Assessment of Nurses' Knowledge and Performance of Transmission Based Precautions in Mahalla Fever Hospital

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1.ABSTRACT

Infection prevention and control are challenging in most healthcare settings, and rising rates of infectious diseases a major concern for patients and healthcare professionals. Therefore, the current study aimed to assess nurses' knowledge a performance of transmission-based precautions in Mahalla Fever Hospital. Through a descriptive cross-sectional stu design; 243 nurses were involved conveniently from Mahalla Fever Hospital, Gharbia governorate. The researcher collec socio-demographic and occupational characteristics, assess knowledge by two self-administrated structured questionnair and documented performance on observational chuckle`, for nurses. Results declare that 56.8% and 95.5% of nurses had p knowledge and incompetent performance, levels respectively regarding transmission-based precautions. The research concludes that; the highest percentages belonged to nurses with poor knowledge and incompetent performance, leve regarding transmission-based precautions. Finally, the study recommends conducting on-duty training programs for nurses transmission-based precautions. In addition to striating on monitoring and coaching nurses' performance of transmissi based precautions by the infection control team.

Keywords: *Knowledge, Nurses, Performance, Transmission-Based Precautions*

2.Introduction

Healthcare-Associated Infections (HAIs) are significant problems that need serious attention worldwide. Healthcare-Associated Infections refer to a group of infections a patient does not have before admission to the hospital. HAIs do not even exist in the latency period; they occur upon arrival at the hospital or within 48–72 hours after access to the hospital (Hazard et al., 2021). Overall, HAIs arise more frequently in developing regions than in developed countries. According to World Health Organization, (WHO, 2020), HAIs occur at a rate of seven per 100 individuals in developed countries and a rate of 15 per 100 patients in developing countries.

Nowadays, such infections are significant problems for societies and healthcare organizations. They prolong the treatment period and make both patients and health centers pay excessive costs, including increased drug intakes and tests (Gozel et al., 2021). Therefore, by preventing and reducing nosocomial infections, significant savings will be made in the costs imposed on health centers, the health system, and society consequently (Bedir Demirdağ et al., 2021).

Wherein, infection control interventions are critical for the prevention and control of HAIs; these interventions are among the most cost-effective available in healthcare settings (Habboush et al., 2021). Infection control measures involve all activities or actions used to minimize the risk of the spread of infection. They are based on how an infectious agent is transmitted and can be grouped into two categories: standard precautions and transmission-based precautions (Alshathri, 2021).

Standard precautions are designed to protect patients, healthcare workers, trainees, and visitors against acquiring infection and to care for all patients all times whatever the diagnosis or presumed infectious status and to reduce the risk of transmission of organisms from both recognized and unrecognized sources of infection in hospitals (Ibrahim Abdeen Mhana, Ahmed Abd El-Aziz, & Mohamed Hassan, 2022). It includes hand hygiene, personal protective equipment (PPE), gloving, mask and eye goggles, gowning, medications storage and preparation, safe injection practices, handling sharps, medical equipment and instruments, equipment reprocessing cycle, handling and disposal of linens, waste

management, cleaning of spillages of blood and body fluids, respiratory hygiene, and cough etiquette (Askeroğlu et al., 2022).

Transmission-based precautions (TBPs) are used in addition to standard precautions when standard precautions alone may be insufficient to prevent transmission of infection. TBPs are used for patients with known infection or suspected to be infected with highly transmissible and epidemiologically important pathogens spread by droplet or airborne modes or by contact with skin or contaminated surfaces, each according to its mode of transmission (WHO, 2021).

Nurses are an integral part of the healthcare system; they make up nearly half of the world's healthcare workforce and deliver almost 80% of the hands-on care. They are often the first healthcare staff to interact with patients and sometimes the only health professional a patient will ever see (Dar, 2021).

Hence, the role of nurses to improve patient safety is to try to break the chain of infection. Nurses play a critical role in the prevention of HAIs through compliance with infection prevention and control practices. In addition to providing bedside care, nurses often act as coordinators of the multidisciplinary healthcare team in the work of infection control and prevention (Antia, & Nuraini, 2020). Therefore, they should make sure that their knowledge and performance regarding infection control and prevention are up-to-date and that their practice is safe and competent (Patil, Raval & Chavan, 2018). Therefore, the present study is carried out to assess nurses' perception about transmission-based precautions.

Aim of the Study

To assess nurses' knowledge and performance of transmission based precautions in Mahalla Fever Hospital.

3.Method

3.1Design

A descriptive cross-sectional study design was utilized to accomplish this study.

3.2Setting

This study was conducted at Mahalla Fever Hospital affiliated with the Ministry of Health and Population. The hospital is located in Gharbia Governorate**.**

3.3Participants

Nurses in the above mentions setting were included according to the following criteria: different qualifications, both genders and assigned to give direct care to patients.

3.4Sampling

The total number of on-job nurses in the above-mentioned setting was 270 nurses, after excluding 10 % for the pilot study, which constituted 27 nurses. The researcher enrolled 243 nurses conveniently.

3.5Tools for Data Collection

The researcher developed three tools for data collection after reviewing the related literature.

Tool (I) Nurses' socio-demographic and occupational characteristics self-administrated structured questionnaire. The researcher used this questionnaire to assess socio-demographic and occupational characteristics of nurses of age, gender, residence, marital status, qualifications, years of experience, department, and attending training programs regarding infection prevention and control and transmission-based precautions, and its number.

Tool (II) Nurses' knowledge self-administrated structured questionnaire. The researcher used this questionnaire to assess the knowledge of nurses regarding transmission-based precautions, such as definition, indication, types of transmission-based precautions, and recommended precautions required for each type. This section was classified into 6 categories; all of these categories were composed of 29 questions.

Nurses' knowledge scoring system. The researcher awarded one mark to each correct answer as the following: general concepts of transmission-based precautions (Included 9 items), contact precautions (Included 6 items), droplet precautions (Included 5 items), airborne precautions (Included 5 items), airborne and contact precautions (Included 2 items), and droplet and contact precautions (Included 2 items). The total score of knowledge was 29 marks. Based on the researcher's cut-off point, knowledge was categorized into three levels as the following:

Poor: Scores less than 60% of total scores (< 17.4 marks)

Fair: Scores from 60% to less than 80% of the total score (17.4 - less than 23.2 marks)

Good: Scores from 80% and more of total scores (≥ 23.2 marks).

Tool (III) Nurses' performance observational checklist. The researcher observed nurses' performance regarding transmission-based precautions, such as patient placement, use of personal protective equipment, patient transport, handling of used equipment, environmental

hygiene, and linen management. This section was classified into three categories; the total items of nurses' performance regarding transmission-based precautions were 87 items.

Nurses' performance scoring system. The researcher awarded one mark to each correct step as the following: **contact** precautions: total items in this category were 36, as follows: patient placement (Included 7 items) ,use of personal protective equipment (Included 13 items), patient transport (Included 3 items), handling of used equipment (Included 5 items), environmental measures (Included 6 items), linen management (Included 2 items), droplet precautions: total items of this category were 23, as the following: patient placement (Included 7 items= 7 marks), use of personal protective equipment (Included 7 items), patient transport (Included 7 items), environmental measures (Included 2 items), airborne precautions: total items of this category were, 28 as the following: patient placement (Included 10 items),use of personal protective equipment (Included 3 items), patient transport (Included 5 items), patient care equipment (Included 3 items), considerations when using N95 mask (Included 4 items), environmental measures (Included 3 items).

Total scores of performance ranged from 0 to 87. Based on the researcher's cut-off point performance was categorized into three categories as the following:

Incompetent: Score < 60% (< 52.2 marks).

Need for improvement: Score from 60% -< 85% (52.2-< 73.9 marks).

Competent: Score ≥ 85% (≥ 73.9 marks).

3.6 Procedure

Administrative process. An official letter from the Faculty of Nursing was submitted to the Director of Mahalla Fever Hospital to obtain their approval for conducting the study. The director was informed about the aim of the study in order to ***gain*** their cooperation and support during the data collection**.**

Ethical consideration. The researcher obtained approval from the Research Ethics Committee, Faculty of Nursing, Mansoura University. The researcher explained the aim of the study to the participants and assured them that their data would be treated anonymously and confidentially and used for research purposes only. In addition, each participant had the right to ask any question related to the study as well as withdraw at any time without giving any reason.

Literature review. The researcher reviewed national and international literature on the various aspects of transmission-***based*** precautions using scientific published articles, internet searches, and textbooks. This review was a guide for developing the study tools.

Development of study tools.

The researcher developed tools for data collection supported by reviewing the relevant literature.

Content validity. Five experts in the field of infection prevention and control tested the study tools for content validity and the required modifications were carried out.

Face validity. A pilot study was carried out on 10 % of the study participants (27 nurses) who were selected conveniently from the same settings and excluded from the study sample. The required modifications were made. The aim of this pilot study was to check the appropriateness and clarity of the questionnaire and identify any unexpected obstacles in data collection.

Reliability. Cronbach's coefficient alpha tested the reliability of the study tools assessing nurses' knowledge, and performance which values were as the following Reliability of knowledge was 0.87, and performance was 0.90.

Data collection: The researcher distributed the self-administrated structured questionnaire to collect nurses' socio-demographic and *occupational* characteristics by tools (I), assess the knowledge regarding transmission-based precautions by tools (II), and collected them after compilation. The researcher observed nurses' performance regarding transmission-based precautions by tools (III). This was carried out six days per week during the three work shifts and lasted for three months from October to December 2021.

3.7 Statistical analysis. Data was sorted, coded, organized, categorized, and then transferred into specially designed formats. Data were analyzed using Statistical Package for Social Science (SPSS) version 23 and were presented by simple frequency tables. Continuous variables were represented as mean, and standard deviation. An Independent t-test was used to test the difference between two means of continuous variables. ANOVA test was used to test the difference between more than two means of continuous variables. Pearson correlation coefficient test was conducted to test the association between two continuous variables.

4. Results

Table 1 shows that the mean age of nurses was 31.967(7.342) years with 50.2% aged 20 to

less than 30 years, 80.6% being women respectively. Regarding qualification, 37.0% of nurses had a bachelor's degree.

Table 2 illustrates that 45.7% of nurses had more than 10 years of experience, with a mean of 10.716(8.669) years and 52.3% worked in an inpatient department. Related to attending previous training courses about infection prevention and control and transmission-based precautions, 72.0%

and 92.0 of nurses had participated from one to less than three courses, respectively.

Table 3 reveals that 56.8% of nurses had a poor score level of knowledge regarding transmission-based precautions compared to only 11.9 % had a good score level with a total mean of 46.35 (7.45).

Table 4 represents that 95.5% of nurses were incompetent regarding transmission-based precautions with a total mean of 45.856(4.628).

Table 1*Socio-demographic characteristics of nurses*

Items	N	%
Gender		
Man	34	**14.0**
Woman	209	**86.0**
Age (in years)		
From 20 to less than 30	122	**50.2**
From 30 to less than 40	90	**37.0**
From 40 and more	31	**12.8**
$\bar{x}$ (SD) 31.967(7.342)		
Residence		
Urban	113	**46.5**
Rural	130	**53.5**
Qualification		
Secondary school	62	**25.5**
Technical institute	65	**26.7**
Bachelor's degree	90	**37.0**
Postgraduate degree	26	**10.7**

Table 2 *Occupational characteristics of nurses*

Items	N	%
Experience years		
Less than 1 year	9	**3.7**
From 1 to less than 5	86	**36.6**
From 5 to less than 10	34	**14.0**
From 10 and more	111	**45.7**
$\bar{x}$ (SD) 10.716(8.669)		
Department		
Outpatient clinics	13	**5.3**
Intensive care unit	20	**8.2**
Hemodialysis unit	25	**10.3**
Intermediate care unit	28	**11.5**
Isolation unit	30	**12.3**
Inpatient unit	127	**52.3**
Attending training courses related to infection prevention and control		
yes	50	**20.6**
Number of attended courses		
From 1 to less than 3	36	**72.0**
From 3 and more	14	**28.0**
$\bar{x}$ (SD) 0.564(1.317)		
Attending training courses related transmission-based precautions		
yes	50	**20.6**
Number of attended courses		
From 1 to less than 3	46	**92.0**
From 3 and more	4	**8.0**
$\bar{x}$ (SD) 0.432(0.983)		

Table 3 *Nurses' total knowledge levels score regarding transmission-based precautions*

Knowledge Levels (29 items)	N	%
Poor	138	56.8
Fair	76	31.3
Good	29	11.9
x̄ (SD)	46.35(7.45)	

Note. Good= scores 80% or more of total scores(23.2 or more). Fair= scores 60% to less than 80% of total scores(17.4- less than 23.2). Poor= scores less than 60% of total scores (0 – less than 17.4).

Table 4 *Nurses' total performance score regarding transmission-based precautions*

Competencies	Incompetent		Need improving		Competent	
	N	%	N	%	N	%
Contact precautions (36 items)	72	29.6	171	70.0	0	0.0
x̄ (SD)	21.905(2.782)					
Droplet precautions (23 items)	215	88.5	28	11.5	0	0.0
x̄ (SD)	12.123(1.237)					
Airborne precautions (28 items)	240	98.8	3	1.2	0	0.0
x̄ (SD)	11.827(1.761)					
Total nurses' performance (87 items)	232	95.5	11	4.5	0	0.0
x̄ (SD)	45.856(4.628)					

Note. Incompetent: Score < 60% (< 52.2). Need for improvement: Score from 60% -< 85% (52.2-< 73.9). Competent: Score ≥ 85% (≥ 73.9).

5.Discussion

Healthcare-associated infections result in increased morbidity, mortality, and expenses, so they are a major public health concern in both developed and developing nations (Hassan, El-Gilany, Abdelaal, El-Mashad & Azim, 2020). According to WHO, (2020), it is estimated that up to 7% of patients in developed countries and 10% in developing countries will acquire at least one type of HAI. These infections also represent a significant economic burden on a societal level. However, a large percentage is preventable through effective infection prevention and control measures.

Every patient has a chance of contracting an infectious disease and transmitting it to other patients or healthcare personnel. As a result, standard precautions should be provided to every patient admitted to a hospital. When treating patients who are suspected or known to have infections with highly transmissible or epidemiologically significant diseases, additional barrier or isolation precautions are required in addition to standard precautions. These precautions are used to prevent direct or indirect contact transmission as well as airborne and droplet transmission (Mohamed Zain-El-Aabedin, Al-Sonosy & Faltas, 2022).

The results of the current study can be argued as follows. The mean age of nurses was 31.967 years with 50.2% aged 20 to less than 30 years. this result agrees with a study conducted by

Ronak, (2016) revealed that; more than half of nurses were in the age group between 25-34 years old and females.

Based on the result of the present study, More than half of nurses have a poor total score level of knowledge regarding transmission-based precautions. Along the same line, a study conducted by Geberemariyam, Donka and Wordofa, (2018) revealed that; a large percentage of healthcare workers in the studied healthcare facilities demonstrated inadequate knowledge about infection prevention.

Additionally, a study carried out by Thu et al. (2012) showed that; the knowledge level of Vietnamese healthcare workers regarding isolation precautions was insufficient. Furthermore, a Nigerian study conducted by Ochie et al. (2022) demonstrated that healthcare workers were found to have a poor level of knowledge of infection control.

On the other hand, this finding disagrees with a Saudi study conducted by Al-Ahmari, Al-Khaldi and Al-Asmari, (2021), in Abha City, which declared that; more than two-thirds of primary care professionals had a good knowledge level regarding infection control. As well, a study carried out by Suliman et al. (2018), assessed knowledge and practices of isolation precautions among nurses in Jordan and found that most of the nurses (90%) have good knowledge regarding isolation precautions.

Based on the result of the present study, most of the nurses are incompetent regarding transmission-based precautions. This finding is consistent with an Egyptian study conducted by Mohamed Zain-El-Aabedin, Al-Sonosy and Faltas, (2022), which investigated nurses' performance regarding isolation precaution measures application in emergency departments and found that three-quarters of nurses had an unsatisfactory level of performance.

Furthermore, a study conducted on the allied hospital, in Faisalabad, Pakistan by Faryad, Inayat, Afzal and Hussain, (2018) illustrated that a very small number of registered nurses had good practices but most of those practices were not according to standards of isolation precautions. Among the same line, Bedoya et al. (2017), in Kenya assessed infection prevention and control practices in primary healthcare and found that nurses did not maintain sufficient compliance with isolation precautions.

However, this finding is in disagreement with a Nigerian study conducted by Afemikhe et al., (2020), which found that the majority of respondents maintained a good level of transmission-based precautions practices. Also, these findings disagree with a study carried out by Karahan, Taşdemir and Çelik, (2019), in Turkish surgical clinics declared that the compliance of the nurses taking isolation precautions was at a good level. As well, a study conducted by Arli and Bakan, (2017), assessed nurses' compliance with isolation precautions, and the affecting factors revealed that; the nurses had good compliance with isolation precautions.

From the researcher's view, the highest percentages of nurses have poor knowledge and incompetent performance; levels regarding transmission-based precautions. These can be interpreted in light; more than half of the nurses graduated from secondary school, and technical institute, less than half have less than a year to less than five years of experience, and less than one-fifth attending training courses related to transmission-based precautions. This highlights the importance of on-job training programs that considers an entry point to improve nurses' knowledge and performance.

6.Conclusion

The researcher concludes that; the highest percentages belonged to nurses with poor knowledge and incompetent performance, levels; regarding transmission-based precautions.

7.Recommendations

- Conducting on-duty training programs for nurses on transmission-based precautions.
- Striating on monitoring and coaching nurses' performance of transmission-based precautions by the infection control team.

8.Acknowledgements

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