Effectiveness of an oral health care education programme delivered by elderly ambassadors: a quasi-randomised controlled trial

ORIGINAL ARTICLE

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ABSTRACT

Background. No Hong Kong–based research into the effectiveness of a geriatric oral health education programme delivered by elderly ambassadors has been published. This study was conducted to assess the effectiveness of an oral health care programme delivered by trained peer educators (elderly ambassadors) in Hong Kong at improving oral hygiene among the elderly, and to examine the improvement in knowledge and self-reported behaviour of the participants.

Methods. A quasi-randomised, controlled, interventional trial was conducted. Elderly people who attended social centres and were willing to join the programme were recruited. Six elderly peer educators were trained; 23 control subjects and 51 test subjects from two social centres were recruited for data analysis. Trained peer educators were instructed to deliver oral care talks to their elderly peers using an interactive approach. The outcomes of the intervention group and control group were measured at baseline, 1 week and 1 month following the programme.

Results. There were no significant differences at baseline between the groups in mean age, sex, mean dental knowledge score, self-reported oral health care behaviour, and oral hygiene level (measured by visible plaque index [VPI] and gingival bleeding index [GBI]). At 1 week following the programme, the mean VPI and GBI differed significantly between the intervention and control groups (-0.25 vs 0.02, p=0.04 and -0.22 vs 0.04, p=0.01, respectively), in favour of the intervention group. Similar results were obtained after 1 month. This was associated with brushing at the gum margin, daily use of dental floss/inter-dental brush, and daily use of antiseptic mouth rinse (McNemar's test, p=0.000).

Conclusion. An oral health care programme delivered by trained elderly peers can improve oral hygiene among elderly people. This provides a model of practice for promoting population-based oral health care to the elderly.

Key words: Dental health services; Health education, dental; Health services for the aged; Oral health

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INTRODUCTION

The ageing population in Hong Kong is expanding. According to local statistics, in 2003[1] the mid-year population of individuals aged 65 years and over was 795 500 and accounted for 11.7% of the total

population. It is predicted the elderly population will grow and reach 24% in 2031. Promotion of health to the elderly thus becomes an important issue. Maintaining a healthy elderly population minimises medical and social costs to the community. The Hong Kong SAR Government has made many attempts to improve quality of life for the elderly.[2] The positive concepts of a golden age and successful ageing are promoted, empowering elderly people to assume an active role in maintaining their health.

Maintenance and promotion of health extends beyond medical or psychological health to include oral health and overall health status. Oral health includes preservation of dentition and maintenance of good oral hygiene. Dental diseases—such as dental caries (tooth decay) and periodontal disease (gum diseases)—cause pain, discomfort on chewing, hypersensitivity, and bad breath. Tooth loss may restrict choices of food,[3] and be associated with loss of pleasure in eating,[4] decline in self-confidence,[4] poor articulation and malnutrition. Chewing difficulties are associated with a personal perception of poor health and depression.[5] Oral health affects the quality of life of older people[6-8]—poor oral health adversely affects the control of ischaemic heart disease, chronic obstructive airway disease, and diabetes mellitus.[9-15] Thus, good oral hygiene benefits both oral and general health.

According to a population-wide oral health survey carried out in Hong Kong in 2001,[16] oral health was unsatisfactory among non-institutionalised people aged 65 to 74 years. Principal dental problems included dental caries, periodontal disease, and denture problems. The survey revealed that 52.9% of elderly people had untreated tooth decay and 55.3% had moderate-to-severe periodontal disease. They had little knowledge of and a poor attitude towards dental disease. In relation to dental caries and gum disease, 28 and 45% respectively were unaware of the causative factors and 31 and 62% respectively knew little about methods of prevention. In addition, they had little knowledge about dental disease (eg dental plaque) and its association with snacking and smoking. The survey recommended that tooth loss could be prevented and positive changes in oral care behaviour could maintain oral health.

In 2002, the Hong Kong Dental Association conducted a project 'Healthy Smile for the Elderly' to promote oral health.[17] The programme covered approximately 50 elderly services centres, and trained approximately 100 elderly ambassadors to assist in health education such as demonstration of the correct tooth-brushing technique, how to use an inter-dental brush, and denture care. More than 90% of the participants changed their attitude and gained a better understanding of oral health. The project demonstrated that involvement of elderly ambassadors to promote oral health to their peers was beneficial. However, it did not determine whether the improved knowledge and attitude could lead to behavioural change and thus improved oral hygiene.

There are advantages to choosing elderly individuals as instructors/peer educators. They can more easily serve as mentors and promote the development of self-empowerment and self-efficacy. They have similar upbringings and backgrounds to those they educate, enabling their health messages to be more easily understood. Peer educators also have a similar oral status and are likely to have encountered similar problems with self-care. Their personal experiences can help other elderly people to adopt appropriate behaviour. Programmes with peer leaders have been shown to result in a significant increase in self-confidence and improved behaviour and motivation.[18] It is also more feasible to use this train-the-trainer (elderly ambassador) approach than to employ experts in the field to carry out such an educational programme on a population-wide basis.

At present, there is no published Hong Kong–based research on the effectiveness of a geriatric oral health education programme delivered by elderly ambassadors. The primary objective of this study was to assess whether oral hygiene of elderly Hong Kong people could be improved by an oral health care education programme delivered by trained elderly ambassadors. The secondary objective was to determine if oral care knowledge and behaviour could be improved.

METHODS

This was a quasi-randomised, controlled, interventional trial conducted at two social centres.

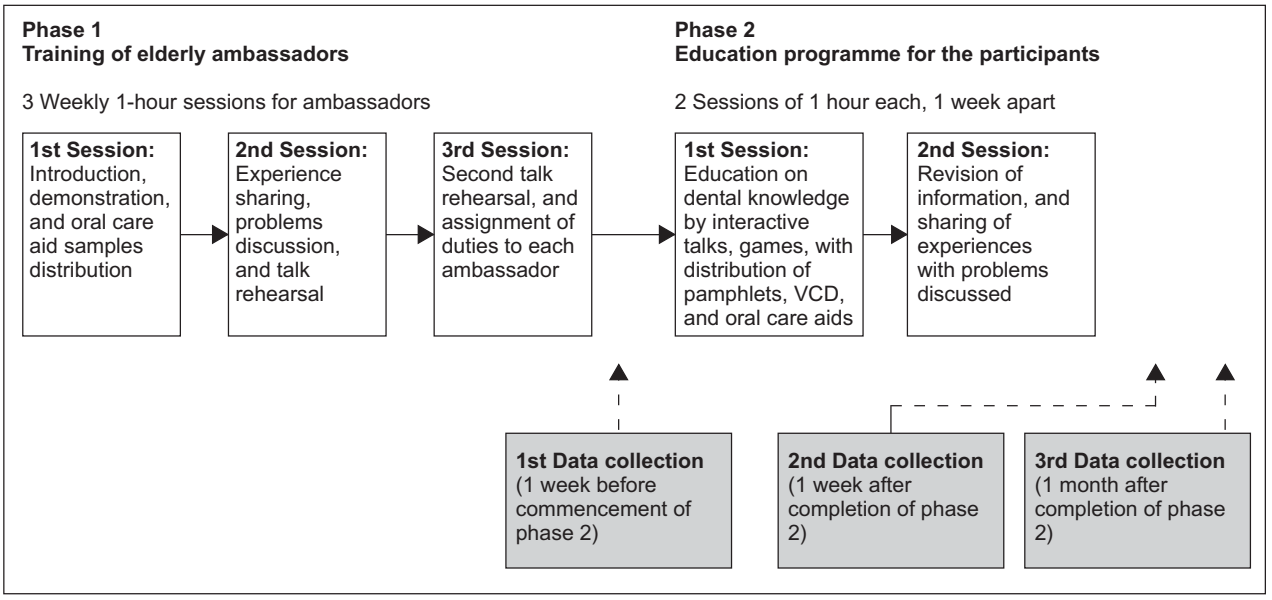

Figure. The oral health education programme flowchart

The study was conducted in two phases. In phase one, elderly ambassadors were trained in oral self-care techniques. In phase two, the oral hygiene of participants was assessed before and after health talks. The two centres were randomly assigned to a control or test group.

Sample selection

Two elderly social centres (A and B) run by two different non-governmental organisations (NGOs) from the New Territories region were selected. The two centres and NGOs were subsidised by the Social Welfare Department. Their operation and clientele were similar to those of other social centres in Hong Kong.

Elderly ambassadors were selected by social workers. Each centre nominated two to four ambassadors. No specific criteria were provided but it was suggested that ambassadors should preferably have previous experience as a peer teacher, and agree to join the programme as educators. It was preferred that they habitually flossed their teeth or used an inter-dental brush or mouth rinse, although the lack of such habits did not exclude them.

Participants were recruited from the elderly social centres through newsletters or bulletins, or verbal recommendations by social centre staff. As the study was conducted as part of a health care promotion activity offered by the centres, all members of the centre could participate. Nonetheless, only those with at least one real tooth, and who had given their written, informed consent to participate in a questionnaire and oral examination, were included in the data analysis.

Procedures

The project consisted of two phases—phase 1: training of the elderly ambassadors; and phase 2: a five-stage oral health education programme as follows (Figure):

1. Baseline data collection at both centres;
2. Oral health talks at centre A;
3. Second data collection (1 week after the talks) at both centres;
4. Oral health talks at centre B; and
5. Third data collection (1 month after the talks) at both centres

From stages 1 to 3, centre B acted as a control to centre A. Two oral health talks, each lasting 1 hour, were delivered by trained elderly ambassadors at each centre. Interviews with the participants were conducted after the programme to explore their perception of the programme.

Phase 1: training of elderly ambassadors

A dentist provided dental information and training in oral care to the elderly ambassadors. The training course consisted of three weekly 1-hour sessions at the ambassadors' social centres. Demonstrations

of tooth-brushing, flossing, and use of an inter-dental brush were performed. Written notes, pamphlets, and video compact discs (VCDs) were given to enable revision of the information at home.

The first session began with an introduction of the programme, followed by information about the causes and effects of dental caries and periodontal disease. Demonstration and practice of appropriate techniques for tooth-brushing, using dental floss and an inter-dental brush, followed. Finally, samples of toothbrushes, toothpaste, floss, inter-dental brushes, mouth-rinses, written notes, pamphlets, and a VCD were distributed. The ambassadors were asked to practise oral care methods at home.

The second session focused on sharing ambassadors' experiences of oral self-care practice at home, and reinforcement of the practices. Problems encountered were discussed, clarified, and solved by the attending dentist. The ambassadors then rehearsed the content and techniques for talks and demonstrations.

The third session provided an opportunity to rehearse the talks again. The programme content was confirmed and the duties of each ambassador were assigned.

Phase 2: oral health education to the elderly participants

The oral health education programme comprised two 1-hour sessions, 1 week apart. Programme content was determined following discussion between the peer educators and the dentist.

The first session was designed to educate the participants about dental caries, periodontal problems and oral self-care (appropriate tooth-brushing techniques, use of floss and inter-dental brushes). The information was designed to be imparted in an interactive way with games and practical demonstrations. Oral care aids, pamphlets, and an educational VCD were also distributed. A 'statement of commitment' was made and participants would receive a certificate of achievement if they committed themselves to the programme and correct oral self-care was practised daily.

The second session was designed to enable participants to share their experiences, and discuss ways to overcome difficulties, to revise course content, and to further reinforce their behaviour.

Data collection

Data concerning dental knowledge, self-reported behaviour (subjective outcome measurement), and oral hygiene levels (objective outcome measurement) were collected from all participants 1 week before and 1 week and 1 month following the oral health education programme. Demographic factors and factors that might affect behaviour were recorded.

Questionnaire on demographic data, knowledge, and self-reported behaviour (subjective outcomes)

The questionnaire comprised three parts: demographic information (part 1: age, sex, educational level), dental knowledge (part 2), and oral self-care behaviour (part 3). Data were obtained at an interview carried out by one interviewer who was not involved in the oral health talks. A pilot version of the questionnaire had been previously tested on five elderly individuals.

Parts 2 and 3 of the questionnaire were based on questions used in the Oral Health Survey 2001[19] on dental knowledge and behaviour. For part 2, there were eight questions on dental knowledge: 1 mark was given for a correct answer and zero for a wrong answer. Possible dental knowledge scores ranged from 0 to 8. For part 3, six questions related to the six indicators for oral self-care behaviour while a seventh acted as a 'dummy' question. Behavioural data were presented as the percentage of participants who reported good oral self-care habits.

Measurements in clinical examination (objective outcomes)

The clinical examination aimed to provide information on individuals' levels of oral hygiene and involved measurements of the visible plaque index (VPI) and gingival bleeding index (GBI).[20] Both indices indicate how well teeth are cleaned and are standard measurement tools in dental research.[21] The examination was performed by a single dentist who was not involved in the oral health talks. For both indices, the possible score ranged from 0.00 to 1.00, with 0.00 signifying absence of plaque/gingival bleeding and 1.00 signifying all teeth with plaque

Table 1
Comparison of baseline demographic factors, dental knowledge, reported oral care behaviour, and oral hygiene between the control and test groups

Variable	Control group (n=23)	Test group (n=51)	p value
Mean age (SD) [years]	74 (6)	73 (7)	0.32*
Sex (F:M)	87%:13%	81%:19%	0.50†
Mean dental knowledge score (SD)	3.83 (1.19)	4.45 (1.70)	0.12*
Self-reported oral self-care habits			
Brushing teeth twice daily (%)	87.0	86.3	0.94†
Brushing at gum margin (%)	4.3	11.8	0.32†
Daily use of dental floss/inter-dental brush (%)	4.3	9.8	0.43†
Daily use of antiseptic mouth rinse (%)	4.3	13.7	0.23†
Twice daily use of fluoride toothpaste (%)	73.9	74.5	0.90†
Frequency of snack: no or not daily (%)	73.9	80.4	0.53†
Objective oral health assessment			
Mean visible plaque index score (SD)	0.76 (0.19)	0.73 (0.19)	0.45*
Mean gingival bleeding index score (SD)	0.48 (0.19)	0.49 (0.19)	0.84*

* Independent-samples *t*-test
† Chi-square test

or contact bleeding on probing. Thus the lower the value of VPI or GBI scores, the better the standard of oral hygiene.

Statistical analysis

Results were analysed using the Statistical Package for the Social Sciences (Windows version 11.0; SPSS Inc, Chicago [IL], US). The categorical variables between control and intervention groups were analysed using a simple chi-square test. The same categorical variables were analysed using McNemar's test for paired comparison with time. Interval variables (dental knowledge score, VPI score, and GBI score) were analysed for statistical differences using the independent *t* test (between groups) and the paired *t* test (pre- and post-comparison within the same group). A p value of less than 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong. Written informed consent was obtained from every participant prior to commencement of the study. Participation was entirely voluntary and oral health talks were open to everyone, regardless of participation in the study.

RESULTS

Six peer educators (4 female and 2 male) were trained at both centres. Two also taught Tai Chi classes to their peers at the centres. One had been a nurse before retirement and another had been an instructor in the Auxiliary Medical Services.

A total of 94 participants (57 from centre A and 37 from centre B) joined the oral health education programme; 76 (81%) were female and 18 (19%) were male. Their age ranged from 60 to 88 years with a mean of 74 (standard deviation [SD], 7) years. Only participants who had real teeth, attended the baseline examination and the oral health talks (for the test group) were included. This was based on our prior study design. Under these conditions, 23 subjects were in the control group and 51 in the test group. No participant was lost to follow-up. **Table 1** shows the baseline comparison of the demographic factors (age and sex), mean dental knowledge score, self-reported behaviour, and objective oral hygiene (VPI and GBI scores) between control and intervention groups. There was no significant difference between the groups at baseline.

Outcome measures 1 week after intervention

Between-group changes in dental knowledge score
At baseline, the mean dental knowledge score for

Table 2
Within-group changes in oral self-care behaviour and oral hygiene level after 1 week

Assessment	Control group (n=23)			Test group (n=51)		
	Baseline	1 week after	p value	Baseline	1 week after	p value
Self-reported oral self-care habits						
Brushing teeth twice daily (%)	87.0	87.0	1.00*	86.3	88.2	1.00*
Brushing at gum margin (%)	4.3	4.3	1.00*	11.8	58.8	0.00*
Daily use of dental floss/inter-dental brush (%)	4.3	4.3	1.00*	9.8	39.2	0.00*
Daily use of antiseptic mouth rinse (%)	4.3	8.6	1.00*	13.7	66.7	0.00*
Twice daily use of fluoride toothpaste (%)	73.9	87.0	1.00*	74.5	88.2	0.75*
Frequency of snack: no or not daily (%)	73.9	73.9	1.00*	80.4	82.4	1.00*
Objective oral health assessment						
Mean visible plaque index score (SD)	0.76 (0.19)	0.78 (0.17)	0.45†	0.73 (0.19)	0.48 (0.24)	0.00†
Mean gingival bleeding index score (SD)	0.48 (0.19)	0.52 (0.19)	0.02†	0.49 (0.19)	0.27 (0.16)	0.00†

* McNemar's test
† Paired *t*-test

Table 3
Comparison between control and test groups of mean changes in visible plaque index (VPI) and gingival bleeding index (GBI) scores, 1 week following intervention

	Control group (n=23)	Test group (n=51)	p value*
Mean difference in VPI score (SD)	0.02 (0.14)	-0.25 (0.19)	0.04
Mean difference in GBI score (SD)	0.04 (0.07)	-0.22 (0.14)	0.01

* Independent-samples *t*-test

the control group and test group was 3.83 (SD, 1.19) and 4.45 (SD, 1.70), respectively. The difference was not significant (p=0.12).

At 1 week following the intervention, the score for the control group was 5.57 (SD, 1.30) and for the intervention group 6.39 (SD, 1.33). The test group demonstrated significant improvement in dental knowledge compared with the control group (p=0.02).

Within-group changes in reported behaviour and oral hygiene level

At 1 week after the study, the control group reported the same oral self-care habits. In the intervention group, the percentage of people who reported appropriate oral self-care habits had uniformly increased for all six questions (**Table 2**). In particular, there was statistically significant improvement in brushing at the gum margin, daily use of dental floss/inter-dental brushes, and daily use of antiseptic mouth rinse (p=0.00, McNemar's test).

These subjective data were supported by the objective oral health assessment. In the intervention group, the mean VPI score decreased from 0.73 to 0.48 (p=0.00) and the mean GBI score decreased from 0.49 to 0.27 (p=0.00). In the control group, there was no statistical difference in the mean VPI score, but a worsening of gingival contact bleeding with a mean GBI score that increased from 0.48 to 0.52 (p=0.02)

Between-group changes in oral hygiene levels

Differences in the mean VPI and GBI scores between the two groups also differed significantly. For the mean VPI score, the intervention group had a decrease of -0.25, whereas the control group had an increase of 0.02 (p=0.04). This phenomenon was also observed for GBI. For the test group, the mean GBI score decreased by -0.22 but the control group showed an increase of 0.04 (p=0.01) [**Table 3**].

Outcome measures 1 month after intervention

Data were collected from the test group (n=51) 1 month after intervention. The mean VPI score was 0.47 (SD, 0.25) and the mean GBI score was 0.28 (SD, 0.19). This represented a sustained reduction of -0.25 for VPI (SD, 0.22; p=0.00) and -0.21 (SD, 0.17; p=0.00) for GBI compared with baseline values. There was no change, reflected by no statistical difference

in mean VPI and GBI scores 1 week and 1 month after the programme.

DISCUSSION

Effectiveness of the programme

The oral health education programme delivered by trained elderly ambassadors resulted in improved oral hygiene among elderly people who attended the talks at the social centre. This was probably mediated through improved oral health care behaviour. The number of participants brushing at the gum margin, using dental floss or an inter-dental brush daily, and using an anti-septic mouth-rinse, increased by absolute values of 47, 29.4, and 53%, respectively. These improvements were statistically significant. In the test group, the mean VPI score decreased by 0.25 and the mean GBI score decreased by 0.22. The effects on both indices were also statistically significant and were maintained for 1 month. These results are comparable with those of an earlier geriatric oral health education programme run in Washington, US, in 1989, which involved 400 elderly people and resulted in a 0.2 to 0.3 decrease in VPI immediately and 3 months after intervention.[22]

There was a marginal increase in the percentage of participants who reported twice daily brushing of teeth, using fluoride on all occasions, and eating snacks less frequently. This did not reach a statistically significant level. However, the baseline prevalence of these three types of behaviour exceeded 74% so it would be difficult to demonstrate an effect. It appeared that the poorer the baseline oral health care behaviour, the more effective the intervention. This evidence of behavioural change among elderly people in Hong Kong following attendance at an oral health education programme is comparable with that from overseas studies.[23-25] Although the content of the programmes and the out-come measures differed, this confirms that oral health behaviour in the elderly can be changed for the better when appropriate methods are used.[26] Possible contributing factors include the selection of elderly peer educators and the structure of the programme itself.

Possible factors contributing to the effectiveness of the programme

Instructors (elderly ambassadors in this study) and their role

Instructors are crucial to health education. They disseminate health messages that aim to influence participants' choices to perform certain tasks. Experience from the 'Healthy Smile for the Elderly' project[17] showed that elderly peer educators could be effective. The various benefits and the reason for using peer educators have been highlighted.

To maximise their potential, peer educators should be actively involved in developing the content of the education programme.[27] They should not act merely as messengers. The peer educators in this oral health education programme were invited to design their own programme and were also encouraged to participate in the areas in which they felt most confident.

The education programme

An interactive, role-play, and story-telling approach was adopted. This was much appreciated by the participants (as revealed by interviews after the programme), who felt more involved and considered the oral health messages easier to understand. They liked the model demonstrations by the elderly ambassadors, and the games and question and answer sections encouraged active participation. This maximised learning capacity and contributed to empowerment.[27] An approach that encourages active involvement when educating elderly people about oral health has been shown to be effective by other studies.[23,24]

The availability, in this study, of free oral care aid samples meant participants could try them out immediately. They were thus more likely to adopt the desired oral care behaviour than if they had to source the appropriate dental products themselves. The supply of oral care aids to the participants was sufficient to last for the whole test period. The participants reported that the provision of samples helped them to choose and buy the correct products, especially after completion of the programme when free samples were no longer available. Participants were not told about the gifts before enrolment in case this influenced their agreement to participate. Real time demonstrations were also performed instead of theory alone. This gave participants confidence, a sense of 'can do' and 'know how to do' directly.

The two-session programme permitted oral health messages to be reiterated, allowing time for

the participants to digest the information and favouring memory recall. It was superior to a one-time-only education session.[28] The participants in this project reported that they valued the more-than-once oral health education lessons because it helped reinforce the information.

This was one of the first studies to investigate the effectiveness of an oral health education programme for the elderly in an Asian setting. The World Health Organization urges different countries to conduct demonstration projects on oral health education to older people and to share experiences across cultures.[29] This study furthered knowledge about oral health in the elderly people, and it demonstrated good practice. It involved peer educators, the provision of oral care aids, and the use of interactive, multi-session and setting approaches. It also confirmed previous studies showing that oral health education can be effective in the elderly.[22-28,30,31]

Limitations of this study

The number of control subjects was small because of an unexpectedly low baseline attendance rate in the control centre. After excluding subjects who had no real teeth, the number of eligible control subjects was 23. As it is more difficult to prove 'no difference' in within-group results (type II error), the greater the number of control subjects the better. Nonetheless, the large effect size of the intervention allowed us to demonstrate the differences in outcome between intervention and control arms.

The post-intervention review was conducted 1 month following the intervention due to time constraints. Whether the effect of the programme can be sustained beyond 1 month, especially after oral care aids ceased to be available from the authors, needs further evaluation.

This study demonstrated the effectiveness of an oral health care programme delivered by elderly ambassadors. It did not determine the effectiveness of a programme if delivered by professional health care staff. Nevertheless, an oral health care programme such as the one in this study could be replicated to provide information to a broader population base.

CONCLUSION

An oral hygiene education programme delivered at social centres by trained elderly ambassadors effectively improved behaviour and oral hygiene among elderly people attending those social centres. The model of 'train-the-trainer, peer educator, interactive with subsequent follow-up approach' provides a reference for the development of local health promotion programmes. This approach is potentially more feasible for a population-based programme than a specialist-educator approach. Whether a specialist-educator–run programme is superior to a peer-educator–run programme requires further studies. In addition, further work is required to determine whether the effects of the programme are sustained or whether a reinforcement programme is required.

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