

## Assessment of Nurses' Performance Regarding Infection Control Standard Precautions during Covid-19 Pandemic in Family Health Centers at Beni-Suef City

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### Abstract

The COVID-19 pandemic has highlighted the importance of infection control standard precautions, especially in healthcare settings. Nurses play a crucial role in implementing and ensuring adherence to these precautions to prevent the spread of the virus. **Aim:** assessment of nurses' performance in implementing infection control standard precautions in family health centers during the pandemic. **Setting:** Family Health Centers at Beni-Suef City. **Sample:** convenient sample of 124 nurses. **Design:** A descriptive exploratory study. **Results:** more than two-thirds of the studied sample was married, and more than one-quarter were in the 40-49 age. Nearly half had a technical nursing institute, followed by more than one quarter with a diploma. Overall, over one-third of the studied nurses had an average and good level of knowledge about COVID-19 and infection control measures. Also, two-thirds of the studied sample had adequate practices, while one-third had inadequate practices. This study **concluded** there were still some nurses with low or high levels of knowledge and perceived barriers. Thus, it **recommended** providing accurate and up-to-date information about COVID-19 and Addressing barriers.

**Keywords:** Barriers; COVID-19 pandemic, Nurses' Performance, infection control standards

### Introduction:

The COVID-19 pandemic caused by the SARS-CoV-2 virus has had a profound global impact since its initial identification in Wuhan, China, in December 2019 **Rabaan, Al-Ahmed, & Haque (2020)**. It has affected virtually every aspect of life, including health, the economy, social interactions, and education. According to the **Centers for Disease Control and Prevention (2020)**, The virus spreads rapidly through respiratory droplets or contact with contaminated surfaces. It can cause a range of symptoms, from mild to severe, including fever, cough, and shortness of breath **Lai et al. (2020)**. Some individuals may also be asymptomatic, which makes controlling the spread of the virus challenging (**World Health Organization, 2020; 2021 & Guan et al., 2020**).

The pandemic has significantly impacted healthcare systems worldwide, with many countries experiencing a surge in cases that overwhelmed hospital capacities and led to shortages of essential medical supplies and equipment **Li et al. (2020)**. Healthcare workers have been the frontline warriors, working tirelessly to care for patients while putting themselves at risk of infection (**Chen, Liu, & Zhang, 2020**).

The pandemic has also had a severe economic impact, with many businesses forced to close or reduce operations due to lockdowns and social distancing measures. This has resulted in job losses and financial hardship for many individuals and families **World Bank (2020)**. Governments worldwide have implemented various measures to control the spread of the virus, including travel restrictions, mandatory mask-wearing, and social distancing. Vaccines have been developed and distributed globally, aiming to reduce the disease's severity and control its spread (**Li, Liang & Gao, 2020**).

In conclusion, the COVID-19 pandemic has made a significant impact globally, affecting health, the economy, and social interactions. It has highlighted the necessity for effective public health measures and healthcare systems to respond to pandemics (**Lai et al., 2020**). While progress has

been made in controlling the spread of the virus, it is essential to remain vigilant and continue efforts to control the pandemic until it is fully under control (**Oh & Kim, 2021**).

The COVID-19 pandemic has emphasized the critical role of infection control standard precautions within healthcare settings, with nurses being responsible for their implementation and enforcement to prevent the virus's spread. Therefore, it is imperative to evaluate nurses' performance in implementing infection control standard precautions in family health centers during the pandemic (**Alghamdi et al., 2021**).

### Significance:

Nursing performance in healthcare settings is important as nurses are critical in implementing infection control measures to prevent the spreading of diseases, including COVID-19, and ensure patients' safety and well-being **Baykara et al. (2021)**. Moreover, nursing performance plays a crucial role in preventing healthcare-associated infections. Nurses are responsible for implementing infection control measures, such as hand hygiene, personal protective equipment use, and environmental cleaning, to prevent the spread of infections among patients and healthcare workers (**Chen & Shih, 2021**).

### Significance of the study:

Globally, during the week of 28 February through 6 March 2022, the number of new COVID-19 cases was over 10 million, and over 52,000 new deaths were reported. As of 6 March 2022, over 433 million confirmed cases and over 5.9 million deaths have been reported globally. As of 7:57 p.m. CET, 16 March 2022, there have been 460,280,168 confirmed cases of COVID-19, including 6,050,018 deaths, reported to WHO. As of 12 March 2022, 10,712,423,741 vaccine doses have been administered (**World Health Organization, 2022**).

In Egypt, As of January 2, 2022, 801 new coronavirus cases were registered, leading the cumulative number of COVID-19 infections in the country to reach its

highest at 387,159 cases. As of the same date, 21,797 deaths and 321,568 recoveries were recorded in the country. From 3 January 2020 to 7:57 p.m. CET, 16 March 2022, there have been 495,373 confirmed cases of COVID-19, with 24,277 deaths, reported to WHO. As of 28 February 2022, 71,361,630 vaccine doses have been administered (WHO, 2022).

**Aim:** Assess nurses' performance regarding infection control standard precautions during the COVID-19 pandemic in family health centers.

#### Research questions:

1. What is the level of nurses' knowledge regarding infection control standard precautions during the pandemic in family health centers?
2. What is the level of nurses' practices regarding infection control standard precautions during covid pandemic in family health centers?

#### Subject and Method

**Design:** a descriptive design was used to achieve the aim of this study.

**Setting:** carried out at Elghamrawy, Elsalwn Elaghdar, and East Nile Family Health centers, Al Mermah Health Center, Abd Elsalam Aref Health Center, affiliated with the Ministry of Health in Beni-Suef City

#### Subject:

A convenient sample of 124 nurses, from both sexes working in previously mentioned settings with experience more than one year.

#### Tools for data collection:

##### Tool I: Self-administered interview questionnaire

This questionnaire was designed by the investigator based on reviewing related literature review and was written in simple Arabic language to gather data entailing the following parts:

- **Part I: Socio-demographic characteristics** of nurses such as age, gender, marital status, level of education, years of experience, and training courses.
- **Part II: Knowledge assessment questionnaire:** The investigator developed this tool based on a literature review (Green, 2021; Kennamer, 2020). It was aimed to assess nurses' knowledge regarding COVID-19 and infection control standard precautions during the COVID pandemic in family health centers, which include two sections:
  - **Section I:** Nurses' knowledge regarding COVID-19 included (15 questions with 30 scores).
  - **Section 2:** Nurses' knowledge regarding standard infection control precautions during COVID-19 included 16 questions with 32 scores).

**Scoring system:** The total score of 31 questions was 62 scores were rated on three Likert scales (don't know = zero, no= one degree, and yes = two degrees). These scores were summed and converted into a percent score. It was classified into three categories according to the following:

- Poor less than < 60% (<43.3 scores)

- Average from 70% < 85% (43.4 < 52.7 scores)
- Good more than  $\geq 85\%$  ( $\geq 52.8$  scores)

**Tool II: Observational checklist to assess nurses' practice regarding infection control standard precautions during covid pandemic:** This tool was adapted from Abd El-Maksoud & Atia (2020). It was aimed to assess nurses' practice regarding infection control standard precautions during covid pandemic in family health centers, which included washing hands before and after contacting patients, wearing a surgical mask during contact with patients, and wearing an N95 mask during contact with patients (14 statements).

#### Scoring system

The total score of 14 statements, with 42 scores, were rated on three Likert scales (rare= 1, sometimes=2 & always=3). These scores were summed and converted into a percent score. It was classified into two categories according to the following:

- Inadequate < 70% (< 29.3 scores)
- Adequate  $\geq 70\%$  ( $\geq 29.4$  scores)

#### Tool validity:

Face and content validity was ascertained by a panel of five experts in Community Health Nursing. Revising the tools for clarity, relevance, comprehensiveness, simplicity, and applicability, minor modifications were made, and the final forms were developed.

#### Reliability:

Reliability was tested using Cronbach's Alpha coefficients for nurses' knowledge regarding COVID-19, infection control standards of 0.83, nurses' practices for infection control standards of 0.87, and barriers of implementation, which were 0.79 indicated accepted level.

#### A pilot study:

A pilot study was carried out on (8) nurses to test the tools' applicability, clarity, and efficiency; it was included in the study sample with no modification.

#### Fieldwork:

- The investigator explained the purpose of the study to the nurses included in the study. This study's actual work started and was completed within six months, from the beginning of December 2022 to the end of May 2023.

- Data were collected by the investigator two days per week, in the morning (Sunday and Wednesday) from 9:00 a.m. to 2:00 p.m. Nurses' oral consent to participate was obtained. They were also informed that their confidentiality was assured.

- The investigator provided the self-administered questionnaire to each nurse individually, which entails knowledge parts. At the same time, they checked their implementation practice of infection control measures during their work; everyone had to fill out the full study tools for about 30 minutes. The average number of nurses interviewed every day was 3 to 4 nurses/day depending on the response of the participants and intense of their day work.

**Ethical Considerations:**

The research protocol was approved was obtained from the faculty scientific ethical committee before starting data collection .All official permissions were taken thoroughly, and the investigator clarified the objectives, the aim of the study, and the expected outcomes. The researcher assured the anonymity and confidentiality of the nurses included in the study. As well as, nurses were informed that they have the right to withdraw from the study at any time without any reason.

**Administrative design:**

Official permission was obtained by submitting official letters from the Dean of the Faculty of Nursing, Beni-Suef University, to the director of the Health Directorate in

Beni-Suef governorate. The title and aim of the study were explained, as well as the main data items and study duration.

**Statistical design**

The collected data were organized, tabulated, and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA). The range, mean, and standard deviation were calculated for quantitative data. Qualitative data describes a categorical data set by frequency, percentage, or proportion of each category using the Chi-square test ( $X^2$ ). Correlation between variables was evaluated using Pearson's correlation coefficient ( $r$ ). Significance was adopted at  $P < 0.05$  for interpretation of results of tests of significance.

**Results:**

**Table (1):** Socio-demographic characteristics of the studied nurses (n=124).

Socio-demographic characteristics	No	%
<b>Age</b>		
- 19 - 29 years	28	22.6
- 30 - 39 years	34	27.4
- 40 - 49 years	35	28.2
- $\geq$ 50 years	27	21.8
<b>Sex</b>		
- Male	43	34.7
- Female	81	65.3
<b>Social status</b>		
- Single	19	15.3
- Married	87	70.2
- Divorced	8	6.5
- widow	10	8.0
<b>Education levels</b>		
- Diploma	36	29.0
- Technical nursing institute	60	48.4
- Bachelor of Nursing	28	22.6
<b>Years of experiences</b>		
- $<$ 5 years	30	24.2
- 5 – 10 years	26	21.0
- $>$ 10 years	68	54.8
<b>Attended courses regarding infection control</b>		
- Yes	42	33.9
- No	82	66.1

As shown in Table 1, 65.3% of the studied nurses are female, and 70.2% are married. Their age distribution is relatively evenly spread, with 28.2% in the 40-49 age range. 48.4% of the studied nurses had a technical nursing institute, followed by 29% had a diploma. 54.8 % of the nurses have more than ten years of experience, and 33.9% have attended infection control courses.

**Table (2):** Mean scores of nurse's knowledge sub items regarding COVID-19 and standard infection control precautions (n=124)

Items	The studied sample (124)		
	mean	SD	Range
knowledge regarding COVID-19	21.29	6.45	26
knowledge regarding standard infection control precautions	26.50	4.74	18

**Table 2** clarifies that the mean score for knowledge regarding COVID-19 was 21.29 out of 26, indicating that the sample had good knowledge about COVID-19. The standard deviation of 6.45 suggests some sample knowledge level variability. The range of scores for knowledge regarding COVID-19 was 26, indicating that some nurses had a perfect score while others had lower scores .The mean score for knowledge regarding standard infection control precautions was 26.50 out of 18, indicating that nurses had a very good level of knowledge about infection control precautions. The lower standard deviation of 4.74 for this category indicates less variability in knowledge levels among the nurses for infection control precautions.

**Table (3):** Total practice levels among nurses' regarding COVID-19 and standard infection control precautions (n=124)

Total nurses' practices	Studied Sample	
	No.	%
<b>Levels of total nurses' practices:</b>		
Adequate	83	66.9
Inadequate	41	33.1
Range	26	
Mean $\pm$ SD	30.52 $\pm$ 7.11	

Regarding the nurses' practices, table 3 illustrates that the mean score for nurses' total practices was 30.52 out of 40, indicating that nurses had adequate practice. The standard deviation of 7.11 suggests some sample practice level variability. The range of scores for nurses' practices was 26, indicating that some nurses had lower scores while others had higher scores. 66.9% of the studied sample had adequate practices, while 33.1% had inadequate practices.

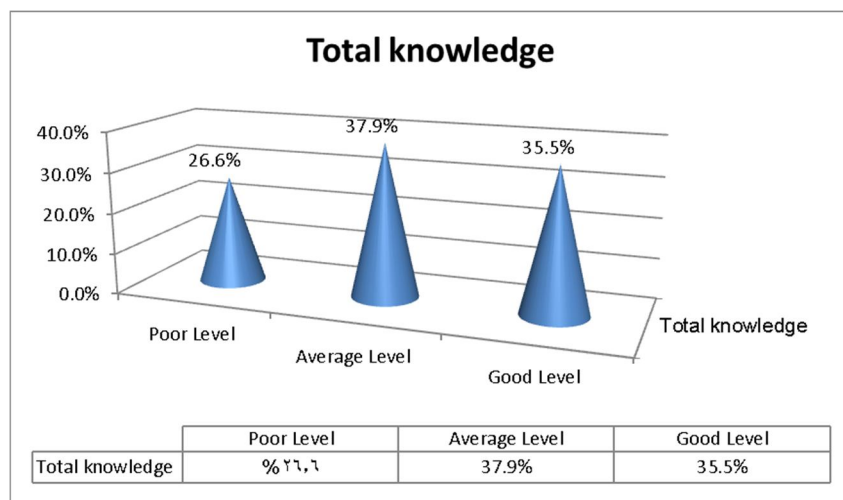


Figure (1): Total knowledge level among nurses regarding COVID-19 and standard infection control precautions (n=124)

Figure 1 shows that 37.9% and 35.5% of the studied nurses had either average or good levels of knowledge, respectively, while 26.6% had poor knowledge.

Table (4): Correlation between knowledge and practices among nurses regarding COVID-19 and standard infection control precautions (n=124)

Items	knowledge	
	r	p
Practices	0.433	0.0001**

As Table 4 shown, there is a significant positive correlation between knowledge and practices related to infection control measures (r=0.433, p<0.001).

Table (5): Relation between total nurses' knowledge and their demographic characteristics (n=124).

Socio-demographic characteristics	Nurses' knowledge						χ <sup>2</sup>	P
	Poor		Average		Good			
	n	%	n	%	n	%		
<b>Age</b>								
19 - 29 years	3	10.7	9	32.1	16	57.1	29.60	0.0001**
30 - 39 years	11	32.4	20	58.8	3	8.8		
40 - 49 years	9	25.7	16	45.7	10	28.6		
≥ 50 years	10	37	2	7.4	15	55.6		
<b>Sex</b>								
Male	14	32.6	16	37.2	13	30.2	1.39	0.49
Female	19	23.5	31	38.3	31	38.3		
<b>Marital status</b>								
Single	5	26.3	3	15.8	11	57.9	10.58	0.102
Married	20	23	37	42.5	30	34.5		
Divorced	3	37.5	3	37.5	2	25		
Widow	5	50	4	40	1	10		
<b>Education levels</b>								
Diploma	13	36.1	14	38.9	9	25	9.33	0.04*
Technical nursing institute	17	28.3	24	40	19	31.7		
Bachelor of Nursing	3	10.7	9	32.1	16	57.1		
<b>Years of experiences</b>								
<5 years	3	10	9	30	18	60	15.54	0.004**
=10 years	10	38.5	13	50	3	11.5		
> 10 years	20	29.4	25	36.8	23	33.8		
<b>Attended courses regarding infection control</b>								
Yes	16	19.5	36	43.9	30	36.6	6.96	0.003**
No	17	40.5	11	26.2	14	33.3		

Table (5) shows that a higher proportion of nurses aged 19-29 years have good knowledge (57.1%) compared to other age groups. Nurses' knowledge levels varied across educational levels, with a higher proportion of bachelor's degree holders having good knowledge (57.1%) compared to diploma and technical nursing institute holders. Nurses with less than five years of experience had the highest proportion of good knowledge (60%), while those with 5-10 years of experience had the lowest proportion of good knowledge (11.5%). Nurses who attended courses regarding infection control had a significantly higher proportion of good knowledge (36.6%) compared to those who did not attend courses (33.3%).

**Table (6):** Relation between total nurses' practices and their demographic characteristics (n=124).

Socio-demographic characteristics	Nurses' practices				$\chi^2$	P
	Adequate (83)		Inadequate (41)			
	n	%	n	%		
<b>Age</b>						
19 - 29 years	19	67.9	9	32.1	9.08	0.02*
30 - 39 years	24	70.6	10	29.4		
40 - 49 years	28	80	7	20		
≥ 50 years	12	44.4	15	55.6		
<b>Sex</b>						
Male	28	65.1	15	34.9	0.098	0.75
Female	55	67.9	26	32.1		
<b>Social status</b>						
Single	9	47.4	10	52.6	5.61	0.132
Married	59	67.8	28	32.2		
Divorced	7	87.5	1	12.5		
widow	8	80	2	20		
<b>Education levels</b>						
Diploma	23	63.9	13	36.1	2.21	0.330
Technical nursing institute	38	63.2	22	36.7		
Bachelor of Nursing	22	78.6	6	21.4		
<b>Years of experiences</b>						
<5 years	21	70	9	30	2.55	0.279
5: 10 years	14	53.8	12	46.2		
>10 years	48	70.6	20	29.4		
<b>Attended courses regarding infection control</b>						
Yes	57	69.5	25	30.5	0.726	0.394
No	26	61.9	16	38.1		

Table (6) presents that a higher proportion of nurses aged 40-49 years have adequate practices (80%) compared to other age groups. On the other hand, no significant difference in practice levels between male and female nurses, social status, education levels, and attendance of courses regarding infection control.

Nurses with less than five years of experience had a higher proportion of adequate practices (70%) compared to those with 5-10 years of experience (53.8%) . Nurses who did not attend courses regarding infection control had a slightly higher proportion of inadequate practices (38.1%) compared to those who attended courses (30.5%), but the difference was not statistically significant.

**Discussion:**

The COVID-19 pandemic has emphasized the significance of adhering to infection control standard precautions, particularly in healthcare settings. In this context, nurses play a critical role in implementing and ensuring compliance with these precautions to prevent the transmission of the virus **Wang et al. (2020)**; Therefore, it is essential to evaluate nurses' performance in implementing infection control standard precautions at family health centers during the pandemic (**Alghamdi et al., 2021**).

Various studies have indicated that nurses have demonstrated satisfactory performance in adhering to infection control standard precautions during the COVID-19 pandemic. However, areas for improvement have been identified, including enhancing hand hygiene compliance, ensuring proper utilization of personal protective equipment, and appropriate disposal of infectious waste. To ensure the safety of healthcare workers and patients, it is crucial to provide ongoing training, supervision, and feedback to nurses regarding infection control standard precautions (**Baykara et al., 2021**).

This study aimed to assess the performance of nurses in implementing infection control standard precautions during the COVID-19 pandemic in family health centers. We employed a descriptive exploratory design to achieve this goal and conducted the study at Primary Health Care Centers under the Ministry of Health in Beni-Suef City. The sample included 124 nurses selected through convenient sampling methods.

Regarding total knowledge Overall, more than one-third of the studied nurses had an average and good level of knowledge about COVID-19 and infection control measures. On the other hand, there were still more than one-quarter of the studied nurses with poor knowledge levels. This result is supported by **Alqurashi and Alshammari (2020)**, on nurses'

knowledge and practices related to infection control in Saudi Arabia found that nurses had good knowledge about infection control measures. Still, there were some gaps in their practices related to hand hygiene and using PPE. Another study by **Alshammari et al. (2020)** on nurses' knowledge and practices related to COVID-19 in Saudi Arabia found that nurses had good knowledge about COVID-19 transmission and prevention measures. Still, there were gaps in their practices related to infection control. Also, a study by **Xu et al. (2020)** on nurses' knowledge and attitudes towards COVID-19 in China found that nurses had good knowledge about COVID-19 prevention measures. Still, there were some knowledge gaps related to the diagnosis and treatment of the disease. All these studies found that nurses generally have good knowledge about infection control and COVID-19 prevention measures. Still, there is a gap in their practices related to infection control.

Concerning mean score for nurses' total practices was 30.52 out of 40, indicating that nurses had an adequate level of practice. The standard deviation of 7.11 suggests some sample practice level variability. The range of scores for nurses' practices was 26, indicating that some nurses had lower scores while others had higher scores. Also, two-thirds of the studied sample had adequate practices, while one-third had inadequate practices.

In accordance with these results, several studies have examined the performance of nurses in implementing these precautions in family health centers. A study conducted in Saudi Arabia by **Alghamdi et al. (2020)** found that nurses' performance in implementing infection control standard precautions was generally satisfactory, with a compliance rate of 80.9%. However, the study identified some areas of improvement, such as hand hygiene compliance, proper use of personal protective equipment, and appropriate disposal of

infectious waste. Another study conducted by Baykara (2021) in Turkey found that nurses' compliance with infection control standard precautions was high, with a compliance rate of 94.6%. The study also identified hand hygiene as an essential focus area for improving nurses' compliance rates.

Also, the same study conducted in Iran found that regular training sessions on infection control standard precautions significantly improved nurses' compliance rates. Another study in China by Liu (2019) found that providing feedback and reminders improved nurses' hand hygiene compliance rates.

From a researcher's perspective, it is believed that these findings may be attributed to insufficient training, limited resources, and an increased workload. Additionally, there is a shortage of time to adhere to infection control standard precautions, the discomfort experienced while wearing personal protective equipment, and a lack of clear instructions regarding standard precautions within the health center.

### Conclusion:

The studied nurses exhibit good knowledge regarding COVID-19 and related in some areas of infection control, but there are still some gaps in their knowledge & practice that need improvement. As well as nurses who have higher levels of knowledge regarding infection control measures are more likely to have better practices related to infection control measures. Also, there is a positive relationship between nurses' knowledge and practices related to infection control measures.

### Recommendations:

They need to adhere to standard infection control precautions to prevent the transmission of COVID-19. So, the study findings recommended that:

1. Improve nurses' infection control training courses.
2. Provide nurses with accurate and up-to-date information about COVID-19 to ensure that knowledge levels remain high.
3. Providing accurate and up-to-date information about infection control is important to
4. Provide training and education to nurses to ensure they have the necessary skills to prevent and effectively control the spread of COVID-19. This can help reduce the risk of transmission of COVID-19 and other infections in healthcare settings, ultimately leading to better health outcomes for patients and healthcare workers.

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