Oral care practices among orally intubated patients - a systematic review

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Abstract

Background: Oral care for orally intubated patient is of paramount importance for various reasons such as to decrease the nosocomial infections, decrease in antibiotic days and length of stay in intensive care unit, reduce the cost of antibiotic use, and decrease the mortality. This review was aimed to identify the various interventions for oral care and its outcomes among orally intubated patients. **Materials and methods:** A systematic review was done between March and April 2014 by using the combination MeSH words and key words in two data bases such as PubMed and Ovid Medline. Articles published between 2005 and till date (April 2014) were included in the review. Initial search had total of 47 studies. After screening for abstract, relevancy and quality the final review included five articles. **Results:** In this review, three articles showed that the oral decontamination with Chlorhexidine digluconate was most effective in decreasing nosocomial infections, colonization of the bacteria, and decreasing the pneumonia. In two articles, there was no statistically significant difference in the development of ventilator associated pneumonia (VAP) with and without mechanical tooth brushing. **Conclusion:** Oral decontamination with Chlorhexidine is very much essential to prevent VAP, to decrease the length of stay in intensive care unit, reduce antibiotic requirement and decrease the mortality associated with oral intubation and mechanical ventilation.

Key words: Critically ill, intra-tracheal intubation, oral hygiene, ventilator associated pneumonia

Introduction

Oral intubation frequently precipitates in deterioration of oral health among critically ill patients. Poor oral care is also associated with xerostomia, development of dental plaque and bacterial growth (Virginia, Ulf, Stefan, & Ingalill Rahm, 2014). Oral health can be undermined by critical illness, mechanical ventilation and is affected by nursing care. Among critically ill adults, oral care is of paramount concern (Munro, Grap, Jones, McClish, & Sessler, 2009). A common nosocomial infection, which is also termed as VAP, is encountered by the critically ill patients during the episodes of life threatening illness and oral intubation (Koenig & Truwit, 2006). In nursing care, oral hygiene is one of the main concerns in patients admitted in intensive care units (Pettit, Mccann, Schneiderman, & Campbell, 2012). Imbalance in oral environment and changes in salivary secretion leads into the formation of biofilm (Miranda, Paula, barbosa de Castro Piau, & Barreto Bezerra, 2016). Due to the high prevalence of VAP, this review aims to assess the beneficial effects of oral care practices among orally intubated patients.

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Aim

The aim of this paper was to review the various oral care interventions used for orally intubated patients.

Methods

This systematic review focused to identify various oral care interventions used for orally intubated patients.

Inclusion criteria: The following studies were included in the systematic review -

a. Studies evaluating various oral care interventions for orally intubated patients.
b. Full text and original articles published in English language journals
c. Studies published after 2005-2014
d. Type of studies: Randomized controlled trials, Quasi-randomized controlled clinical trials, Before and after intervention studies and Cross-over trials

Exclusion criteria:

a. Articles published other than English language
b. Survey studies of oral care practices among orally intubated patients
c. Studies published before 2005

Search strategy:

A. A comprehensive search was undertaken in scientific databases using search terms in combination with Boolean operators AND, OR in March and April 2014. Search was undertaken in Pub Med and Ovid Medline databases by using following search terms such as - oral care, endotracheal intubation, oral intubation, intubation endotracheal, intra-tracheal intubation, intubation intra-tracheal, hygiene dental, dental hygiene, randomised control trials, non-randomized control trials, before after design, and quasi experimental design.

B. Data extraction: Investigators screened the titles and abstracts for the inclusion criteria. Full text of the required articles was then retrieved for further assessment. Data was extracted independently from the studies included by reviewers into the structured data extraction forms which were pre-designed based on Cochrane data base as per the plan.

Methodology rating: Risk of bias was assessed by the reviewer for all included studies independently by using the Cochrane risk of bias tool. Cochrane risk of bias checklist included 'Random sequence generation (selection bias); allocation concealment (selection bias); blinding of participants and personnel (performance bias); blinding of outcome assessment (detection bias); selective reporting (reporting bias); and other bias.'

Data synthesis

Narrative synthesis is adapted to summarize the findings as the outcome measure was assessed by different statistical measures among the studies. It is
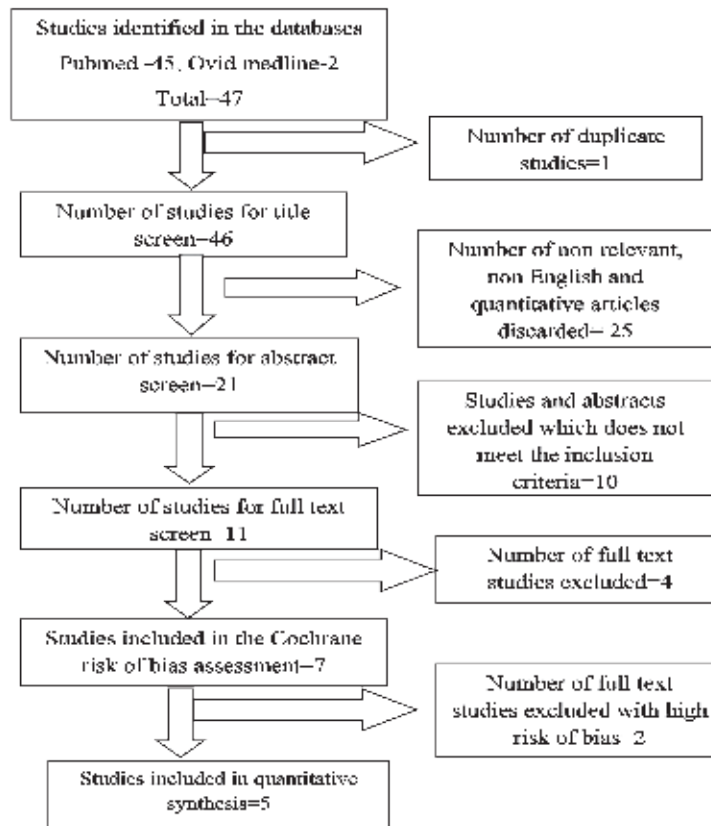

Figure 1: PRISMA flow chart representing the selection process of articles for review

an approach for the systematic review and synthesis of review findings from numerous research studies. Narrative synthesis uses texts and words to sum up and explain the findings (Popay, et al., 2006)

Results

A total of 47 studies retrieved through the initial search in two data bases. After removal of one duplicated study, 46 articles were screened based on abstract and title. After abstract and title screening, 11 articles found to be relevant and these were assessed for full text screening. Four articles were excluded based on the inclusion criteria. Seven articles subjected to Cochrane risk of bias out of which two articles had high risk of bias. Thus, the screening yielded five articles that fulfilled the eligibility criteria and the data was extracted from these five studies. The various outcome measures by the studies are given in Table 1.

Risk of bias: The risk of bias was assessed according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins, et al., 2011). Each included trial was assessed independently by reviewer by using the Cochrane Collaboration's tool for assessing risk of bias. The risk of bias will be assessed based on the following: Random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting and other bias.

The results suggest that the oral decontamination with Chlorhexidine digluconate was most effective in decreasing and preventing the VAP. There was no difference in VAP among the patients with or without tooth brushing.

The summary of the studies obtained in the 'PRISMA Flow chart'; a summary of all exercise interventions and the quality rating based on Cochrane risk of bias tool is given in figure 1.

Table 1: *Methodological characteristics of the studies reviewed*

Authors/ year	Study design	Objectives	Sample and intervention	Outcome measures	Study findings
Lorente, et al., 2012	RCT	For comparing the incidence of VAP among receiving oral care with and without manual brushing of the teeth at critical care unit	*Location:* Tenerife, Spain *Study period:* From August 2010 and August 2011 **Participants:** *Setting:* Medical/surgical ICU *Number randomized:* 436 (217/219) **Intervention:** *Control group:* Oral cleansing after every eight hours, checking the cuff pressure of endotracheal tube, oropharyngeal secretions aspiration, cleaning the tongue, teeth and mucosal surfaces with gauze soaked in 0.12% of Chlorhexidine digluconate, followed by the rinsing the oral cavity by injecting 10 mL of 0.12% Chlorhexidine digluconate for 30 seconds and suctioning oral cavity. *Intervention group:* In addition to control group intervention, manual toothbrush to brush the patient's tongue, teeth and the gum line for 90 seconds.	Ventilator associated pneumonia, antibiotic free days, mechanical ventilation free days, and days of ICU stay.	The incidence of VAP had no significant differences between groups; i.e. with and without tooth brushing.
Cabov, et al., 2010	RCT	To assess the influence of oral health on the occurrence of nosocomial infections and to record the results of oral antiseptic decontamination on oral health	Location: Croatia *Number of study centres:* One *Study duration:* From March 2008 and December 2008 **Participants:** *Setting:* Surgical ICU *Number randomized:* 60 **Intervention:** *Control group:* Providing standard oral care three times in day with application of placebo gel *Intervention group:* Standard oral care three times in a day. Followed by Bicarbonate isotonic serum mouth rinse then gentle aspiration of oropharynx followed by application of 0.2% Chlorhexidine gel by using gloved fingers on gingival and oral surfaces.	Dental plaque, Nosocomial infections, ventilator associated pneumonia, Bacterial colonization, length of stay, mortality, ICU length of stay	The control group showed statistically significant increase in colonization of aerobic pathogens during the stay in ICU with development of nosocomial infections (26.7%) and plaque score. Length of stay in ICU was longer for control group (5.1 ± 1.6 *vs.* 6.8 ± 3.5 days, *P* = 0.019). Reduction of mortality trend was noted in the treated group (3.3% *vs.* 10%). Significant decrease in incidence of nosocomial infections, ICU length of stay, oropharyngeal colonization and mortality was resulted among subjects with oral decontamination by using Chlorhexidine.

Authors/ year	Study design	Objectives	Sample and intervention	Outcome measures	Study findings
Pobo, et al., 2009	RCT	To evaluate effectiveness of using a mechanical debridement system with standard oral care in reducing the VAP incidence	Location: Spain Number of centres: One medical surgical ICU Study period: 30-month period **Participants:** *Setting:* Intensive care unit *Number randomized:* 147 (73 in control arm and 74 in experimental arm) **Description of intervention:** *Control arm:* 30-degree head end elevation maintenance, endotracheal tube cuff pressure adjustment followed by aspiration of oropharyngeal secretions, application of a gauze piece soaked with 0.12% Chlorhexidine digluconate (20ml) on all the surfaces of oral cavity, mucosal surfaces and tongue, followed by injecting 0.12% Chlorhexidine digluconate, 10 ml into oral cavity. Aspiration of these secretions was done after 30 seconds. And the procedure was repeated every eight hourly. *Experimental arm:* Besides the intervention of control arm, tooth by tooth, tooth brushing was performed on posterior and anterior surfaces. Brushing was also performed along the gum line and tongue. A powered (electric) tooth brush was used (Braun Oral B Advance Power 450 TX, Braun GmbH). Experimental group received the procedure once every eight hours.	Ventilator associated pneumonia, mortality, duration of mechanical ventilation, antibiotic-free days, and length of stay in hospital ICU.	A similar rate of pneumonia associated with ventilator was suspected among the experimental arm and control arm (20.3% vs 24.7%; p _ 0.55). No statistically significant difference among the groups in antibiotic free-days, mortality or hospital ICU LOS. Additionally, using the electric tooth brush with standard or routine oral care was not effective in preventing the VAP.
Munro, Grap, Jones, McClish, & Sessler, 2009	RCT	To examine the effects of topical oral care chlorhexidine, tooth brushing and combination oral care in the occurrence of VAP in critically ill mechanically ventilated patients.	Location: Virginia, USA Number of centres: Three ICUs **Participants:** **Description of intervention** *First group:* Daily twice oral swabbing with 5ml solution of 0.12% Chlorhexidine gluconate (at 10 AM and 10 PM) (n = 44) *Second group:* Three times in a day manual tooth brushing by following the protocol on tooth brushing (n = 49) *Third group:* Combination of Chlorhexidine 12th hourly and tooth brushing three times a day (n = 48) *Fourth group:* Controls with usual care (n = 51)	VAP	On day three, significant reduction in the incidence of pneumonia among patients with baseline ($P =$ .006). There was no effect on clinical pulmonary infection score by tooth brushing.
Needleman, et al., 2011	RCT	To evaluate the effect of an electrical powered toothbrush on development (colonization) of dental plaque and VAP associated organisms and removal of plaque.	*Location:* London *Study period:* March 2007 to May 2009 **Participants:** *Setting:* Neuro critical care unit *Number randomized:* 46 **Description of intervention:** *Experimental arm:* Electrical charged toothbrush (Colgate Actibrush) and 20ml of Chlorhexidine solution was used for oral hygiene four times daily which was provided two minutes per every session. Suctioning of oropharynx to remove excess fluid and/ or debris (n = 23). *Control arm:* Use of sponge toothette and chlorhexidine solution 20ml was used for oral hygiene four times every day for two minutes per session. Excessive fluid and debris were removed by oropharyngeal suctioning (n = 23).	Dental plaque, VAP pathogens, bacterial counts	Highly statistically significant reduction in dental plaque among powered toothbrush compared with the control group. There was also highly statistically significant lower total bacterial viable count in the test group at day five. Thus, powered tooth brush was effective in removing the plaque.

Discussion

This review was aimed at identifying the various interventions for oral care used for orally intubated patients. The results showed that the oral decontamination with Chlorhexidine digluconate was effective in decreasing and preventing VAP. There was no difference in VAP among the patients with or without tooth brushing. The results of a systematic review on oral hygiene care practices for critically ill patients to prevent VAP also shows that Chlorhexidine either as a gel or mouth rinses decreases VAP in adults by about 40%. There was no difference between with and without use of tooth brushing in the risk of developing VAP (Shi, et al., 2013).

Conclusion

Orally intubated critically ill clients are at high risk of developing VAP. Oral decontamination with Chlorhexidine digluconate is very much essential to reduce such risk and in terms to reduce the length of stay in intensive care unit, reduce the antibiotic usage and mortality rate. Mechanical tooth brushing is also essential to reduce the tooth plaque. However, its association with VAP has not yet been established.

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