

Assessing the Preparedness of Frontline Nurses: Infection Prevention and Control Strategies for Emerging Pandemic Disorders

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Abstract

Background: An emerging pandemic disorder represents a public health emergency of global concern, making infection prevention and control (IPC) practices among healthcare professionals critical for reducing disease transmission and maintaining patient safety. This study assessed the knowledge regarding infection prevention and control of pandemic disorders among nurses and evaluated its association with selected background variables.

Methods: A cross-sectional, descriptive correlational research design was adopted among 100 nurses working in selected hospitals in Chennai, India, selected via a purposive sampling technique. Data were collected through Google Forms using a pretested background proforma and a structured knowledge questionnaire. Data analysis was performed using descriptive statistics and Chi-square tests via SPSS-20.

Results: The sample predominantly consisted of females (99%), individuals aged up to 25 years (80%), and B.Sc. Nursing graduates (54%). The data revealed that 86% of the nurses possessed good knowledge, 10% had excellent knowledge, and 4% had average knowledge, with an overall mean knowledge score of $13.40/20 \pm 1.93$. Chi-square analysis demonstrated no statistically significant association between the nurses' knowledge scores and background variables such as age ($X^2 = 1.561$, $p = 0.211$), qualification ($X^2 = 0.023$, $p = 0.881$), or prior pandemic ward experience ($X^2 = 3.258$, $p = 0.071$).

Conclusion: Frontline nurses in this setting exhibit a strong baseline level of knowledge regarding infection prevention and control strategies for pandemic disorders. Since demographic and professional factors did not significantly impact their baseline understanding, structured educational frameworks remain consistently effective across the cadre. Continued empowerment and updated professional development are vital to sustaining workforce readiness against emerging pandemic disorders.

Keywords: Pandemic disorders; Infection prevention and control; Frontline nurses; Pandemic preparedness; Knowledge assessment; Correlational study.

1. INTRODUCTION

Emerging pandemic disorders represent a major public health emergency worldwide, posing significant challenges to healthcare systems and communities.¹ They are characterized by rapid transmission, unpredictable progression, and high morbidity and mortality, necessitating robust infection prevention and control (IPC) strategies.² Nurses, as frontline healthcare providers, play a pivotal role in implementing IPC measures, ensuring patient safety, and reducing the risk of disease spread.³ Their preparedness and knowledge directly influence the effectiveness of pandemic response and the resilience of healthcare institutions.⁴

Globally, pandemics such as COVID-19 have highlighted the vulnerability of health systems and the critical importance of well-trained nursing professionals.⁵ Inadequate IPC practices can lead to nosocomial infections, increased transmission rates, and compromised patient outcomes.⁶ Conversely, adequate knowledge and adherence to IPC guidelines empower nurses to deliver safe, evidence-based care, protect themselves and their patients, and maintain public trust in healthcare services.⁷

Preparedness among nurses encompasses not only technical knowledge but also professional attitudes, adaptability, and confidence in managing emerging infectious threats.⁸ Studies across different countries have reported variations in nurses' knowledge and practice levels, often influenced by demographic, educational, and experiential factors.⁹ However, gaps in training, limited exposure to pandemic wards, and insufficient structured educational interventions may hinder optimal preparedness.¹⁰

In India, the burden of pandemic disorders has underscored the need for strengthening IPC competencies among nurses.¹¹ With a rapidly evolving healthcare landscape, ensuring that frontline nurses possess adequate knowledge and preparedness is vital for sustaining workforce readiness and safeguarding public health.¹² Assessing their knowledge levels and exploring associations with background variables can provide valuable insights for curriculum development, targeted training, and policy planning.¹³

Therefore, the present study was undertaken to assess the preparedness of frontline nurses by evaluating their knowledge regarding infection prevention and control strategies for emerging pandemic disorders. The study also sought to examine the relationship between knowledge scores and selected background variables. The findings may contribute to the development of structured educational frameworks and continuous professional development programs aimed at enhancing nurses' competence and confidence in pandemic preparedness.¹⁴

2. METHODOLOGY

The present study adopted a cross-sectional descriptive correlational design to assess the preparedness of frontline nurses regarding infection prevention and control (IPC) strategies for emerging pandemic disorders. The study was conducted among 100 nurses working in selected hospitals in Chennai, India. Ethical clearance was obtained from the Institutional Ethics Committee, and administrative permission was secured from hospital authorities prior to data collection.

The study sample comprised staff nurses selected through a purposive sampling technique. Inclusion criteria were nurses who were willing to participate and currently working in clinical areas, while those who were unavailable or unwilling to participate were excluded.

Data were collected using two validated instruments:

- **Background Variables Proforma:** This captured demographic and professional details such as age, gender, qualification, designation, years of experience, and prior exposure to pandemic wards.
- **Structured Knowledge Questionnaire:** This consisted of 20 multiple-choice questions covering infection prevention and control practices, including risk reduction, patient safety measures, and pandemic preparedness strategies. Each correct response was awarded one point, yielding a total score ranging from 0 to 20.

Informed consent was obtained from all participants, and confidentiality and anonymity were strictly maintained. The content validity of the instruments was established by experts in Psychiatric Nursing and Community Health Nursing, and reliability testing was done. Data collection was carried out through Google Forms, ensuring ease of access and standardization. Responses were compiled electronically and analyzed using SPSS version 20. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize background variables and knowledge scores. Inferential statistics, specifically the Chi-square test, were applied to determine associations between knowledge scores and selected background variables (age, qualification, and pandemic ward experience).

3. Results

Table 1: Frequency and Percentage Distribution of Background Variables of Nurses.
(N = 100)

Demographic Variables	f & %
Age	
Upto 25 years	80
26 – 30 years	11
Above 30 years	9
Gender	
Female	99
Male	1
Marital status	
Married	18
Unmarried	64
Divorced	18
Single	-
Qualification	
GNM	36
P.B.B.Sc.(N)	9
B.Sc.(N)	54
M.Sc.(N)	1
Designation	
Staff nurse	89
Ward incharge	6
Nursing officer	1
Nursing superintendent	4

Demographic Variables	f & %
Others	-
Please specify your area of work	
Ward	90
ICU	8
Others	2
Years of experience	
Less than 1 year	20
1 – 5 years	57
More than 5 years	23
Do you have experience in prior pandemic ward	
Yes	39
No	61
If yes, total days of experience in prior pandemic ward	
Total duration of experience in prior pandemic ward	
No experience	61
Up to 3 months	36
3 to 6 months	3

Tab 1 depicts that the study participants was predominantly young ≤ 25 years, 80%), female (99%), unmarried (64%), and B.Sc. Nursing graduates (54%). Most were staff nurses (89%) working in general wards (90%), with 1–5 years of experience (57%). While the majority had no prior pandemic ward experience (61%), a notable proportion (39%) reported limited exposure, mainly up to 3 months.

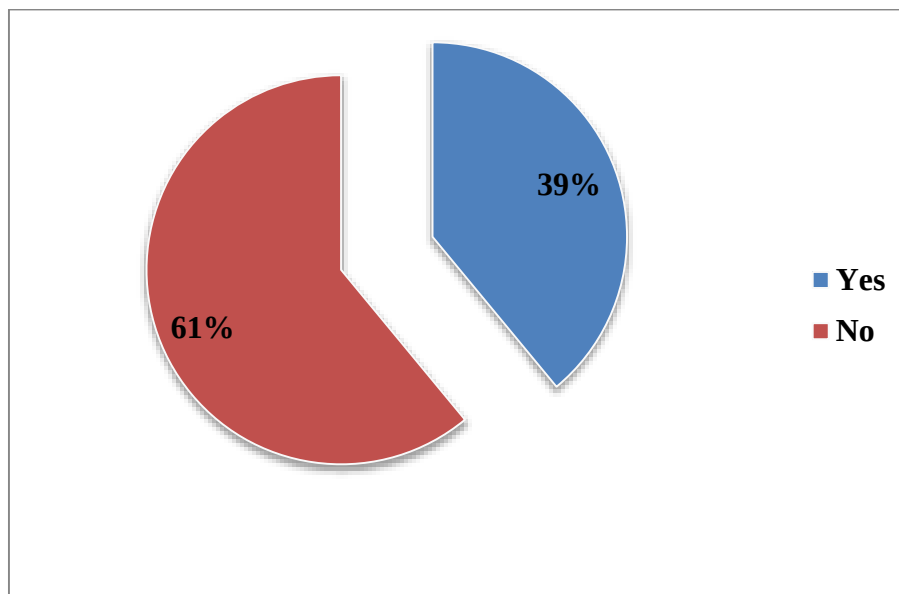


Fig 1: Percentage Distribution of Experience in Pandemic Ward among nurses

The figure shows that a majority of nurses (61%) lacked prior pandemic ward experience, while a smaller proportion (39%) had exposure.

Table 2: Frequency and Percentage distribution Level of Knowledge of Nurses on Infection Prevention and Control of Pandemic Disorders
(N = 100)

Knowledge on Infection Control	No.	%
Average (1 – 10)	4	4.0
Good (11 – 15)	86	86.0
Excellent (16 – 20)	10	10.0

The above table 2 shows that, 86% of them had good knowledge (86%), had Excellent knowledge (10%) and 4(4%) had average knowledge regarding infection prevention and control on Pandemic disorder

Table 3: Mean and Standard Deviation of knowledge Scores on Infection Prevention and Control of Pandemic Ward among Nurses.
(N = 100)

Obtainable score	Min Score	Max Score	Mean	SD
0-20	7.00	17.00	13.40	1.93

The table 3 depicts that the mean scores of knowledge regarding infection prevention and control on Pandemic disorders among nurses was 13.40/20 with standard deviation of 1.93. The minimum score was 7.0 and the maximum score was 17.0

Table 4: Association between Selected Background Variables and Knowledge Scores of Nurses on Infection Prevention and Control of Pandemic Disorder
(N =100)

Background Variables	Below Mean		Above Mean		Chi-Square Test value
	f	%	f	%	
Age					$\chi^2 = 1.561$ df=1 p = 0.211
≤25 years	35	35.0	39	39.0	
>25 years	16	16.0	10	10.0	
Qualification					$\chi^2 = 0.023$ df=1 p = 0.881
B.Sc (N)	18	18.0	18	18.0	
GNM	33	33.0	31	31.0	
Experience of Nurses in Pandemic ward					$\chi^2 = 3.258$ df=1 p = 0.071
Yes	36	36.0	26	26.0	
No	15	15.0	23	23.0	

Tab 4 depicts that none of the background variables (age, qualification, or pandemic ward experience) showed a significant association with knowledge scores (p > 0.05). Knowledge levels were largely

independent of these factors, though nurse's ≤ 25 years and those with pandemic ward experience had slightly higher proportions above the mean.

4. DISCUSSION

The present study revealed that 86% of nurses had good knowledge and 10% had excellent knowledge regarding IPC strategies, with only 4% showing average knowledge. This reflects a strong baseline preparedness among frontline nurses, consistent with previous studies reporting adequate IPC competence among healthcare workers during pandemics.¹⁵

The mean knowledge score of 13.40 ± 1.93 out of 20 indicates consistent understanding of IPC practices. Structured training and standardized guidelines have been shown to improve nurses' knowledge scores in pandemic preparedness, reinforcing the importance of competency-based education.¹⁶

Statistical analysis demonstrated no significant association between knowledge scores and background variables such as age, qualification, or pandemic ward experience. This suggests that demographic and professional characteristics did not substantially influence baseline knowledge. Similar observations have been reported in surveys where IPC knowledge was found to be independent of demographic profiles, highlighting the role of universal training frameworks.¹⁷

The findings highlight the importance of on-going professional development and regular updates in IPC guidelines to sustain workforce readiness. Strengthening health systems through continuous training, institutional support, and reinforcement of evidence-based practices is critical to maintaining preparedness against future pandemics.¹⁸

Furthermore, structured pathway interventions have demonstrated measurable improvements in patient satisfaction and clinical outcomes, particularly in chronic conditions such as heart failure, where clinical nursing pathways enhanced both care quality and patient experience.¹⁹ These findings align with the present study's emphasis on standardized frameworks, reinforcing the value of structured approaches in strengthening preparedness.

Educational innovations also play a pivotal role. Comparative evaluations of OSCE versus traditional methods have shown that competency-based assessments significantly improve student satisfaction and preparedness.²⁰ This supports the argument that experiential and structured evaluation methods can enhance nurses' confidence in infection prevention and control practices.

In addition, digital learning platforms have emerged as effective tools for capacity building. Randomized controlled trials on CPR (Mental Health First Aid) e-learning modules demonstrated significant improvements in suicide prevention knowledge among college students.²¹ Such evidence highlights the potential of e-learning interventions to complement traditional IPC training, offering scalable and accessible solutions for workforce preparedness.

Integrated clinical care pathway programs have also been shown to improve nurses' competency in managing complex patient conditions.²² These structured interventions mirror the importance of standardized IPC frameworks, ensuring that frontline nurses are equipped with both technical and organizational competencies to respond effectively during pandemics.

Beyond technical skills, preparedness must encompass ethical and patient-centered care. Studies on respectful maternity care practices emphasize the importance of embedding empathy, dignity, and respect into routine nursing practice.²²⁻²⁵ Incorporating such principles into IPC strategies ensures that nurses deliver holistic care, fostering trust and compliance during health crises.

Simulation-based training has also been highlighted as an effective strategy for strengthening infection prevention competencies. Controlled studies have shown that simulation exercises improve nurses' confidence, critical thinking, and adherence to IPC protocols, thereby enhancing workforce readiness during health emergencies.²⁶⁻²⁸ These findings complement the present study's emphasis on structured educational frameworks, underscoring the importance of experiential learning in pandemic preparedness. Moreover, sensitization programs focusing on ethical and patient-centered care have demonstrated significant improvements in nurses' attitudes and compliance with evidence-based practices.²⁹ Such interventions reinforce the need to integrate both technical and ethical dimensions into IPC training, ensuring that frontline nurses are equipped to deliver safe, competent, and compassionate care during pandemics.

Overall, the findings suggest that frontline nurses demonstrated strong baseline knowledge of infection prevention and control strategies, yet variations in preparedness highlight the need for continuous reinforcement. Comprehensive IPC education, simulation-based training, and structured capacity-building programs are essential to equip nurses with the competence and confidence required to respond effectively to emerging pandemics. Hospitals can integrate mentorship programs pairing junior nurses with experienced staff to enhance clinical exposure, while community health initiatives can provide opportunities for nurses to engage in public awareness campaigns. By combining evidence-based IPC practices with experiential learning, nursing education and hospital policy can empower frontline professionals to deliver safe, competent, and patient-centered care during health crises.

5. LIMITATIONS

The study's limitations include its relatively small sample size, single-site design, and non-random sampling, which restrict generalizability. The reliance on self-reported measures may also introduce bias. Future research should employ larger, randomized samples and longitudinal designs to evaluate the sustained impact of IPC training interventions. Experimental studies testing simulation-based or sensitization programs could provide stronger evidence for effective strategies to enhance both knowledge and preparedness. For nursing practice, these findings emphasize the role of nurses in early infection recognition and control, as highlighted in prior preparedness studies. Hospitals can implement structured mentorship and continuous training programs to strengthen workforce readiness.

6. CONCLUSION

This study revealed that frontline nurses possess strong baseline knowledge of IPC strategies, but preparedness levels vary depending on exposure and training. While knowledge was generally high, the absence of significant associations with demographic variables suggests that standardized frameworks are effective across cadres. The slight advantage observed among younger nurses and those with prior pandemic ward experience underscores the importance of experiential learning. To address gaps, nursing curricula and hospital policies should incorporate IPC-focused modules, simulation-based training, and structured mentorship programs. By bridging these gaps, nursing education can empower frontline professionals to deliver safe, evidence-based care that enhances resilience during future pandemics.

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