Preventive Strategies For Ventilator Associated Pneumonia: Critical Care Nurses.

Dr Thoudam Kheroda Devi [a], Maj Bomneichong Leivon [b]

[a] Associate professor, JJTU,Rajasthan, India.
[b] Research Scholar, PhD Scholar, JJTU,Rajasthan, India.

Abstract: Ventilator-associated pneumonia (VAP) continues to be a significant problem in hospital environments due to its exceptionally high cost, morbidity, and mortality rates. Because of the significance of this medical conditions, it is critical to take preventative steps when providing care for patients on mechanical ventilation. As a common nosocomial illness, ventilator-associated pneumonia (VAP) need trained nursing staff who adhere to established guidelines to enhance patient outcomes. 350 critical care nurses working in various ICUs of an Indian tertiary care hospital participated in a descriptive survey. A self-structured questionnaire was utilized in conjunction with a basic random selection procedure. We looked into the relationship between oral care practices and demographic characteristics using Mann Whitney and ANNOVA. There were 219 (62.6%) critical care nurses with good practice scores, 122 (34.9%) with average practice scores, 5 (1.4%) with exceptional practice scores, and 4 (1.1%) with poor practice scores. The age range of 31 to 35 years old is represented by Critical Are nurses, who adhere to the best oral care practices. Higher professional qualification graduates were found to execute VAP preventive methods more effectively. There was no discernible effect of the nurse-to-patient ratio, hospital type, or critical care setting on promoting appropriate oral hygiene practices for ventilated patients. It has been demonstrated that oral health education, ICU training, and the availability of oral care protocols encourage improved preventative practices in critical care nurses. It is discovered that gender has little bearing on oral care procedures. When providing oral care to ventilated patients, married critical care nurses adhered to greater standards. Hindu critical care nurses have advanced care techniques. The primary nursing bottlenecks for giving oral care to ventilated patients are lack of doctors, concern of tube displacement, lack of time, lack of confidence, and inadequate supplies and equipment.

Key words: Practice; Oral care; Critical care nurse; Ventilator associated pneumonia.

I. INTRODUCTION

Ventilator-associated pneumonia (VAP) continues to be a significant problem in hospital environments due to its exceptionally high cost, morbidity, and mortality rates. Because of the significance of this medical conditions, it is critical to take preventative steps when providing care for patients on mechanical ventilation. VAP, as defined by the World Health Organization, is pneumonia that develops at least 48 hours following the administration of artificial breathing through tracheostomy or endotracheal tube. Institution-specific VAP prevalence ranges from 0.0 to 4.40 per 1,000 ventilator days, according to the National Healthcare Safety Network (NHSN). The incidence of ventilator-associated pneumonia (VAP) varies greatly throughout nations, ranging from 2.13 to 116 per thousand ventilator days. The medical intensive care unit (MICU) in India reported the highest prevalence rate, at 37.5%, while the palliative care ICU in South Korea recorded the lowest prevalence rate, at 2.13%. Depending on the underlying medical condition, the attributable mortality rate for VAP varies from 33-50%, according to study data. Over time, the attributable risk of death has decreased with the introduction of preventative interventions; it is currently estimated to be between 9 and 13 percent. For nourishment and health maintenance, patients in intensive care

units who need mechanical breathing are completely dependent on their nurses. The conditions of the patients are therefore significantly impacted by the skills, attitudes, and actions of critical care nurses. There are numerous methods for lowering the incidence or occurrence of VAP. One of the best methods for lowering VAP in ICU patients using mechanical ventilation is systematic oral care. In actuality, oral care has been superseded and subordinated by numerous other crucial needs of patients admitted to the intensive care unit. Critical care nurses need to be well-versed in these mentioned preventative tactics and promote a positive attitude in order to be able to practice approaches to minimize VAP in ICUs.

2.Materials and Methods

A cross-sectional online survey was undertaken with 350 critical care nurses between the ages of 20 and 45 who operated in critical care settings in tertiary care hospitals in India. Before responding out the questionnaire, all study participants were informed about the study's objective anonymity, and confidentiality, and their agreement was obtained. The final investigation tapped into the responses of 350 nurses. A self-structured attitude scale of 20 items was designed and verified by professionals to assess the attitude on oral care in preventing VAP. Following that, 30 nurses from three tertiary care institutions engaged in a preliminary pilot study. SPSS version 24 was used for statistical analysis. Using descriptive statistics, the overall features of critical care nurses and practice score on oral care were examined. ANNOVA, Mann Whitney, and other statistical methods were used to examine the relationship between critical care nurses' practice score about reducing ventilator-associated pneumonia and selected demographic characteristics. At a significance threshold of 0.05, all statistical analyses were evaluated.

3. Results:

Table 1: Oral care practices in preventing ventilator associated pneumonia amongst critical care nurses.

Practice score	No of cases	Percentage
0 – 12 (Poor)	4	1.1
13 – 24 (Average)	122	34.9
25 – 36 (Good)	219	62.6
37 – 48 (Excellent)	5	1.4
Total	350	100.0

Out of the critical care nurses, 219 (62.6%) had good practice score, 122 (34.9%) had average practice score, 5 (1.4%) had exceptional practice score, and 4 (1.1%) had poor practice score.

With a mean practice score of 27.69 at F value 8.50 and P value <0.0001, critical care nurses in the age range of 31–35 years old have the finest set of practices. There was a statistically insignificant difference in the practice score between males and females. It was discovered that, with a Z value of 0.77 and a P value of 0.44, men and women used the same oral hygiene procedures to prevent VAP. At Z value 4.10, married critical care nurses' practice scores were considerably higher than those of single critical care nurses. Married critical care nurses had a substantially higher practice score (Z value 4.10, P value <0.0001) than single critical care nurses.

Critical care nurses who identify as Hindu have a higher practice score for preventing VAP than nurses from other religions (P = 0.003).P=0.002, or the practice score was considerably higher in graduate and post-graduate critical care nurses than in 12th grade, indicates that graduate critical care nurses exercised superior preventative oral care measures of ventilator associated pneumonia. The study group's practice score for preventing VAP varies with experience year as P<0.0001, meaning that those with 10–12 years of experience had a considerably higher practice score than those with less experience. A professional's degree directly affects their practice score especially when it pertains to preventing VAP; according to study results, P=0.004 indicates that those with a B Sc./M Sc. professional degree had considerably higher practice scores than those with other professional qualifications. The practice score for preventing VAP with a nurse-patient ratio in the study group is unaffected by the ratio, as P>0.05. The study group's type of hospital had no significant impact on the practice score for preventing VAP, with P>0.05 indicating that the practice score for teaching hospitals was higher than that of non-teaching hospitals, but the difference was not statistically significant.

The availability of an oral care protocol enhances the clinical practice of critical care nurses in preventing ventilator-associated pneumonia (VAP). In the study group, the practice score was considerably higher when the

protocol was available (P<0.0001) than when it wasn't. Critical care nurses who receive oral health training improve their oral health practices; in the study group, there is a significant difference in practice scores regarding preventing VAP (P<0.0001), meaning that those who received oral health training had significantly higher practice scores than those who did not. Critical care nurses who have received ICU training report improved clinical oral care practices; in the study group, there was a significant difference in practice scores for preventing VAP (P=0.047) i.e. practice score was significantly more in attended ICU training than not-attended ICU training.

Table 2: Oral Care practices followed in ventilated patients

	Parameters	No of cases	Percentage (n=350)
Total Time take in providing oral care (min)	≤1	9	2.57
	2 – 5	169	48.29
	5 – 10	140	40
	>10	50	14.29
Materials and solvents used for oral care in ventilated patients	Gauze piece and chlorhexidine solution	347	99.14
	Toothbrush and paste	56	16
	Gauze piece and normal saline	47	13.43
	Gauze piece and diluted betadine solution	40	11.43
	Gauze piece and plain Water	96	27.43
	Sodium bicarbonate	13	3.71
Equipment and tools used for oral care in ventilated patients	Toothbrush	63	18
	Fingers manually	71	20.29
	Syringes	148	42.29
	Artery forceps and gauze pieces	350	100
	Tongue depressor	225	64.29
Nursing bottleneck for providing oral care in ventilated patients	Fear of tube displacement	261	74.57
	Non availability of anesthetist or doctor	137	39.14
	Time constraint	246	70.29
	Lack of knowledge	80	22.86
	Low confidence	73	20.86
	Shortage of equipment and supplies	62	17.71
	Not nurses job	12	3.43
Complications encountered while providing oral care	Bleeding	187	53.43
	Biting	291	83.14
	Agitation	224	64
	Tube displacement	161	46
	Aspiration	164	46.86
	Mucosal injury	179	51.14

1.42 (50) % of critical care nurses require more than 10 minutes to provide oral care for ventilated patients, whereas 2.57 (9) % require less than 1 minute. 48.29 (169) % use 2 to 5 minutes. 40 (140) % use 5 to 10 minutes.
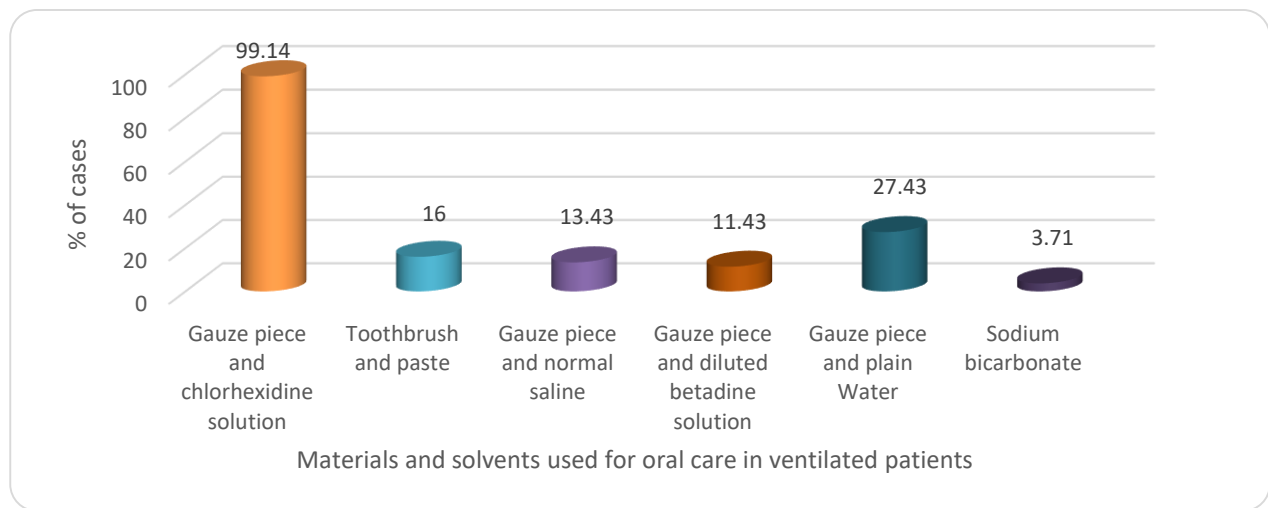
Fig No: 1

Critical care nurses, in general, use a variety of methods to provide oral care to ventilated patients. Of them, 99.14 (347)% prefer to use a Gauze piece and Chlorhexidine solution; 16 (56%), 13.43 (47) % use a toothbrush and paste; 11.43 (40) % use a Gauze piece and diluted betadine solution; 27.43 (96) % use a Gauze piece and plain water; and 3.71 (13) % use sodium bicarbonate solution.

18 (63) % critical care nurses use toothbrush for oral care, 20.29 (71) % uses fingers manually, 42.29 (148) % uses syringes, 100 (350)% critical nurses practice the procedure with artery forceps and gauze pieces and 64.29 (225) % uses tongue depressor.
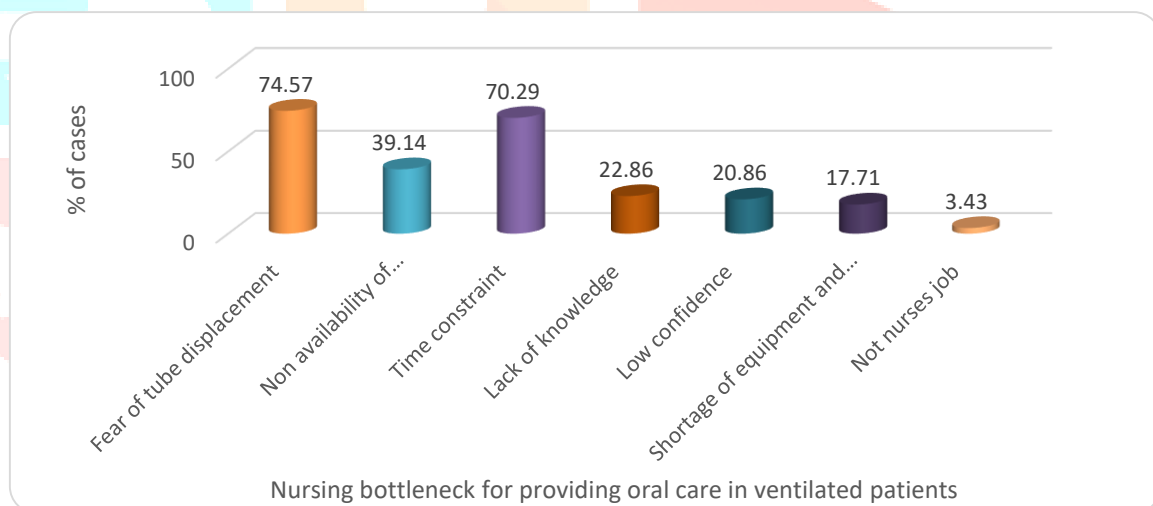

Fig No: 2

74.57 (261) % critical care nurses fears tube displacement during oral care procedures in ventilated patients, 39.14 (137) % experience non-availability of anesthetist or doctor for oral care procedure supervision, 70.29 (246) % critical care nurses feel time constraint, 22.86 (80)% experiences lack of knowledge ,20.86 (73) % have low confidence in performing the procedure, 17.71 (62) % verbalize shortage of equipment and supplies and 3.43 (12) % believe it is not Nurses job.
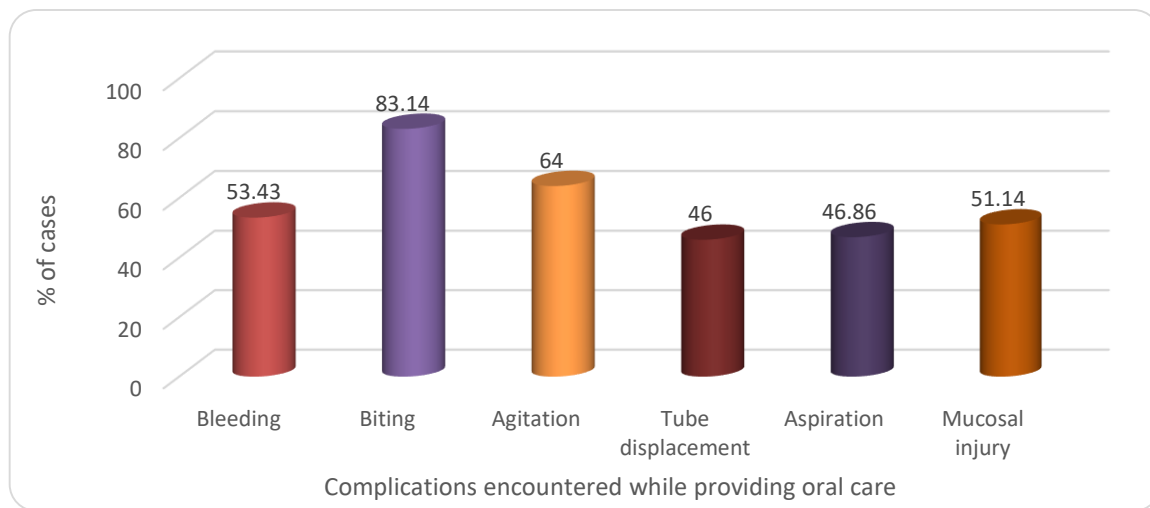
Fig No: 3

53.43 (187) % critical care nurses encounter bleeding as complications encountered during oral care procedures, 83.14 (291) % experience biting, 64 (224)% witnessed agitation, 46 (161)% experience tube displacement, 46.86 (164)% experience aspiration and 51.14 (179) % witnessed mucosal injury.

4. Discussion

Out of 219 critical care nurses (62.6%), 122 (34.9%) had ordinary practice scores, 4 (1.1%) had poor practice ratings, and 5 (1.4%) had exceptional practice scores. Comparable studies showed that 4 nurses (5.56%) had successful VAP prevention measures, while 68 nurses (94.44%) had mediocre ones. For the practice, the median (SD) score was 29.26 (3.01). The outcome aligns with a research conducted by Geetanjali Kalyan (2020).P<0.0001 and F value of 8.50 indicate a significant difference in the study group's practice score for preventing VAP with age. Compared to older age groups, younger age groups are more qualified to provide oral care for ventilated patients. There is no discernible variation in the research group's practice score for preventing VAP based on gender, as indicated by P>0.05 and Z value of 0.77. Although there was a statistically insignificant difference, the practice score of male critical care nurses was greater than that of female nurses. P<0.0001 and Z value of 4.10 indicate a significant difference in the study group's practice score for preventing VAP with married status. Compared to single critical care nurses, married critical care nurses scored much higher on the practice scale. P=0.003 and F value of 4.73 indicate a significant difference in the study group's practice score for preventing VAP by religion; that is, the Hindu faith has a significantly higher practice score than the other religions. P=0.002 and F value of 6.57 indicate a significant difference in the study group's practice score for preventing VAP with certification. Scores for graduate and post-graduate work were significantly higher than those for the 12th grade. The study group's practice score for preventing VAP varies significantly depending on expertise level; P0.0001 and F value are 17.17, respectively. Compared to the other years of experience, the practice score was significantly higher in the group with 10–12 years of experience. Esther Tembo (2019) found that nurses with 10 to 20 years of experience demonstrated greater expertise 45.35% of the time. In contrast, Asia Mukhtar, Muhammad Afzal, and colleagues (2016) found no statistically significant relationship (P (.313) value) between practice and organizational retention. P=0.004 and F value of 3.98 indicate a significant difference in the study group's practice score for preventing VAP with professional qualification, or B Sc/M Sc. Compared to other professional qualifications, the professional qualification received a significantly higher practice score. Abbas Haghighat et al. (2023) found no changes in the practice of nurses with varying degrees, though. Asia Mukhtar, Muhammad Afzal, and associates discovered that there was no statistically significant correlation between the p value (.232) and participant practice and certification. There is no discernible difference in the study group's practice score for preventing VAP with nurse-patient ratio, as indicated by P>0.05 and F value of 1.07. There is no discernible difference in the study group's practice score for preventing VAP with hospital type, as indicated by P>0.05 and Z value of 1.80. Although there was a practice score difference between teaching and non-teaching hospitals, it was not statistically significant. P0.0001 and Z value of 6.22 indicate a significant difference in practice score for preventing VAP with the oral care regimen given in the study group i.e. the practice score was considerably higher in the oral care protocol available group than in the oral care protocol not available group.

The research group's practice score for preventing VAP with oral health education differed significantly, as shown by P<0.0001 and Z value 5.22. Compared to individuals who did not receive oral health training, those who did had a far higher practice score. P=0.047 and Z value=1.99, respectively, indicate a significant difference in the study group's practice score for preventing VAP with ICU training. The practice score for the group that attended ICU training was much higher than for the group that did not.

The duration of an oral care procedure is as follows: 2.57% (09) take less than one minute, 48.29% (169) take two to five minutes, 40% take five to ten minutes, and 14.2% take more than ten minutes (50). Oral care takes less than a minute (6.3%), two to five minutes (68.7%), six to ten minutes (18.7%), and more than ten minutes (6.0%), according to Singla Bhavika, Akshaya N. Shetti, et al. (2019).

Materials and solvents used in the oral care of ventilated patients Of those surveyed, 16% (56) preferred using a toothbrush and paste, whereas 99.14% (347) preferred using a gauze piece and chlorhexidine solution. Normal saline is preferred by 13.43% (47) of respondents, diluted betadine solution by 11.43% (40), plain water by 27.43% (96), and sodium bicarbonate by 3.71% (13) of respondents. According to a survey on mouthwash usage by Abbas Haghighat, Iman Mohammadi, et al. from 2023, 170 nurses (79.4%) preferred chlorhexidine, whereas 44 nurses (20.6%) preferred regular saline. Songwon-ro, Jangan-gu, Suwon-si et al. (2022) identified chlorhexidine' accounted for 41.6% of the oral care products used, and 'gauze' for 25.6%. Akshaya N. Shetti, Singla Bhavika, et al. (2019) revealed similar results where the solutions/materials used for oral care are normal saline 14 (21.8%), Water 26 (40.6%), Toothpaste 08 (12.5%), Chlorhexidine 50 (78.1%), Glycerin 12 (18.7%), and Sodium bicarb 02 (3.1%).

The following equipment and tools are used to provide oral care for ventilated patients: 18% (63) of critical care nurses use a toothbrush, 20.29% (71) use their hands, 42.29% (148) use syringes, 100% of critical nurses use artery forceps and gauze pieces, and 64.29% (225) use a tongue depressor. Singla Bhavika, Akshaya N. Shetti, et al. (2019) drew conclusion of equipments /Tools used in ventilated patients are Tongue depressor 40 (62.3%), Forceps and gauze 60 (93.7%), and Oral suctioning 28 (43.7%).

Nursing bottleneck for administering oral care to ventilated patients: 74.57% (261) critical care nurses fear tube displacement during the procedure; 39.14% (137) experience lack of anesthetist or doctor availability for oral care procedure supervision; 70.29% (246) critical care nurses feel time is limited; 22.86% (80) experience lack of knowledge; 20.86% (73) have low confidence in administering the procedure; 17.71% (62) verbalize lack of equipment and supplies. In Singla Bhavika, Akshaya N. Shetti et al. (2019), similar outcomes are seen. obstacles and issues encountered when giving oral care Patient uncooperative 52 (81.2%), tube displacement (intubated patients) 42 (65.6%), time constraint 08 (12.5%), lack of knowledge 10 (15.6%), and lack of equipment 04 (6.2%) are the most frequent causes of patient resistance.

Complications encountered when offering oral care: 53.43% (187) of critical care nurses experienced bleeding during the procedure, 83.14% (291) spotted biting, 64% (224) noticed agitation, 46% (161) observed tube displacement, 46.86% (164) experienced aspiration, and 51.14% (179) recognized mucosal injury. Complications encountered when delivering care included Bleeding 46 (71.8%), Biting 28 (43.7%), Agitation 20 (31.2%), and Extubation 34 (53.2%), as seen in Singla Bhavika, Akshaya N. Shetti etal (2019).

5. Conclusion:

The critical care nurses' clinical performance is greatly influenced by their education and training in the critical care domain. This, in turn, lowers the morbidity and death rates by improving the health of patients on mechanical ventilation. To support these young nurses and enhance their practical abilities, it is imperative that oral care protocols be updated on a regular basis using evidence-based practice.

Reference:
1. Gadani H, Vyas A, Kar AK. A study of ventilator-associated pneumonia: Incidence, outcome, risk factors and measures to be taken for prevention. Indian J Anaesth 2010;54:535-40.

2. Bhavika S, Shetti AN, Mustilwar R, Anshul S. Awareness and practice of patient's oral care among critical care nurses in a rural tertiary care hospital. Anaesth pain & intensive care 2019;23(3):296-301

3. Kalyan G, Bibi R, Kaur R, Bhatti R, Kumari R, Rana R, et al. Knowledge and practices of intensive care unit nurses related to prevention of ventilator associated pneumonia in selected intensive care units of a tertiary care centre, India. Iran J Nurs Midwifery Res 2020;25:369-75.

4. Ginny Kaushal, Impact of Training on Knowledge, Attitude and Practices Scores of ICU Nurses regarding Standard Precautions of Infection Control in a Super Speciality Hospital of Delhi, PARIPEX - INDIAN JOURNAL OF RESEARCH, Volume: 4, Issue: 8, Page No 282-285. ISSN - 2250-1991

5. Philcy Philip, Amy Villarosa, Anitha Gopinath, Carolin Elizabeth, Gift Norman & Ajesh George (2019) Oral health knowledge, attitude and practices among nurses in a tertiary care hospital in Bangalore, India: a cross-sectional survey, Contemporary Nurse, 55:2-3, 261-274, DOI:10.1080/10376178.2019.1647790

6. Gupta A, Gupta A, Singh TK, Saxsena A. Role of oral care to prevent VAP in mechanically ventilated Intensive Care Unit patients. Saudi J Anaesth 2016;10:95-7. DOI: 10.4103/1658-354X.169484

7. Kharel S, Bist A, Mishra SK (2021) Ventilator-associated pneumonia among ICU patients in WHO Southeast Asian region: A systematic review. PLoS ONE 16(3): e0247832. https://doi.org/10.1371/journal.pone.0247832

8. Sujun Chen , Li Hua, Qianqian Jin and Hezhuo Wang, Correlation of ICU Nurses' Cognitive Level with Their Attitude and Behavior toward the Prevention of Ventilator-Associated Pneumonia. Hindawi, Journal of Healthcare Engineering, Volume 2022, Article ID 8229812, 7 pages. https://doi.org/10.1155/2022/8229812

9. Haghighat A, Mohammadi I, Tahani B. Knowledge, attitude, and practice of nurses in intensive care unit regarding oral and dental care in hospitalized patients. Dental Research Journal. Wolters Kluwer – Medknow. 2021;18:83. 2021.

10. Asia Mukhtar, Muhammad Afzal, Hajra Sarwar. Knowledge, attitude and practices of nurses to oral care for hospitalized patients in services hospital. Saudi journal of medical and pharmaceutical sciences; Vol-3, Issue-5. May 2017:399-407