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Disinfectants Use Awareness Among College of Nursing Students and Nurses in Some Healthcare Settings, Kuwait

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Abstract: The use of many chemicals with toxic characteristics in health care environments necessitates additional protection for health care workers. In addition to worker safety, patient safety needs to be considered when selecting possibly hazardous chemicals to be used in the health care setting. The aim of the present study was to assess disinfectants use awareness and knowledge among qualified nurses and undergraduate nurses. An untitled questionnaire was completed by 507 nursing students and qualified nurses. The questionnaire was divided into four sections: knowledge of disinfectants, types of disinfectants, symptoms related to the use of disinfectants and the precautions necessary when using disinfectants. Answers were given using a three-point Likert-type scale. The differences between two population proportions and t-test were used. Qualified nurse respondents (n=241; 47.5%) included one hundred and eighty seven females (77.5%) and 54 males (22.5%). Student nurse respondents (n=266; 52.5%) included 210 females (78.9%) and 56 (21.1%) males. Regarding the correct answers, the results showed that qualified nurses had significantly higher mean scores than undergraduate nurses. Male nurse respondents showed the highest mean scores in Sections I, II and III ($P < 0.005$). This study has revealed a gap between knowledge and practices, which, if addressed, that would protect nurses against the misuse of disinfectants. In conclusion, undergraduate students are needed to improve knowledge and awareness in the four sections prior to graduation.

Key words: Awareness · Disinfectants · Knowledge · Nurses

INTRODUCTION

Disinfection is an important strategy in prevention and control of cross contamination between surfaces and patients by direct or indirect contact. Healthcare settings are stages for a fight against healthcare-associated infections (HAIs) [1]. The increasing importance of infection prevention and control is due to the increasing strains of multi-drug resistant organisms (MDROs) that can result in serious illness and even death in workers and patients [2].

In order to address HAIs as well as other infection prevention and control concerns, many hospitals have expanded the use of cleaning and disinfecting products. Conventional cleaning products are complex combinations of chemical ingredients. Although many ingredients have not been tested and their effects are still unknown, many of these ingredients are known or believed to be correlated with asthma and other respiratory disorders. Some others are associated with dermatitis, endocrine and neurologic effects and cancer. Possibly, harmful exposures from cleaning are a function of multiple factors, including: (i) the chemical characteristics of the cleaning product, (ii) the physical characteristics (aerosols vs. liquids for example), (iii) the characteristics of cleaning tasks (spraying vs. mopping) and (iv) the characteristics of the built environment (ventilation, room size) [3]. There is evidence that some

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cleaning product ingredients harm the environment by bioaccumulation in plants and animals, damaging aquatic ecosystems and polluting indoor air, outdoor air and drinking water supplies [4].

A wide diversity of chemical agents (biocides) is found in cleaning products and has been utilized for hundreds of years. Although, little is known about the mode of action of the active broad-spectrum antimicrobial agents in comparison to antibiotics, most of these agents reveal broad-spectrum antimicrobial activity. Disinfection is one of the essential strategies to prevent diseases. It can eliminate the majority of pathogenic microorganisms, except bacterial and fungal spores [5-7]. Disinfectant activity can be influenced by many factors, such as formulation effects, presence of an organic load, synergy, temperature, dilution and test method [8-10]. The objective of the present study was to assess and compare knowledge and awareness of disinfection and sterilization among qualified nurses and undergraduate nursing students.

MATERIALS AND METHODS

The tool used in the present study was an untitled questionnaire. In fall 2011, the questionnaire was distributed to students enrolled in the College of Nursing ADN (Associate Degree in Nursing), BSN (Bachelor Degree in Nursing), or Post-Basic programs. The questionnaire was also distributed to a group of nurses that are working in some hospitals, medical centers, or poly-clinics.

Questionnaire: The first part of the questionnaire gathered demographic data, such as nationality, gender, etc. The second part was split into four sections; each section was comprised of a group of questions to cover four different areas. Section I dealt with knowledge of disinfectants, Section II dealt with the types of disinfectants, Section III dealt with the symptoms related to the use of disinfectants and Section IV dealt with the precautions when using disinfectants. Answers were on a three-point Likert scale of: I agree, I do not know and I disagree. The questionnaire was available to respondents in English and Arabic versions for preferences of answers.

The sample included individuals from different ages and nationalities. This segment of society represents one of the important groups in the healthcare settings, whether present nurses or future nurses. The role of this segment has been crucial in controlling, reducing and preventing the transmission of pathogenic microorganisms.

Pilot Study: To test the suitability and feasibility of the research method, the questionnaire was distributed to twenty consenting participants before starting the distribution of the final questionnaire.

Statistical Analysis: Analyses of data were carried out using SPSS for Windows (Version 14) and Microsoft Office Excel 2007. The difference between the two population proportions and t-test were used to determine the significant difference between mean scores of the different groups, practicing nurses (male and female) and student nurses (male and female). Awareness was assessed according to the correct answers to the questions with $p<0.05$ and was considered statistically significant.

RESULTS

Five hundred and seven individuals responded to the questionnaire. Qualified nurse respondents (n=241; 47.5%) included one hundred and eighty seven females (77.5%) and 54 males (22.5%). Student nurse respondents (n=266; 52.5%) included 210 females (78.9%) and 56 (21.1%) males (Fig. 1). Regarding the qualification of the nurse respondents, 77 female nurses (41.1%) had graduated from the ADN program, 84 (44.9%) from the BSN program and 26 (13.9%) Post-Basic program. While for male nurses, 41(75.9%), 11 (20.3%) and two (3.7%) had graduated from ADN, BSN and Post-Basic, respectively. Among female students studying at the College of Nursing, 156 (74.2%) were enrolled in the ADN program, 34 (16.1%) enrolled in the BSN program and two (0.95%) in the Post-Basic program. For male students, 56 (100%) were enrolled only in the ADN program and no BSN or Post-Basic program is allowed for the male students in the College of Nursing in Kuwait, as demonstrated in (Fig. 2).

According to the results, respondents' abilities to correctly answer the questionnaire varied. In Section I (about knowledge of disinfectants), the results revealed that male nurses gave the highest percentage of the correct answers 65.9% (20.6% of male nurses gave wrong answers); then 62.1% of the female students gave the correct answers (17.1% gave wrong answers); 60.7% of female nurse respondents gave correct answers (42.2% of

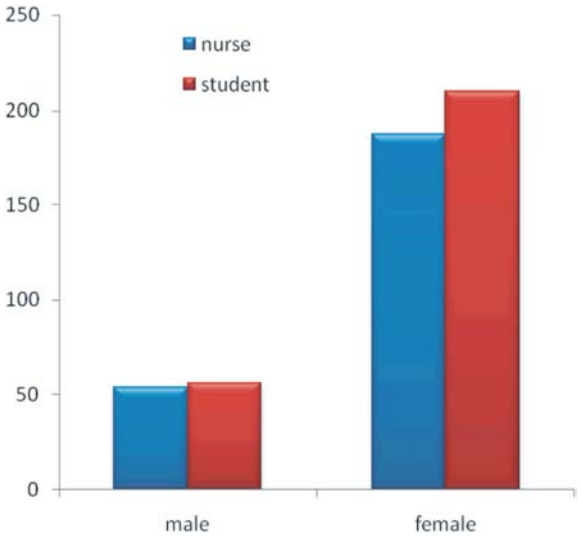

Fig. 1: Number of qualified nurses vs. student nurses

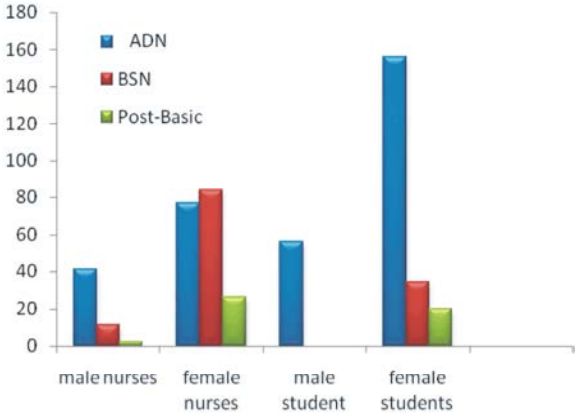

Fig. 2: Differences in respondents' qualifications

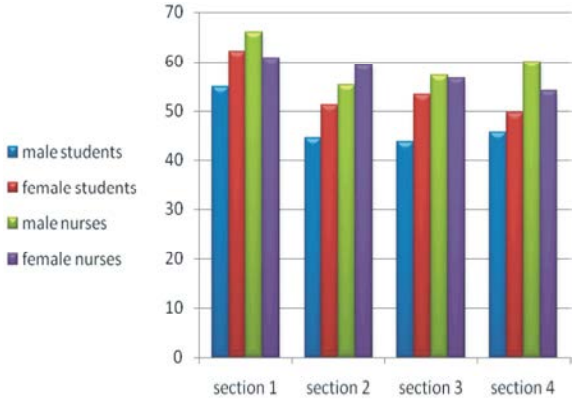

Fig. 3: Percentage of correct answers for the four sections

the respondents gave wrong answers) and male students had lowest percentage of the correct answers 54.9%, though only 16.2% of them gave the wrong answers (Fig. 3).

A statistically highly significant difference (P<0.005) occurred between the nurses and student respondents; in addition, male nurses and female students showed significant differences in their mean scores as compared to female nurses and male students, respectively.

On the other hand, Section II, which dealt with the types of disinfectants, showed that female nurses gave the highest percentage of the correct answers, followed by male nurses, female students and then male students (with results of 59.3, 55.2, 51.1 and 44.4%, respectively) (Fig. 3). In the same section, female nurses gave the highest percentage of mean scores, followed by male nurses, female students and then male students (with the values of 22.3, 21.8, 17.8 and 16.6%, respectively). According to the statistical analysis, awareness in Section II revealed a significant difference between nurses and students, with nurses giving highest average of the correct answers ($P < 0.05$). On the other hand, female nurses showed significant difference when compared with male nurses. The same significant difference occurred between female and male students ($P < 0.05$).

For the third sections that dealt with the symptoms related to the use of disinfectants, the results showed that male nurses (57.1%) and female nurses (56.4%) had the highest percentages of the correct answers, followed by female students (53.3%) and male students (43.7%). For the wrong answers, male students had the highest percentage (22.4%), followed by male nurses (22.1%), female nurses (20.3%) and female students (18.7%). Nurses showed statistically significant difference compared to students respondents ($P < 0.05$), male nurses and female nurses gave significant difference as compared to female and male students respectively.

The fourth section, which was about precautions when using disinfectants, the highest awareness was leaded by male nurses followed by female nurses, female students and male students with percentages of 57.9, 54.1, 49.6 and 45.6%, respectively. However, 23.7, 26.4, 28.9 and 29.3% of female nurses, male nurses, female students and male students, respectively gave wrong answers. In the fourth section, there was a clear statistically significant difference ($P < 0.05$) between the nurse respondents and student respondents; also in addition, male nurses and female nurses showed significant difference by giving more correct answers compared with either female or male students. Table (1) represents the mean scores and SD for qualified nurse (male and female) and nursing student (male and female) respondents who gave significantly correct answers in the four sections.

Table 1: Mean scores and SD for qualified nurses (male and female) and nursing students (male and female) in the four sections

	Nurses				Students			
Section	Male	Female	SD	p-value	Male	Female	SD	p- value
1	65.95	60.71	3.70524	0.026	54.9	62.1	5.09117	0.039
2	55.29	59.30	2.83550	0.022	44.47	51.15	4.72347	0.044
3	57.06	56.48	0.41012	0.003	43.75	53.33	6.77408	0.063
4	57.97	54.13	2.71529	0.022	45.60	49.67	2.17082	0.020

DISCUSSION

There are far more female than male respondents, whether qualified males nurses or undergraduates; this might be due to the fact that nursing as a profession is not preferred among males [11]. Qualified nurses had higher percentages than the undergraduate students; this could be explained by the fact that the qualified nurses realize and practice the importance of disinfections in their profession, while undergraduate students still lack the understanding and awareness of the importance, advantages and disadvantages of using disinfectants. This is in accordance with a previous study that stated that students perform better in biosciences when they realize the significance of this awareness in their clinical practice [12]. The lower awareness percentage among undergraduate male nurses was clear in this study as compared to the qualified female and male nurses and/or undergraduate female nurses. This is supported by previous studies, which have stated that male nurses, especially the undergraduates, underwent serious psychological stress and showed low individuality to the nursing [13, 14].

The data from this study indicated that experience in the hospital is significantly correlated to increased knowledge and awareness among the nurses respondents; this is in accordance with the findings of a recent study by Sessa and colleagues [15]. They stated that the average knowledge level of guidelines for the prevention of HAIs was higher in those more experienced. Educational programs such as seminars and workshops for infection prevention awareness are not only needed but also welcomed. A high percentage of nurses categorized these programs and professional guidelines or standards of practice as desirable sources of information that they lacked in the undergraduate levels. Also in the present study, results revealed that undergraduate nurses have poorer knowledge and awareness than the qualified nurses. A similar result has been observed by Suchitra and Lakshmi [16] that there is a significant difference in the pre-education and the post-education responses between health care workers.

Therefore, nursing colleges should provide support and resources in the form of intensive education and training opportunities designed to increase in the undergraduate nursing students 'awareness of the disinfection procedures, types of disinfections, adverse effects of disinfectants and the precautions to be taken into consideration when use disinfection. This would enhance appropriate behaviors, both decreasing incidences of infections and protecting themselves and patients from the side effect of disinfectants. This is also supported by the fact that the respondents in the present study, especially the undergraduate nurses, need supplementary information regarding disinfection procedures and disinfectants in order to improve their knowledge. Kogevinas and colleagues [17] stated that nurses have the highest risk for work-related asthma, with a rate of above 50% among nurses who have high exposure to disinfectants and cleansers. Despite not every sickness having an environmental etiology, all practitioners can have health problems related to an environmental hazard for which evaluation or advice is appropriate in terms of good nursing practice. Such nursing practice is important to identify not only the hazards that contribute to a current diagnosis but also that have not yet caused illness but are due to interference, such as aerosols, formaldehyde gases, carbon monoxide and nitrogen oxides.

By increasing awareness, nurses can begin precautionary actions to decrease hazards before they manifest as disease. Therefore, consideration of environmental health perceptions as a core nursing function will greatly strengthen nurses' awareness of disinfectants use and, hence, their role to disease prevention. In this study, qualified nurse respondents showed positive results towards the knowledge and awareness of disinfection use. A similar result by Angelillo and colleagues [18] who stated that 96.2% of nurses working in operating theaters Italy agree that

guidelines for disinfection and sterilization practice should be used and maintained [18]. Furthermore, nurse respondents' in the same study conveyed a need for additional information about disinfectants and disinfection procedures that are considered significant inducements to positive approach.

Additional protection is needed for health care workers due to the toxic nature of many chemicals in the health care settings [19, 20]. Hospital workers might be at higher risk compared to other personnel due to disinfectants and the regularity of cleaning activities in hospitals. Regulations and guidelines for protecting patients and workers from infectious diseases are needed. If the use of disinfectants cross its limits it will cause negative impact, so the importance of attention is needed in the whole society especially hospitals [21]. In a study by Abdou and Saber, they stated that nurses should raise their safety awareness by providing insight into nurses' safety attitudes that can be used as a baseline throughout the hospitals [22].

This study has demonstrated that knowledge and experience are an important factor in promoting the use of disinfectants to improve awareness. This study has brought a gap between knowledge and practices that would protect nurses against the misuse and/or hazards of disinfectants. In order to improve knowledge and awareness to disinfectants, studies including evaluations and educational strategies are needed.

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REFERENCES

1. Dancer, S.J., 2005. Mopping up hospital infection. J. Hosp. Infect., 43: 85-100.
2. Klein, E., D.L. Smith and R. Laxminarayan, 2007. Hospitalizations and deaths caused by methicillin-resistant *Staphylococcus aureus*, United States, 1999-2005. Emerging Infectious Diseases, 13: 1840-1846.
3. Bello, A., 2008. Assessment of Exposures to Cleaning Product Ingredients Used for Common Cleaning Tasks, Doctoral dissertation, Department of Work Environment, University of Massachusetts, Lowell.
4. Office of the Federal Environmental Executive (OFEE), 2009 Green cleaning pollution prevention calculator. US Environmental Protection Agency. FEE website. Available at: http://www.ofee.gov/janitor/index.asp. Accessed: 04/02/09.
5. Rutala, W.A., 1996. APIC guideline for selection and use of disinfectants. American Journal of Infection Control, 24: 313-342.
6. Rutala, W.A. and D.J. Weber, 1997. Use of inorganic hypochlorite (bleach) in health-care facilities. Clinical Microbiology Reviews, 10: 597-610.
7. Brady, H.J., C.M. Lisay, A.V. Yurteoveskiy and S.P. Sawan, 2003. Persistent silver disinfectant for the environmental control of pathogenic bacteria. American Journal of Infection Control, 31: 208-214.
8. Denyer, S.P., W.B. Hugo and V.D. Harding, 1985. Synergy in preservative combinations. International Journal of Pharmacology, 25: 245-253.
9. Russell, A.D., W.B. Hugo and G.A.J. Ayliffe, 1992. Principles of disinfection, preservation and sterilization. 2nd ed. (Blackwell Scientific Publications Ltd. Oxford, England).
10. Russell, A.D. and N.J. Russell, 1995. Biocides: activity, action and resistance. Symposium Society of General Microbiology, 53: 327-365.
11. Al-Kandari, F. and V.L. Vidal, 2007. Correlation of the health-promoting lifestyle, enrollment level and academic performance of College of Nursing students in Kuwait. Nursing and Health Sciences, 9: 112-119.
12. Davis, G.M., 2010. What is provided and what the registered nurse needs-bioscience learning through the pre-registration curriculum. Nurse Education Today, 30: 707-712.
13. Lian-di, M.A. and S. Ning, 2006.The present status and countermeasures of male nurse's education. Journal of Nursing Administration DOI: CNK1: 1SSN:1671-315X.O. 2006-07-005.
14. Ding, D., X. Song and H. Wang, 2008. Investigation and analysis on the attitude towards nursing specialty in male nursing students. Journal of Nursing Administration. DOI: CNK1: SUN: HLGL.0.2008-01-009.
15. Sessa, A., G.D. Giuseppe, L. Albano and I.F. Angelillo, 2011. An investigation of Nurses' knowledge, attitudes and practices regarding disinfection procedures in Italy. BMC Infectious Diseases, 11: 148-154.

16. Suchitra, J.B. and D.N. Lakshmi, 2007. Impact of education on knowledge attitudes and pictures among various categories of health care workers on nosocomial infections. Indian Journal of Medical Microbiology, 25: 181-187.
17. Kogevinas, M., J.P. Zock, D. Jarvis, H. Kromhout, L. Lillienberg, E. Plana and K. Radon, 2007. Exposure to substances in the workplace and new-onset asthma: An international prospective population-based study (ECRHS-II). The Lancet DOI: 10,1016/ S0140-6736(07)61164-7.
18. Angelillo, I.F., A. Mazziotta and G. Nicotera, 1999. Nurses and hospital infection control: knowledge, attitudes and behavior of Italian operating theatre staff. Journal of Hospital Infections, 42: 105-112.
19. Bello, A., M.M. Quinn, M.J. Perry and D.K. Milton, 2009. Characterization of occupational exposures to cleaning products used for common cleaning tasks-a pilot study of hospital cleaners. Environmental Health, 8: 11.
20. Medina-Ramon, M., J.P. Zock, M. Kogevinas, J. Sunyer J and J.M. Anto , 2003. Asthma symptoms in women employed in domestic cleaning: a community based study. Thorax, 58: 950-954.
21. Chintan, P. and C.M. Hiren, 2011. Impact of environmental pollution on human future. World Journal of Environmental Pollution, 1: 8-10.
22. Abdou, H.A. and K.M. Saber, 2011. A baseline assessment of patient safety culture among nurses at student University Hospital. World Journal of Medical Sciences, 6: 17-26.