



BMJ Open Intensive care unit registered nurses' perceived barriers towards ventilated associated pneumonia prevention in southeast Iran: a cross-sectional descriptive – an analytical study

Mahlagha Dehghan ¹, Mansoor Arab,² Tayebe Akafzadeh,³ Alireza Malakoutikhah,¹ Mahbubeh Mazallahi,⁴ Mansooreh Azizzadeh Forouzi ⁵

To cite: Dehghan M, Arab M, Akafzadeh T, *et al.* Intensive care unit registered nurses' perceived barriers towards ventilated associated pneumonia prevention in southeast Iran: a cross-sectional descriptive – an analytical study. *BMJ Open* 2022;**12**:e064147. doi:10.1136/bmjopen-2022-064147

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-064147>).

Received 09 May 2022
Accepted 22 August 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to
Mansooreh Azizzadeh Forouzi;
forozy@gmail.com

ABSTRACT

Objectives Ventilated associated pneumonia (VAP) is one of the most common nosocomial infection and complication occurring in intensive care units (ICUs) worldwide. This study aimed to assess the ICU registered nurses' perceived barriers towards VAP prevention in southeast Iran.

Setting This was a cross-sectional descriptive–an analytical study to examine the registered nurses' perceived barriers towards VAP prevention in southeast Iran.

Participants The study population consisted of 242 nurses working in ICU and emergency departments.

Primary and secondary outcome measures The data was collected using demographic characteristics' questionnaire and a researcher-made ventilator-associated pneumonia barriers prevention questionnaire.

Results The mean score of nurses' perceived barriers towards VAP prevention was 2.82±0.46. The highest mean score of perceived barriers were related to items of 'lack of staff', 'lack of a team-based approach to care and interventions', and 'lack of support from management'.

Conclusions This study indicates most of the barriers are related to organisational factors and lack of teamwork. Further studies are needed to obtain more accurate results.

Trial registration number The study protocol was approved by the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1395.908).

INTRODUCTION

Healthcare-associated infections are the most common complications in hospitalised patients. Although intensive care units (ICUs) account for about 5%–15% of hospital beds, a WHO systematic review and meta-analysis showed healthcare-associated infection concentration in adult ICUs in developing countries was 47.9 per 1000 patient-days.¹ Ventilator-associated pneumonia (VAP) is a subset of healthcare-associated pneumonia that develops 48 hours or longer after

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ There were no dropouts in samples.
- ⇒ Samples were engaged in discussions about the finding of research.
- ⇒ All data were from Kerman Province, and the results were influenced by the region. Hence, the findings may have limited generalisability.
- ⇒ For collecting questionnaires, anonymous box was not provided in the wards, and questionnaires were gathered by researcher which might have had an impact on nurses to answer with no concerns.
- ⇒ The Ventilator-Associated Pneumonia Barriers Prevention Questionnaire had only the content validity and internal consistency for reliability; all psychometric properties were not evaluated.

intubation and being under mechanical ventilation.²

VAP occurs in 28% of patients who receive mechanical ventilation, with a variable duration of mechanical ventilation of 3% per day for the first 5 days, 2% per day for days 6–10 and 1% per day after day 10.³ VAP is associated with serious complications such as morbidity, mortality, prolonged ICU stay, nursing workload increase and financial problems.⁴ It is estimated that the incident will increase the length of hospital stay in ICUs by 14 days, with a mortality rate of 19.4%–53% and an increased cost of more than US\$ 40 000 per patient.⁵

Prevention is the best cost-effective approach to mitigate the complications associated with VAP.⁶ Avoiding intubation, minimising sedation, paired daily spontaneous awakening and breathing trials, conservative fluid management, conservative transfusion thresholds, low tidal volume ventilation and early mobility are some preventive measures for VAP aimed at improving patient's quality

of life. According to SoniSoni, prevention measures for VAP are important components of the nursing care plan among ICU nurses.⁷ Furthermore, safety is considered as an indicator for quality improvement and criteria for evaluating ICUs patients in many healthcare systems.⁸

Several factors impede the prevention of VAP. In a study conducted by Al-Sayaghi, shortage of nursing staff, forgetfulness, cost control policies were reported barriers towards VAP prevention guidelines in ICUs.⁹ According to Aloush and Al-Rawajfa, other contributing barriers include, lack of education, lack of policies and protocols, lack of resources and the shortage of staff.¹⁰ Dagnev report lack of oral care equipment, absence of guidelines, time constraints, poor supervision, high workload,¹¹ and in the qualitative descriptive study by Atashi *et al* factors such as unfavourable professional attitude, low job motivation, limited professional accountability, inadequate or inappropriate equipment, heavy workload, staff shortage, inadequate staff training and ineffective supervision were reported as barriers to oral care in ICUs.¹² Jansson *et al* indicated that the performance of more experienced nurses was significantly better than their less-experienced colleagues. The nurses self-reported barriers towards evidence-based guidelines for VAP prevention include inadequate resources, lack of time, skills, knowledge and guidance.¹³ Given the importance of VAP and its consequences on ICUs patients and the fact that nurses are one of the most important members of the healthcare team, the results of such studies enhance nurses' knowledge and help them play effective role by using appropriate prevention methods. Therefore, this study aimed to examine the ICU registered nurses' perceived barriers towards VAP prevention in southeast Iran.

RESEARCH METHODOLOGY

Study design

A cross-sectional descriptive–analytical study.

Sample

Nurses working in ICUs and emergency departments (EDs) of Shafa, Bahonar and Afzalipour hospitals that included Shafa=77, Bahonar=112 and Afzalipour=132 for a total of 321 at the time of the study. The sample size was estimated based on the pilot study was 242 nurses, with a confidence coefficient of 95% and the power of 80.

Inclusion criteria were (a) having BSc. or higher degree and (b) job experience of 6 months in ICUs. The participants were excluded if they voluntarily withdrew from the study or avoided sharing their experiences. Eligible nurses were selected by quota sampling method from each unit and shift, according to its specified proportion.

Tool: the data was collected through a two-part researcher-made questionnaire.

Demographic characteristics questionnaire

This questionnaire included age, sex, education, unit name, job experience, the experience of working in ICUs

and having training courses on VAP as well as the type of protocols they adhere to (hand hygiene, oral care and suctioning).

Ventilator-associated pneumonia barriers prevention questionnaire

This questionnaire contained 18 items with 4-point Likert scales (one=strongly disagree, four=strongly agree). It was developed using various sources in the literature.^{7 13 14}

The higher the average score of each item represents that the barrier was perceived more by nurses. The Content Validity Index (CVI) of the questionnaire was 0.87 evaluated by giving the questionnaire to 10 faculty members of Kerman University of Medical Sciences, and for reliability, the questionnaire was provided to 30 target populations. Internal consistency was calculated using Cronbach's alpha ($\alpha=0.95$).

The eligible nurses were invited to participate in the study after obtaining consent following an explanation of the process of the study. The nurses completed the questionnaires in the form of self-report. Two hundred forty-two nurses were enrolled in the study starting from January to May 2017, lasting for 5 months with no dropouts.

Data were analysed using SPSS V.18 (SPSS, Chicago, IL, USA). Descriptive statistics (frequency, percentage, mean and SD) were applied to describe the participants' demographic characteristics. Kolmogorov-Smirnov test was used to study the normalisation of quantitative variables. Perceived barriers towards VAP prevention score did not have normal distributions. Therefore, Kruskal-Wallis and Mann-Whitney U tests were used to compare the mean scores perceived barriers towards VAP prevention according to qualitative variables. The significance level of the p value was considered <0.05 .

Ethical consideration

The study protocol was approved by the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1395.908). The study objectives were presented to all participants before their enrollment, and the written informed consent was taken. All participants were assured that all information as confidential, and their participation was optional, and they could withdraw from the study at any time.

Patient and public involvement

Nurses in ICUs informed the survey questions and methods and have been engaged in discussions about the finding of research.

Findings

Results related to nurses' demographic characteristics showed the mean age of 32.9 ± 5.87 (min=22, max=50), 43% of them were 30 years old or younger and 80.2% of the participants were female. Only eight nurses had MSc, and the rest had BSc. Most of the nurses 66.1% were in ICUs, and the rest were in the ED. The job experience mean score was

Table 1 The relationship between perceived barriers towards VAP prevention and demographic characteristics (qualitative variables) of participants:r

Variable	Frequency (%)	Perceived barriers towards VAP prevention		
		Mean/SD	P value	
Age	≤ 30	104 (43)	2.73 (0.45)	0.2
	31–40	115 (47.5)	2.87 (0.45)	
	40 <	23 (9.5)	2.92 (0.45)	
Sex	Female	194 (80.2)	2.89 (0.42)	0.14
	Male	48 (19.8)	2.8 (0.4)	
Education	BSc	234 (96.7)	2.82 (0.46)	0.86
	MSc	8 (3.3)	2.63 (0.71)	
Unit name	ICU	160 (66.1)	2.82 (0.48)	0.43
	ED	82 (33.9)	2.8 (0.44)	
Job experience (year)	≤ 5	121	2.78 (0.44)	0.47
	6–10	93	2.76 (0.48)	
	10–15	24	2.88 (0.5)	
	15 <	4	2.93 (0.32)	
Experience of working in ICUs or EDs (year)	≤ 5	121	2.8 (0.43)	0.52
	6–10	93	2.8 (0.52)	
	10–15	24	3 (0.41)	
	≤ 5	4	2.83 (0.2)	

9.51±5.14 years (min=1, max=27), and the mean experience of working in ICUs was 6.33±3.7 (min=1, max=20) (table 1).

According to table 2, 89.7% of the nurses had passed infection control training courses; 53.7% had been trained in the last 6 months from the time of sampling. Also, 45% had received VAP prevention training and 35.8% had been trained in the last 6 months. 83.4% of nurses stated that they adhered to a specific protocol for VAP prevention, of which 44.2% adhered to all three of hand hygiene, oral care and suctioning protocols. 66.1% reported that nurses do not report to the authorities about the number of patients with VAP (table 2).

The mean score of nurses' perceived barriers towards VAP prevention was 2.82±0.46 (minimum mean=1.1, maximum mean=4). According to table 3, the highest mean score of perceived barriers were related to items of 'lack of staff' (3.1±0.7), 'lack of a team-based approach to care and interventions' (2.93±0.77), 'lack of support from management' (2.91±0.69) and the lowest mean score were related to items of 'the concern of detachment of attached tubes to the patient' (2/67±0/72), 'the concern of harming the patient' (2/69±0/74) and 'the concern of the side effects it has on the patient' (2/69±0/73) (table 3).

The nurses' perceived barriers towards VAP prevention did not differ according to any of the demographic characteristics (table 1).

Table 2 Participants' experience of training courses and their adherence to protocols

Items	Frequency	Percentage
1. Have you passed any nosocomial infection control training courses?		
Yes	217	89.7
No	25	10.3
2. If the answer to the previous question is Yes, specify the time.*		
The last 6 months	116	53.7
Between the last 6 months to 1 year	70	32.4
More than a year	30	13.9
3. Have you had VAP prevention training?		
Yes	109	45
No	133	55
4. If the answer to the previous question is Yes, specify the time.		
The last 6 months	33	35.8
Between the last 6 months to 1 year	46	42.2
More than a year	24	22
5. Do you follow a specific procedure or protocol for preventing VAP?*		
Yes	201	83.4
No	40	16.6
6. If the answer to the previous question is Yes, specify the protocol.		
Oral care protocol	8	4
Suctioning protocol	29	14.4
Hand hygiene protocol	43	21.4
All three protocols	89	44/2
Oral care and suctioning protocols	4	2
Oral care and hand hygiene protocols	4	2
Suctioning and hand hygiene protocols	24	12
7. Do nurses report periodically to authorities about the number of patients with VAP?		
Yes	82	33/9
No	160	66/1
8. Have you been asked, directly or by the Nursing and Medical Administrators, to use VAP prevention procedures?		
Yes	89	36/8
No	153	63/2

*There was a missing data.

DISCUSSION

The mean score of nurses' perceived barriers towards VAP prevention was 2.82±0.46, which was higher than the median of the questionnaire ranges of scores (1 to 4; Median=2.5). The highest mean score of perceived

Table 3 Participants' respond to Ventilator Associated Pneumonia Barriers Prevention Questionnaire

Items	Mean	SD	Agree and totally agree		Disagree and strongly disagree	
			Frequency	Percentage	Frequency	Percentage
1. Lack of funding and facilities.	2.8	0.7	64	26.5	178	73.5
2. Improper physical structure of the unit.	2.86	0.73	61	25.2	181	74.8
3. Lack of time.	2.9	0.73	55	22.7	187	77.3
4. Lack of staff.	3.1	0.70	37	15.3	205	84.7
5. Lack of a team-based approach to care and interventions.	2.93	0.77	66	27.3	176	72.7
6. Lack of a specific protocol for doing the procedures.	2.83	0.78	80	33	162	70
7. Disagreement on protocol recommendations.	2.8	0.74	81	33.5	161	66.5
8. Lack of support from management.	2.91	0.69	57	23.6	185	76.4
9. Insufficient skill.	2.73	0.81	93	38.4	149	61.4
10. Inadequate knowledge and lack of information.	2.81	0.83	78	32.3	164	67.7
11. Inability to use clinical research findings in clinical environment.	2.79	0.76	78	32.2	164	67.8
12. Inability to use devices for VAP prevention.	2.79	0.78	76	31.4	166	86.6
13. Lack of familiarity with VAP prevention protocols.	2.8	0.76	72	29.7	170	70.3
14. The existence of unnecessary procedures.	2.78	0.71	75	31	167	69
15. Deterioration of the patient's condition.	2.81	0.75	72	29.8	170	70.2
16. The concern of harming the patient.	2.69	0.74	94	38.8	148	61.2
17. The concern of detachment of attached tubes to the patient.	2.67	0.72	96	36.9	146	60.4
18. The concern of the side effects it has on the patient.	2.69	0.73	94	38.8	148	61.2

barriers was related to items of 'lack of staff', 'lack of a team-based approach to care and interventions', and 'lack of support from Management' which indicated that most perceived barriers were related to the organisation of the healthcare system. The lowest mean scores of perceived barriers were related to items of 'the concern of detachment of attached tubes to the patient', 'the concern of harming the patient', and 'the concern of the side effects it has on the patient'. From the nurses' viewpoint, perceived barriers towards VAP prevention were related to the organisational management than the procedures or nurses. Such results may be related to data collected on the barriers towards VAP prevention from the nurses' point of view that does not include members in management positions as well as an existing shortage of nursing staff in the ICUs understudy, that made team-based approaches hard or even impossible.

The results of this study regarding staff shortage in similar to Aloush and Al-Rawajfa's study¹⁰ and Soni's study indicated that the major nurses' perceived barriers towards prevention of VAP were lack of adequate resources, inadequate staff, and lack of education.⁷ In Rashnou *et al's* descriptive qualitative study conducted on twelve critical care nurses in Iran, the major barriers to VAP management were low quality of working life (unprofessional practice and lack of opportunities for learning and skill development) and poor organisational culture (supervision and control, organisational relations, and

managerial support). The results were consistent with the results of this study regarding managerial support and organisational relations which may be related to the same healthcare system setting in the country.¹⁴ Jansson *et al* study in Finland on 101 critical care nurses revealed that the main barriers towards the prevention of VAP were inadequate resources which were not consistent with the results of this study. Also, lack of staff and patient-related barriers were the least important barriers which were the opposite of the results of this study. This inconsistency could be because of different healthcare system setting in the two countries.¹³ In the study by Jansson *et al*, the main barriers were related to the nurse respondents (eg, lack of education), environment (eg, role ambiguities and inadequate resources), and patients (eg, patient discomfort and fear of adverse effects), which were in the opposite of the results of this study and indicated a need for changes that are beyond the control of individual nurses.¹⁵

Engaging samples in discussions about the finding could be consider as a strength for this study, which might have been feedback for nurses to consider some changes in their future practice. There were, also, no dropouts which showed a strength in sampling process. For limitation of this study, we could mention that data were limited to only three hospitals in Kerman province which makes the generalisation of the results to the larger population less valid. For future studies, it is recommended to have samples from different regions and even consider

financial and cultural factors of that region. We can consider the difference of the present study's result with other studies from different setting to be systemic regulations and lack of facilities in larger scale in the healthcare system of the country. What would be the best solution and strategy for such healthcare systems with these obstacles? Now that we know the problem in this region, having future studies aiming for finding the solutions seems necessary. Informing authorities of the results of such studies and recommending to conduct future studies to find the best cost-benefit solutions for the system. As most of the perceived barriers could be addressed by authorities, we also should look for solutions in the management level of the system.

CONCLUSION

According to the present study, most of the barriers mentioned were related to organisational factors such as lack of teamwork. One of the major problems of most Kerman hospitals seems to be the shortage of staff. It shows that there is a systemic problem with regulations and resources in Iran's healthcare system, and most problems could be addressed by authorities. Since no similar study has been found in this field, the results of the present study cannot be confirmed or rejected. Further studies are needed in Kerman and other cities of Iran to obtain more accurate results.

Author affiliations

¹Nursing Research Center, Department of Critical Care Nursing, Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences, Kerman, Iran

²Bam University of Medical Sciences, Medical Surgical Nursing Department, Bam, Iran

³Nursing Research center, Kerman University of Medical Sciences, Kerman, Iran

⁴Nursing Research Center, Department of Critical Care Nursing Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences, Kerman, Iran

⁵Neuroscience Research Center, Institute of Neuropharmacology, Kerman University of Medical Sciences, Kerman, Iran

Acknowledgements We would like to thank all nurses for their cooperation.

Contributors TA and MA were involved in the study, data curation and writing original draft. MD, MAF participated in the design of the study and data analysis, writing and review the article. AM and MM, writing and review the article. All authors (MD, MA, TA, AM, MM, MAF) have read and approved the manuscript. MA accept full responsibility for the work and/or conduct of the study, had access to the data, and controlled the decision to publish.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Ethics Committee of Kerman University of Medical Sciences (IR.KMU).

REC.1395.908). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. Because of ethical issues participants of this study did not agree for their data to be shared publicly.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Mahlagha Dehghan <http://orcid.org/0000-0002-4205-829X>

Mansooreh Azizzadeh Forouzi <http://orcid.org/0000-0002-9327-4937>

REFERENCES

- 1 Haque M, Sartelli M, McKimm J, *et al*. Health care-associated infections—an overview. *Infect Drug Resist* 2018;11:2321–33.
- 2 Osman S, Al Talhi YM, AlDabbagh M, *et al*. The incidence of ventilator-associated pneumonia (VAP) in a tertiary-care center: comparison between pre- and post-VAP prevention bundle. *J Infect Public Health* 2020;13:552–7.
- 3 Abdelrazik Othman A, Salah Abdelazim M, Othman AA. Ventilator-Associated pneumonia in adult intensive care unit prevalence and complications. *The Egyptian Journal of Critical Care Medicine* 2017;5:61–3.
- 4 Pozuelo-Carrascosa DP, Torres-Costoso A, Alvarez-Bueno C, *et al*. Multimodality respiratory physiotherapy reduces mortality but may not prevent ventilator-associated pneumonia or reduce length of stay in the intensive care unit: a systematic review. *J Physiother* 2018;64:222–8.
- 5 Tabaeian SM, Yazdannik A, Abbasi S. Compliance with the standards for prevention of ventilator-associated pneumonia by nurses in the intensive care units. *Iran J Nurs Midwifery Res* 2017;22:31.
- 6 Osti C, Wosti D, Pandey B, *et al*. Ventilator-Associated pneumonia and role of nurses in its prevention. *JNMA J Nepal Med Assoc* 2017;56:461–8.
- 7 Soni K. Knowledge, adherence and barriers towards the prevention of ventilator associated pneumonia among nurses. *Int J Sci Res* 2018;7:358–63.
- 8 Shaw SJ, Jacobs B, Stockwell DC, *et al*. Effect of a real-time pediatric ICU safety bundle dashboard on quality improvement measures. *Jt Comm J Qual Patient Saf* 2015;41:414–20.
- 9 Al-Sayaghi KM. Critical care nurses' compliance and barriers toward ventilator-associated pneumonia prevention guidelines: cross-sectional survey. *J Taibah Univ Med Sci* 2021;16:274–82.
- 10 Aloush SM, Al-Rawajfa OM. Prevention of ventilator-associated pneumonia in intensive care units: barriers and compliance. *Int J Nurs Pract* 2020;26:e12838.
- 11 Dagnev ZA, Abraham IA, Beraki GG, *et al*. Do nurses have barriers to quality oral care practice at a generalized hospital care in Asmara, Eritrea? A cross-sectional study. *BMC Oral Health* 2020;20:1–11.
- 12 Atashi V, Yousefi H, Mahjobipoor H, *et al*. Effect of oral care program on prevention of ventilator-associated pneumonia in intensive care unit patients: a randomized controlled trial. *Iran J Nurs Midwifery Res* 2018;23:486.
- 13 Jansson M, Ala-Kokko T, Ylipalosaari P, *et al*. Critical care nurses' knowledge of, adherence to and barriers towards evidence-based guidelines for the prevention of ventilator-associated pneumonia—a survey study. *Intensive Crit Care Nurs* 2013;29:216–27.
- 14 Rashnou F, Toulabi T, Hasanvand S. Barriers to the Management of Ventilator-Associated Pneumonia : A Qualitative Study of Critical Care Nurses' Experiences. *ME-JFM* 2017;15:174–82.
- 15 Jansson MM, Syrjälä HP, Talman K, *et al*. Critical care nurses' knowledge of, adherence to, and barriers toward institution-specific ventilator bundle. *Am J Infect Control* 2018;46:1051–6.