Oral care practices in Egypt intensive care units—a national survey.

Dr. Mohammed A. Osman¹, Dr. Reham Lotfy Aggour²


Affiliation:
1. Consultant Critical Care Medicine, Arab Contractors Medical Center, Cairo, Egypt
2. Lecturer, Department of Oral Medicine and Periodontology, Faculty of Dentistry, October 6 University, 6th October city, Egypt

Correspondence Address:
Reham Lotfy Aggour
Lecturer, Department of Oral Medicine and Periodontology, Faculty of Dentistry, October 6 University, 6th October city, Egypt
rehamaggour@rocketmail.com

ABSTRACT:
Background: Oral care is often given lower priority than other nursing interventions in intensive care units (ICUs) and little work has been done to measure reliably current oral care practices nationwide.

Objectives: The objectives of the study were to explore the type and frequency of oral care delivered to ventilated patients and the availability of oral care protocols in the ICU.

Methods: A randomly selected survey was conducted among 30 intensive ICUs within Egypt using self-administered questionnaire. The oral care survey items were designed to elucidate information on the type and frequency of each specific task for oral care.

Results: Twenty-eight questionnaires were received and evaluated (93%). About 64% of all respondents reported having protocols available for preventing VAP. Systemic antibiotic regimens performed by 16 units (57%). Only 6 units (21%) reported cleaning the patients' teeth mechanically with a toothbrush. Four units (14%) use chlorhexidine as a disinfectant. About 78% use the gel form. Forty-three percent of the responding hospitals performed routine oral cleaning procedures three times a day. 64% units start oral care measures immediately after intubation.

Conclusions: Oral care practices were neither standardized nor consistently implemented in the evaluated Egyptian intensive care units of the responding hospitals. Additional and improved measures have to be determined to confirm or optimize prophylactic oral strategies and to create standards and guidelines for this at-risk patient collective. The use of toothbrushes should be given more attention.

Key words: Intensive care unit; dental plaque; pneumonia

Introduction:
The oral cavity has long been considered a potential
reservoir for respiratory pathogens. Bacteria commonly causing nosocomial pneumonia colonize the oral habitat of ICU patients, and microaspiration of oropharyngeal secretions is recognized as a major risk factor for nosocomial pneumonia. Scannapieco et al. found that 65% of the plaque and/or oral mucosa in 34 medical ICU patients was colonized by respiratory pathogens, compared with only 16% in 25 preventive dentistry clinic patients (P <.05). The mechanisms of infection could be aspiration into the lung of oral pathogens capable of causing pneumonia, colonization of dental plaque by respiratory pathogens followed by aspiration, or facilitation by periodontal pathogens of colonization of the upper airway by pulmonary pathogen. Dental plaque and the number and type of oral organisms increase over time in the critically ill intubated patient. In a study by Heo and colleagues, isolates of Staphylococcus aureus, Pseudomonas aeruginosa, Acinetobacter, and enteric species recovered from plaque were indistinguishable from isolates obtained from broncho-alveolar lavage. Moreover, Actinobacillus actinomycetemcomitans and Fusobacterium nucleatum have both been isolated from infected lungs, whereas Pseudomonas aeruginosa, a known pulmonary pathogen, has been isolated from patients with “refractory” periodontitis.

Moreover, salivary volume plays a role in ventilator associated pneumonia (VAP). Abnormalities in salivary flow may place patients at risk for overgrowth of organisms. The immune components of saliva control oral microorganisms; however, lower salivary volumes decrease this response and are associated with risk for VAP. Additionally, increased levels of proteases in the oral secretions of critically ill patients remove from their epithelial cell surfaces, a glycoprotein substance called fibronectin. Fibronectin is probably involved in the ecology of the mucosal flora by providing binding sites for oral streptococci while inhibiting adhesion of more virulent bacteria. This depletion of fibronectin in the critically ill allows cell receptor sites to replace normal flora with virulent pathogens such as Staphylococcus aureus and different strains of gram negative bacteria, including Pseudomonas aeruginosa and Actinobacter on buccal and pharyngeal epithelial cells.

Thus, VAP might be avoided by preventing pathogen colonization of the oropharynx. VAP is the second most common nosocomial infection in the ICU; affecting approximately 27% of ICU patients. VAP is associated with increased morbidity and mortality, longer ICU and hospital stays, and higher healthcare costs. Healthy persons can maintain oral health independently, but critically ill patients in the intensive care units (ICU) are occasionally unconscious and intubated. They are, therefore, dependent on the quality and frequency of care provided by healthcare professionals to prevent dental plaque formation and oral microbial growth. However, despite the fact that recent research has highlighted the importance of oral care in the prevention of VAP, oral care has been a low-priority intervention in intensive care units (ICUs) and has been regarded by the ICU team as a comfort measure for patients. Oral care practices in the ICU vary widely with some being more effective than others. The most important focus of oral care is plaque control.

The two most effective practices for controlling plaque are tooth brushing (if correctly done) and the use of chlorhexidine (CHD), a broad-spectrum antibacterial agent.\(^ {17}\) Foam/gauze swabs moistened with either mouthwash or water are still frequently used in practice\(^ {18, 19}\), even though they have been found to be ineffective for plaque removal.\(^ {20}\)

Providing evidence-based oral care may improve oral health and decrease the incidence of VAP in critically ill patients. Surveys of oral care practices conducted in ICUs in the USA\(^ {14}\), Europe\(^ {21}\) and the UK\(^ {22}\) were found in the literature, but no such studies appear to have been published in Egypt. An important first step in changing practice is to ascertain current practice. It was therefore decided to conduct a national survey of current oral care practices in Egypt ICUs to assess current practice and to identify areas for potential improvement.

**METHODS:**

**Study design**

A randomly selected survey was conducted among 30 intensive care units (ICU) within Egypt using self-administered questionnaire. The oral care survey items were designed to elucidate information on the type and frequency of each specific task for oral care.

**Participants**

Our target group was directors of ICUs. The director of each unit was contacted by mail to ask permission for participation. Directors mailed the questionnaire by post to the primary investigator. Selected ICU was defined as an unit meeting all the following criteria: provides facilities for invasive mechanical ventilation, and pump-controlled administration of infusion, functions 24 hours a day and 7 days a week, and there is at least one doctor immediately available at all times to deal with emergencies. Units were excluded if they cared solely for pediatric patients, specialist patient groups (e.g. neuro-intensive care units) or if they were mixed high dependency/ICU facilities with a large proportion of non-ventilated patients. Participation in the study was voluntary, and anonymity and confidentiality were assured.

**Survey instrument**

The questionnaire used for the survey was based on one developed by Gmür et al\(^ {27}\). Permission to use the questionnaire was obtained from these authors. The survey was conducted using a 10-item self-administered questionnaire with YES/NO and multiple choice questions. Prior to starting the official survey, the questionnaire was tested at 3 clinics for the comprehensibility and completeness of the items. The questionnaire was designed to gather information related to current oral care practices; it was kept very short to improve participation. Data collection was conducted from 1 December 2013 until 29 December 2013.

One of the first central points of this survey was whether protocols for VAP prevention existed. Furthermore, questions on the use of mechanical and chemical interventions were asked in addition to mode and frequency of application (Table I). We added to Gmür’s questionnaire questions addressing barriers that prevent oral care (Table I). Answers were described and evaluated (number of positive answers and percentages).
Table I: Questionnaire findings in Egyptian units (n=28).

Questions and answers: Evaluation of data was descriptive (number of positive answers and percentage).

<table>
<thead>
<tr>
<th>(Choice) Question</th>
<th>Answered with “yes”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>1 Does your clinic have protocols for preventing VAP?</td>
<td>18</td>
</tr>
<tr>
<td>2 Is systemic antibiotic prophylaxis conducted routinely?</td>
<td>16</td>
</tr>
<tr>
<td>3 Which oral hygiene measures are performed? (multiple answers possible)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Toothbrush</td>
<td>6</td>
</tr>
<tr>
<td>Toothpaste</td>
<td>6</td>
</tr>
<tr>
<td>4 A. Are disinfectants used?</td>
<td>24</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>4</td>
</tr>
<tr>
<td>Iodine</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
<td>20</td>
</tr>
<tr>
<td>B. In what form are the disinfectants used?</td>
<td></td>
</tr>
<tr>
<td>Spray</td>
<td>0</td>
</tr>
<tr>
<td>Gel</td>
<td>22</td>
</tr>
<tr>
<td>Ointment</td>
<td>0</td>
</tr>
<tr>
<td>Solution</td>
<td>4</td>
</tr>
<tr>
<td>C. How is the agent applied?</td>
<td></td>
</tr>
<tr>
<td>Toothbrush</td>
<td>0</td>
</tr>
<tr>
<td>Finger</td>
<td>4</td>
</tr>
<tr>
<td>Gauze</td>
<td>22</td>
</tr>
<tr>
<td>Medication carrier/tray</td>
<td>0</td>
</tr>
<tr>
<td>5 How many times per day are these oral hygiene measures conducted?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>2×</td>
<td>12</td>
</tr>
</tbody>
</table>
3x

6  Who performs them? 12  43
   Nursing staff 24  86
   Patients' relatives/friends 2  7

7  How many days after intubation are the oral hygiene measures started? 18  64
   Immediately
   1 day 4  14
   2 days 4  14
   Later 0  0

8  Are removable dental prostheses removed? 28  100

9  Is saliva substitute used? 0  0

10 Which barriers prevent proper oral care? (multiple answers possible) 12  43
    Time constraints
    Fear of dislodging the patient’s endotracheal tube. 6  21
    Patient discomfort 2  7

Results
In total, 28 of the 30 questionnaires were returned, which is a 93% response rate.

Protocol/guideline
The results are given in (Table I). Eighteen units (64%) acknowledged the availability of a VAP-prevention protocol in their units. Ten (36%) stated that they had no oral care protocol/guideline available.

Measurements
Type and frequency
Both the type and frequency of oral care provision varied among the participants in this survey (Table I).

Sixteen ICU (57%) routinely performed a systemic antibiotic regimen to prevent VAP. Only 6 units (21%) reported cleaning the patients' teeth mechanically with a toothbrush. Another 6 (21%) ICU use toothpaste.

Mouthwash was used by all but 4 ICU. Four units (14%) use Chlorhexidine as a disinfectant. None used Povidone-iodine solutions. Twenty ICU (71%) used other solutions.

Twelve ICU (43%) report rinsing their patients' mouths 8-hourly. Another twelve indicated doing so twice a day.

Gel was the primary material used by the majority (78%). In 14% of the cases, a solution was mentioned as the application form. No spray or ointment forms were used.

The answers to the question on application form: 78% used gauze, 14% used a (gloved) finger, and 7% answered this question by none.

Most units (n=18, 64%) started oral care measures immediately to admission. Four ICU began oral prophylaxis after one day, and 4 ICU after 2 days of intubation.

In response to "who performs oral care?" more than 86% (n = 24) responded "nursing staff," 7% (n = 2) indicated patients' relatives/friends.

Removable dental prostheses were always removed before intubation. Saliva substitute was not administered by any of the clinics.

Participants reported that barriers preventing proper oral care for patients who are intubated are insufficient time to provide oral care (43%), fear dislodging or displacing the endotracheal tube (21%), patient discomfort (7%). Thirty-six % reported that neither of these factors are barriers against performing oral care.
Discussion

Recent research has highlighted the importance of oral care in the prevention of ventilator-associated pneumonia. Increases in dental plaque are noted to predict VAP in severely critically ill patients. The center for Infectious Disease Control and Prevention CDC's 1983 guidelines for prevention of nosocomial pneumonia were the first recommendations for oral prophylaxis in critically ill patients, however, important aspects of oral hygiene are still the subject of controversial discussion, and even today no consensus exists on how to uniformly conduct oral hygiene most efficiently and simply. In the last 5 years, a clear tendency toward standardizing the VAP prophylaxis protocols has become evident. This survey described the type and frequency of oral care provided to ventilated patients in the ICUs in Egypt. The survey has provided an important insight into oral care practice and identified areas for future improvement.

The central, primary item in the present survey was the presence of VAP prevention protocols. The presence of protocols in the unit was found to affect the oral care provided. Cutler and Davis found that there was an increase in the frequency and comprehensiveness of the oral care that was provided after the implementation of a standardized protocol. About 64% of the participating Egyptian ICUs possessed protocols for preventing VAP. This finding is similar to the previous study performed by Gmürl et al. In the contrary, Perrie & McCur acknowledged the availability of such a document in 33.3% and 46% of their units respectively; however, the participants in our survey were the directors of the ICUs not nurses as in Perrie & McCur’s study. This may account for the difference in results. Although the presence of an oral care protocol/guideline does not guarantee compliance with the recommendations, the large number of units that do not have protocols/guidelines must be considered.

In the present survey, 16 (57%) of the participating clinics performed systemic antibiotic prophylaxis. The dominant opinion among the rest was that the disadvantages due to the development of resistant pathogens outweigh the benefits of prophylactic antibiotic treatment for preventing VAP.

In terms of the question on plaque reduction, only 6 units (21%) reported brushing the teeth of intubated patients, and 6 (21%) used toothpaste. In the literature, mechanical plaque control is seen as an important factor in the prevention of VAP. Less importance is placed on the use of various cleaning agents. A previous European survey found that although 88% of ICUs used mouthwashes, principally chlorhexidine, only 41% brushed the patients' teeth. This is similar to the 40% of ICUs in the United States that include regular toothbrushing in their oral care practice. A toothbrush is the most effective method of cleaning the mouth and removing plaque or other debris from the teeth, gums and hard palate. In 2006, the American Association of Critical Care Nurses published a clinical practice alert recommending that ICU protocols include tooth brushing with a soft pediatric or adult-sized manual toothbrush to remove dental plaque. The use of a manual toothbrush has been emphasized as part of standard oral care. Electric toothbrush is probably more effective than a manual one at removing plaque but is rarely used in the ICU setting.

The recently published National Institute for Health and Clinical Excellence (NICE) guidelines on the prevention of VAP in adults recommend the use of an
oral antiseptic in all patients who are intubated and receiving mechanical ventilation. More than 85% of the participating Egyptian ICUs answered that they applied oral disinfectants. Of these, only 14% used chlorhexidine. These data differ from those of similar surveys in Europe (61%) and the USA (61%).

The application of chlorhexidine (CHX) in oral hygiene regimen for VAP prevention was suggested by NICE in cooperation with National Patient Safety Agency (NPSA). However, a meta-analysis of 4 randomized, controlled studies demonstrated that the sole use of CHX for oral decontamination did not significantly reduce the incidence of nosocomial pneumonia and had no influence on the mortality rate. However, the results of this meta-analysis must be viewed critically, since more recent studies showed a positive effect. In a prospective, randomized, placebo-controlled double-blind study, Cabov et al. showed that oral decontamination with CHX significantly reduced the oropharyngeal colonization rate, the incidence of nosocomial infections, the length of stay at the hospital, and the mortality of patients at a surgical ICU. The anti-plaque activity of CHX is superior to that of other antiseptic mouthwashes, having better antibacterial properties making it the agent of choice.

In this survey, only 14% ICUs used CHX. The lack of usage of CHX may indicate lack of awareness about current best practice recommendations. None of the participating clinics reported using iodine as a disinfectant in the oral cavity. Due to the danger of absorption with prolonged use, iodine use in the oral cavity is not recommended; furthermore, an allergenic potential has been discussed. Twenty ICUs (71%) used other solutions mainly oral antifungals.

In terms of application form, the majority of participants (78%) indicated using the active substances as gels. In 14% of the cases, a solution was mentioned as the application form. No spray or ointment forms were used. Regarding relevance, the application of CHX solution seems to make the most sense. An in-vivo study compared the antimicrobial activity of CHX in 0.2% and 0.12% solutions, as a 0.2% gel, as 0.2% and 0.12% sprays, and as a swab saturated with 0.2% solution. The results clearly demonstrated the superior antimicrobial properties of the 0.2% CHX solution. Surprisingly, this data on using CHX is not included in the discussions of comparative meta-analyses of chlorhexidine, its form and its effect on the incidence of VAP.

Regarding implement ability, the spray application or decontamination using gauze soaked with CHX are probably much simpler than thorough, adequate rinsing of the oral cavity with a solution or using a toothbrush. This point should not be underestimated, given the fact that some studies found that many of the surveyed nurses found cleaning the mechanically ventilated patient's oral cavity difficult. This situation should be taken into consideration when developing a protocol. In the current survey, gauze was the method of choice (79%). A gloved finger was the second most frequently used method (14%). None uses toothbrush or medication carrier/trays. A similar survey showed that in intubated patients, toothbrushes were used less and gauze more often. This in contrast to other studies which reported using a toothbrush for performing oral hygiene by 67% of those surveyed. The finger application of CHX – reported by 14% of the clinics – makes little sense as no relevant studies on it exist, and only CHX gel can be applied using a finger, meaning it is less effective.

Oral hygiene measures were performed three times a day by twelve ICU (43%) of those surveyed, twice a day by twelve. No one do this once a day. The same question in the survey by Gmür et al showed that 0% performed...
oral hygiene once, 24% twice, and 76% three times a day. As far as is currently known, the ideal frequency of such measures in the context of VAP has never been examined.

The question as to how long after intubation such measures should be started must also be discussed. Eighteen of 28 ICUs start oral hygiene immediately after intubation. Four ICU began oral prophylaxis after one day, and 4 ICU after 2 days of intubation. It would have been helpful to learn the reason for this. Plaque formation and its external colonization with pneumopathogenic bacteria should be fought as quickly as possible. Using chlorhexidine in the early phase after intubation decreases the number of cultivatable oral bacteria and can slow the development of VAP.\[49\]

All Egyptian clinics removed any removable dental prostheses before intubation. Prostheses serve as a reservoir for bacteria which can cause VAP.\[50\] Removing the prosthesis thus easily eliminates a dangerous source of contamination and should always be done.

None of the participating clinics reported using moisturizing agents. There is different assessment of this point. Because intubation keeps the mouth open, it dries out; thus, moistening the oral cavity makes sense. However, saliva substitute leads to more liquid in the oral cavity, thus possibly facilitating micro aspiration around the tube's cuff.

Improving oral care in ICUs is a multi-layered task – certainly not as simple as it appears on the surface. Barriers to providing adequate oral care in hospitalized patients have been identified. Participants reported that barriers preventing proper oral care for patients who are intubated are insufficient time to provide oral care (43%), fear dislodging or displacing the endotracheal tube (21%), patient discomfort (7%). Interestingly, 36% reported that neither of these factors are barriers against performing oral care for Intubated patients.

As adequate oral hygiene may provide a simple and cost-effective method of reducing the incidence of VAP and consequently morbidity and mortality in ICU patients, then providing more training in this area and the provision of adequate resources could be beneficial. Dentistry can make a relevant contribution to this. Oral hygiene guidelines should contain simple, clear statements on which mechanical and/or chemical aids of what type must be applied and how often.

This survey describes some aspects of current practice of oral care in Egypt and should be a step towards changing practice in our ICUs. The various practices indicate that there is a need of having a standardized oral care protocol. Apparently, there is to date no Egypt-wide standardized evidence-based guidelines on oral hygiene practices for preventing nosocomial pneumonia, in particular VAP.

The 81% response rate of ICU directors in the randomly selected institutions that agreed to participate in this survey research project was satisfactory considering the busy ICU environment. We believe that a representative sample based on geographic distribution and heterogeneity of the institutions and respondents was achieved.

Selection bias must be considered as a limitation of this study. As in any survey research, ICU directors most interested in oral care were most likely to have agreed to participate even though the individual surveys were anonymous.

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