Original Article

pISSN, eISSN 0125-5614
M Dent J 2022; 42 (2) : 157-174

Effect of an educational program in oral hygiene care for a group of older persons with schizophrenia

Theeyarat Chakrabhandu Na Ayutaya[1], **Potchaman Sinavarat**[2], Prasert Assantachai[3], Chuchai Anunmana[2]

[1] *Graduate student, Master of Science (Geriatric dentistry), Faculty of Dentistry, Mahidol University, Bangkok, Thailand*
[2] *Department of Prosthodontics, Faculty of Dentistry, Mahidol University, Bangkok, Thailand*
[3] *Department of Preventive and Social Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand*

Objective: Schizophrenia patients may lack self-care and are at risk of poor oral hygiene. They tend to develop oral diseases due to the secondary effects of medications. This research aimed to evaluate the efficiency of the educational program in oral hygiene care based on the health belief model (HBM) and encouragement from caregivers to improve oral health and oral health behaviors of schizophrenia older persons.

Materials and Methods: The study consisted of 24 schizophrenia out-patients at Srithanya Hospital and their caregivers. Participants were randomly allocated to testing and controlling groups. The test group received the educational program. The control group got instruction at the chairside. Oral health status, behaviors, health beliefs, and patients' perception of support from caregivers were assessed before and after intervention and at 1-and 4- month follow-ups and compared. The oral health knowledge of caregivers was also assessed.

Results: There were no statistically significant differences between the test and control groups in oral health status, behaviors, health beliefs, the patients' perception of support, and oral health knowledge of caregivers at baseline ($p \leq 0.05$). After the intervention, all mentioned variable scores of the test group improved significantly and were better than the control group ($p \leq 0.05$). There were an 83.3% improvement in social support scores in the test group and 56.9% in the control group. The knowledge scores of caregivers in the test group were significantly higher than the control group ($p \leq 0.05$).

Conclusion: This educational program based on the HBM was effective in reducing plaque scores, increasing perception of oral diseases, and leading to better oral health behaviors while the caregivers also paid more attention to the patients' oral health.

Keywords: caregivers, health belief model, schizophrenia, social support

How to cite: Chakrabhandu Na Ayutaya T, Sinavarat P, Assantachai P, Anunmana C. Effect of an educational program in oral hygiene care for a group of older persons with schizophrenia. M Dent J 2022; 42: 157-174.

Introduction

At present, mental disorders are common in the society. Schizophrenia is one of the severe mental disorders that affects approximately 1% of the world's population [1], including 390,943 people in Thailand [2]. The exact causes of schizophrenia are unknown. Schizophrenia is a psychotic disorder that affects varying degrees of personality disorganization which lessens an individual's ability to work and communicate with others effectively. It is characterized by the presence of abnormalities in one or more of the following domains varying in intensity: the most dramatic are delusions, hallucinations, mental dissociation, and, for the most handicapping, social withdrawal, denial of the body, and cognitive difficulties. Compared to the general population, persons with schizophrenia suffer from a higher risk of developing major health problems such as

Correspondence author: Potchaman Sinavarat
Department of Prosthodontics, Faculty of Dentistry, Mahidol University
6 Yothi Road, Ralchathewi, Bangkok 10400, Thailand
Tel. +66 2200 7817
Email: potchaman.sin@mahidol.ac.th
Received: 6 May 2022 Revised: 8 June 2022 Accepted: 8 June 2022

coronary artery disease, diabetes mellitus, obesity, and respiratory illnesses [3]. Most of them have poor oral hygiene, including conditions such as dry mouth, periodontitis, dental caries, and tooth loss. They tend to develop dental and oral diseases due to the secondary effects of medications they receive and lack of self-care [4]. Schizophrenia is usually treated with antipsychotic or neuroleptic drugs, which have beneficial effects on the patient's mood and thought processes. However, these neuroleptic agents can cause adverse orofacial effects such as hyposalivation or xerostomia and long-term effects of extrapyramidal symptoms termed tardive dyskinesia. Tardive dyskinesia is characterized by involuntary movement of the body, face, tongue, and jaw. It does not affect all patients who receive antipsychotic medications, but if it happens, it is sometimes permanent and its treatments have remained unsatisfactory [5]. Poor oral health may affect the ability to eat, speak and socialize and several aspects of general health, including respiratory diseases [6], diabetes mellitus [7], and cardiovascular diseases [8]. Thus, good oral health can contribute to the quality of life. Generally, preventive dental care is not an integral part of psychiatric care [9]. Hence, most patients have heavy plaque and calculus deposited with gingival inflammation and dental caries [10]. For this reason, preventive dental education is a critical aspect of dental management. Routine oral care instruction at the chairside as provided to general patients may not be appropriate for schizophrenia patients due to their symptoms of illness, such as lack of motivation and interest. A small group-based educational program improved patients' oral health knowledge [11] and may lead to better oral hygiene behavior. In addition, the program includes multimedia with clear illustrations, the text is written in large font size, and interesting activities were suggested to enhance better understanding for older people [12].

Generally, patients receive oral hygiene advice from dentists using verbal instructions in dental practice. This method was tested to succeed in improving knowledge regarding oral and denture hygiene care [13]. In contrast, written information alone was ineffective in encouraging and bringing attention to elderly people [14]. Cognitive deficits in schizophrenia may affect many areas including attention, learning, perception, memory, and problem-solving. These factors may influence the ability of the patients to perceive verbal instruction and perform sufficient oral self-care [15]. The present study suggested an educational program in oral hygiene care to raise awareness of oral health and motivate attention which might lead to improved oral care behaviors and oral hygiene of patients. In planning the program, the investigators attempted to motivate healthy oral health behaviors of individuals, such as tooth brushing twice a day, using fluoride toothpaste, and using some oral hygiene aids. Many studies [16-18] reported that health behavior theories have contributed to expanding the understanding of human behavior, provide the foundation to evaluate health-related interventions, and have evidenced moderate to significant success in changing unhealthy habits to healthy behaviors. The health belief model (HBM) is one of the well-recognized theories. This theory is based on the concept that people wish to avoid illness and that people who practice specific available health actions will prevent illness [19]. The components of HBM that predict the probability of adopting a certain behavior include 1) perceived susceptibility, 2) perceived severity, 3) perceived benefits, and 4) perceived barriers [20-21]. Each component of the HBM can help to guide health promotion. If persons perceive susceptibility or risk to oral diseases and perceive their severity, these perceptions may lead to compliance with dentists' advice. If persons give a high value to the

benefits of good oral health and low value to the barriers to perform oral care, they will have healthy behavior and enhance self-efficacy to prevent oral diseases. Meanwhile, if health personnel know which model components are low, they might be able to adapt the intervention to suit the particular needs of each patient [20].

In general, the co-operation and understanding of patients may be inconsistent depending on the phases of schizophrenia, and some may neglect their oral hygiene. Thus, the present educational program wanted to encourage their caregivers to motivate and support the oral hygiene care of this group of older patients. Their caregivers could provide physical and emotional comfort to patients and enhance good health and quality of life. Social support can be provided in many ways. House [22] has classified four types of supportive behaviors including 1) emotional support, 2) instrumental support, 3) informational support, and 4) appraisal support. At present, little attention is paid to the oral hygiene care of schizophrenia patients and the role of their caregivers in assisting them with the oral care is not encouraged.

The purpose of this study was to evaluate the efficiency of the educational program in oral hygiene care for older persons with schizophrenia by applying the health belief model and the encouragement from caregivers to modify their behaviors. This aim would be achieved in the context of research to determine if the educational program in oral hygiene care contributed to

1) the change in patients' oral health behaviors
2) the decreasing plaque scores of the patients
3) the patients' perception of oral diseases in terms of oral disease risk, disease severity, benefits/barriers of behavior change, and caregiver support
4) the improvement of oral health knowledge of their caregivers.

It was hypothesized that the educational program in oral hygiene care would reduce plaque scores, improve oral health behaviors of schizophrenia patients, and improve the oral health knowledge of their caregivers more than the routine verbal instruction at the chairside.

Materials and Methods

Study design

A randomized controlled trial research (two groups comparison, pre-test, and post-test designs) was carried out from January to May 2021. The estimated sample size was calculated based on the differences in means and standard deviations of plaque scores obtained from the study reported by Almomani *et al.* [23]. The sample size of 12 participants per group and the total number of participants was 24 schizophrenia patients and 24 caregivers. Participants were randomly allocated for testing and controlling groups using computer-generated simple random samples. The participants in the test group received oral hygiene care knowledge by attending for a single episode of a 40-minute educational program. The participants who received verbal oral hygiene instruction at the chairside as a routine basis served as the control group. The duration of the intervention was four months. A 15% of improvement was the expected value of the intervention.

Study population

The participants were schizophrenia older persons aged 60 years and above who had been diagnosed with schizophrenia by psychiatrists in a psychiatric hospital as defined according to the World Health Organization (F20-F29 from ICD 10th edition) [24], had routinely visited the psychiatric clinic, did not have medication changed for at least six months, retained at least six natural teeth, were able to brush their teeth and well cooperate with dental treatment.

The patients had a Barthel Index of Activities of Daily Living (ADL) score ≥12 out of 20, with lower scores indicating increased disability [25]. They had a score on the Brief Psychiatric Rating Scale (BPRS) to measure the severity of schizophrenia ≤36, indicating mild illness [26]. The caregivers were at least 18 years old and had a minimum experience of 3 months in caring for schizophrenia patients. They had a score on a cognitive screening test using the Thai Mental State Examination (TMSE) ≥23/30 [27]. The participants (the older persons and caregivers) were Thai native speakers and could read and understand Thai and communicate in Thai. Persons who met these criteria were invited to participate. The exclusion criteria were the patients who were diagnosed other than schizophrenia, had unstabilized symptoms from a psychiatric viewpoint, had problems of communication, could not answer questions by interviewing, and did not have relatives or caregivers to accompany or those who were unwilling to participate.

Data collection

The study was commenced after getting ethical approval from the Faculty of Dentistry, Faculty of Pharmacy, Mahidol University Institutional Review Board (COA.No.MU-DT/PY-IRB 2020/061.0610) and the Research Ethics Committee, Srithanya Hospital (STY. COA006/2564). The director of Srithanya Hospital was asked for permission to approach the patients for volunteers. The participants were informed of the study briefly. They were also made aware that refusal or withdrawal from the investigation and their opinions regarding the study did not affect the standard of care they would receive in the future. Written consent was obtained from participants after they agreed to participate.

Instruments

Questionnaire for interviewing the patient

The format of an interview was prepared using a 5-part questionnaire which included:

Part 1: the demographic data

Part 2: the information on medical history and mental illness

Part 3: oral hygiene care behaviors

The interview included the patient's ability to brush their teeth, frequency of tooth brushing, the usual period and method of brushing, and the type of toothpaste used. If the patient wore a removable denture, the questions included denture care and soft tissue care behavior.

Part 4: Health belief model

A 12-item questionnaire with a 3-point Likert scale was used to assess oral health perception based on the HBM theory. The questions included perception of susceptibility or oral disease risk and disease severity, and benefits and barriers of behavior change. A possible score for each item ranged from 1-to 3. A score marked 1 indicated disagree, 2 indicated not sure, and 3 indicated agree for the perception of disease risk, severity and benefit. In contrast, a score marked 1 of the perception of barrier represented agree, 2 represented not sure, and 3 represented disagree.

Part 5: Social support

Based on the social support theory, an 8-item questionnaire with a 3-point Likert scale was used to assess the patient's perception of oral care supported by a caregiver. The questions regarding emotional support, information support, instrumental support, and appraisal support were asked. A possible score for each item ranged from 0-2. A zero indicated no or never, 1 indicated not sure, and 2 indicated yes.

Questionnaire related to oral health knowledge of caregivers

The questionnaire included two parts of questions. The first part contained questions regarding the demographic data of caregivers. In the second part, there were 15 items of true-false questions related to caregivers' knowledge towards oral health. The maximum knowledge score was 15 points.

Before using these questionnaires, the questions were reviewed by three faculty colleagues who were not involved in the study to minimize error. The suggestions were obtained, and some wording was changed to fit the understanding level of the participants. Content validity was used to assess the validity of the questionnaires. The value calculated was 0.91. Subsequently, the questionnaires were pre-tested by another group of patients and caregivers with similar demographic characteristics to ensure that all questions were clear and understandable. The reliability of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, social support, and oral health knowledge were calculated using Cronbach's alpha technique and the Cronbach's alpha coefficient for these items were 0.75, 0.80, 0.78, 0.80, 0.75, and 0.74, respectively, considered as desirable.

Educational program in oral hygiene care

The content of the program consisted of 4 activities: 1) group discussion related to their experiences of oral health problems and how they solved the problems 2) slide presentation regarding the importance of good oral health, the effect of dental plaque and the oral diseases 3) the video clips demonstrating the technique of tooth brushing, denture cleaning, using dental floss and other oral hygiene aids and 4) a demonstration and self-practice on models. The whole program was organized by a dentist who was one of the investigators. The present educational program was designed for groups of 4-6 schizophrenia patients and 4-6 of their accompanying caregivers. The classroom was set by maintaining a physical distancing between each person to prevent the transmission of infectious disease. The program lasted approximately 40 minutes.

Assessment of oral health status

Dental assessment

The dental examination recorded the number of teeth affected by caries, missing and filled teeth (DMFT) in accordance with the World Health Organization criteria [28]. The number of natural teeth present and the number of posterior functional units were noted (third molars and retained roots or teeth that not restorable were excluded). The presence and type of dental prostheses were also recorded.

Oral mucosal dryness assessment

The Clinical Oral Dryness Scoring (CODS) was used to assess the dryness of the oral mucosa. Ten features of the clinical appearance were assessed and scored. The total score was ten, with higher scores indicating increased severity of oral dryness [29].

Dental and denture plaque assessment

The dental plaque index (PI) was assessed using Silness- Löe Index [30]. A CPI probe was used to pass over the cervical third to test for the presence of plaque on six indices teeth (number 16, 12, 24, 36, 32 and 44). The possible plaque index scores for each tooth surface ranged from 0-3. A zero indicated no plaque, 1 indicated a film of plaque present on the tooth, 2 represented moderate accumulation of soft deposits in the gingival pocket or on the tooth that could be seen by the naked eye and 3 represented an abundance of soft matter within the pocket or on the tooth [31]. An average plaque index score was evaluated for each patient.

If the patient wore removable prostheses, the denture plaque on polished and tissue surfaces was evaluated using the criteria modified from Augsburger *et al*. [32]. A zero indicated no plaque on both surfaces, 1 indicated light plaque on one surface (1% - 25% of the area covered), 2 indicated light plaque on both surfaces (1% - 25% of the area covered), 3 represented plaque on polished or tissue surface or both (>25% - 50% of the area covered) and 4 represented heavy plaque on polished or tissue surface or both (>50% of area covered). If the patient wore upper and lower dentures, the average value of both plaque scores was used to determine the denture plaque score of that patient.

Procedures

Before commencing the investigation, all schizophrenia patients received necessary dental treatment to relieve pain and discomfort, such as tooth extraction. Subsequently, all participants were interviewed by a dentist who was one of the investigators.

Data were obtained from the patients using face-to-face interview. The patients' oral and dental status was examined by a standardized dentist who was not involved in the study. To avoid information bias, the examiner was blinded to the participants' group assignment. Adverse orofacial effects caused by antipsychotic medications such as hyposalivation and tardive dyskinesia were observed and recorded. If the patient was wearing a denture, oral soft tissue and denture condition were examined by the dentist. Dental and denture plaque scores were recorded as baseline data or pre-test scores. Meanwhile, the caregivers were asked to answer the 15-item questionnaires regarding the oral health knowledge. The knowledge scores served as the pre-test scores at baseline. Subsequently, patients accompanied by their caregivers in the control group received oral hygiene care instruction at the chairside for approximately 10 minutes. The instruction included an explanation of the effect of plaque accumulation and a model demonstration of how to remove plaque using a toothbrush and other equipment. The patients in the test group with their caregivers attended the educational program in the demonstration room for approximately 40 minutes. A single dentist (one of the investigators) instructed oral hygiene care for the control group and organized the educational program for the test group. The dentist recommended appropriate oral hygiene aids for each schizophrenia patient in both groups and provided these tools to each of them. Two booklets, one of which related to oral hygiene care instructions for older persons and another one that explained the methods of assisting oral care for caregivers, were distributed to both the patients and caregivers to review at home.

Immediately after receiving the oral hygiene care instruction, the patients answered the 12-item questionnaires regarding the oral health perceptions, and the caregivers answered the oral health knowledge questionnaires. Obtained data were recorded as post-test scores.

Two weeks after the oral hygiene instruction, the investigator motivated the participants by making a phone call to each of them to ensure compliance and review oral care practice, which took 5-10 minutes.

At the 1-month follow-up, the patients in both test and control groups with their caregivers were scheduled to come. The patients were interviewed by the investigator regarding the changes in their oral hygiene care behaviors, the oral health perceptions, and the perception of caregiver support. Dental and denture plaque scores were also assessed by the standardized dentist. The caregivers answered the oral health knowledge questionnaires. Data was recorded as a 1-month follow-up.

At a 4-month follow-up, the participants were invited again. Data obtained from a 1-month follow-up were repeatedly interviewed, assessed, and recorded as a 4-month follow-up.

At the end of the investigation, the patients and their caregivers in the control group were invited to attend and benefit from the educational program.

Statistical Analysis

Descriptive statistics were obtained for each variable. Means, standard deviations, and frequency distribution were calculated. Repeated measures ANOVA or Friedman Test was used to compare intragroup differences and Independent t-test or the Mann-Whitney U test was used to compare between the intervention and the control groups of the outcome measures at pre-test, post-test, 1-month and 4-month follow-ups. All analyses used a 95%confidence interval, and statistical significance was at a p-value of less than 0.05.

Results

Twenty-four schizophrenia patients and 24 caregivers were involved in this study, and all of them returned for the 1- and 4-month follow-ups, which was a 100% return rate. To achieve the research purpose, the researchers designed a randomized allocation of the test and control groups in such a way that the participants did not know to which group they belonged. The consistency of the two groups in demographic variables and the initial data in oral health before the investigation showed no difference between the groups.

Sociodemographic characteristics and oral health status of patients

The number of female and male participants in both test and control groups was equal, with an average age of 64.2±3.5 years (range 60-70 years) and 64.8±5.0 years (range 60-78 years), respectively. About half of the patients in both groups had completed high school or high vocational certificate. Most of the patients in both groups had mental illness for 20-39 years with an average BPRS of 19 and only one patient in each group presented with tardive dyskinesia. All of them had history of hospital admission due to mental illness.

Oral health status

All patients still retained some of their natural teeth. The average number of teeth present was 18.2 and 19.0 teeth/person, range 7-28 and 6-28 teeth, in test and control groups, respectively. Six patients (50%) in the test group and 7 patients (58.3%) in the control group had ≥20 natural teeth. The number of posterior opposing teeth pairs was 3.3 and 3.0 pairs/person with DMFT 17.7 and 18.7 teeth per person in the test and control groups, respectively. Mild to moderate oral mucosal dryness was found in all patients of both groups. All of them could perform oral self-care. In this present study, the symptoms of tardive dyskinesia were diagnosed in only two patients, one in each group. They presented with tongue protrusion, and abnormal movements of the lips and jaws that could affect tooth brushing and cause poor oral hygiene. They had only a few teeth remaining and no denture replacement. They manifested by poor oral health described as many decayed teeth, several missing teeth, no filled teeth, and high plaque index scores.

Sociodemographic characteristics of caregivers

Most of the caregivers were female with a mean age of 45.8±14.0 years (range 19-64 years) and 40.4±16.8 years (range 18-70 years) for the test and control groups, respectively. The persons taking care of the patients were nurses, nurse assistants, and employed caregivers in both test and control groups.

Oral care behaviors

The details are presented in Table 1. At baseline, most of the patients (83.3% and 91.7% in test and control groups, respectively) were brushing twice daily, in the morning and before bedtime. While 16.7% and 8.3% in test and control groups, respectively, were brushing only in the morning. All of them used manual tooth brushing and fluoride toothpaste. There was no statistically significant difference in frequency of tooth brushing between both groups at baseline, 1-month and 4-month follow-ups. When comparing the frequency and time of oral cleaning within the test group, the baseline score was significantly lower than the 1-month follow-up. Within the control group, there were no statistically significant differences between baseline scores, 1-and 4-month follow-ups.

Regarding the interproximal cleaning device, at baseline dental floss was rarely used by participants in the test group (16.7%) and never used by those in the control group. The interdentalbrush was never used by participants in both groups. One and four months later, more than half of the group participants used dental floss and an interdental brush for interproximal cleaning. When comparing the results within the test and control groups using a repeated ANOVA, it revealed statistically significant differences between baseline and 1-and 4-month follow-ups in both groups ($p \leq 0.05$). The oral care behavior scores increased with 19.3% improvement in the test group and 17.4%, in the control group. The scores of both groups increased and reached the expected value of 15% improvement (Table 2).

Table 1 Comparison of the oral care behaviors at baseline, 1- and 4- month follow-ups between the test and control groups.

Oral care behaviors	n	Baseline n(%)		1M FU n(%)		4M FU n(%)	
Frequency and interval of oral cleaning	12	Test	Control	Test	Control	Test	Control
Once per day		2(16.7)	1(8.3)	1(8.3)	1(8.3)	0(0.0)	0(0.0)
Twice per day		10(83.3)	11(91.7)	7(58.3)	10(83.3)	10(83.3)	11(91.7)
Three times per day or more		0(0.0)	0(0.0)	4(33.3)	1(8.3)	2(16.7)	1(8.3)
p-value[a] *inter-group*		.557		.265		.557	
p-value[b] within test group		comparing between pre-test and 1M =0.05*					
p-value[b] within control group		-----					
Using equipment for oral cleaning	12	Test	Control	Test	Control	Test	Control
Toothbrush only		10(83.3)	12(100.0)	4(33.3)	6(50.0)	3(25.0)	5(41.7)
Toothbrush+interpoximal brush or floss		2(16.7)	0(0.0)	8(66.7)	6(50.0)	9(75.0)	7(58.3)
p-value[a] *inter-group*		.166		.430		.409	
p-value[b] within test group		comparing between pre-test and 1M =0.021* comparing between pre-test and 4M =0.007*					
p-value[b] within control group		comparing between pre-test and 1M =0.021* comparing between pre-test and 4M =0.007*					

a Statistical analysis used was Independent t-test.

b Statistical analysis used was Repeated measures ANOVA.

* The significance level is 0.05

Table 2 Percentage of improvement between the test and control groups.

Improvement	Test group	Control group
	Mean(%)	Mean(%)
Plaque index scores	18.6	3.6
Oral care behaviors	19.3	17.4
Perceived susceptibility scores	27.5	11.1
Perceived severity scores	21.5	10.6
Perceived benefits scores	24.9	1.1
Perceived barriers scores	18.8	13.7
Social support scores	83.3	56.9
Oral health knowledge scores	13.1	1.2

Plaque index scores

Plaque index scores were shown in Table 3. There were no statistically significant differences between the test and control groups at baseline. However, after the intervention plaque scores of test and control groups decreased and significant differences were found between these 2 groups at 1- and 4-month follow-ups ($p \leq 0.05$). When comparing within the test group, no significant difference was found between baseline and 1- month follow-up ($p > 0.05$), whereas significant differences were revealed when comparing between baseline and 4- month follow-up and 1- and 4- month follow-up. Though the plaque scores in the control group decreased after the intervention, no significant differences were found when comparing between pre-test and 1- and 4- month follow-ups ($p > 0.05$). The mean plaque scores decreased 18.6% in the test group which was higher than the expected value of 15% improvement and only 3.6% in the control group. (Table 2).

Table 3 Comparison of plaque index scores at baseline, 1- and 4-month follow-ups between the test and control groups.

Variable	Test gr. (Mean ± SD)	Control gr. (Mean ± SD)	Mean Difference	*p*-value [a] *(intergr.)*
Plaque index scores				
Pre-test (baseline)	1.96 ± 0.46	2.28 ± 0.39	0.32±0.18	0.085
1 month	1.95 ± 0.40	2.27 ± 0.23	0.32±0.13	0.026*
4 months	1.59 ± 0.43	2.14 ± 0.24	0.54±0.14	0.001*
***p*-value [b] (within group)**	0.001*	0.354		
p_1 value (Pre-1M)	1.000	1.000		
p_2 value (Pre -4M)	0.010*	0.669		
p_3 value (1M – 4M)	<0.001*	0.088		

[a] Statistical analysis used was Independent t-test.

[b] Statistical analysis used was Repeated measures ANOVA.

* The significance level is 0.05

Denture care behaviors

There were only 2 patients, one in the test group and another one in the control group, who used removable partial dentures. At baseline, the patient in the test group reported that she did not remove the denture at night, and the denture plaque index was 3. At the 1-month follow-up after attending the oral health care program, she took the denture off at night and cleaned it using a soft brush and liquid soap instead of toothpaste. The denture plaque index was reduced to 2.5. Unfortunately, at a 4-month follow-up, she informed me that she had recently lost her denture. In the patient in the control group, the denture plaque index at baseline was 2.5, and the denture was occasionally removed and washed after a meal. He also removed the denture at bedtime but did not soak it in water. At the 4-month follow-up, he reported always removing the denture and washing it after meals. The denture plaque score was reduced to 1. The denture was removed at bedtime and kept in water as instructed.

Health belief model scores

At baseline, the mean scores of the four components of oral health beliefs of the test group did not significantly differ from those of the control group ($p > 0.05$). After the intervention, the test and control groups had higher oral health belief scores. In comparison between the test and control groups, the test group had significantly better health belief of oral disease risk, and benefits of behavior change at post-test, and 1- and 4- month follow-ups than the control group ($p \leq 0.05$). The belief of severity of the test group was significantly higher than the control group at post-test and 4-month follow-up, while the belief of barriers to behavior change was found to be significantly higher in the test group than in the control group at 1-and 4-month follow-ups ($p \leq 0.05$). In comparison within the group, a significant improvement in all four components of health belief scores was observed at post-test, 1- and 4-month follow-ups for the test group ($p \leq 0.05$) but there was no significant difference in the control group ($p > 0.05$). The results are shown in detail in Table 4.

Table 4 Comparison of each component of the HBM at baseline, post-test, 1- and 4-month follow-ups between the test and control groups.

Variable	Test gr. (Mean ± SD)	Control gr. (Mean ± SD)	Mean Difference	*p*-value [a] *(intergroup)*
Perceived susceptibility				
Pre-test (baseline)	6.50 ± 1.51	5.92 ± 1.44	0.58 ± 0.60	.313
Post-test	8.33 ± 0.99	6.33 ± 1.43	2.00 ± 0.50	.002*
1 month	8.08 ± 1.56	6.58 ± 1.38	1.50 ± 0.60	.025*
4 months	8.08 ± 1.56	6.42 ± 1.17	1.67 ± 0.56	.011*
p value [b] *(within group)*	< 0.001*	.069		
p_1 value (Pre-post)	0.004*	.059		
p_2 value (Pre -1M)	0.007*	.143		
p_3 value (Pre – 4M)	0.007*	.165		

Table 4 (continued.) Comparison of each component of the HBM at baseline, post-test, 1- and 4-month follow-ups between the test and control groups.

Variable	Test gr. (Mean ± SD)	Control gr. (Mean ± SD)	Mean Difference	*p*-value [a] *(intergroup)*
Perceived severity				
Pre-test (baseline)	7.00 ± 0.43	7.00 ± 0.74	0.00 ± 0.25	.684
Post-test	8.17 ± 1.03	6.83 ± 1.27	1.33 ± 0.47	.017*
1 month	8.00 ± 1.04	7.58 ± 0.99	0.42 ± 0.42	.340
4 months	8.50 ± 0.91	7.42 ± 0.79	1.08 ± 0.35	.008*
p* value** [b] ***(within group)	< 0.001*	.091		
p_1 value (Pre-post)	0.008*	.516		
p_2 value (Pre -1M)	0.014*	.168		
p_3 value (Pre – 4M)	0.003*	.238		
Perceived benefit				
Pre-test (baseline)	6.25 ± 0.97	6.75 ± 0.75	0.50 ± 0.35	0.151
Post-test	8.17 ± 1.03	7.33 ± 0.65	0.83 ± 0.35	0.048*
1 month	8.00 ± 1.04	7.08 ± 0.52	0.92 ± 0.34	0.043*
4 months	7.75 ± 1.06	6.75 ± 1.06	1.00 ± 0.43	0.044*
***p* value** [b] **(within group)**	< 0.001*	.052		
p_1 value (Pre-post)	0.002*	.072		
p_2 value (Pre -1M)	0.031*	.333		
p_3 value (Pre – 4M)	0.002*	1.000		
Perceived barriers				
Pre-test (baseline)	6.75 ± 1.14	6.67 ± 1.07	0.08 ± 0.45	.558
Post-test	8.50 ± 1.00	7.58 ± 1.17	0.92 ± 0.44	.050*
1 month	8.42 ± 1.00	7.33 ± 1.30	1.08 ± 0.47	.032*
4 months	7.92 ± 0.67	6.67 ± 0.78	1.25 ± 0.30	.001*
***p* value** [b] **(within group)**	< 0.001*	.122		
p_1 value (Pre-post)	0.008*	.051		
p_2 value (Pre -1M)	0.010*	.263		
p_3 value (Pre – 4M)	0.009*	1.000		

[a] Statistical analysis used was Mann-Whitney U test.

[b] Statistical analysis used was Friedman Test.

* The significance level is 0.05

The health belief scores were found to increase with 27.5%, 21.5%, 24.9%, and 18.8% improvement in the perception of susceptibility, severity, benefit, and barrier, respectively, in the test group and only 11.1%, 10.6%, 1.1%, and 13.7%, respectively, in the control group. The improvement of the test group only reached the expected value of 15%. (Table 2) The results also revealed that the health belief of barrier (difficulty in using dental floss) was the lowest difference perception score found in the test group, and the health belief of benefits was shown to be the lowest difference perception score in the control group.

Social support scores

At baseline, no statistical differences were found between these two groups prior to the intervention ($p > 0.05$). After the intervention, the social support scores increased in both groups. In comparison between the test and control groups, no significant differences were found at 1- and 4-month follow-ups ($p > 0.05$). When comparing within the group, significant differences were demonstrated between baseline and 1-month and 4-month follow-ups in both test and control groups (Table 5). The social support scores increased with 83.3% improvement in the test group and 56.9% in the control group. The scores of both groups increased much more than the expected value of 15%. (Table 2).

Table 5 Comparison of the mean social support scores at baseline, 1- and 4-month follow-ups between the test and control groups.

Variable	Test gr. (Mean ± SD)	Control gr. (Mean ± SD)	Mean Difference	*p*-value [a] *(intergroup)*
Social support				
Pre-test (baseline)	4.50 ± 1.14	4.83 ± 1.03	0.33 ± 0.40	.397
1 month	7.17 ± 1.03	6.67 ± 0.99	0.50 ± 0.41	.229
4 months	8.00 ± 0.85	7.33 ± 0.99	0.67 ± 0.38	.092
***p* value [b] (within group)**	<0.001*	<0.001*		
p_1 value (Pre-1M)	0.001*	0.002*		
p_2 value (Pre -4M)	0.002*	0.002*		
p_3 value (1M – 4M)	0.025*	0.046*		

[a] Statistical analysis used was Mann-Whitney U test.
[b] Statistical analysis used was Friedman Test.
* The significance level is 0.05

Oral health knowledge scores

The oral health knowledge scores of the caregivers are shown in Table 6. The baseline scores showed no statistically significant difference between the groups. After providing knowledge to the participants, the knowledge scores were statistically significant differences between the test and control groups at post-test and 1-month follow-up (p= 0.042, 0.046, respectively). When comparing the scores within the test group, there were significant differences between baseline, post-test, 1- and 4-month follow-ups (p<0.001, <0.001,=0.009, respectively). In addition, the post-test score was significantly higher than the 1-and 4-month follow-up scores (p=0.034, 0.046, respectively). In comparison within the control group using Bonferroni post-hoc analysis, the same results were shown as in the test group. It revealed that the post-test score was significantly higher than the baseline score (p=0.037), and the 1- and 4-month follow-up scores (p=0.012, 0.046, respectively). The knowledge scores improved with a 13.1% improvement in the test group and only 1.2% in the control group. (Table 2).

Table 6 Comparison of the oral health knowledge scores at baseline, post-test, 1- and 4- month follow-ups between the test and control groups.

Variable	Test gr. (Mean ± SD)	Control gr. (Mean ± SD)	Mean Difference	*p*-value [a] *(intergroup)*
The oral health knowledge score				
Pre-test (baseline)	11.17 ± 1.03	11.67 ± 0.89	0.50 ± 0.39	0.216
Post-test	13.50 ± 0.80	12.67 ± 1.07	0.83 ± 0.04	0.042*
1 month	12.92 ± 1.24	12.00 ± 0.85	0.92 ± 0.05	0.046*
4 months	12.58 ± 1.31	11.75 ± 1.29	0.83 ± 0.13	0.131
***p* value** [b] **(within group)**	< 0.001*	.040		
p_1 value (Pre-post)	< 0.001*	0.037*		
p_2 value (Pre -1M)	< 0.001*	1.000		
p_3 value (Pre- 4M)	0.009*	1.000		
p_4 value (Post-1M)	0.034*	0.012*		
p_5 value (Post-4M)	0.046*	0.046*		

[a] Statistical analysis used was Independent t-test.

[b] Statistical analysis used was Repeated measures ANOVA.

* The significance level is 0.05

Discussion

In previous studies, there was a study on the effectiveness of an oral health promotion program on oral health behaviors and oral health among older people. The experimental group received the HBM theory-based oral health education program and brushing practice in other small groups. The results revealed that the oral health promotion program could improve perceptions, behaviors, and oral health conditions in older adults [33]. The present educational program based on the HBM is effective in improving oral health and oral health behavior of this group of schizophrenia patients and also improving the oral health knowledge of their caregivers. This supports our hypothesis that the educational program in oral hygiene care would reduce plaque scores, improve oral health behaviors of schizophrenia patients, and improve the oral health knowledge of their caregivers more than routine verbal instruction.

This study demonstrated that schizophrenia patients had poor oral health, as shown in the results. Though the average number of teeth present and the number of pairs of posterior opposing teeth were consistent with the results of the 8th National Oral Health Survey, they were less than the goal of the Ministry of Public Health to promote the older persons to have at least 20 teeth and 4 occluding pairs [34]. The DMFT of the test and control groups were 17.7 and 18.7 teeth per person, respectively, which were greater than the average value of Thai population aged 60-74 (15.9 teeth/person) [34]. Furthermore, patients in both test and control groups in the present study had oral mucosal dryness. Therefore, they were at high risk of candidiasis, gingival inflammation, periodontitis, dental caries, and tooth loss afterward [4]. It was possible that they were subject to a great number of risk factors for oral diseases than the general population due to side effects of their medications, inadequate self-care, difficulty in attending health services, and lack of co-operation with dental treatment. This result was in agreement with the previous studies [4, 35] in which a similar outcome was found. Apart from the oral mucosal dryness, which was the side effect of their medications, two patients suffered from the symptom of tardive dyskinesia. Both of them presented with poorer oral hygiene and poorer dental status than the others. They had several missing teeth, and no filled teeth at all. The abnormal movement of the tongue and lips and Parkinsonian-like movements caused difficulties in their capability of tooth brushing and provision of professional dental care. Tardive dyskinesia is a potentially irreversible long-term adverse effect of treatment with first-generation antipsychotic medications. These abnormal movements affect the process of tooth brushing and cause strong relation to poor oral hygiene [5]. This finding indicated that dentists should pay more attention to patients treated with first-generation antipsychotics and presented with tardive dyskinesia, and should schedule them for frequent oral care or at least every 3-month.

The educational program was a small group discussion related to their experiences of oral health problems. By sharing their own problems, a number of participants appreciated to be heard and got attention and idea for resolving problems from the investigators.

In dentistry, the concept of HBM is receiving increasing recognition as a predictor of health behavior change and maintenance care [16, 33, 36]. The results from this study demonstrated that oral hygiene care advice provided at the chair side and the one received from the program could improve the perception or belief of risk, severity, benefits, and barriers of the patients in

both control and test groups but the test group had significantly higher scores than the control group. The educational program based on HBM could successfully promote oral health behavior change. This result was also confirmed by the study carried out by Wongsanao *et al* [16]. In the test group, the health belief of barrier (difficulty in using dental floss) obtained the least percentage of improvement while in the control group, the belief of benefits obtained the least percentage of improvement. These findings revealed that lack of practical skill in cleaning their own teeth in the test group and lack of oral health knowledge in the control group lead to such the lowest scores. For these reasons, the intervention of the program should be considered to adapt to suit the needs of patients.

Regarding measuring patients' compliance, some studies used self-report of behavior [37]. This might lead to social desirability bias. Measuring clinical outcomes can eliminate bias caused by self-report and provide more reliable data [36]. The present study used both self-reported behavior and clinical outcome in measuring compliance which were demonstrated by the patients' reporting of frequency of tooth brushing and using of oral hygiene aids (dental floss, interproximal brush) and the dentist's recording of dental plaque scores.

It was clear that the plaque score decreased when the patients changed their behaviors. Attempts to improve oral hygiene and reduce plaque scores of schizophrenia patients require intensive effort to improve the knowledge of both patients and caregivers. This study demonstrated that the HBM might contribute to a better understanding of patient compliance with oral hygiene care advice.

A schizophrenia needs more support and motivation in oral hygiene care from dental personnel, family, and caregivers. It seemed that after attending the program, the caregivers realized the importance of oral health and intended to enhance the well-being of the patients. However, the present study assessed only patients' perceptions of support. The actual support that was given by the caregivers was not evaluated. Hence, these perceptions were not always accurate.

Regarding the oral health knowledge of the caregivers, the results demonstrated that after the intervention there was an improvement in knowledge scores but the scores dropped at 4-month follow-up. Therefore, continuous motivation should be considered. We found that the patients in the test group received more interest and support from their caregivers regarding oral care. This result was in contrast with the studies of Davies *et al*. [38]. They reported that improvement in knowledge was ineffective in changing oral health practice behavior or decreasing the levels of oral diseases in older persons. In this current study, the patients could brush their teeth. Hence, the caregivers only provided appropriate advice.

The findings of this study revealed that the scores of all measures of the test group reached a 15% improvement except the caregivers' knowledge scores. While only the perception of social support scores and the scores of behavioral change of the control group reached the 15% improvement. The improvement of the knowledge score of caregivers in the test and control groups was 13.1% and 1.2%, respectively. This improvement did not reach the expected value. This was probably due to the high scores obtained at baseline and declining memory after 4 months of the intervention. This study suggested that the program should be arranged regularly for both schizophrenia patients and caregivers to increase their knowledge and motivate behavioral change to prevent

oral problems. Additionally, in a study of schizophrenic patients in a psychiatric hospital, it was recommended that schizophrenia patients should be scheduled for restimulation of their knowledge of oral care and continuous periodontal care every 3 months [39]. Psychiatric hospitals should develop a policy to integrate regular dental check-ups with psychiatric care for schizophrenia patients. Moreover, dental professionals should collaborate with the mental health team to enhance patients' quality of life by preventing deterioration of oral health and preserving as many teeth as possible.

The limitation of this study was that the practical skill of cleaning their teeth in the oral hygiene care program could not be arranged due to the pandemic of coronavirus disease 2019. Practice on a model might differ from the skill obtained from the actual practice in their mouth.

Future study may benefit from including some other compliance measures such as actual oral hygiene care practice, gingival index scores, long term follow-up for maintenance of behavioral changes, and dental service utilization. Support reported by caregivers should also be considered in further study to avoid patient bias.

Conclusion

This educational program based on the HBM was effective in reducing dental plaque scores, increasing perception of oral diseases and lead to better oral health behaviors of this group of schizophrenia patients. In addition, after the caregivers gained more knowledge, they paid more attention to the oral health of the patients. Therefore, oral care educational program and dental check-ups should be regularly integrated into physical and mental health appointments so that these patients will have better oral health. This early prevention of oral diseases and maintenance of oral health can help prevent severe oral diseases when their mental status getting worse.

Funding Resouces: Mahidol University

References

1. Jablensky A. Epidemiology of schizophrenia: the global burden of disease and disability. ***Eur Arch Psychiatry Clin Neurosci*** 2000; 250: 274-85.
2. Department of mental health. Annual report 2019. Bangkok: Lamom Co.; 2019.
3. Seeman MV. An outcome measure in schizophrenia: mortality. ***Can J Psych*** 2007; 55: 55-60.
4. Torales J, Barrios I, González I. Oral and dental health issues in people with mental disorders. ***Medwave*** 2017; 17: e7045.
5. Janardhanan T, Cohen CI, Kim S, Rizvi BF. Dental care and associated factors among older adults with schizophrenia. ***J Am Dent Assoc*** 2011; 142: 57-65.
6. Andersson P, Hallberg IR, Lorefält B, Unosson M, Renvert S. Oral health problems in elderly rehabilitation patients. ***Int J Dent Hyg*** 2004; 2: 70-7.
7. Tsai C, Hayes C, Taylor GW. Glycemic control of type 2 diabetes and severe periodontal disease in the US adult population. ***Community Dent Oral Epidemiol*** 2002; 30: 182-92.
8. Geismar K, Stoltze K, Sigurd M, Gyntelberg F, Holmstrup P. Periodontal disease and coronary heart disease. ***J Periodontol*** 2006; 77: 1547-54.
9. Nielsen J, Munk-Jørgensen P, Skadhede S, Correll CU. Determinants of poor dental care in patients with schizophrenia: a historical, prospective database study. ***J Clin Psychiatr*** 2011; 72: 140-3.
10. McCreadie RG, Stevens H, Henderson J, Hall D, McCaul R, Filik R, *et al.* The dental health of people with schizophrenia. ***Acta Psychiatr Scand*** 2004; 110: 306-10.

11. Poole R, Smith D, Simpson S. Patients' perspectives of the feasibility, acceptability and impact of a group-based psychoeducation programme for bipolar disorder: a qualitative analysis. ***BMC Psychiatry*** 2015; 15: 184.
12. Dhanarun T. Multimedia design for learning diabetes with old age patients. ***Veridian e-Journal Silapakorn University*** 2013; 6: 1-15.
13. Goodkind RJ, Loupe MJ, Clay DJ, DiAngelis AJ. Modifying the knowledge, skills and habits of denture patients. ***Gerodontics*** 1988; 4: 95-100.
14. Rueanphoo S, Sinavarat P, Rattanasuwan K, Muangpaisan W, Jitramontree N, Rojanavipart P, Pisalsarakij D. Effects of using oral hygiene care pamphlets for housebound older persons. ***M Dent J*** 2021; 41: 35-48.
15. Clark DB. Dental care for the patient with schizophrenia. ***Can J Dent Hygiene*** 2008; 42: 17-24.
16. Wongsanao S, Sumpowthong K. Oral health care promotion program in pregnant women by application of the health belief model and the encouragement from their husbands to prevent gingivitis. ***J Med Health Sci*** 2015; 22: 34-40.
17. Bridle C, Riemsma RP, Pattenden J, Sowden AJ, Mather L, Watt IS, *et al*. Systematic review of the effectiveness of health behavior interventions based on the transtheoretical model. ***Psychol Health*** 2005; 20: 283-301.
18. Janz NK, Becker MH. The Health Belief Model: a decade later. ***Health Educ Q*** 1984; 11: 1-47.
19. Chitten M, Vemulakonda S, Byrapaneni RB. Using behavior change theory to guide health promotion to prevent noncommunicable diseases in India. In: Chopra HK, editor. Cardiological Society of India: Cardiology Update. 2014. 1st ed. New Delhi: Jaypee, 2015: p. 201-4.
20. Becker MH. The health belief model and sick role behavior. ***Health Educ Monogr*** 1974; 2: 409-19.
21. Rosenstock IM. The health belief model and preventive health behavior. ***Health Educ Monogr*** 1974; 2: 354-86.
22. House JS. Social support and social structure. ***Sociological Forum*** 1987; 2: 135-46.
23. Almomani F, William K, Catley D, Brown C. Effects of an oral health promotion program in people with mental illness. ***J Dent Res*** 2009; 88: 648-52.
24. World Health Organization. International statistical classification of diseases and related health problems, 10th revision. 5th ed. France: WHO; 2016.
25. Collin C, Wade DT, Davis S, Horne V. The Barthel ADL Index: a reliability study. ***Int Disabil Studies*** 1988; 10: 61-3.
26. Anderson J, Larsen JK, Korner A, Nielsen BM, Schultz V, Behnke K, *et al*. The brief psychiatric rating scale: schizophrenia, reliability and validity studies. ***Nordisk Psykiatrisk Tidsskrift*** 1986; 40: 135-8.
27. Muangpaisan W, Assantachai P, Sitthichai K, Richardson K, Brayne C. The distribution of Thai Mental State Examination scores among non-demented elderly in suburban Bangkok metropolitan and associated factors. ***J Med Assoc Thai*** 2015; 98: 916-24.
28. Petersen PE, Baez RJ, editors. Oral health surveys: basic methods. 5th ed. France: WHO; 2013.
29. Osailan SM, Pramanik R, Shirlaw P, Proctor GB, Challacombe SJ. Clinical assessment of oral dryness: development of a scoring system related to salivary flow and mucosal wetness. ***Oral Surg Oral Med Oral Pathol Oral Radiol*** 2012; 114: 597-603.
30. Löe H. The Gingival Index, the Plaque Index and the Retention Index Systems. ***J Periodontol*** 1967; 38: 610-6.
31. O'Leary TJ, Drake RB, Naylor JE. The plaque control record. ***J Periodontol*** 1972; 43: 38.
32. Augsburger RH, Elahi JM. Evaluation of seven proprietary denture cleansers. ***J Prosthet Dent*** 1982; 47: 356-9.
33. Keyong E, Thitasomakul S, Tianviwat S. Effectiveness of an oral health promotion program for the elderly in Khiri Mat district, Sukhothai province: A randomized control trial. ***J Int Soc Prev Community Dent*** 2019; 9: 225-31.
34. Dental Health Bureau. The 8th National oral health survey report,2017. Bangkok: Samcharoen-panit Co.; 2018.

35. Wey MC, Loh S, Doss JG, Abu Bakar AK, Kisely S. The oral health of people with schizophrenia: A neglected public health burden. ***Aust N Z J Psychiatry*** 2016; 50: 685-94.
36. Barker T. Role of health beliefs in patient compliance with preventive dental advice. ***Community Dent Oral Epidemiol*** 1994; 22: 327-30.
37. Boyer EM, Nikias MK. Self-reported compliance with a preventive dental regimen. ***Clin Prev Dent*** 1983; 5: 3-7.
38. Davies KW, Whittle JG. Dental health education: training of homecarers of mentally handicapped adults. ***Community Dent Health*** 1990; 7: 193-7.
39. Kaewmongkol S. A randomized, controlled study of dental care intervention in schizophrenia patients. ***J Ment Health Thai*** 2015; 23: 102-11.