Surgeons' Microbiological Attitudes and Knowledge

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Abstract: Surgery-related microbiological infections can cause serious morbidity and mortality. Therefore, infection control guidelines need to be enacted properly post- and per-surgery to avoid infections. An effective dose, duration and mode of administration of antibiotics and disinfectants require a microbiological understanding of infections and their causative agents. Here, we report the results of a study that explored these issues through a self-completed questionnaire delivered to surgeons from Saudi Arabia, who responded to the online advertisement and met the study inclusion criteria. The questionnaire measured the attitudes and knowledge of surgeons toward microbiological aspects of infection control. The analysis of 100 questionnaires, completed by respondents that met the study inclusion criteria, revealed a discrepancy between the recommended requirements and practice of infection control procedures, which include the presence of checklists and guidelines, training, supervision and surveillance.
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1. Introduction

Microorganisms are small living organisms found in abundance in most environments. They dominate the mass of feces and exist in large numbers inside the gastrointestinal system, the oral cavity, genitourinary system and on the skin (Baquero and Nombela, 2012). The human body is reported to harbor more microorganism cells than human cells (Baquero and Nombela, 2012; Kraal et al., 2014). These microorganisms, which are naturally found in the human host, include: (1) pathogenic microorganisms, capable of causing diseases; (2) opportunistic microorganisms, which cause disease in special circumstances; (3) commensals, which are usually harmless to the human host; and (4) probiotics, which are beneficial to the human host (Caminero et al., 2014; de Andrade Ramos et al., 2014; He et al., 2014). For example, *Staphylococcus aureus* and other staphylococci are common inhabitants of the human skin and nasal mucosa (Agerso et al., 2014; Askarian et al., 2014). Nonetheless, these organisms cause serious infections post-surgery and can be harmful in many other circumstances. In addition, *Neisseria meningitidis* (Gasparini et al., 2014), *Streptococcus pneumoniae* (Moyo et al., 2012), *Streptococcus pyogenes* (Prajapati et al., 2012) and *Haemophilus influenzae* (Wen et al., 2009) commonly make the human host, asymptomatically, their habitat.

The causes, preventative measures and treatments of surgical infections are important aspects of any surgeon's practice, since they are related to infection control, and thereby surgery outcomes. The attitudes towards these factors are also important in discovering any weakness in the current practice and implementing effective infection control strategies. In this study, we explored these issues by analyzing the results obtained via a questionnaire from 100 Saudi Arabian surgeons that met the study inclusion criteria. The aim was to measure their microbiological knowledge, attitudes and infection control practices.

2. Materials and Methods

Sample selection: Practicing surgeons from Saudi Arabian hospitals were selected via an internet-based advertisement. Only surgeons with a 5 years' experience were eligible for participation in the online survey. The advertisements and survey remained active online from 1/7/2012 until 20/12/2013. While 132 respondents, claiming to be surgeons in Saudi Arabia, attempted to participate in the study, only 100 met the study inclusion criteria, including passing a surgeon-confirmation quiz, and were therefore eligible for inclusion in the subsequent analyses. The quiz consisted of the first ten multi-choice questions obtained from the book Lange Q&A Surgery (Cayten, 2007). Only respondents that correctly answered at least eight questions were included in this study.

The questionnaire: The questionnaire focused on the following aspects of infection control: (1) presence of updated infection control checklists and guidelines for surgical procedures; (2) accessibility and regularity of training courses on these infection control checklists and guidelines, aiming to achieve proper adherence to, and consistency of, infection

control measures across personnel; (3) supervision and measurement of adherence levels and outcomes; (4) regular nosocomial surgical infections surveillance by the infection control department, with subsequent feedback to surgeons; (5) identification of carriers of methicillin resistant *Staphylococcus aureus* personnel and patients and other high risk individuals (those diagnosed with diabetes, obesity, etc.); (6) presence of rules or procedures ensuring removal of jewelry, watches and other artifacts, such as artificial fingernails.

3. Results

As previously noted, while 132 individuals attempted to take part in the survey, only 100 (75.75%) met the study inclusion criteria and completed the questionnaire. The analysis of their responses to demographic questions revealed that the respondents were aged 35-59 (mean 37;standard deviation = 12.6). Moreover, 27 of the participating surgeons were female and 73 were male. All respondents were holders of Bachelor of Medicine Bachelor of Surgery degrees, registered by the Saudi Council for Health Specialties. The respondents were from the following locations: Eastern Province (n = 37), Central Province (n = 24), Western Province (n = 18), Northern Province (n = 11), and Southern Provinces (n = 10). With respect to the type of workplace, 82% of the study participants indicated that they worked for governmental agencies, with 68% working for the Ministry of Health and 14% for the Ministry of Defense. The remaining 18% were private hospital employees. Figure 1 depicts the demographics of the surgeons that took part in the survey.

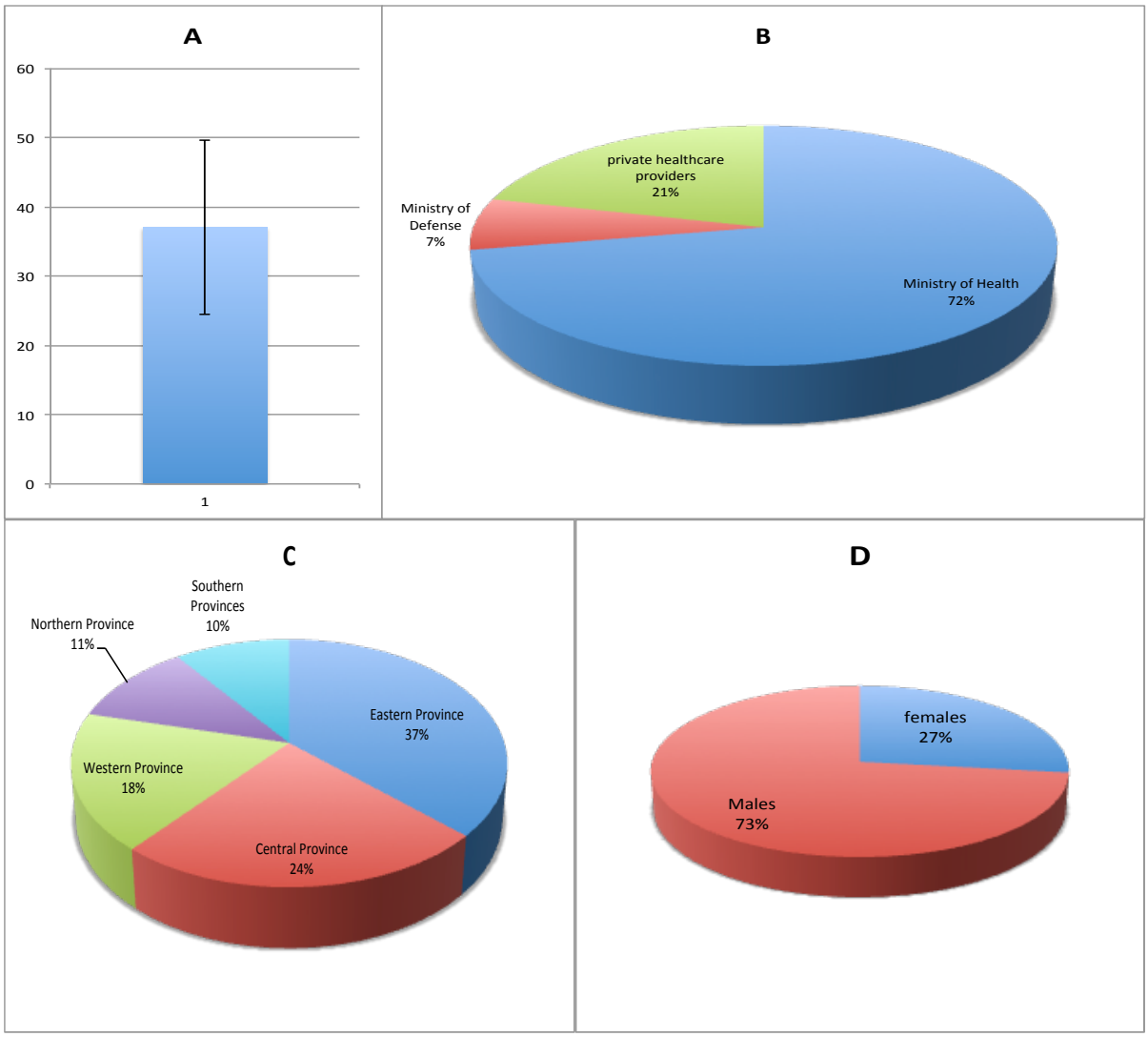

Figure 1: Demographics of Surgeons in Saudi Arabia: A, mean age and standard deviation; B, type of employment; C, work location; D, gender.

When asked to indicate whether their workplace provides infection control checklist and guidelines for surgical procedures, 32% of the responding surgeons inculcated that their hospitals contain an updated checklist and 63% stated that guidelines are available for them.

When questioned on accessibility and regularity of training courses on infection control checklist and guidelines, only 12% of the surveyed surgeons stated that their workplace offered training courses on infection control measures (guidelines or checklist). However, 5% of these respondents stated that, even though the courses were available, they did not have the opportunity to attend them due to time constrains (82%) or due to other unspecified reasons (18%). In addition, 76% of the respondents stated that infection control measures were part of their basic surgical training, but no other training courses were available. Absence of any training programs was reported by 7% of the responding surgeons.

In relation to the supervision and measurement of adherence levels and outcomes of infection control programs, 86% of the responding surgeons stated that no supervision was available at their workplace, while the remaining 14% reported that the infection control department performed occasional supervision. An overwhelming majority of the sampled surgeons (96%) stated that surgical audits were available, and were the only means for measuring outcomes and rate of surgical infection. However, they noted lack of specificity in describing or measuring adherence levels to protocols, as well as absence of standards or guidelines pertaining to infection control. The remaining 4% of the respondents indicated that no measurements of adherence levels to infection control protocols, standards or guidelines was in place in the medical institution they worked in.

When asked to indicate whether the infection control department conducted nosocomial infection surveillance and provided feedback to surgeons, 91% of the respondents stated that no surgical infection surveillance was conducted at their workplace, and 7% indicated that limited surgical infection surveillance was present, while the remaining 1% did not know whether surveillance was available or not.

In terms of identification of carriers of methicillin-resistant *Staphylococcus aureus* (MRSA) personnel, 97% of the surveyed surgeons stated that MRSA carriers are identified at their workplace only in case of outbreaks or an increase in the rate of MRSA infection. The remaining 3% of the surgeons were of opinion that protocols that mandate MRSA screening before transferring patients from one health facility to another are a sufficient measure.

Rules and procedures to ensure removal of jewelry and similar artifacts before surgery were in place in most institutions, as 98% of the respondents stated that they remove body appliances before surgery. The remaining 2% stated that removal of body appliances is part of the nursing job.

4. Discussion

The study findings revealed significant misalignment between the reported status quo and the necessary requirements needed for effective infection control (Mangram, 2001; Mangram et al., 1999). In addition to the commonly unavailable checklists (68%) and guidelines (37%), training was reported to be scarce for 88% of surgeons, while 7% stated a complete absence of any training programs. Supervision and measurement of adherence levels and outcomes were not present in most cases. In most medical institutions, only surgical audits were performed, which are not actually part of infection control, and lack specificity for measuring adherence levels to infection control protocols, standards or guidelines.

Alarmingly, a majority of the surveyed surgeons (91%) reported that no surgical infection surveillance was conducted at their workplace and 7% indicated limited surveillance, while the remaining 1% did not know whether surveillance was available or not. Surveillance is an important aspect of infection control guidelines and must be operational (Mangram, 2001; Mangram et al., 1999). Therefore, it is a serious concern to note that they are not readily available at the institutions where the surveyed surgeons work. In addition, identification of carriers of methicillin-resistant *Staphylococcus aureus* (MRSA) personnel and patients is needed to reduce hard-to-treat nosocomial infections. Nonetheless, the majority (97%) of the respondents stated that identification of carriers of MRSA is performed only in case of outbreaks or an increase in the rate of MRSA infection. This approach does not meet the guidelines required to reduce surgical site infections (Mangram, 2001; Mangram et al., 1999).

5. Conclusion

The current status of surgical infection control in Saudi Arabia is below the required recommendations. Thus, more attention to guidelines and protocols, as well as their implementation and adherence, is needed to improve the current practice.

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