Effect of Professional Oral Care on the Incidence of Pneumonia in the Elderly Living in Nursing Homes – A Pilot Study

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ABSTRACT

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Objective: To evaluate the efficacy of professional oral health care on the elderly living in nursing homes in decreasing the incidence of pneumonia.

Study Design: Sixty elderly subjects between the age group of 75 to 85 (mean age 81 with a standard deviation of +/- 0.25 were included the study. They were divided into two groups: with professional oral health care and without professional health care. They were followed up for a period of one year to determine the prevalence of fever (38.5oC and above) and aspiration pneumonia.

Setting: Two nursing homes in an urban town in Kerala

Results: The prevalence of fever and aspiration pneumonia was significantly lower in subjects receiving professional oral health care than those without professional health care.

Conclusion: This study showed that professional oral health care decreases the incidence of aspiration pneumonia in elderly people.

Keywords: Oral healthcare, Elderly, Aspiration pneumonia, Nursing home care.

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INTRODUCTION

Viruses, atypical organisms, mycobacteria or fungal pathogens enter the respiratory tract via an inhalation route. Infection caused by bacteria typically occurs when the upper respiratory tract is colonized, followed by aspiration of bacteria laden secretions into the lower respiratory tract.[1]

Dental plaque has been described as a specific and highly variable structural entity resulting from colonization and growth of microorganisms on the surfaces of the teeth, soft tissues and dental prosthesis. It is a dynamic and complex system that associates microorganisms embedded in an extra cellular matrix. Plaque originates from the colonization of surfaces of bacteria due to selective adherence mechanisms. Plaque mass grows by cumulative addition of aerobic, anaerobic and filamentous microorganisms. Without mechanical elimination, it can cover the entire tooth surface. It predominates on the sub and supra gingival surfaces of the teeth. Bacteria constitute approximately 70% to 80% of the solid material and 1mm^3 of plaque contains more than 10^6 bacteria with 300 different aerobic and anaerobic microorganisms. Poor oral hygiene and lack of mechanical elimination are the main factors leading to proliferation and accumulation of dental plaque and subsequent colonization.[2]

Cross sectional studies have shown that the oral hygiene status of elderly people in nursing homes was significantly poorer than that in the general population.[3,4] This is because they may be affected with systemic diseases and are under treatment with many types of drugs. They may also have dementia and motor dysfunction making professional oral care indispensable.

The aim of this study was to investigate if professional oral care had any effect on the incidence of aspiration pneumonia in elderly who had compromised overall health, poor immune response and deficient neurological reflexes.

MATERIALS AND METHODS

Study setting:

Two nursing homes for the elderly in an urban town in Kerala.

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Methods:

The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http:// www.wma.net/e/policy/17-c_e.html). The subjects of the study were 60 elderly persons of two nursing homes in an urban town in Kerala. Informed consent was obtained from the subjects and in those who suffered from dementia, informed consent was obtained from the caretakers. Most of the subjects had some kind of medical problem and all were under medication of some kind.

The mean age was 81 with a standard deviation of +/-0.25 and 58.2 % of them were females. They were divided into two groups using the randomized sampling technique. Thirty subjects received professional oral care, while 30 persons did not. Dental Hygienists performed professional oral care thrice weekly for one year. The subjects were brought to their washing facilities in their wheel chair or walker and those who could not move were given professional care in their bed.

Mechanical cleaning was performed using scaling with hand scalers, automatic tooth brush and tongue scrapers. The tongue, the oral mucosa, the buccal mucosa, dentition and dentures were all cleaned. The subjects were made to rinse their mouth with 0.2% chlorhexidine gluconate solution. In those who could not rinse, chlorhexidine gluconate solution was applied on the dentition and mucosa with a sponge. In those patients not receiving professional oral care, basic cleaning of the mouth was done by staff at the old age home using a brush and denture cleaning.

The temperatures of all subjects were recorded routinely by the nurses at 7.00am every day. The data were analyzed. Those with temperatures of 37.8°C and above were considered to be feverish. Those with fever and cough, or cough and breathing difficulty (Assessed by the nurse) were sent to the nearest hospital and radiograph of the chest was performed. It was evaluated by the pulmonologist. The criteria for Aspiration pneumonia was defined as the presence of infiltrates in the chest x-rays plus fever or dyspnoea plus infiltrates in chest x-ray irrespective of the underlying systemic diseases.

RESULTS

Statistical analysis was done using SPSS 11.5 software.

Table 1. Case Processing Summary

	Cases					
	N	Percent	N	Percent	N	Percent
POHC Group * Non -POHC Group	30	100.0%	0	0%	30	100.0%

When fever was analysed, for the first 2 months, there was no significant difference between the two groups. The occurrence of fever in the POHC group (Professional Oral Hygiene Care Group) was found to be significantly lower than in the non POHC group. (P<0.05)

When cases of pneumonia were considered, two subjects in the POHC and six in the non-POHC group were admitted due to aspiration pneumonia. Comparison of the two groups was performed with Fisher exact test and it showed the prevalence of aspiration pneumonia in the POHC group was significantly less than the non POHC group (P<.01).

DISCUSSION

High salivary concentrations of Porphyromonas gingivalis enhance risk for respiratory disease with an Odds ratio of 4.2.[4] Staphylococcus aureus, an

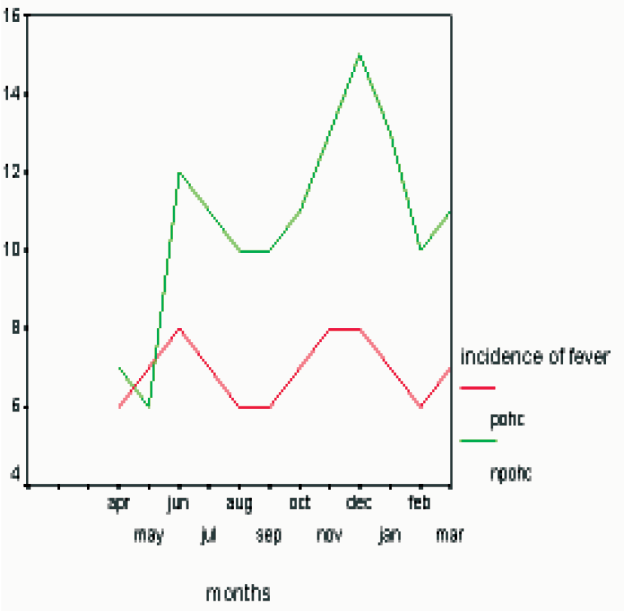

Figure 1. **Incidence of Fever in Professional and Nonprofessional Oral Healthcare Group**

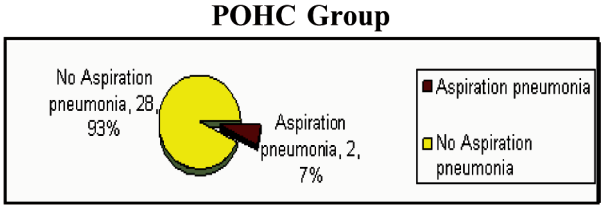

Figure 2. **Incidence of pneumonia in the POHC Group**

Table 2. Incidence of pneumonia in the POHC Group

		Fre-quency	Percent	Valid Percent	Cumulative Percent
Valid	No. Aspiration pneumonia	28	93.3	93.3	93.3
	Aspiration pneumonia	2	6.7	6.7	100.0
	Total	30	100.0	100.0	800

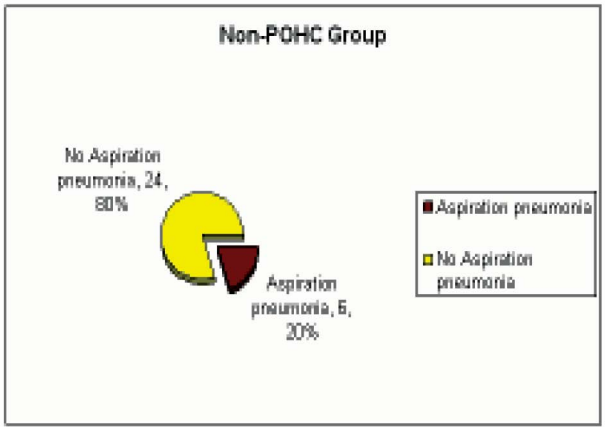

Figure 3. **Incidence of pneumonia in the Non POHC Group**

Table 3. Incidence of pneumonia in the Non POHC Group

		Frequency	Valid Percent	Cumulative Percent
Valid	No Aspiration	24	80.0 80.0	80.0
	Aspiration pneumonia	6	20.0 20.0	100.0
	Total	30	100.0 100.0	

Table 4. Chi-Square Tests

	Value	df	Asym p. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.571(b)	1	.003		
Continuity Correction(a)	4.051	1	044		
Likelihood Ratio	7.058	1	.008		
Fisher's Exact Test				.034	.034
Linear-by-Linear Association	8.286	1	.004		
N of Valid Cases	30				

organism normally found in the oral flora, can colonize the mouths of debilitated or institutionalized persons. S. aureus in saliva enhances risk for aspiration pneumonia by 7.4 fold.[4] Anaerobic bacteria in general are a significant cause of aspiration pneumonia and lung abscess formation. While bacteria comprise an important component of respiratory disease, the bacteria alone are insufficient to cause disease.

Factors contributing to aspiration

There exists a fine tuned underlying mechanism to desynchronize swallowing and breathing. However in neurologic conditions, the swallowing mechanism is often disordered.[5] This is seen in stroke patients many of whom reside in nursing homes, and in many older persons who have Parkinson's disease.

The lungs are protected from aspirated material by cough. The cough must be neurologically intact and not suppressed by medication or noxious agents such as cigarette smoke. The ability of the lung to move the unwanted material, which is referred to as lung clearance, is a key factor in the lung's ability to protect itself from infection.

Chronic aspiration

Chronic mechanical aspiration of small amounts of saliva and oral particulate matter takes place in all human beings. The most common aspirate is the patient's own saliva. If that saliva contains high amounts bacteria, they are also aspirated.[6]

Aspiration of pathogenic bacteria

The aspiration of pathogenic contents is probably one of the important links between oral and periodontal disease and respiratory infection.

The bacterial content of saliva varies, and high counts of many species of bacteria in saliva give rise to the suspicion that direct transfer of bacteria from the mouth to the airways occurs. Many organisms present in aspirated saliva have been identified as anaerobic bacteria. The association between bacteria and aspiration pneumonia was investigated in the 1980's and 1990's.[7, 8]

Once in the lungs, oral bacteria including periodontal pathogens can bind to lung epithelial cells and enhance adherence and colonization by respiratory pathogens, as well as activate respiratory epithelial cells to produce and secrete large quantities of inflammatory mediators.[9] These mediators call forth an inflammatory infiltrate consisting of macrophages, T lymphocytes, neutrophils and cytotoxic CD8+ lymphocytes[10] as determined by the components present in the fluid harvested from affected lungs. Respiratory epithelium and inflammatory cells produce mediators that perpetuate inflammation including leukotriene B tumor necrosis factor–á, interleukin-8, interleukin-6 and macrophage chemotactic protein-1. In addition, they produce large amounts of destructive enzymes including elastase and matrix metalloproteinases that degrade elastin and connective tissue. In this study, it was found that fever was significantly lower in the professional care group

(P<.05). In patients with professional health care, the amounts of gram negative microorganisms and their antigenic lipopolysaccharides were lowered hence diminishing the incidence of fever.

It was also found that the number of cases of aspiration pneumonia in those with professional cleaning was lowered due to decreased bacterial load in the saliva which would inevitably be aspirated as a result of decreased reflex in the elderly. As pneumonia is the major cause of death in elderly, methods to reduce the incidence of pneumonia should be implemented wherever possible.

The drawbacks of this study are that microbiological analyses of saliva and from the periodontal pockets were not included in the study. A longitudinal study with larger samples would be more appropriate. Culture from the periodontal pocket, saliva and lavage from the lung before and after professional cleaning will give a clearer picture on the cause and effect relationship between periodontal disease and respiratory infections.

END NOTE

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REFERENCES

1. Johanson WG, Pierce AK, Sanford JP, Thomas GD. Nosocomial respiratory infections with gram-negative bacilli. The significance of colonization of the respiratory tract. Ann Intern Med. 1972 Nov;77(5):701–6.
2. Fourrier F, Cau-Pottier E, Boutigny H, Roussel-Delvallez M, Jourdain M, Chopin C. Effects of dental plaque antiseptic decontamination on bacterial colonization and nosocomial infections in critically ill patients. Intensive Care Med. 2000 Sep;26(9):1239–47.
3. Kiyak HA, Grayston MN, Crinean CL. Oral health problems and needs of nursing home residents. Community Dent Oral Epidemiol. 1993 Feb;21(1):49–52.
4. Stockwell AJ. Survey of the oral health needs of institutionalised elderly patients in Western Australia. Community Dent Oral Epidemiol. 1987 Oct;15(5):273–6.
5. Terpenning MS. The relationship between infections and chronic respiratory diseases: an overview. Ann Periodontol. 2001 Dec;6(1):66–70.
6. Langmore SE, Terpenning MS, Schork A, Chen Y, Murray JT, Lopatin D, et al. Predictors of aspiration pneumonia: how important is dysphagia? Dysphagia. 1998;13(2):69–81.
7. Megran DW, Chow AW. Bacterial aspiration and anaerobic pleuro pulmonary infections. In: Sande MA, Hudson LD, Root RK, eds. Respiratory Infections. Newyork: Churchill Livingstone: 1986:269-292
8. Bartlett JG, Finegold SM. Anaerobic pleuropulmonary infections. Medicine (Baltimore). 1972 Nov;51(6):413–50.
9. Scannapieco FA, Wang B, Shiau HJ. Oral bacteria and respiratory infection: effects on respiratory pathogen adhesion and epithelial cell proinflammatory cytokine production. Ann Periodontol. 2001 Dec;6(1):78–86.
10. Pesci A, Balbi B, Majori M, Cacciani G, Bertacco S, Alciato P, et al. Inflammatory cells and mediators in bronchial lavage of patients with chronic obstructive pulmonary disease. Eur Respir J. 1998 Aug;12(2):380–6.