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Preschool teachers as agents of oral health promotion: an intervention study in Sri Lanka

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Background: According to National Oral Health Survey reports and research, Early Childhood Caries has been identified as a serious public health problem in Sri Lanka. More than 65% of preschool-aged children have dental decay and only 2% of them have had treatment. With proper interventions and commitment from public health personnel and responsible community leaders this should be a largely preventable disease. ***Methods:*** An intervention study was conducted among preschool teachers in the District of Colombo, Sri Lanka, to assess their influence on oral health promotion in the school environment. All the available 52 preschools and all 72 teachers registered under a local government authority were involved in the study. Preschools were divided into intervention group and control group based on geographically defined areas. The intervention included training preschool teachers using a manual covering health education, health promotion, incorporation of oral-health-friendly activities into the preschool curriculum, and hands-on experience of oral examination. Pre- and post- assessments were conducted with a 6 month interval. ***Results:*** After 6 months, the median oral health knowledge score of the intervention group improved from 55 to 72 (p=0.005) and the mean score for oral health related practices from 32 to 35 (p=0.032). The variables: oral-health-friendly preschool environment (p=0.02), availability of brushing facilities (p=0.005) and availability of information, education and communication materials related to oral health (p=0.004) were significantly different between the two groups after 6 months. ***Conclusion:*** Oral health promotion activities can be effectively instilled in a pre-school environment by the education of teachers.

Key words: *oral health, health promotion, settings approach, children, preschool, Sri Lanka*

Introduction

Oral health is an essential and integral component of general health and wellbeing. Although largely preventable, many across the world are still suffering unnecessarily from pain and discomfort associated with oral diseases. A significant longitudinal shift in global oral disease patterns has been observed in the past 2-3 decades (Petersen, 2003). In most developed countries, the prevalence of dental caries and the mean dental caries experience of children have declined, although pockets of underprivileged communities, ethnicities and groups with high morbidity still exist (US General Accounting Office, 2000). School medical inspections conducted in Sri Lanka report that dental caries is *the* commonest health problem among children at present (Ministry of Health, 2012). Current oral health services do not have planned and/or sustainable community-based preventive oral healthcare programmes for preschool children, although interested parties and organisations conduct *ad hoc* programmes. According to the National Oral Health Survey 64% of 6 year old children have caries in their deciduous teeth and only 1.8% of these children have been treated (Ministry of Health Care and Nutrition, 2003). Unfortunately their periodontal status was not assessed. Of all the children under study, 83% had never visited a dental facility while only 7% had ever visited a school dental clinic. The current oral healthcare system in Sri Lanka is ill-equipped to serve children under five years of age and a significant burden of dental caries exists (Ministry of Health, 2012).

The last few years have seen a gradual rise in awareness of the principles of health promotion: a concept that runs counter to the traditional curative model of health provision, aimed at reducing health disparities and ensuring equal opportunities and resources for all people to achieve their fullest health potential (Conrado *et al.*, 2004; Ministry of Health, 2003) Oral health promotion likewise should increase peoples' control over their oral health by empowering them with the knowledge and skills necessary for effective preventive practices (WHO, 2003).

The school environment provides an ideal setting for health promotion as it could reach over a billion children worldwide. They could be used as change agents to deliver healthy messages and practices to school staff, pupils' families and the wider community (Kwan *et al.,* 2005; Mullen *et al.,* 1994). Many risk behaviours start at early school age so schools may have a powerful influence over children's development and wellbeing. Further, it has been shown that poor oral health has detrimental effects on children's quality of life, performance at school and success in later life. Children who suffer from poor oral health are more likely to have restricted activity days than those who do not (Mullen *et al.,* 1994; US General Accounting Office, 2000). The first six years are the most critical of a child's life since these are their greatest rate of development and habits developed at this time are generally sustained longer (Carino *et al.,* 2003; Currie *et al.,* 2000). Teachers have an influential position, and are often taken as role models by children. With proper

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training teachers can make valuable contributions to health promotion in the school community. Therefore, oral health authorities need to identify ways to develop the professional skills of teachers and encourage them to use their skills and knowledge to benefit children's health. Such programmes have successfully employed group participation, colouring or activity books, and films to improve knowledge and motivate oral hygiene practices (Mullen *et al.,* 1994; Petersen, 2003). The objectives of the present study were to improve the oral health knowledge and practices of preschool teachers, to promote the preschool environment as a setting friendly to oral health and so to promote oral-health-friendly behaviours among preschool children.

Materials and methods

To evaluate the effectiveness of an oral health promotion programme implemented by trained preschool teachers, the community based quasi-experimental study design chosen was that recommended by Conrado *et al.* (2004) and Rothman and Greenland (1998). The study was conducted in Sri Lanka during 2010.

There are ten Medical Officer of Health (MOH) areas in the district of Colombo and these areas are the smallest administrative units in the Sri Lankan health system. The study was conducted in two geographically defined MOH areas selected to be similar when considering ethnicity, age and gender distribution and the level and distribution of education and income (Central Bank of Sri Lanka, 2012). One area (Padukka) was selected as the intervention group (IG) and the other (Boralesgamuwa) as a control (CG).

All preschools and teachers registered with the pradeshiya sabha (a civil administrative unit) in each MOH area were considered eligible and invited to participate. Those consenting were recruited. For the study of oral health promotion settings, 52 preschools were involved and 31 were in the IG area and 21 in the CG area (Figure 1). Coincidentally, there were 36 eligible teachers in each arm of the study. Two instruments were used to assess the effectiveness of the intervention: a pre-coded self-administered questionnaire for preschool teachers, and a pre-coded checklist against which to score the preschool environment and children's behaviours.

These instruments were developed with expert advice from personnel in the fields of public health and preschool education. Preschool teachers' knowledge on deciduous dentition, common oral health problems among children, their causes, and oral healthcare services were addressed along with the oral healthcare practices of the teachers themselves. All questions were pre-coded and each teacher was given a score out of 100. Where there was just one correct answer, five marks were given for the correct response. Where there was more than one correct answer, five marks were given each for correct responses identified as correct and likewise five marks awarded for each incorrect response identified as incorrect.

The observational assessment technique evaluated how oral-health-friendly the preschool settings were using the items: availability of water and other sanitary facilities, cleanliness of the environment, good oral hygiene practices, oral-health-friendly dietary practices, availability of menus for school snacks, regular brushing programmes, annual screening and awareness programmes for oral health. A two-point scale was used with three marks for a response if regular oral healthcare activities were present and zero if not. These instruments were pre-tested and finalised among a group of 10 preschool teachers in a third socio-economically similar local area, in Puttalam District.

Prior to data collection proper, all preschool teachers were contacted via their administrative head and letters sent, followed by telephone reminders a week later. The two groups were approached on different days and written informed consent was obtained from teachers to participate in the study (Figure 1). Preschool teachers themselves answered the questionnaires which were then scored to assess their oral health knowledge and practice.

As for preschools, all 52 were visited during school hours and observations made by the principal investigator (see Figure 1). Environments were categorised for oral-health-friendliness by recording: the availability of facilities for brushing; the presence of educational materials related to oral health (e.g. posters, leaflets, wall charts); evidence of existing oral health promotion activities; oral-health-friendly food practices, and oral-health-friendly habits of the preschool children. Data from both study groups were collected on two occasions; at pre-intervention stage and, 6 months after the intervention.

The training manual based intervention was developed following pre-intervention data collection and that manual is available on request from the authors. Varying levels of

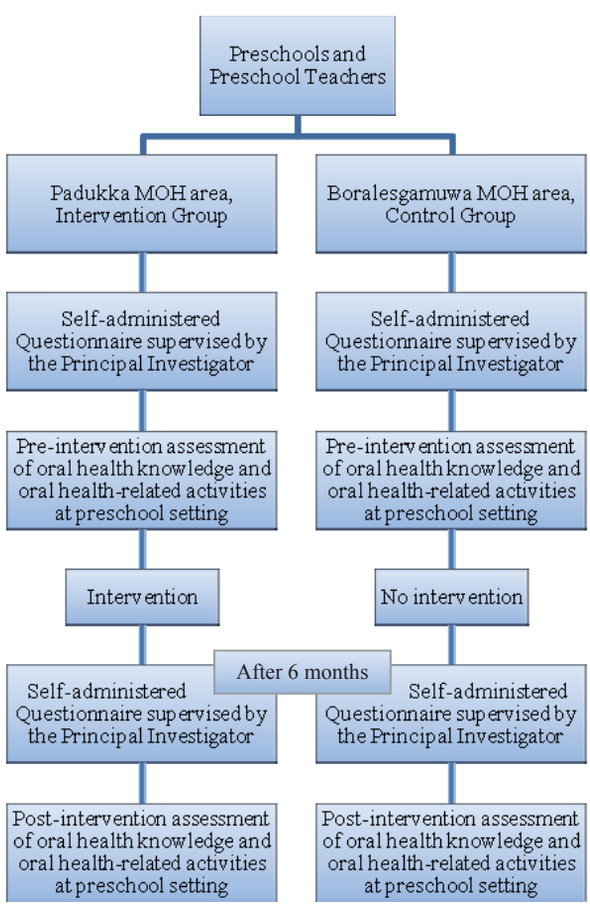

Figure 1. *Procedure of data collection*

existing oral health knowledge, practices and feasible educational activities for preschool children were considered during drafting and field testing phases of development of the manual (Ross *et al.,* 1991; Smith *et al.,* 1993).

The principal investigator and a dental public health specialist facilitated the training, explaining the learning objectives at the beginning of each chapter of the manual and using participatory learning techniques including examining each other's mouths for dental caries, practicing brushing using a dental model, sharing ideas for stories to promote healthy behaviours among preschool children and introducing activities, such as puzzles, sorting games and colouring activities suitable for improving healthy habits among preschool children (Mullen *et al.,* 1994).

EpiData (v.3.1) software was used for data entry and checking as it handled the branching data forms involved. The final data set was exported to SPSS (v.15) and MINITAB (v.14) software for analysis. The distribution of teachers' knowledge and oral health practice scores were subjected to tests for normality and the Kolmogorov-Smirnov statistic (KS) was obtained. Scores with a significant KS were analysed with Wilcoxon signed rank test.

The outcome measure for each group was the level of oral health knowledge and oral health related practices of preschool teachers, and oral health promotion activities at preschools before and after the intervention.

Ethical clearance for the proposed study was obtained from the Ethical Review Committee of the Faculty of Medicine, Colombo, Sri Lanka. Permission to conduct the study in Colombo district was obtained from the Regional Director of Health Services, Colombo and administrative clearance from Kesbewa and Padukka pradeshiya sabha was obtained from the Secretaries of respective areas. When the research was completed preschool teachers in the CG were also given the identical intervention as the other group.

Results

All 72 preschool teachers from the two MOH areas in Colombo were invited and consented. Of the 52 preschools involved in the study, 31 were in the IG area and 21 in the CG. Basic characteristics of preschool teachers in the two groups were similar (Tables 1 and 2). To assess oral health knowledge, each teacher was given a score for knowledge and practices. Median group scores for knowledge score remained the same in the CG whereas an improvement was observed in the IG following the intervention (Table 2). As for oral health practices, median scores increased post-intervention, but only the IG showed a significant improvement (Table 2). The oral health knowledge score of teachers improved 30% from the baseline median ($p=0.005$) while only a 9% increase was observed in oral health practice scores ($p=0.032$).

Regarding the oral health promoting practices of the schools, the IG median scores showed significant improvements post-intervention in all categories except for evidence suggesting teachers carried out oral health promotion activities (Table 3). A significant difference was observed in the CG only for oral-health-friendly habits of children, which included sub-components; sharing cutlery, crockery, toys and drinking bottles.

Discussion

The concept of oral health promotion within a discrete setting is not a new approach, although a comparatively unexplored one. Within the field of education, researchers have found that two types can influence health. First, education in general (years of education or level of literacy) is linked with improvements in health status. Second, school based health education improves knowledge, attitudes and skills related to health risk behaviours and thus health promotion (Cutler and Lleras-Muney, 2006). This study focused on preschool children because their behaviours may be more easily changed. The teachers' position as role models for healthy behaviours was a factor helping programmes achieve their objectives.

Our data show that oral health promotion activity can be improved by involving preschool teachers. The intervention had a positive effect on the oral-health-friendliness of the preschool environment ($p=0.02$), availability of brushing facilities ($p=0.005$) and availability of teaching materials ($p=0.004$) indicating that preschools can be used as a health promotion settings.

Our results are in line with similar international studies (Begzati *et al.,* 2011; Conrado *et al.,* 2004; Leurs *et al.,* 2007; Seman *et al.,* 2008). Seman observed in Malaysia that the oral health knowledge of a group of preschool children improved after an education intervention. According to Leurs *et al.,* barriers to health promotion in primary schools are "a lack of knowledge" and a "lack of consensus" in schools with regard to the importance of health promotion. That study also suggested that a link with preschool staff is essential, as staff themselves are responsible for additional training and expertise development. Begzati *et al.* found preschool teachers lacked basic knowledge of oral health issues and recommended training them to manage oral health preventive programmes for children. The present study attempted to improve oral health behaviours and practices of preschool children by empowering teachers through training and skills development.

A health promoting preschool offers opportunities for, and requires commitment to, providing a safe and health-enhancing social and physical environment which can influence children's oral health (De Farias *et al.,* 2009; Deschesnes *et al.,* 2003; Wenhall *et al.,* 2008). The present study successfully created an oral health promotion setting in preschools. The findings provide much needed evidence for primary healthcare providers and dental public health personnel to strengthen preventive programmes in such settings. Teachers could beneficially be given information on oral health problems, causes, consequences and prevention modalities during their basic training and be regularly updated through periodic in-service programmes.

This study had certain limitations. There are 333 MOH areas in Sri Lanka. The two areas chosen had similar socio-economic and demographic profiles, so the findings might reasonably be generalised only for areas of similar characteristics. This would help retain the external validity of the findings. Further, the follow up was limited to six months, so sustainability could not be evaluated. Certain aspects related to advocacy could not be addressed in the present study due to restrictions in funding and time so no formal link between health and education authorities could be achieved.

Table 1. Socio-demographic characteristics of preschool teachers in the two study groups

	Padukka area Intervention group		*Boralesgamuwa area Control group*		
Variable	*n*	*%*	*n*	*%*	*Significance*
Age of the preschool teacher					
≤30 yrs	12	33.3	16	44.4	χ^2=5.127
31-40 yrs	7	19.4	12	33.3	df=2
≥40 yrs	17	47.2	8	22.2	p=0.077
Duration of service					
≤5 yrs	15	41.7	13	36.1	χ^2=6.104
6-10 yrs	5	13.9	12	33.3	df=3
11-15 yrs	3	8.3	5	13.9	p=0.107
≥15 yrs	13	36.1	6	16.7	
Trained as a preschool teacher					
Yes	35	97.2	36	100	
No *	1	2.8	-	-	

* Excluded from analysis due to small number

Table 2. Comparison pre- and post-intervention group scores for oral health knowledge and practices of preschool teachers

	Intervention group			*Control group*			
Variable	*Pre-median (mean)*	*Post-median (mean)*	*Significance*	*Pre-median (mean)*	*Post-median (mean)*	*Significance*	*Normality test scores*
Oral health knowledge	55 (54)	72 (69)	z=–4.583 **p<0.005**	62 (61)	62 (63)	z=-0.743 p=0.458	KS=0.110 **p=0.03**
Oral health related practices	32 (31)	34 (35)	z=2.140 **p=0.032**	30 (28)	33 (33)	z=-1.788 p=0.074	KS=0.110 **p=0.03**

z, Wilcoxon Signed Ranks Test has been performed
KS, Kolmogorov-Smirnov statistic for Normality

Table 3. Comparison of pre- and post-intervention median group scores for oral health promoting practices

	Intervention group			*Control group*		
Variable	*Pre-(n=31)*	*Post-(n=31)*	*Significance*	*Pre-(n=21)*	*Post-(n=21)*	*Significance*
Oral-health-friendly preschool environment	25	30	z=-3.621 **p<0.005**	30	30	z=-0.577 p=0.564
Availability of facilities for brushing	0	10	z=-4.470 **p<0.005**	0	0	z=-1.00 p=0.317
Availability of teaching materials related to oral health	5	10	z=-3.743 **p<0.005**	5	5	z=-1.633 p=0.102
Availability of evidence on oral health promotion activities	0	0	-	0	0	-
Oral-health-friendly food practices	15	25	z=-4.058 **p<0.005**	20	20	z=-1.449 p=0.147
Oral-health-friendly habits of preschool children	2	10	z=-3.849 **p<0.005**	2.5	10	z=-3.852 **p<0.005**

z, Wilcoxon Signed Ranks Test has been performed

Conclusion

This study demonstrated the suitability of preschool teachers as agents of oral health promotion by improving their knowledge and practices on oral health. The low cost and feasible methods used in the intervention improved preschools as oral-health-friendly environments.

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References:

Begzati, A., Meqa, K., Siegenthaler, D., Berisha, M and Mautsch, W. (2011): Dental health evaluation of children in Kosovo. *European Journal of Dentistry* **5**, 32-39.

Cariño, K.M.G., Shinada, K. and Kawaguchi, Y. (2003): Early Childhood caries in northern Philippines. *Community Dentistry and Oral Epidemiology* **31**, 81-89.

Central Bank of Sri Lanka (2012): *Annual report of economic and social statistics of Sri Lanka.* http://www.cbsl.gov.lk

Conrado, C.A., Maciel, S.M. and Oliveirra, M.R. (2004): A school based oral health education programme: the experience of Maringa-PR, Brazil. *Journal of Applied Oral Science* **12**, 27-33.

Currie, C., Hurrelmann, K., Settertobulte, W., Smith, R. and Todd, J. (2000): Health and health behaviour among young people. *WHO Policy Series: Health policy for children and adolescents Issue 1, International Report*. Copenhagen: WHO Regional Office for Europe.

Cutler, D.M. and Lleras-Muney, A. (2006): *Education and Health: Evaluating the theories and evidence*. Cambridge, MA: National Bureau of Economic Research USA. www.nber.org/papers/w12352

De Farias, I.A., De Araujo, S.G.C. and Ferreira, M.A.F. (2009): A health education programme for Brazilian public school children: The effects on dental health practice and oral health awareness. *Journal of Public Health Dentistry* **69**, 225-230.

Deschesnes, M., Martin, C. and Hill, A.J. (2003): Comprehensive approaches to school health promotion: how to achieve broader implementation. *Health Promotion International* **18**, 387-396.

Kwan, S.Y.L., Petersen, P.E., Pine, C.M. and Borutt, A. (2005): Health promoting schools: an opportunity for oral health promotion. *Bulletin of the World Health Organization* **83**, 677-685.

Leurs, M.T.W., Bessems, K., Schaalma, H.P. and De Vries, H. (2007): Focus points for school health promotion improvements in Dutch primary schools. *Health Education Research* **22**, 58-69.

Ministry of Health Care and Nutrition, Sri Lanka (2003): *National Oral Health Survey Report*.

Ministry of Health, Sri Lanka (2012): *Research priorities in Health.* www.health.gov.lk/Pub&Reports.htm

Mullen, P.D., Evans, D., Forster J., Gottlieb, N.H., Kreuter, M., Moon, R., O'Rourke, T. and Strecher, V.J. (1994): Settings as an important dimension in health education/promotion policy, Programs and Research. *Health Education Quarterly* **22**, 329-345.

Petersen, P.E. (2003): *The World Oral Health Report: Continuous improvement of oral health in the 21st century - the approach of the WHO Global Oral Health Programme*. Geneva: WHO. www.who.int/oral_health/media/en/orh_report03_en.pdf

Ross, J.G., Leupker, R.V., Nelson G.D., Saavedra P. and Hubbard, B.M. (1991): Teenage health teaching modules: Impact of teacher training on implementation and student outcomes. *Journal of School Health* **61**, 31-34.

Rothman, K.J. and Greenland, S. (1998): Precision and validity in epidemiological Studies. *Modern Epidemiology,* 2nd edn: p115-134.

Seman, K., Yaacob, H., Hamid, A.H.M., Ismail, A.R. and Azizah, Y. (2008): Evaluation of a training programme for non-health professionals as oral health educators. *Malaysian Journal of Medical Sciences* **15**, 33-36.

Smith, D.W., McCormic, L.K., Steckle, A.B. and McLeroy, K.R. (1993): Teacher's use of health curricula: Implementation of growing healthy, project SMART, and teenage health teaching modules. *Journal of School Health* **63**, 349-354.

US General Accounting Offices, (2000): *Oral health in low income populations*. Washington, DC: Health education and human services division. www.gao.gov/new.items/he00072.pdf

Wenhall, I.M.L., Schroder, U. and Twetman, S. (2008): Outcome of an oral health outreach programme for preschool children in a low socio-economic multicultural area. *International Journal of Paediatric Dentistry* **18**, 84-90.

World Health Organisation (2003): *WHO Information series on school health. Document Twelve. Promoting physical activity in schools: An important element of a health-promoting school*. Geneva: WHO, Chronic Diseases and Health Promotion. www.who.int/school_youth_health/resources/information_series/