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## Oral care practices in intensive care unit patients- A critical issue

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### ABSTRACT

*Critically ill patients, who may be unconscious or sedated while they are treated in ICUs, often need assistance of machines to help them breathe (ventilators). The use of these machines for more than 48 hours may result in ventilator-associated pneumonia (VAP). Oral hygiene care, using a mouthrinse, gel, toothbrush, or combination, together with suctioning secretions, may reduce the risk of VAP in these patients. There are recommendations and guidelines for oral care in the ICU administered patients in 2005 AACN Procedure Manual for Critical Care and the guidelines from the Centers for Disease Control and Prevention respectively. However, no gold standard exists for oral care for critically ill patients who are orally intubated. A descriptive study using a self-administered 25 questionnaire was used to describe oral care practices performed by 100 nurses posted in ICU. 84% of the respondents reported oral care practices as a high priority in ICU administered patient. 63% of nurses provided oral care twice a day for an average duration of 20-40 seconds. The most common tool used were spatulas and gauge (30%); toothbrush (16%); spatulas, gauge, tooth brush and suctioning (14%) followed by spatulas, gauge and suctioning (10%) with least used being swabs and foams (2%). 83% of the responders also mentioned use of chemical plaque control, 6% uses toothpaste, 50% used 0.12% chlorhexidine and 25% used toothpaste and chlorhexidine. There is a gap in actual practices compared with policies because of the variations among different organization policies.*

**Keywords:** HAP, VAP, Nosocomial Infection, Oral Care Practices, AACN.

### 1. INTRODUCTION

Ventilator-associated pneumonia (VAP) is defined as pneumonia developing in people who have received mechanical ventilation for at least 48 hours. VAP is a potentially serious complication in those patients who are already critically ill. Intensive care unit patient needs oral assessment and oral care to avoid complications caused by oropharyngeal bacteria. Oropharyngeal colonization is associated with several systemic diseases, including cardiovascular disease, chronic obstructive pulmonary disease and in the intensive care unit (ICU), ventilator-associated pneumonia (VAP).<sup>[1,2,3]</sup>

Oral care is emphasized as an infection control practice for the prevention of Ventilator-Associated Pneumonia (VAP) that has occurrence rate of 9%-24% with mortality rate of 54-71%<sup>[4]</sup> or Hospital Acquired Pneumonia (HAP) that has occurrence rate of 15% with mortality of 20-33%.<sup>[5]</sup> Oral care is an important nursing practice to prevent VAP and HAP development in intensive care unit patients. The materials used during oral care by the intensive care nurses are foam swab, gauze pads, tongue depressors, suction, toothbrush, chlorhexidine mouthwash.<sup>[6]</sup>

Till now there is neither standard oral evaluation tool nor clarity on oral care practices frequency, appropriate solution and appropriate material in ICU patients. An attempt is made to fill this lacunae in knowledge. This study projects on oral care practices in intensive care patients to have a high proof level and be experimental, and longitudinal.

### 2. OBJECTIVES OF THE STUDY

1. To assess the level of knowledge and difficulties concerning hospitalized patients regarding preventive oral health measures among nurses working in Intensive Care Units (ICUs).
2. To describe the frequency of use of oral care interventions reported by nurses in intensive care units (ICUs).

### **3. MATERIALS AND METHODS**

#### **Study Design**

The study was conducted on healthcare professionals posted in the Emergency, General Surgery, Cardiovascular Surgery, and Respiratory ICUs of the Kempegowda Institute Of Medical Science Hospital, V.V.Puram, Bangalore. All the participants were informed about the study protocol and an informed consent was signed and the participation were made voluntary under the approval of AMO, KIMS, Bangalore. Inclusion criteria includes nurses with atleast baccalaureate degree, ICU Professional Experience Year of minimum 2 years, ICU patients with or without mechanical ventilation.

The data were collected using 'Oral Care Practices Survey', which consisted of 25 questionnaires in two sections with multiple choice answers. The first part included questions about demographic characteristics such as age, place of employment, nursing education, years of general nursing experience and years of ICU nursing experience. The second section asked about current nurse's practices and views on oral care such as the type of supplies, solutions and methods used, frequency of oral care and oral assessment. The research team consulted the Public Health Dentistry experts related to the construction of the questionnaires.

Descriptive statistics like percentages were calculated. Inferential statistics like chi-square were used using SPSS (statistical package for social science) version 20. IBM SPASS Statistics [IBM corp. released 2011].

**Sample Size calculation is by formula:  $\{Z^2 \cdot (p) \cdot (q)\} / \Delta^2$**

where,

**Z value** is for the confidence level chosen = 2.58 (for 99% confidence level - from standard normal distribution);

**p** = 88% (based on the accuracy of practice among the nurses from the article Isti HK et al);

**q** = 1-prevalence = (1-0.88) = 0.12;

**Δ** = Margin of error which is acceptable=0.1(or10%); therefore,

**SS** =  $[(2.58)^2 \cdot (0.88) \cdot (0.12)] / (0.1 \cdot 0.88)^2$ .

### **4. RESULT**

A 25 questionnaire based survey(...Annexure 1) was taken from 100 nurses working in ICUs, KIMS Hospital between June,1<sup>st</sup>-December,31<sup>st</sup> 2018 regarding preventive oral health care practices performed in ICU admitted patients.

#### **Demographic characteristics:**

99% of nursing staff in the study were female nurses and 1% brother. 60% of nursing staff were with mean age of  $35.28 \pm 5.66$  years, 84% with graduation degree and 12% were ICU certified. 50% of nurses had mean 7.425 years of experience. The nurses were posted on monthly rotation basis to trauma, cardiac, medicine and surgery ICUs. Demographic data have been presented in Table1, Graph1.

#### **VAP/HAP rates and priority level of oral care:**

68% of the nurses reported to have knowledge about VAP/HAP while 32% reported not knowing the incidence from hospital administration. 18.84% of nurses (n=13 out of 69) who knew about nosocomial infection did not know about coated tongue/biofilm. 84% of the respondents reported oral care practices as a high priority in ICU administered patient and 98% of them provided oral hygiene in ICU administered patients on a daily basis. Table 2 summarizes knowledge about the VAP/HAP.

#### **Oral Care Frequency, Tools, and Duration**

Results indicated that 63% of nurses provided oral care twice a day for an average duration of 20-40 seconds. The most common tool used for oral hygiene practices were spatulas and gauge (30%); toothbrush (16%); spatulas, gauge, tooth brush and suctioning (14%) followed by spatulas, gauge and suctioning (10%) with least used being swabs and foams (2%). 83% of the responders also mentioned use of chemical plaque control, 6% uses toothpaste, 50% uses 0.12% chlorhexidine and 25% uses toothpaste and chlorhexidine. Table 3 summarizes the oral care frequency, tool and duration of tool use. Graph 2,3 represents frequency of oral care and materials used to control biofilm in percentage.

#### **Oral Care Products, Secretion Management, and Oral Cavity Assessments**

0.12% Chlorhexidine gluconate oral rinse solutions were used by 50% of the nurses. 25% of nurses combined toothbrushing, toothpaste, and 0.12% chlorhexidine oral rinses. Graph 4 represents chemical plaque control (%) in percentage. The sequence of chlorhexidine used should be at least 2 hours before manually brushing the teeth to ensure that the chlorhexidine does not deactivate. 66% of the responders perform oral care for patients with oro-tracheal intubation with an average gap of 4.3 hours frequency. During oral cavity assessments, the respondents reported checking for the following: bleeding gums (14%); ulcers and abrasion of soft tissue or oral mucosa (12%); bleeding gums, ulcers and abrasion of soft tissue or oral mucosa (11%); dry mouth (6%) and other conditions being minor observed were dental abscess, dental caries. 78% out of total responders reported they used suctioning with toothbrushing.

#### **Professional attitude towards oral care practices in ICU**

91% of the responders agreed that they get adequate time to provide oral care. 88% out of them provided they have been given adequate training in providing oral care. 94% of the responders agreed that oral care is a high priority for mechanically ventilated patients and 86% out of them considered cleaning oral cavity is difficult task in intubated patients. 68% of nurses disagreed cleaning oral cavity is an unpleasant task. 98% of the nurses reported that they needed better supplies and equipment for oral care maintenance.

## **5. DISCUSSION**

Emergency life-saving therapies, includes external ventilation and blood oxygenation, in severely ill hospitalized patients. Oral health had been found to deteriorate, especially in case of those staying in intensive care units. There is a lack of oral care, as treatment priority is given to advanced medical care, intubation, tracheostomy, external ventilation, as well as mouth breathing leading to hyposalivation which exacerbates oral health deterioration and subsequent complications, also affecting the lower respiratory tract, similar to aspiration pneumonia (Wu et al., 2020).<sup>[7]</sup> Ventilated patients are especially susceptible to pneumonia as their normal host defenses are hampered, blocked or disabled during mechanical ventilation by the physical presence of the assisted-breathing device.

Author Scannapieco JP in 2000 correlated oral bacteria, oral infection, and pneumonia.<sup>[8]</sup> The bacterial load in 1mm<sup>3</sup> of oral biofilm has approx 100 million bacteria that colonizes the supra- or subgingival dental plaque and are shed into the saliva. These pathogenic bacteria can be either those associated with periodontal disease (*P. gingivalis*, *Fusobacterium nucleatum*, etc.) or respiratory pathogens (*P. aeruginosa*, *Klebsiella pneumoniae*, etc.). The saliva is aspirated into the lower respiratory tract (bronchus) where an infection can ensue. Cytokines from periodontally diseased tissues that enter the saliva from the gingival crevicular may be aspirated to stimulate local inflammatory processes that contribute to the initiation and/or progression of infection in the lung. These are predisposing factors of serious oral problems in ICU patients such as increased dental plaque accumulation, bacterial colonization, nosocomial infection and especially VAP.<sup>[9]</sup>

Till date there is no gold standard set for oral care practices in critically ill ICU administered patients. The 2005 AACN procedure manual for critical care<sup>[10]</sup> and the CDC guidelines<sup>[11]</sup> provide recommendations for oral care in ICU patients; however the level of evidence supporting these recommendations is low at present. There exists a gap in the clinical practices performed with the policies proposed and there are even variations among different organisations.

68% of nurses who indicated that they were following oral care policies for critically ill patients admitted in ICU, using most commonly toothbrush and toothpaste, spatula, gauze, suctioning the oral cavity as well as chlorhexidine oral rinse solution. The AACN guidelines recommended brushing the teeth twice daily, swabbing the mouth every 2-4 hours and suctioning the oral cavity frequently.<sup>[10]</sup> Quite large number of professional nurses did not know about the VAP, which was not surprising.

The most common mechanical tool used was spatula and gauge (30%) followed by toothbrush with suctioning (23%) which was significantly greater in intubated patients than non-intubated patients respectively. Previous studies found that toothbrushes and toothpaste are not available in the supply system or less commonly used.<sup>[12,13]</sup> Although the American Dental Association has no standards for the orally intubated patient, toothbrushing with toothpaste is recommended twice a day,<sup>[14]</sup> and this practice is now included in the AACN's oral care protocol for practice.<sup>[15]</sup> Routine use of chlorhexidine in all ICU patients is not recommended by AACN. Nurses in present study reported using 0.2% chlorhexidine mouthwash in 60% of cases. Till date no studies have reported the frequency of suctioning the oral cavity which is indicated to prevent aspiration of oral care solutions and rinses during oral care.<sup>[16-20]</sup> In present study, 78% of nurses reported to perform suctioning the oral cavity while providing oral care practices.

90% of the nurses reported that oral care practices is utmost important in oro-tracheal intubated patients with regular oral status assessment at every 8 hours and the common observations were bleeding gums, ulcers, abrasion of soft tissues and dry mouth. 91% of the nurses agreed that they get adequate time to perform oral care in ICU patients. However, 91% nurses reported that providing oral care practices in ICU patients is a difficult task and 68% of the nurses disagreed that it is an unpleasant task.

The outcome of the study corresponds with the findings of Binkley et al<sup>[12]</sup> and Jones et al<sup>[20]</sup> that oral care is a moderate to high priority (94%) in ICU administered patients. A shift in the priority of oral care in ICU patients had been put forward by AACN and the Institute for Healthcare Improvement when the prevalence of VAP has been campaigned. Furthermore, the critical care nurses may now view oral care as an intervention that prevents HAP and VAP in critically ill patients rather than considering oral care practices only as a comfort-care measure. Meta-analysis suggested that oral care is significantly associated with reduced VAP rates.<sup>[21]</sup>

Among medical and nursing staff in the ICU, oral care is unfortunately a neglected area when compared with other clinical practices.<sup>[22-24]</sup> There is evidence that oral care can minimize the incidence of oral complications in ICU patients as well as decreasing the risk of the development of oral problems, and can hinder the onset of these complications.<sup>[25-28]</sup> The 2005 AACN Procedure Manual for Critical Care and the CDC guidelines provide recommendations for oral care; however, the level of evidence supporting these recommendations is generally low. Therefore, we should not surprise to see a gap in actual practices compared with policies because of the variations among different organization policies.

Additionally, a review of literature shows that nurses have been reported to lack the necessary knowledge to adequately assess patient's oral health status and to accurately manage oral care practices.<sup>[29]</sup> Although sound oral care is efficacious in reducing oral problems, it has been demonstrated in the literature that the oral care measures of ICU nurses are not documented nor are they in accordance with the most recent evidence. Furr et al. point out some barriers such as insufficient time, lack of continuity of care and equipment shortage, which lead to this situation.<sup>[30]</sup>

## **6. LIMITATIONS OF THE STUDY**

1. Limited sample size
2. Variability in the Oral Care Practices in ICU set up
3. Insufficient certified ICU staffs

4. Inter and Intra hospital variability in oral care practices not established
5. No standardized oral care protocol established in ICU administered patients

## 7. CONCLUSION

In India, not enough studies have been conducted dealing with the implications of effective oral care in ICUs, and different techniques and products are used for oral care by ICU nurses. Furthermore, there is sometimes no uniform method of oral care even in the same unit, and no data is available about the current state of oral care practices and the factors related to its practice among ICU nurses. Therefore, this study have been conducted to assess the knowledge of oral care practices prevailing among ICU set up healthcare workers. An insight into the difficulties concerning hospitalized patients with preventive oral health measures were highlighted among nurses working in Intensive Care Units (ICUs). Additionally, it is thought that the results of this study could be a reference point for further education and training of nurses imparting oral health care in ICU administered patients. There is a gap in actual practices compared with policies because of the variations among different organization policies. An attempt has been made to fill the lacunae and further establishing studies related to oral care interventions in critically ill patients.

## 8. ACKNOWLEDGEMENT

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## 9. CONFLICT OF INTEREST

None declared.

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**TABLES**

**Table 1. Demographic data**

<b>Gender</b>	<b>Female (99)</b>	<b>Male (1)</b>
<b>Mean age (mean)</b>	<b>35.28 ± 5.66 years</b>	
<b>Professional qualification</b>	<b>Graduate (84)</b>	<b>Post graduate (1)</b>
<b>ICU certified</b>	<b>12</b>	
<b>Professional experience (mean)</b>	<b>7.425 years</b>	

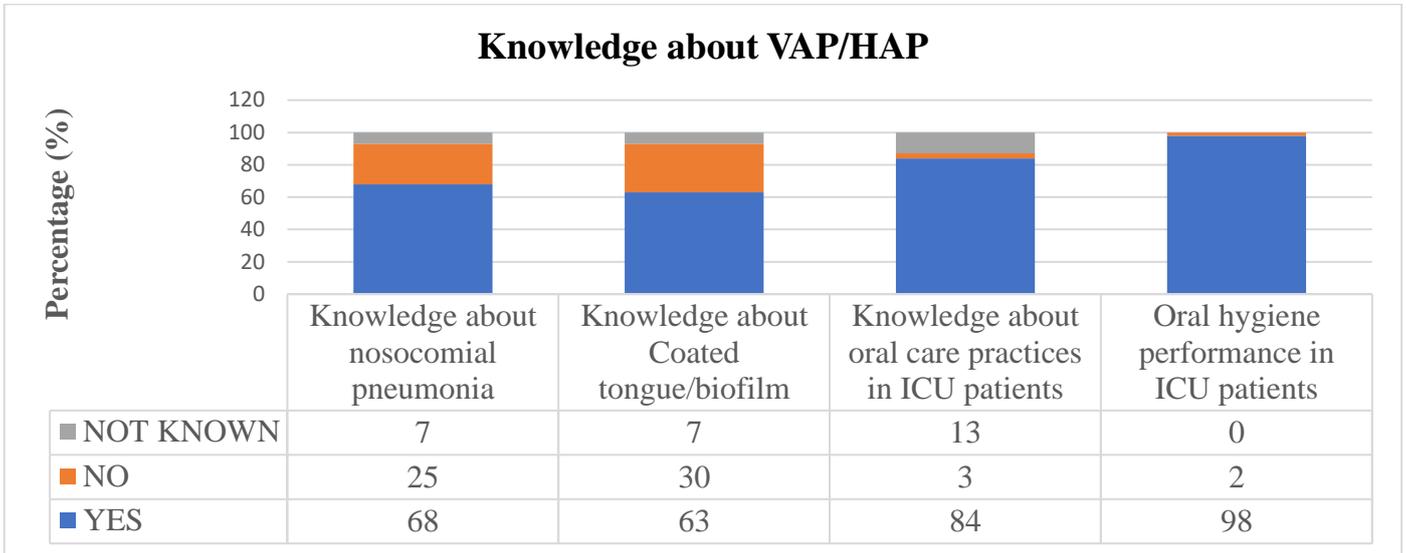
**Table 2. Knowledge about VAP/HAP**

<b>Frequency of oral care in ICU patients</b>	<b>Once (22)</b>	<b>Twice (63)</b>	<b>Thrice (3)</b>	<b>More (2)</b>
<b>Material used to control biofilm</b>	<b>Spatulas and gauge (30)</b>	<b>Toothbrush (16)</b>	<b>Suctioning (10)</b>	<b>Swabs and foams (2)</b>
<b>Chemical plaque control</b>	<b>0.2% CHX (60)</b>	<b>Toothpaste (6)</b>	<b>0.2 CHX+ Toothpaste (17)</b>	<b>None (17)</b>
<b>Duration of material use</b>	<b>≤20 sec (6)</b>	<b>20-40 sec (66)</b>	<b>40-60 sec (9)</b>	<b>≥60 sec (19)</b>

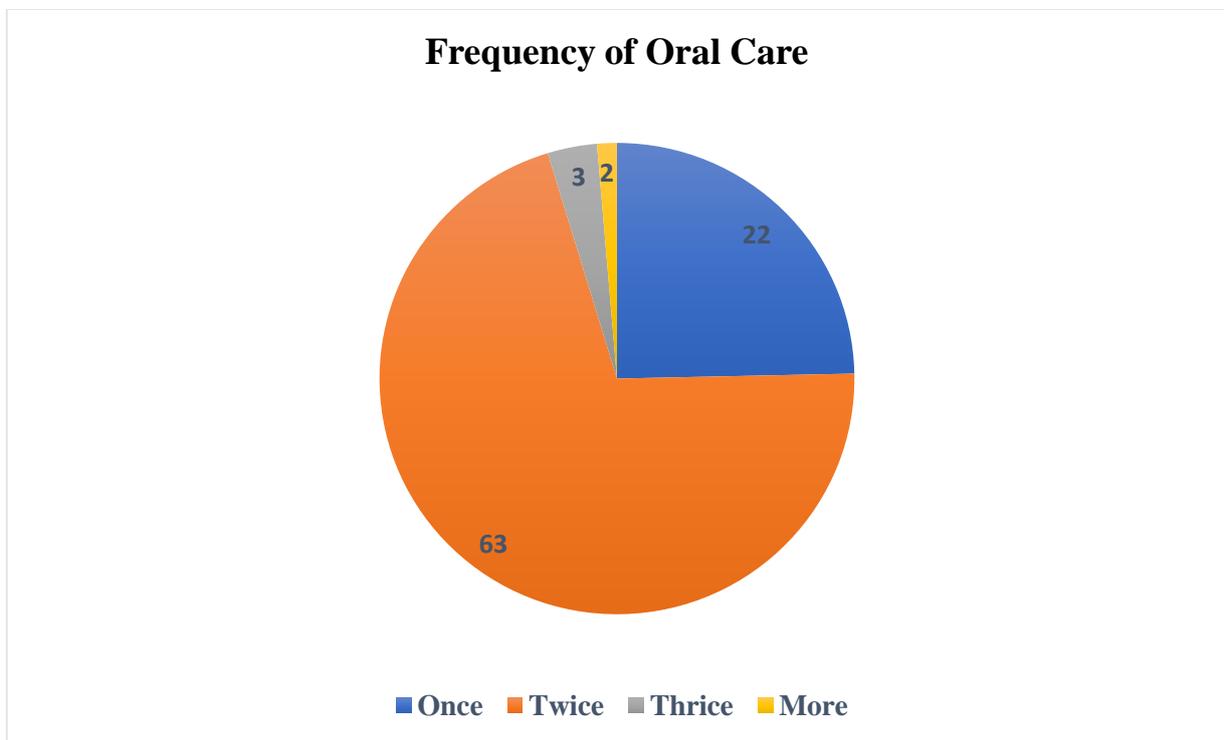
**Table 3. Oral care frequency, tool and duration of tool use.**

<b>Knowledge about nosocomial pneumonia</b>	<b>Yes (68)</b>	<b>No (25)</b>	<b>Not known (7)</b>
<b>Knowledge about Coated tongue/biofilm</b>	<b>Yes (63)</b>	<b>No (30)</b>	<b>Not known (7)</b>
<b>Knowledge about oral care practices in ICU patients</b>	<b>Yes (84)</b>	<b>No (3)</b>	<b>Not known (13)</b>
<b>Oral hygiene performance in ICU patients</b>	<b>Yes (98)</b>	<b>No (2)</b>	

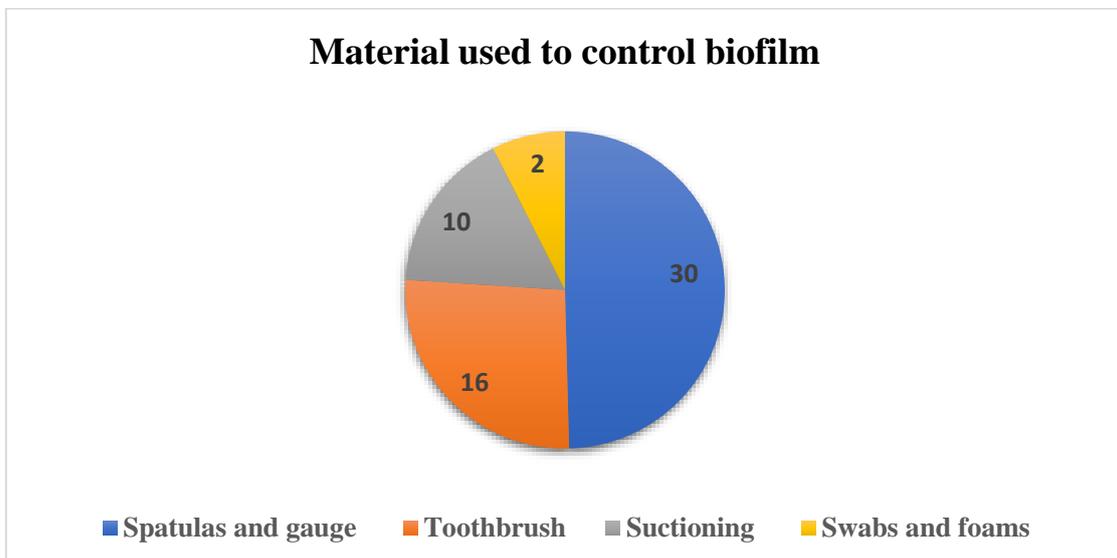
**GRAPHS**



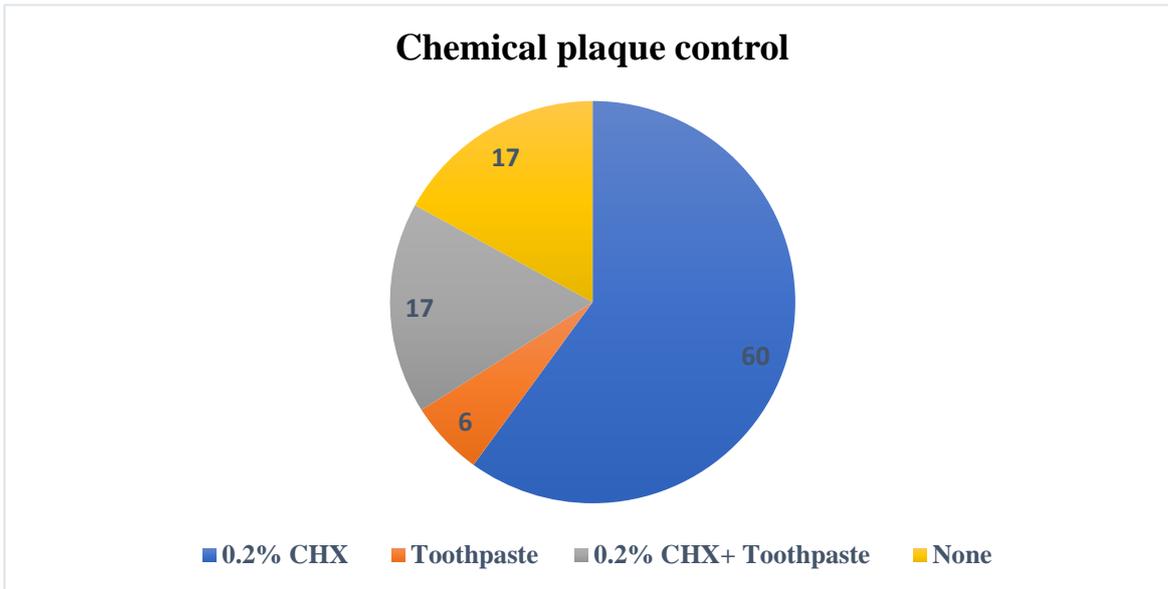
Graph 1. Describes knowledge about VAP/HAP in percentage.



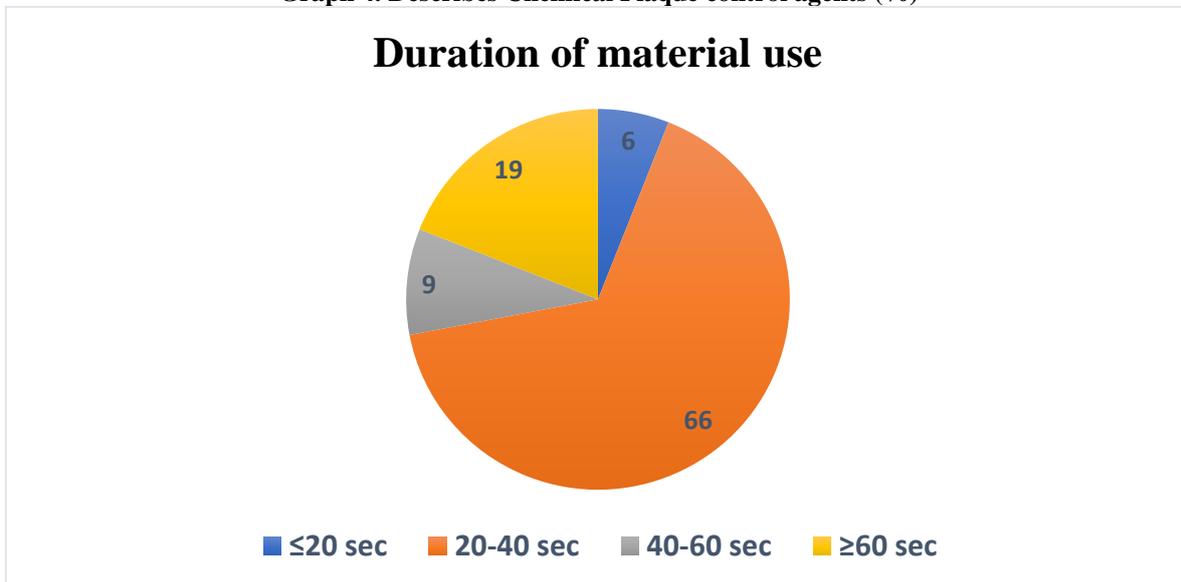
Graph 2. Describes frequency of Oral Care (%)



Graph 3. Describes material used to control biofilm (%)



Graph 4. Describes Chemical Plaque control agents (%)



Graph 5. Describes Duration of Material Use (%)

**Annexure 1.**

**SURVEY ON “ASSESSMENT OF ORAL CARE PRACTICES IN INTENSIVE CARE UNIT PATIENTS: A HOSPITAL BASED SURVEY”**

The purpose of this study is to assess the knowledge of oral care practices done by Nurses among patients admitted In ICU whether mechanically ventilated or non-ventilated.

**CONSENT**

I have had the opportunity to ask questions about the survey and any questions that I had, have been answered to my satisfaction. I gave consent to participate in this survey.

Date: \_\_\_\_\_ Signature of the Participant: \_\_\_\_\_

AGE: \_\_\_\_\_ GENDER: \_\_\_\_\_ PROFESSION: \_\_\_\_\_

**1. PROFESSIONAL QUALIFICATION:**

- i. Graduate degree
- ii. Postgraduate
- iii. ICU certified
- iv. Post basic critical care

**2. PROFESSIONAL EXPERIENCE (Years):**

- i. 1-3
- ii. 3-6
- iii. 6-9
- iv. >9

**3. SHIFT \_\_\_\_\_ LENGTH \_\_\_\_\_ (hours/day):**

- i. 6
- ii. 8
- iii. 12
- iv. 24

**4. ICU DEPARTMENT:**

- i. Trauma
- ii. Cardio
- iii. Medicine
- iv. Surgery

**5. NUMBER OF BEDS IN ICU:**

- i. 5-10
- ii. 10-15
- iii. 15-20
- iv. >20

**6. DO YOU KNOW ABOUT NOSOCOMIAL PNEUMONIA:**

- i. Yes
- ii. No
- iii. Not Known

**7. DO YOU KNOW ABOUT COATED TONGUE/ BIOFILM:**

- i. Yes
- ii. No
- iii. Not Known

**8. DO YOU KNOW ABOUT ORAL CARE PRACTICES IN PATIENT WITH ICU:**

- i. Yes                      ii. No                      iii. Not Known

9. DO YOU PERFORM ORAL HYGIENE ON ICU PATIENTS:

- i. Yes                      ii. No

IF YES ANSWER ( 10,11,12,13,14 )

10. FREQUENCY OF ORAL CARE PROVIDED (PER DAY):

- i. once                      ii. Twice                      iii. Thrice                      iv. or more

11. WHAT MATERIALS ARE USED FOR CONTROL OF BIOFILMS:

- i.Spatulas and Gauze                      ii.Tooth Brush  
iii.Suctioning                      iv.Foam Swabs                      v. None

12. WHAT IS THE DURATION OF MATERIAL USE:

- i. <= 20 sec                      ii. 20-40 sec                      iii.40-60 sec                      iv. > 60 sec

13. DO YOU USE CHEMICAL CONTROL OF BIOFILM:

- i. Yes                      ii. No

14. IF YES, WHAT MATERIALS YOU USE IN CHEMICAL PLAQUE CONTROL:

- i. Toothpaste                      ii. 0.12% chlorhexidene  
iii. 0.12% chlorhexidene and toothpaste                      iv. None

15. DO YOU PERFORM ORAL HYGIENE FOR PATIENT WITH ORO-TRACHEAL TUBE INTUBATION:

- i. Yes                      ii. No

16. WHAT IS THE FREQUENCY OF ASSESSING ORAL CAVITY:

- i. Every 2hrs                      ii. Every 4hrs                      iii. Every 8hrs or more                      iv. Do not assess

17.DO YOU ASSESS THE ORAL STATUS OF MECHANICALLY INTUBATED PATIENTS:

- i.Yes                      ii. No

18. WHICH OF THESE DO YOU OBSERVE WHILE ORAL ASSESSMENT :

- i. Dental caries                      ii. Bleeding Gums  
iii. Dry mouth                      iv. Ulcers and abrasion of soft tissue or oral mucosa  
v. Oral mucosal or dental abscess                      vi. I do not assess the oral cavity

**PROFESSIONAL ATTITUDE TOWARDS ORAL CARE PRACTICES IN ICU:**

19. I HAVE ADEQUATE TIME TO PROVIDE ORAL CARE:

- i. Agree                      ii. Disagree

20. I HAVE BEEN GIVEN ADEQUATE TRAINING IN PROVIDING ORAL CARE:

- i. Agree                      ii. Disagree

21. ORAL CARE IS HIGH PRIORITY FOR MECHANICALLY VENTILATED PATIENTS:

- i. Agree                      ii. Disagree

22. CLEANING THE ORAL CAVITY IS UNPLEASANT TASK:

- i. Agree                      ii. Disagree

23. THE ORAL CAVITY IS DIFFICULT TO CLEAN SPECIALLY IN PATIENT WITH ORO-TRACHEAL INTUBATION:

- i. Agree                      ii. Disagree

24. I NEED BETTER SUPPLIES AND EQUIPMENT FOR MAINTAINING ORAL CARE:

- i. Agree                      ii. Disagree

25. WHEN I PERFORM TOOTHBRUSHING I ALSO USE THE ASPIRATION:

- i. Agree                      ii. Disagree