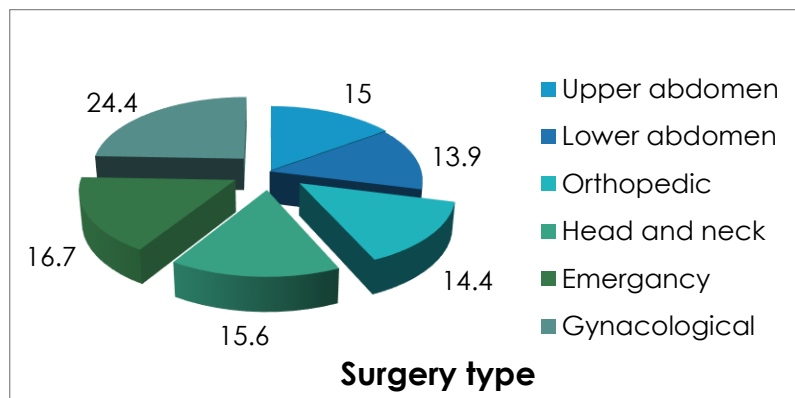
**Figure 3: distribution of the studied group regarding their hospital stay (days)**

**- Type of surgery:**

The patients were distributed according to the type of surgery as most of the subjects were having upper and lower abdominal surgery (28.9%) followed by 24.4% for gynecological surgeries then emergency surgeries (16.7%), 15.6% for head and neck surgeries and 14.4% for orthopedic surgeries (Table 4 and figure4).

**Table 4: distribution of the studied group regarding their surgery type**

	Number	Percent
Upper and lower abdomen	52	28.9
Orthopedic	26	14.4
Head and neck	28	15.6
Emergency	30	16.7
Gynecological	44	24.4
Total	180	100.0



**Figure 4: distribution of the studied group regarding their Surgery type**

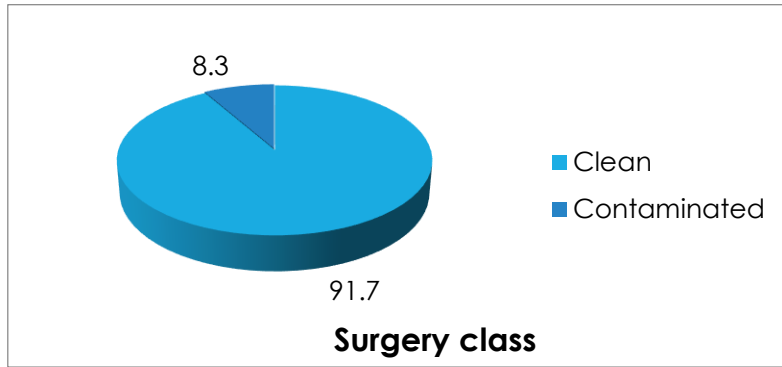
**- Surgery class:**

Most of the included surgeries were clean (91.7%) and 8.3% were contaminated (Table 5 and figure 5).

**Table 5: distribution of the studied group regarding their surgery class**

	Number	Percent
Clean	165	91.7
Contaminated	15	8.3
Total	180	100.0

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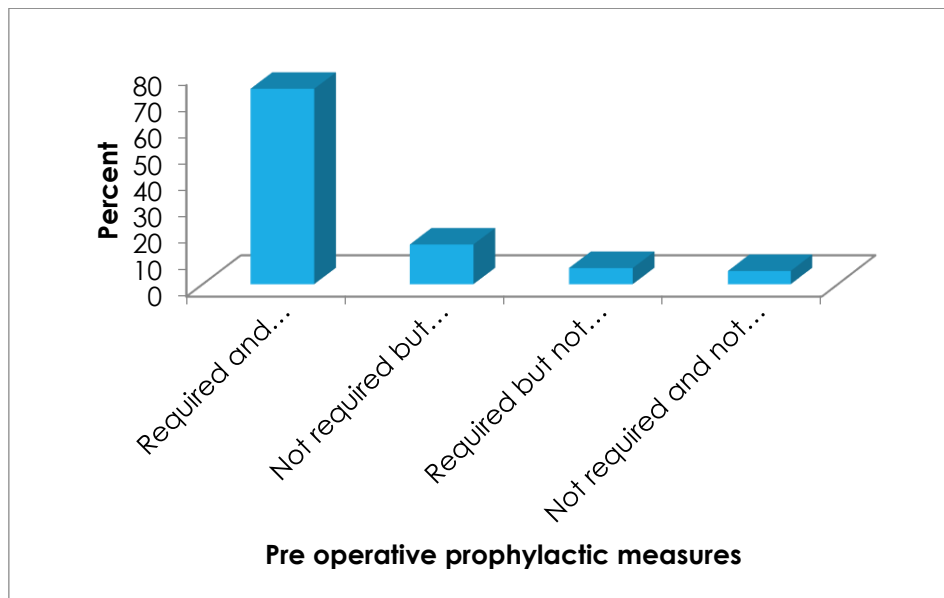
**Figure 5: distribution of the studied group regarding their surgery class**

**- Pre-operative prophylactic measures:**

Most of the included surgeons showed no error among 73.9% who give the required antibiotics and 5% among those who don't require antibiotics. Only 21% of errors were shown as 15% administrated non required antibiotics and 6.1% of surgeons didn't give the required antibiotic (Table .6, figure. 6)

**Table 6: distribution of the studied group regarding their pre operative prophylactic measures**

	Number	Percent
<b>No error</b>		
Required and administrated	133	73.9
Not required and not administrated	9	5.0
<b>Error:</b>		
Not required but administrated	27	15.0
Required but not administrated	11	6.1
<b>Total</b>	<b>180</b>	<b>100.0</b>



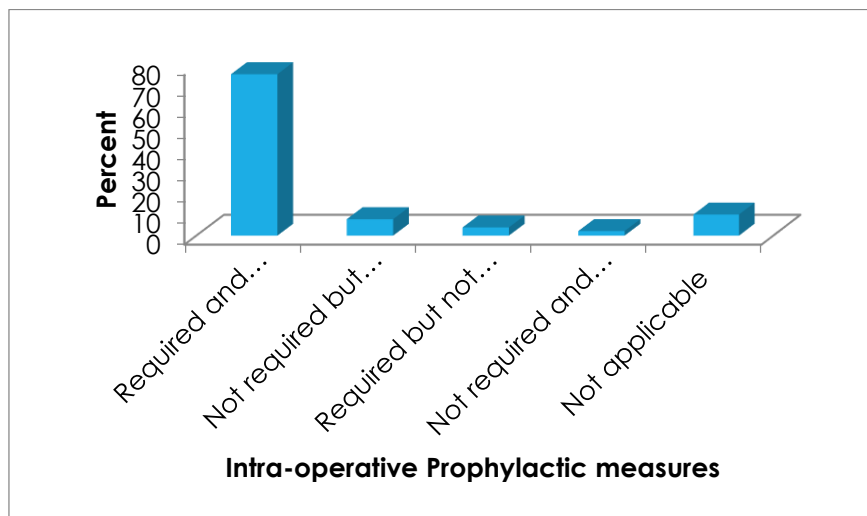
**Figure 6: distribution of the studied group regarding their pre operative prophylactic measures**

**Intraoperative prophylactic measure:**

Most of the surgeons showed no error during the surgery as 76.1% of patients were administrated the required doses, while the intraoperative error was 11.7% among patients. On the other hand 10% of the patients were not detectable about their intraoperative prophylactic measures.

**Table 7: distribution of the studied group regarding their intra-operative prophylactic measures**

<b>No error</b>	<b>Number</b>	<b>Percent</b>
Required and administrated	137	76.1
Not required and not administrated	4	2.2
<b>Error</b>		
Not required but administrated	14	7.8
Required but not administrated	7	3.9
<b>Total</b>	<b>180</b>	<b>100.0</b>



**Figure 7: distribution of the studied group regarding their Intra-operative Prophylactic measures**

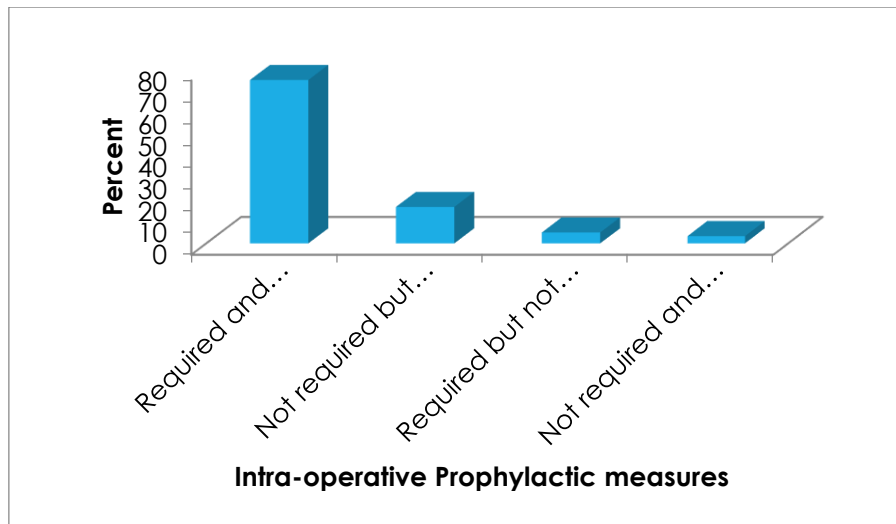
- Postoperative prophylactic measures:

Most of the surgeries showed no error among 75% and 3.3% of patients but 16.7% of patients were administrated non required doses of antibiotics and 5% were not administrated their required antibiotic doses.

Table (8): Distribution of the studied group regarding their Post operative Prophylactic measures

<b>No error</b>	<b>Number</b>	<b>Percent</b>
Required and administrated	135	75.0
Not required and not administrated	6	3.3
<b>Error</b>		
Not required but administrated	30	16.7
Required but not administrated	9	5.0
<b>Total</b>	<b>180</b>	<b>100.0</b>

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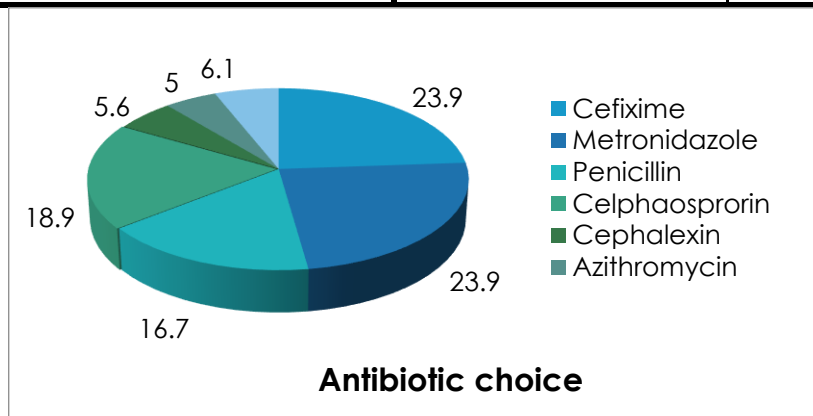
**Figure 8: distribution of the studied group regarding their Post operative Prophylactic measures**

- **Antibiotic choice:**

Table 9 showed that the most commonly used antibiotic were cefixime and metronidazole followed by Celphaosprorin and penicillin (Table 9 and figure 9). The dosage of administration were once or twice among most of the subjects (Table10 and figure 10)

**Table 9: distribution of the studied group regarding their antibiotic choice**

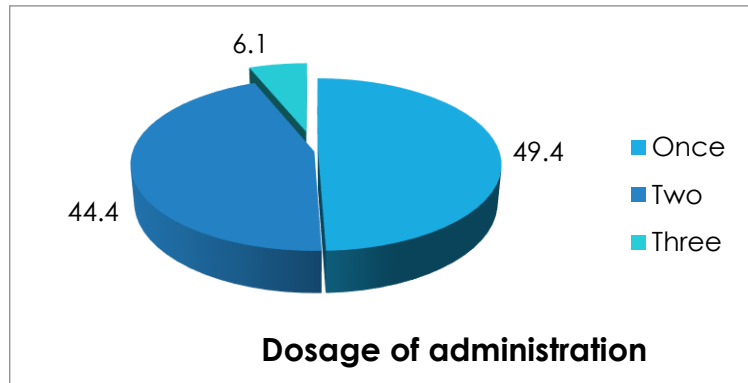
	Number	Percent
Cefixime	43	23.9
Metronidazole	43	23.9
Penicillin	30	16.7
Celphaosprorin	34	18.9
Cephalexin	10	5.6
Azithromycin	9	5.0
Fluroquinolones	11	6.1
Total	180	100.0



**Figure 9: distribution of the studied group regarding their antibiotic choice**

**Table 10: distribution of the studied group regarding their dosage of administration**

	Number	Percent
Once	89	49.4
Two	80	44.4
Three	11	6.1
Total	180	100.0



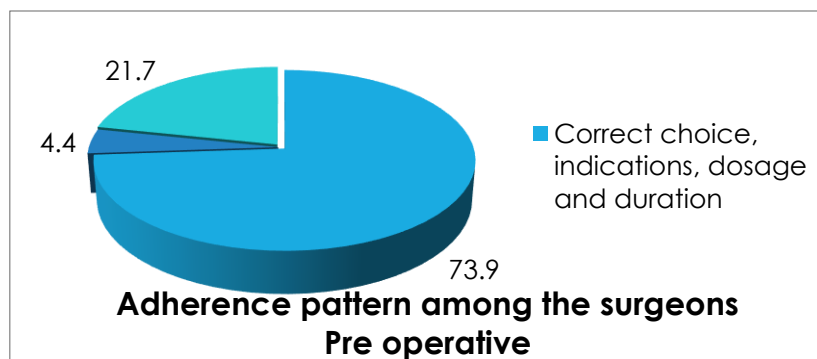
**Figure 10: distribution of the studied group regarding their dosage of administration**

**Preoperative adherence of surgeons:**

Table 11 showed the preoperative adherence of surgeons as most of the surgeons (73.9%) followed the prophylactic measures including correct choice, indications, dosage and duration, 4.4% followed the correct choice and dosage while 21.7% followed only the correct choice.

**Table 11: distribution of the adherence pattern among the surgeons: pre-operative**

	Number	Percent
Correct choice, indications, dosage and duration	133	73.9
Correct choice and dosage	8	4.4
Correct choice	39	21.7
Total	180	100.0



**Figure 11: distribution of the studied group regarding their adherence pattern among the surgeons Pre-operative**

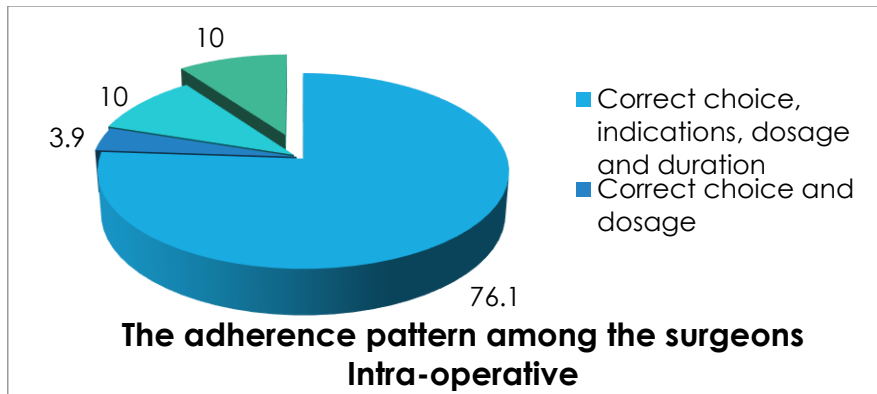
**- Intraoperative adherence:**

Most of the surgeons (76.1%) followed the prophylactic measures including correct choice, indications, dosage and duration, 3.9% followed the correct choice and dosage while 10% followed only the correct choice and 10% were not applicable.



**Table 12: distribution of the adherence pattern among the surgeons: intra-operative**

	Number	Percent
Correct choice, indications, dosage and duration	137	76.1
Correct choice and dosage	7	3.9
Correct choice	18	10.0
Not applicable	18	10.0
Total	180	100.0

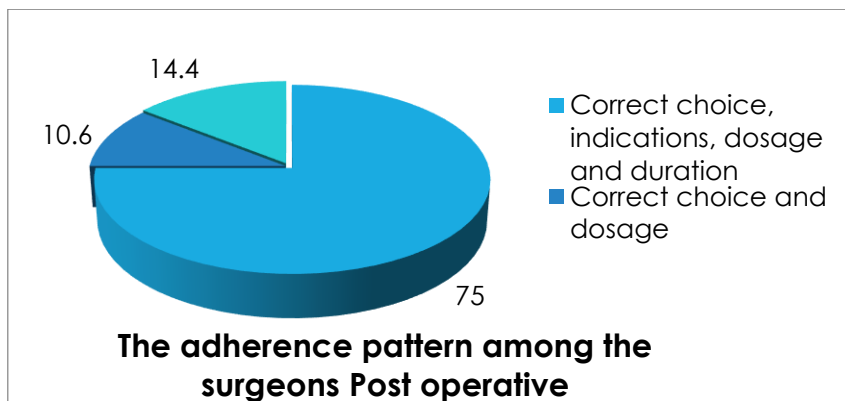


**Figure 12: distribution of the adherence pattern among the surgeons: intra-operative**  
**Post-operative adherence:**

The majority of the surgeons (75%) followed the prophylactic measures including correct choice, indications, dosage and duration, 10.6% followed the correct choice and dosage while 14.4% followed only the correct choice.

**Table 13: distribution of the adherence pattern among the surgeons: post-operative**

	Number	Percent
Correct choice, indications, dosage and duration	135	75.0
Correct choice and dosage	19	10.6
Correct choice	26	14.4
Total	180	100.0



**Figure 13: distribution of the adherence pattern among the surgeons post-operative**

## Discussion

The surgical site infection is considered one of the most common risk factors for nosocomial infections resulting in high mortality rates <sup>(16)</sup>. The antibiotic prophylactic measures pre, intra and post-surgery could reduce the morbidity and mortality related infections <sup>(17, 18)</sup>. A little is known about the adherence of surgeons to American Society of Health-System Pharmacists Surgical Antibiotic Prophylaxis Guidelines in KSA. This study showed good rates of adherence to prophylactic procedures among most of the surgeons during the pre, intra and post-surgical procedures. In Tokyo, the adherence rates to the antibiotic selection were high ranging from 53-84% and the adherence to the timing and duration was lower but still high reaching to 68% <sup>(19)</sup>. Stimulatingly, in France, about 49% of surgeons were adherent to the prophylactic measures for a period of two years <sup>(20)</sup>. However, these results were in contrast of other studies that showed poor rates of prophylactic guidelines adherence <sup>(11, 21)</sup>. Also, other studies have shown low levels of adherence among surgeons and this could be attributed to ignorance of the prophylactic measures and improper over-prescription <sup>(22, 23)</sup>. Another study showed a low level of adherence to all the guidelines aspects (28%) among Dutch hospitals <sup>(24)</sup>. Higher rate of non-commitment to proper antibiotic, dosage, duration and timing selection which were contract to our results as the levels of errors were not that high and the level of compliance to prophylactic measures was good enough among most of the subjects <sup>(9, 25-27)</sup>. The same results were found in Canada with a low adherence levels as only 32% of patients received the recommended prophylaxis <sup>(28)</sup>. Supplementary, the adherence to the antibiotic prophylaxis duration was inappropriate among 65% of the surgeries <sup>(29)</sup>. The present study showed that the most commonly used antibiotic were cefixime and metronidazole. The dosage of administration was once or twice among most of the subjects. The same results were reported in **Abdel-Aziz *et al.*** <sup>(9)</sup> study shows that cefazolin (44.6%) was the most frequently used antibiotic and other studies declared that cephalosporin antibiotics were the preferred choice in most of surgical procedures <sup>(30)</sup>. Also, cephalosporin and ceftriaxone were used as the drug of choice in most of studies but excessive use of ceftriaxone could result in antibiotic resistance <sup>(11, 21)</sup>.

## Conclusion

The level of surgeon's adherence to antibiotic prophylactic guidelines was efficient among most of surgeons regarding the proper choice of antibiotic, duration, timing and indication. However, these results differ from other available studies, this study showed a good sign for application of antibiotic prophylactic measures in KSA hospitals. Further studies should be conducted to increase the knowledge and adherence of surgeons all over KSA.

## Ethical considerations:

A written approval was provided from the supervisors regarding the aim of the study. The questionnaire was validated by 3 supervisors. An informed consent was given by all participants who approved to take part in the study.

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