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치의학석사 학위논문

Evaluation of oral health education by different oral
health workforce in Bulacan, Philippines

서로 다른 구강보건 교육자에 의한 필리핀 블라칸 지역
중등학교 학생 구강보건교육 효과 평가

2018 년 8 월

서울대학교 대학원

치의과학과 예방치학전공

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2018 년 6 월

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Abstract

Evaluation of oral health education by different oral health workforce in Bulacan, Philippines

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Aim: The purpose of the study was to determine if there was an improvement in the students' oral health knowledge after conducting the oral health promotion based on oral health knowledge test results, as well as the results from the students' knowledge, attitudes, skills and aspirations (KASA) survey with several socioeconomic factors of students considered.

Methodology: Three health workers were randomly selected to participate in a descriptive cross-sectional study on the oral health knowledge, and KASA assessment of the students. The study consisted of 324 (34.90% males, 65.10% females) 12- to 21- year old secondary school (Grades 7 - 12) students living in San Jose Del Monte, Bulacan. Students were selected according to class availability and were assigned to each health worker and dentist at random. Community Health Worker 1 (CHW1) was a university graduate while members of the Community Health Worker 2 (CHW2) group did not have a university degree. A socioeconomic status (SES) questionnaire and a pretest were first distributed to the students. Classes were each randomly assigned to one of the three oral health educators namely: Dentist, CHW1 and CHW2. Lecture and proper tooth brushing demonstration were performed. Posttest and KASA questionnaires were handed out afterwards. Chi-square test for categorical variables and one-way Analysis of Variance (ANOVA) for continuous variables were used to compare the socio-demographic factors among the oral health educators' students. One-way ANOVA, and one-way Analysis of Covariance (ANCOVA) adjusting for covariates:

pretest, and socioeconomic factors (age, gender, age of father, age of mother, educational attainment of father, educational attainment of mother, household size and number of minors in the household) were used for comparison among the three groups., Post hoc tests (Scheffé, Dunnett T3 and Sidak) were also applied to compare the pretest and posttest results while ANOVA, ANCOVA, and post hoc tests (Scheffé and Sidak) were used for the KASA survey results.

Results: Results showed that there was a significant difference between the pretest and posttest scores among the groups by paired samples t-test ($p < 0.001$). Through ANCOVA, it was observed that, after adjusting for the covariates, a statistically significant difference ($p < 0.001$) was found among the students' posttest scores in all three groups of educators (Dentist, CHW1, and CHW2). Furthermore, Sidak post hoc test for ANCOVA specifically indicated a significant difference between the Dentist and CHW2 groups ($p < 0.001$), as well as in between the CHW1 and CHW2 groups ($p < 0.001$). For KASA, after adjusting for the covariates by ANCOVA, all comparisons showed no significant difference

among the three groups except for the Knowledge part ($p < 0.001$). Moreover, Sidak post hoc test for ANCOVA revealed that the Dentist group, in particular, demonstrated a significant difference with the CHW1 group ($p < 0.001$).

Conclusion: An improvement in the students' oral health knowledge after conducting the oral health promotion has been observed. CHW1 was found to be as effective as the dentist in enhancing the students' oral health knowledge. The educational background of CHWs played a vital role in terms of effectiveness which was reflected in the posttest results. KASA survey overall results demonstrated similar outcome in the three groups. However, the influence of socioeconomic factors was not significantly evident.

Keywords: oral health education, oral health knowledge, community health worker, Philippines, KASA

Student Number: 2016–26598

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1. Introduction

Dental caries and periodontal disease are the foremost oral health problems in the Philippines. Based on the 2011 National Monitoring and Evaluation Dental Survey (NMEDS) done by the Department of Health (DOH), 87.4% or roughly 83 million Filipinos are suffering from tooth decay while 48.3% have periodontal disease. Statistics also show that 77% or more than seven out of ten Filipinos have never been to a dentist and that 20% of which are six-year-old children.¹ In addition, studies presented by Fédération Dentaire Internationale (FDI) confirm that the Philippines also has one of the highest rate of dental caries (98%) among children three to five years of age.² In relation to the decayed, missing, filled teeth index (DMFT), the Philippines has one of the poorest oral health condition among 21 WHO Western Pacific countries.³ Besides data from a few national surveys, the latest of which is from 2006,⁴ there is a shortage of published information concerning the oral health status and needs, knowledge and attitudes of young adult to adult Filipinos especially in those considered the urban poor or poor.

Knowledge and understanding of oral health is a fundamental step for developing an individual's healthy attitude and behavior, and it has been

shown that there is an association between increased knowledge and better oral health⁵. In addition, positive attitudes and behavior toward oral health-related practices are better performed if an individual has an enhanced understanding on the concepts of oral health, the common diseases that come along with it, as well as how these diseases occur⁶.

The knowledge and understanding in oral health can be acquired with regular visits to the dentist.⁶ However, according to the psychosocial survey conducted by the Department of Health (DOH)¹ in 2011, only 45.3% of Filipinos consult with a dentist at least once a year and majority (67%) do not consult a dentist although needed due to financial burden (63%). There is also a preference for public health personnel (60%) over private practitioners/dentists (29%) as providers for dental services. Due to this, it might be feasible to also examine the effectivity of public health personnel in oral health promotion. Although dentists, as experts in oral health, still have the public' s trust and confidence in the ability to deliver health services and prescribe medicine (92%).

In order to improve oral health knowledge in rural areas and communities, oral health promotion and oral health educators are needed. However, a problem on the sufficiency of public health dentists is present. Nationally, there are 18 public dentists per 1 million Filipinos according to the

Department of Health.¹ Aside from hiring a small number of public health dentists, the government also allocates scant resources for oral health care. In 2013, the Department of Education (DepEd) spent around P9 million (~\$170,000) for dental supplies out of its P37.5 million (~\$700,000) expenses for supplies – or P2 (~\$0.04) per student¹⁰. In order to meet the demands on the lack human resources for oral health promotion in communities, the CHWs were considered. This is because the CHWs perform tasks that are related to healthcare provision, and are instructed to treat the interventions that they are asked to perform¹¹. They have some basic knowledge and training pertaining to health, and also have the communication skills to be able to convey information to the community where they are assigned to. Thus, CHWs may also have the potential to help in improving the community’ s oral health knowledge since they already have some health background, social skills, and can be trained. Due to the minimum qualification requirements to be accepted as a CHW (e.g. high school graduate)¹², a comparison between those with and without a formal college degree and the effectiveness on oral health promotion was included in the study. Furthermore, the effects of the community’ s socioeconomic status (SES) such as the participants’ age and gender, parents’ age and educational attainment, household size, and

the number of minors in the household in oral health knowledge were also considered.

Since one of the scopes of the study is on the improvement of students' oral health knowledge, it is essential that the quality of teachers be considered. A number of literatures have provided focus relating to teacher contribution and student achievements.¹³ However, several studies that attempted to correlate students' achievement and teachers' qualifications, one of which is educational attainment, have provided trivial evidence that students perform better when the teachers have better credentials.^{14,15,16} With the CHWs taking the role of educators in oral health promotion, it is beneficial to understand the importance of their level of education in the effectiveness of improving the students' knowledge and perceptions towards oral health. In a study by Frazao and Marques on the effectiveness of a CHW program on oral health promotion, it was found that there were observed significant perception changes on oral health, and utilization of health services in a Brazilian community when CHWs and homemaker literate women and mothers (25–39 years old) were assigned as promoters of oral health.¹⁷ In a systematic review on cardiovascular disease management and community health worker

training programs, the researchers suggest that CHW training could be effective in cardiovascular disease prevention and control.¹⁸

The knowledge, attitudes, skills and aspirations (KASA) was one of the models for outcome evaluation and program development.⁷ In order to assess their understanding of the taught oral health concepts after the oral health education, KASA was used. The KASA is firstly invented in 1975 by Professor Claude Bennett, an educational methodology and evaluation specialist, and was proposed as a four-part program outcome evaluation⁷. We hypothesized that the Community Health Workers (CHWs), despite varying educational backgrounds, can be as effective as the dentist in oral health promotion which can be reflected on the students' test scores and KASA survey results. In addition, we also explored other socioeconomic factors that may contribute to the results of the test and survey.

The study assessed the effectiveness of oral health education by the dentist versus the community health workers of different educational backgrounds based on secondary school students' oral health knowledge through pretest and posttest results, as well as the results from the students' knowledge, attitudes, skills and aspirations (KASA) survey.

The aim of this paper was to determine if there was an improvement in the students' oral health knowledge after conducting the oral health promotion based on test scores and KASA survey results with several socioeconomic factors of students considered.

2. Materials and methods

The study has been conducted in compliance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of the School of Dentistry of Seoul National University (S-D20180013) in South Korea.

2.1 Participants:

The participants of the study were the dentist-researcher, three community health workers, and 324 public high school students of Marangal National High School (School A, n=138), Minuyan National High School (School B, n=105) and Towerville National High School (School C, n=81) on which classes were selected randomly.

2.1.1 Educators:

Four female oral health educators participated in the study namely, the dentist (n=1), CHW1 (n=1), and CHW2 (n=2) (see Table 1). CHW 1 was

classified as a university graduate while CHW2 was classified as those who did not study in the university level. The dentist is considered as having a high educational attainment. She taught in both School A (n=46) and School B (n=55). CHW1 also has a high educational attainment being a registered secondary school science teacher. She is also a CHW of one year and taught the students from School A (n=50) and School B (n=50). Lastly, CHW2 group has been a full-time health worker for an average of 11.5 years and taught in School A (n=42) and School C (n=81).

2.1.2 Students:

324 students (Male=113, Female=211) participated in the study with an average age of 14.90 ± 1.67 ranging from 12 to 21 years old (see Table 2). Participants were enrolled in one of the three schools, School A (n=138), School B (n=105), and School C (n=81). The average age of the father is 44.69 ± 7.71 ranging from 30 to 83 years old while that of the mother is 41.74 ± 6.66 ranging from 29 to 65 years old. The parents' educational attainment is categorized into the

following: 1= Primary or elementary school graduate (Father=61, 18.80%; Mother=42, 13.00%), 2= Secondary school graduate (Father=182, 56.20%; Mother=195, 60.20%), 3=Associate or vocational school graduate (Father=18, 5.60%; Mother=18, 5.60%), 4=Tertiary school or college graduate (Father=50, 15.40%; Mother=60, 18.50%), and 5=None of the above (Father=13, 4.00%; Mother=9, 2.80%). The average household size or members living together in the house is 6.13 ± 2.32 ranging from 2 to 15 members. Lastly, the average number of minors in the household or the number of dependents is 3.11 ± 1.63 ranging from 0 to 9 members.

2.2 Knowledge, Attitudes, Skills, Aspirations (KASA):

KASA has become a framework for professional development that takes into account four areas suggested by Professor Donald Freeman, an expert in educational studies, in his seminal 1989 article 'Teacher training, development and decision making: a model of teaching and

related strategies for language teacher education’⁸. By definition, knowledge is the factual information; attitudes are the beliefs and values; skills are the capacities we hope the target audience will acquire; and aspirations are the motivators to act. KASA’s objective indicators include test scores or scales that can validate knowledge, attitudes, skills, and aspirations while participants’ self-assessment of their KASA is considered to be a subjective indicator.⁷ The KASA framework can be useful for teachers, leaders, coordinators and teacher educators since it can provide a starting point for reflection on Continuing Professional Development (CPD) needs. CPD is defined as the learning activities such as lectures, seminars, trainings, publications, etc. that professionals participate in for the development and advancement of their skills and abilities. KASA model is used in this study since it promotes a conscious and proactive learning rather than passive and reactive. It may also help teachers/community health workers (CHWs) identify and systematize their own strengths and areas for development. It might be used to inform decisions as to what area to emphasize in the oral health program. Lastly,

it can be revisited from time to time in order to assess whether development aims have been achieved.⁹

2.2.1 Knowledge:

Generally, knowledge in KASA pertains to acquired information, social, economic, and environmental factors, and learning to understand decision-making process whether individual or by group. It answers the question, “What do you know?”⁹

2.2.2 Attitudes:

Attitudes indicate a person’s personal beliefs, opinions, sentiments, or viewpoints which answer the question, “How do you feel?”⁹

2.2.3 Skills:

Skills refer to an individual’s intellectual and physical abilities in utilizing modern or unconventional practices. It answers the question, “What can you do?”⁹

2.2.4 Aspirations:

Aspirations refer to ambitions, hopes, plans, goals, or desires which answers “What would you desire?”⁹

2.3 Research Setting:

The study was carried out in one of the rural areas in the Philippines, particularly in San Jose Del Monte, Bulacan, wherein the scarcity of dentists in the community or public health setting is a major concern. San Jose Del Monte, Bulacan is a part of the province of Bulacan in Central Luzon, Philippines.¹² In the south, it is surrounded by the Caloocan City and Quezon City of Metro Manila. The town of Rodriguez, Rizal is found in the east, while the towns of Santa Maria and Marilao are in the west, and Norzagaray in the north. San Jose Del Monte has a population of 574,089 people, according to the 2015 census¹⁰ This makes San Jose Del Monte the largest local government unit within Bulacan province, and the 18th most populated city in the Philippines.

San Jose del Monte is the home of one of the biggest resettlement area in the Philippines – Sapang Palay resettlement in 36 barangays with an estimated population of 250,000 and some others such as Pabahay 2000 in Muzon had an estimated population of 106,603. Towerville in Minuyan Proper is made up of 38,846 Filipinos and 40 others scattered along the city. People living here came from former informal settlers along public places or government-owned land in Manila, Makati, Parañaque and Quezon City.¹⁹

2.4 Organization involved:

The study was conducted in partnership with Center for Asian Mission for the Poor – Asia Incorporated (CAMP Asia Inc./CAMP) in which majority of their projects are located in San Jose Del Monte, Bulacan. This is where a multitude of resettlers reside.¹⁹ It is a non-profit, non-stock Non-Governmental Organization (NGO) that facilitates Community Development and Social Enterprise, creating sustainable communities for

Relocation Sites. According to their website²⁰, CAMP has been working in the relocation sites since 2011 providing relief and support to families that had been forced to be relocated due to natural disasters, as well as Government urban development plans. CAMP aims to support these families through sustainable livelihoods and continue to work on poverty alleviation through the establishment of Social Enterprises, Job Training Centers, Health Centers, Daycare Centers, and other services. To date, CAMP' s projects are concentrated in San Jose Del Monte Bulacan specifically in Towerville Relocation Site Phase 1–5 in Barangay Minuyan and Phase–6 in barangay Gaya–Gaya, providing services in the field of Health, Education, and Livelihood. Towerville is a relocation site for people who were displaced due to typhoons, floods, fire, and other natural disasters, as well as demolished families due to government development projects.¹⁹

2.5 Training of educators:

The Training of Teachers (TOT) Program for the health workers was conducted on May 9–11, July 18–20, and December 4, 2017, respectively, in the Center for Asian Mission for the Poor (CAMP) Asia Compound, San Jose Del Monte, Bulacan, Philippines. The program included topics on the leading diseases in Bulacan (cardiovascular diseases, acute respiratory infection, hypertension, pneumonia, tuberculosis, etc.), first aid treatment, community health, and oral health. After the last training, three health workers were randomly selected to participate in a descriptive cross-sectional study on the oral health knowledge, and knowledge, attitudes, skills and aspirations (KASA) assessment of the students.

2.6 Education to students:

The research was conducted on December 5, 2017, which consisted of 324 (34.9% males, 65.1% females) 12– to 21– year old secondary school (Year 7 – 12) students living in San Jose Del Monte. Three high schools were selected by location namely, Marangal National High School (School

A), Minuyan National High School (School B), and Towerville National High School (School C) (Table 1). Students were selected according to class availability and were assigned to each health worker and dentist at random. Educators were divided into three groups by their educational attainment: dentist (high), college graduate (high), and high school or vocational course graduate (low).

After program introduction, pretest and SES questionnaires were distributed to the students. Oral health promotion, and question and answer portion from the educators, as well as the students followed. Lastly, the students were asked to answer the posttest and KASA questionnaires.

2.7 Informed consent and questionnaires:

2.7.1 Informed consent:

A written consent was obtained from the principal of each school, as well as the parent or guardian to perform a health education program, and oral health knowledge assessment. (See Appendices A to C) Verbal consent

was also obtained from the students' corresponding adviser. Prior to the research proper, twenty students were asked to answer the prepared questionnaires in order to determine the suitability and appropriateness of the questions to the sample population. The health workers and the dentist-researcher then proceeded to their respective classrooms.

2.7.2 Pretest and posttest

Pretest and posttest consist of a fifteen-item questionnaire (see Appendix D). Questions such as whether foods and drinks that are high in sugar can adversely affect the teeth, whether fluoride can strengthen the teeth, the necessity of dental visits, and the presence or absence of a link between general health and oral health were asked. Also included in the test were questions such as the correct tooth brushing frequency and duration, type of bristles, and the amount of toothpaste to be dispensed. Finally, awareness on gum bleeding and how to address it, knowledge of dental plaque and its primary effect, dental caries and its causes, and the effects of smoking on oral health were also asked.

2.7.3 Knowledge, Attitudes, Skills, Aspirations (KASA)

The KASA survey included four items in each category (Knowledge, Attitudes, Skills, and Aspirations) (see Appendix E). The survey was a Likert Scale and values were assigned for the analysis as follows: 1= Strongly Disagree, 2= Disagree, 3= Neutral 4= Agree, and 5= Strongly Agree. Statements included in the Knowledge part were about how positively or negatively the participants react on the information provided in the lecture, oral health status in the Philippines, smoking and oral health, and a diet high in sugar and oral health. For the Attitudes part, items such as the students' degree of satisfaction in the oral health promotion program, the importance of oral health, the emphasis of oral health disease prevention than treatment, and the relevance of oral health to the Philippines' health needs are included. Enhancement of the capacity to achieve good oral health through the program, following proper tooth brushing and flossing technique, not smoking or quitting smoking, and minimizing sugar intake comprise the Skills part. Lastly, Aspirations consists of statements on being a role model of oral health in the

participants' respective communities, if they look forward to sharing the information on oral health that they acquired, if the presenter inspired them to become an oral health advocate, and if they hope that the oral health status in the Philippines will improve in the near future.

2.7.4 Socioeconomic Status (SES)

The socioeconomic status (SES) of the participants' family was also asked (see Appendix F). In addition to the gender and age of the students and their parents or guardians, the parents or guardian's educational attainment, household size, and the number of minors in the household were also asked. Household size is defined as the number of persons living together in one house. The number of minors in the household is the number of people living in one house who are under 18 years of age. Educational attainment pertains to the highest degree of education an individual has completed. The educational attainment is divided into five categories: 1=elementary school graduate or those who graduated in the primary or basic level, 2=secondary school graduate or participants' parents or guardians who graduated in high school level, 3=associate or vocational or those who took informal courses or training that are usually

less than four years, 4=tertiary level graduate or those parents or guardians who were able to acquire a diploma from a university (minimum of four years), and 5=none of the choices mentioned.

2.8 Statistical analysis:

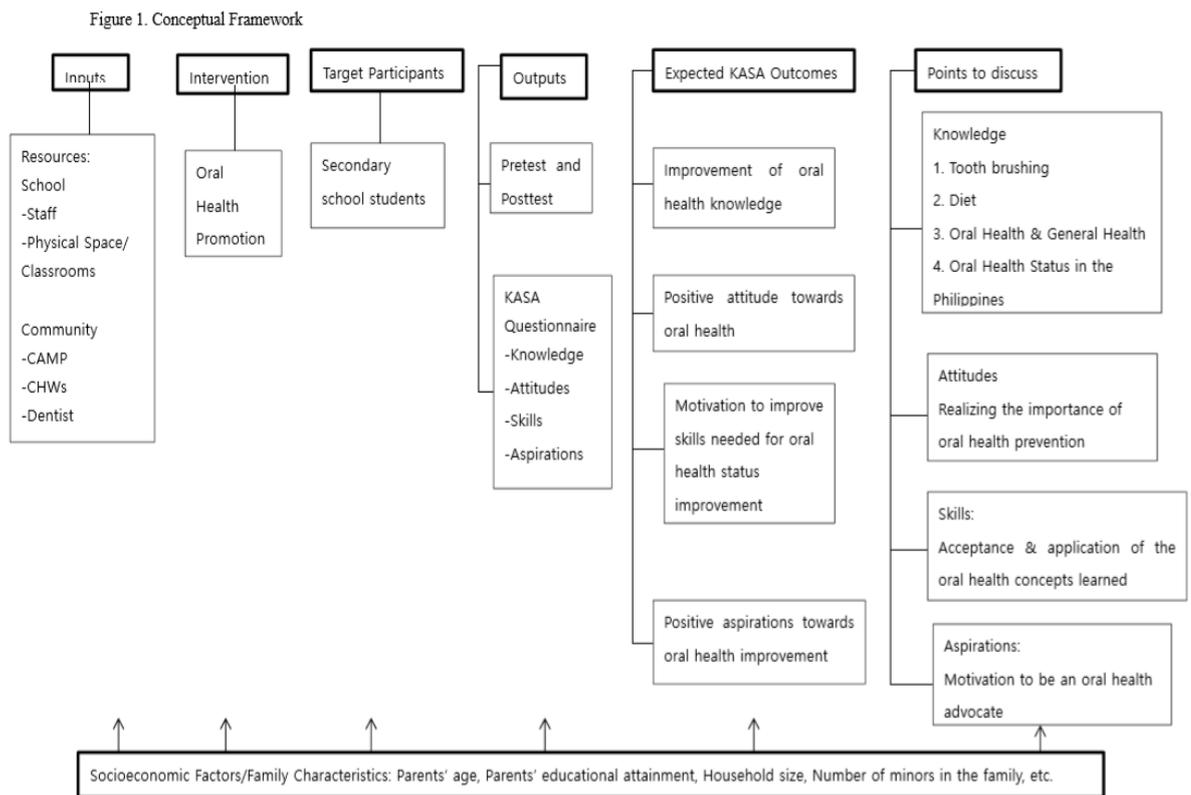
The results of the pretest, posttest, SES, and KASA questionnaires were analyzed using IBM SPSS Statistics Version 23.0 (SPSS Co. Chicago IL, USA). Descriptive and frequency analyses were used to confirm the distribution of students' socio-demographic information and oral health behaviors. Chi-square test for categorical variables and one-way Analysis of Variance (ANOVA) for continuous variables were used to compare the socio-demographic factors among the oral health educators' students. One-way ANOVA and one-way Analysis of Covariance (ANCOVA) adjusting for covariates: pretest, and socioeconomic factors (age, gender, age of father, age of mother, educational attainment of father, educational attainment of mother, household size and number of minors in the household) were used. Moreover, post hoc tests (Scheffe, Dunnett T3 and Sidak) were also conducted to compare the pretest and posttest results among the three groups: Dentist, CHW1, and CHW2. For

the KASA survey results, in comparing the three groups, ANOVA, ANCOVA and post hoc tests (Scheffe and Sidak) were applied. Scheffé post hoc test assumes uneven subject distribution and equal variance while Dunnett T3 test assumes uneven subject distribution and unequal variance. Sidak test was used for ANCOVA.

2.9 Framework:

The conceptual framework (Figure 1) included the inputs, intervention, target participants, outputs, expected KASA outcomes, and points to discuss. Inputs included were resources in the target school such as staff or teachers and classrooms while CAMP, CHWs, and dentist were community resources. The oral health promotion was the main program and was considered as the intervention for the students who were the target participants. The pretest and posttest, as well as the KASA, were considered as outputs. Through the KASA, assessment on oral health knowledge improvement, as well as positive oral health attitude, motivation in improving the skills for oral health improvement, and positive aspirations towards oral health improvement were expected to be observed. In terms of knowledge, tooth brushing, diet, oral health in

relation with general health, and oral health status in the Philippines were discussed. Details were also provided regarding the importance of oral health prevention, acceptance and application of oral health concepts, and motivation to become an oral health advocate. Some socioeconomic factors were also considered in the program.



3. Results

3.1 Socioeconomic Status (SES):

The students' and educators' socio-demographic characteristics were presented in Table 2. The students' mean age was 14.90 ± 1.67 ranging from 12 to 21 years old of which 113 (34.90%) were males while 211 (65.10%) were females. The students mean age for those who were taught by the Dentist was 15.50 ± 2.23 ranging from 13–21 years old. The students who were supervised by CHW1 had an average age of 14.56 ± 1.39 ranging from 12 to 19 years old while those who were under CHW2 had a mean age of 14.67 ± 1.15 ranging from 12 to 18 years old. The age of the three groups were significantly different ($p < 0.001$) by one-way ANOVA. In the Dentist group, 34 (33.70%) students were males while 67 (66.30%) students were females. The CHW1 group consisted of 32 (32.00%) males and 68 (68.00%) females while the CHW2 group had 47 (38.20%) males and 76 (61.80%) females. Chi-

square test showed that there was no significant difference in age among the three groups ($p = 0.597$). A total of 324 students participated in the study: 138 students (42.60%) from School A (Marangal National High School), 105 students (32.40%) from School B (Minuyan National High School), and 81 students (25.00%) from School C (Towerville National High School). Of the 324 students, the Dentist supervised a total of 101: 46 students (45.54%) from School A, and 55 students (54.46%) from School B; CHW 1 supervised 100 students: 50 (50.00%) students each from Schools A and B; and CHW2 supervised 123 students: 42 (34.15%) students from School A and 81 (65.85%) students from School C. A significant difference was shown among the groups by chi-square test ($p < 0.001$).

The average age of the students' fathers was 44.69 ± 7.71 ranging from 30 to 83 years old. The fathers' mean age of the students who were under the Dentist was 45.15 ± 8.31 ranging from 31 to 80 years old while CHW1 was 44.37 ± 7.04 (32 to 63) years old, and CHW2 was 44.59 ± 7.81 (30–83) years old. One-way ANOVA demonstrated no

significant difference among the groups ($p = 0.553$). For the average age of the students' mothers, it was 41.74 ± 6.66 ranging from 29 to 65 years old. The students' mothers' average age was 42.03 ± 7.46 (30–65) years old, 40.96 ± 6.37 (29–58) years old, and 42.16 ± 6.19 (29–60) years old for the participants supervised by the Dentist, CHW1 and, CHW2 respectively. One-way ANOVA also indicated no significant difference among the three groups ($p = 0.809$).

The father's educational attainment was 1= Primary or elementary school graduate (61 males, 18.83%), 2= Secondary school graduate (182 males, 56.17%), 3= Associate or vocational school graduate (18 males, 5.56%), 4= Tertiary school or college graduate (47 males, 14.51%), and 5= None of the above (16 males, 4.94%). For those students supervised by the Dentist, their fathers' level of education was as follows: 1= 24 males, 23.76%; 2= 59 males, 58.42%; 3= 8 males, 7.92%; 4= 10 males, 9.90%; and 5= 0 males. For those managed by CHW1, their fathers' educational attainment was as follows: 1= 13 males, 13.00%; 2= 56 males, 56.00%; 3= 5 males, 5.00%; 4= 19 males, 19.00%; and 5= 7 males, 7.00%

while those handled by CHW2 were the following: 1= 24 males, 19.51%; 2= 67 males, 54.47%; 3= 5 males, 4.07%; 4= 18 males, 14.63%; and 5= 9 males, 7.32%. Chi-square test among the groups presented a significant difference ($p = 0.016$).

The mother's educational attainment was 1= Primary or elementary school graduate (42 females, 12.96%), 2= Secondary school graduate (195 females, 60.19%), 3= Associate or vocational school graduate (18 females, 5.56%), 4= Tertiary school or college graduate (57 females, 17.59%), and 5= None of the above (12 females, 3.70%). For those students supervised by the Dentist, their fathers' level of education was as follows: 1= 17 females, 16.83%; 2= 68 females, 67.33%; 3= 3 females, 2.97%; 4= 10 females, 9.90%; and 5= 3 females, 2.97%. For those managed by CHW1, their mothers' educational attainment was as follows: 1= 11 females, 11.00%; 2= 61 females, 61.00%; 3= 6 females, 6.00%; 4= 20 females, 20.00%; and 5= 2 females, 2.00% while those handled by CHW2 were the following: 1= 14 females, 11.38%; 2= 66 females, 53.66%; 3= 9 females, 7.32%; 4= 27 females, 21.95%; and 5= 7 females,

5.69%. Chi-square test among the three groups also demonstrated no significant difference ($p = 0.102$).

The overall mean household size or the mean number of members living together in the house was 6.13 ± 2.32 ranging from 2 to 15 members. For the average household size of the participants who were under the supervision of the Dentist, the mean was 6.28 ± 2.35 ranging from 2 to 15 members. Those students who were taught by CHW1, their average household size was 6.36 ± 2.65 ranging from 2 to 15 members while CHW2 had an average of 5.83 ± 1.96 ranging from 2 to 14 members. One-way ANOVA showed no significant difference among the three groups ($p = 0.177$).

Finally, the overall average number of minors in the household was 3.11 ± 1.63 ranging from 0 to 9 members. For the average number of minors for the participants who were supervised by the Dentist, the mean was 3.14 ± 1.71 ranging from 0 to 8 members while that of CHW1 was 3.21 ± 1.76 ranging from 0 to 8 members, and CHW2 was 3.01 ± 1.44 ranging

from 1 to 9 members. There was no significant difference among the three groups using one-way ANOVA ($p = 0.642$).

3.2 Pretest and Posttest:

The results of secondary school students' pretest and posttest scores were presented in Tables 3 and 4. These included students' responses to questions on their oral health knowledge in toothbrush and tooth brushing (frequency, duration, type of bristles, amount of toothpaste, etc.), fluoride, dental caries, dental plaque, gingivitis, and sugars and smoking and their corresponding effects on the oral cavity. One-way ANOVA and ANCOVA were applied for the data analysis. The ANCOVA was adjusted for the following covariates: pretest, students' age and gender, parents' or guardian's age, gender and educational attainment, family's household size, and the number of minors in the house. The ANOVA [$F(2,321) = 7.99, p < 0.001$] and ANCOVA [$F(2,313) = 8.77, p < 0.001$] both showed that there was a significant difference among the groups (Dentist, CHW1, CHW2). Post hoc analysis using the Scheffé post hoc criterion for significance in ANOVA (Table 3) indicated that the pretest scores were significantly higher in students who were assigned to CHW2

($M = 9.66$, $SD = 2.02$) than in the other two groups: Dentist ($M = 8.60$, $SD = 1.95$), and CHW1 ($M = 9.04$, $SD = 1.98$). Comparisons indicated that the pretest scores were not significantly different from the Dentist and CHW1 ($p = 0.300$), and no significant difference between CHW1 and CHW2 scores were also shown ($p = 0.071$). This is in contrast with Dentist and CHW2 pretest results which demonstrated a significant difference between the groups ($p < 0.001$).

For the students' posttest scores, one-way ANOVA [$F(2,321) = 30.67$, ($p < 0.001$)] and ANCOVA [$F(2,312) = 36.54$, ($p < 0.001$)] showed that the effect of the health workers (Dentist, CHW1, CHW2) on the students' performance were significant. Dunnett T3 post hoc criterion for significance revealed that the posttest scores were significantly higher in students who were supervised by the Dentist ($M = 14.34$, $SD = 1.25$) and CHW1 ($M = 14.09$, $SD = 1.22$) than in CHW2 ($M = 13.11$, $SD = 1.51$). Comparison between Dentist and CHW1 indicated no significant difference in the students' performance ($p = 0.150$). This is in contrast to Dentist and CHW2, as well as CHW1 and CHW2 both of which had demonstrated a significant difference in between groups ($p < 0.001$).

In analyzing for the difference in between the students' pretest and posttest scores (Table 3), one-way ANOVA showed a similar trend with

the posttest results. The effect of the health workers' (Dentist, CHW1, CHW2) training on the students' performance was significant for ANOVA [$F(2,321) = 40.69, p < 0.001$]. Post-hoc analyses using the Scheffé post hoc criterion for significance indicated that the results of the difference were significantly higher in students under the Dentist ($M = 5.80, SD = 1.85$). This is followed by CHW1 ($M = 5.05, SD = 2.06$), and CHW2 ($M = 3.46, SD = 2.07$) which presented significantly lower results. In addition, Dentist versus CHW2, as well as CHW1 versus CHW2 both had demonstrated a significant difference between groups ($p < 0.001$).

In table 4, the posttest scores for the three groups presented a significant difference through ANCOVA ($p < 0.001$) after adjusting for the pretest and some socioeconomic factors (students' age and gender, parents' or guardian's age and educational attainment, household size, and the number of minors in the household). Demonstrating similar results with Dunnett T3 test, the Sidak post hoc test for ANCOVA also showed no significant difference between the Dentist ($M = 14.42, SE = 0.13$) and CHW1 ($M = 14.14, SE = 0.13$), ($p = 0.346$). On the other hand, Dentist and CHW2 ($M = 13.00, SE = 0.12$), as well as CHW1 and CHW2, showed a significant difference ($p < 0.001$).

3.3 KASA:

Table 5 indicates the outcomes of the students' Knowledge, Attitudes, Skills and Aspirations (KASA) survey using the Likert scale. One-way ANOVA showed that there was no significant difference among the three groups: Dentist ($M = 71.33$, $SD = 6.03$), CHW1 ($M = 73.06$, $SD = 6.06$), CHW2 ($M = 72.15$, $SD = 5.59$), and the students' overall KASA score [$F(2,321) = 2.19$, $p = 0.114$]. The results of the overall KASA for the three groups did not present a significant difference through ANCOVA [$F(2,313) = 1.89$, $p = 0.152$]. The ANCOVA was adjusted for the following covariates: students' age and gender, parents' or guardian's age, gender and educational attainment, family's household size, and the number of minors in the house. Showing similar results with Scheffé test, Sidak post hoc test for ANCOVA (Table 6) also did not demonstrate a significant difference between the Dentist ($M = 71.44$, $SE = 0.60$) and CHW1 ($M = 73.08$, $SE = 0.59$), ($p = 0.162$). In addition, Dentist and CHW2 ($M = 72.04$, $SE = 0.54$), ($p = 0.844$), as well as CHW1 and CHW2 did not show a significant difference ($p = 0.474$).

Knowledge scores indicated opposite results [$F(2,321) = 5.53$, $p = 0.004$] showing a significant difference among the groups. Post-hoc analyses using the Scheffé post hoc criterion for significance indicated

that the Knowledge scores were significantly higher in students who were assigned to CHW1 ($M = 18.45$, $SD = 1.79$) and CHW2 ($M = 18.08$, $SD = 1.78$) than in the Dentist group ($M = 17.61$, $SD = 1.81$). Comparisons indicated that the Knowledge scores were significantly different from the Dentist and CHW1 ($p = 0.004$). Conversely, no significant difference between Dentist and CHW2 scores ($p = 0.152$), as well as CHW1 and CHW2 scores ($p = 0.311$) were shown. On the other hand, the results of the Knowledge scores for the three groups presented a significant difference through ANCOVA [$F(2,313) = 8.22$, $p < 0.001$]. Showing similar results with Scheffé test, Sidak post hoc test for ANCOVA (Table 6) also demonstrated a significant difference between the Dentist ($M = 17.50$, $SE = 0.18$) and CHW1 ($M = 18.54$, $SE = 0.18$), ($p < 0.001$).

For Attitudes, one-way ANOVA presented no significant difference on the survey results and the groups where students were randomly assigned (Dentist, CHW1, CHW2) $F(2,321) = 0.50$, $p = 0.610$. Scheffé post hoc criterion for significance indicated that there was no significant difference among the results of the three groups: Dentist ($M = 17.60$, $SD = 1.92$), CHW1 ($M = 17.87$, $SD = 1.84$), and CHW2 ($M = 17.74$, $SD = 1.92$). Specifically comparing the Dentist versus CHW1 ($p = 0.610$), Dentist versus CHW2 ($p = 0.867$), and CHW1 versus CHW2 ($p = 0.878$)

demonstrated no significant difference in students' survey results. The results of the Attitude scores for the three groups did not present a significant difference through ANCOVA [$F(2,313) = 0.37, p = 0.696$]. Showing similar results with Scheffé test, Sidak post hoc test for ANCOVA (Table 6) also did not demonstrate a significant difference between the Dentist ($M = 17.65, SE = 0.19$) and CHW1 ($M = 17.87, SE = 0.19$), ($p = 0.803$). In addition, Dentist and CHW2 ($M = 17.71, SE = 0.17$), ($p = 0.994$), as well as CHW1 and CHW2 did not show a significant difference ($p = 0.891$).

For Skills, one-way ANOVA also showed no significant difference on the survey results and the three groups (Dentist, CHW1, CHW2) $F(2,321) = 0.43, p = 0.651$. Scheffé post hoc criterion for significance also presented no significant difference among the results of the three groups: Dentist ($M = 18.32, SD = 1.73$), CHW1 ($M = 18.52, SD = 1.68$), and CHW2 ($M = 18.35, SD = 1.65$). In particular, comparing the Dentist versus CHW1 ($p = 0.694$), Dentist versus CHW2 ($p = 0.990$), and CHW1 versus CHW2 ($p = 0.754$) demonstrated no significant difference in students' survey results. The results of the Skills scores for the three groups also did not present a significant difference through ANCOVA [$F(2,313) = 0.39, p = 0.679$]. Having similar results with Scheffé test, Sidak post hoc test for

ANCOVA (Table 6) also did not demonstrate a significant difference between the Dentist ($M = 18.42$, $SE = 0.17$) and CHW1 ($M = 18.49$, $SE = 0.17$), ($p = 0.990$). In addition, Dentist and CHW2 ($M = 18.29$, $SE = 0.15$), ($p = 0.928$), as well as CHW1 and CHW2 did not show a significant difference ($p = 0.774$).

Lastly for Aspirations, similar to Attitudes and Skills, one-way ANOVA also presented no significant difference on the survey results and the groups where students were randomly assigned (Dentist, CHW1, CHW2) $F(2,321) = 1.37$, $p = 0.255$. Scheffé post-hoc criterion for significance also indicated that there was no significant difference among the results of the three groups: Dentist ($M = 17.79$, $SD = 1.82$), CHW1 ($M = 18.22$, $SD = 1.77$), and CHW2 ($M = 17.98$, $SD = 1.90$). Specifically comparing the Dentist versus CHW1 ($p = 0.256$), Dentist versus CHW2 ($p = 0.739$), and CHW1 versus CHW2 ($p = 0.633$) revealed no significant difference in students' survey results. The results of the Aspirations scores for the three groups did not present a significant difference through ANCOVA [$F(2,313) = 0.76$, $p = 0.469$]. Presenting similar results with Scheffé test, Sidak post-hoc test for ANCOVA (Table 6) also did not demonstrate a significant difference between the Dentist ($M = 17.87$, $SE = 0.19$) and CHW1 ($M = 18.19$, $SE = 0.19$), ($p = 0.573$). In addition, Dentist and

CHW2 ($M = 17.95$, $SE = 0.17$), ($p = 0.987$), as well as CHW1 and CHW2 did not show a significant difference ($p = 0.717$).

Table 1. Socio-demographic variables among oral health educators

Variables	Dentist (n=1)	CHW1 (n=1)	CHW2 (n=2)
Age (in years)	29	31	51
Gender	Female	Female	Female
Educational attainment*	High	High	Low
Duration as a community health worker (in years)	–	1	11.5
Occupation	Dentist	Teacher/CHW	CHW
School (n=324) †			
A (n=138)	46	50	42
B (n=105)	55	50	0
C (n=81)	0	0	81
Total (n=324)	101 (31.20%)	100 (30.90%)	123 (37.90%)

* High = College Graduate

Low = Undergraduate

† A=Marangal National High School

B=Minuyan National High School

C=Towerville National High School

Table 2. Socio-demographic variables among students and oral health educators

Variables	Students (n=324)		Educators (n=4)						P [†]
			Dentist (n=101 students)		CHW1 (n=100 students)		CHW2 (n=123 students)		
	N	%	N	%	N	%	N	%	
Students' age in years (n=324)*	14.90 ± 1.67 (12 - 21)		15.50 ± 2.23 (13-21)		14.56 ± 1.39 (12-19)		14.67 ± 1.15 (12-18)		<0.001
Students' gender (n=324)									0.597 [†]
Male	113	34.90	34	33.70	32	32.00	47	38.20	
Female	211	65.10	67	66.30	68	68.00	76	61.80	
School [§]									<0.001 [†]
A	138	42.60	46	45.54	50	50.00	42	34.15	
B	105	32.40	55	54.46	50	50.00	0	0	
C	81	25.00	0	0	0	0	81	65.85	
Age in years (Father)*	44.69 ± 7.71 (30 - 83)		45.15 ± 8.31 (31-80)		44.37 ± 7.04 (32-63)		44.59 ± 7.81 (30-83)		0.553

Age in years (Mother)*	41.74 ± 6.66 (29 – 65)		42.03 ± 7.46 (30–65)		40.96 ± 6.37 (29–58)		42.16 ± 6.19 (29–60)		0.809
Educational attainment (Father)									0.016 [†]
1=Elementary school graduate	61	18.83	24	23.76	13	13.00	24	19.51	
2=Secondary school graduate	182	56.17	59	58.42	56	56.00	67	54.47	
3=Associate or vocational school graduate	18	5.56	8	7.92	5	5.00	5	4.07	
4=Tertiary school or college graduate	47	14.51	10	9.90	19	19.00	18	14.63	
5=None of the	16	4.94	0	0	7	7.00	9	7.32	

choices above

Educational
attainment
(Mother)

0.102[†]

1=Elementary school graduate	42	12.96	17	16.83	11	11.00	14	11.38
2=Secondary school graduate	195	60.19	68	67.33	61	61.00	66	53.66
3=Associate or vocational school graduate	18	5.56	3	2.97	6	6.00	9	7.32
4=Tertiary school or college graduate	57	17.59	10	9.90	20	20.00	27	21.95
5=None of the choices above	12	3.70	3	2.97	2	2.00	7	5.69

Household size*	6.13 ± 2.32 (2 – 15)	6.28 ± 2.35 (2–15)	6.36 ± 2.65 (2–15)	5.83 ± 1.96 (2–14)	0.177
Minors in the household*	3.11 ± 1.63 (0 – 9)	3.14 ± 1.71 (0–8)	3.21 ± 1.76 (0–8)	3.01 ± 1.44 (1–9)	0.642

*Presented as the mean ± standard deviation (range)

† P-values obtained through one-way ANOVA for continuous variables

‡ P-values obtained through chi-square test for categorical variables

§ A=Marangal National High School

B=Minuyan National High School

C=Towerville National High School

Table 3. Comparisons of the students' pretest and posttest performance among the three groups

Variable	Mean (SD) Range*			P^{\dagger}
	Dentist (n = 101)	CHW1 (n = 100)	CHW2 (n = 123)	
Pretest	8.60 (1.95)	9.04 (1.98)	9.66 (2.02) [‡]	<0.001
Posttest	14.34 (1.08)	14.09 (1.22)	13.11 (1.51) ^{§¶}	<0.001
P^{**}	<0.001	<0.001	<0.001	-
Difference	5.74 (1.85)	5.05 (2.06)	3.46 (2.07) ^{‡¶}	<0.001

*The data was presented by mean and standard deviation.

[†]p-value was determined by one-way ANOVA

[‡]0.05<p-value was determined by post hoc Scheffé test with Dentist group

[§]0.05<p-value was determined by post hoc Dunnett T3 test with Dentist group

[¶]0.05<p-value was determined by post hoc Dunnett T3 test with CHW1 group

[¶]0.05<p-value was determined by post hoc Scheffé test with CHW1 group

**p-value of pretest and posttest was determined by paired samples t-test

Table 4. Students' posttest performance among the three groups by ANCOVA

Variable	Mean - SE*						P [†]
	Dentist (n = 101)		CHW1 (n = 100)		CHW2 (n = 123)		
	Mean	SE	Mean	SE	Mean	SE	
Posttest	14.42	0.13	14.14	0.13	13.00 ^{‡ §}	0.12	<0.001

*The data was presented by mean and standard error.

[†]p-value was determined by one-way ANCOVA adjusting for covariates: pretest, and socioeconomic factors (age, gender, age of father, age of mother, educational attainment of father, educational attainment of mother, household size and number of minors in the household).

[‡]0.05<p-value was determined by post hoc Sidak test with Dentist group

[§]0.05<p-value was determined by post hoc Sidak test with CHW1 group

Table 5. Comparisons of the students' KASA survey outcome among the three groups

Variable	Mean (SD) Range*			<i>P</i> [†]
	Dentist (n = 101)	CHW1 (n = 100)	CHW2 (n = 123)	
KASA	71.33 (6.03)	73.06 (6.06)	72.15 (5.59)	0.114
Knowledge	17.61 (1.81)	18.45 (1.79) [‡]	18.08 (1.77)	0.004
Attitudes	17.60 (1.92)	17.87 (1.84)	17.74 (1.92)	0.610
Skills	18.32 (1.73)	18.52 (1.68)	18.35 (1.65)	0.651
Aspirations	17.79 (1.82)	18.22 (1.77)	17.98 (1.90)	0.255

*The data was presented by mean and standard deviation.

[†]p-value was determined by one-way ANOVA

[‡]0.05 < p-value was determined by post hoc Scheffé test with Dentist group

Table 6. Comparisons of the students' KASA survey outcome among the three groups using ANCOVA

	Mean – SE*						<i>P</i> [†]
	Dentist (n = 101)		CHW1 (n = 100)		CHW2 (n = 123)		
	Mean	SE	Mean	SE	Mean	SE	
KASA	71.44	0.60	73.08	0.59	72.04	0.54	0.152
Knowledge	17.50	0.18	18.54 [‡]	0.18	18.00	0.16	<0.001
Attitudes	17.65	0.19	17.87	0.19	17.71	0.17	0.696
Skills	18.42	0.17	18.49	0.17	18.29	0.15	0.679
Aspirations	17.87	0.19	18.19	0.19	17.95	0.17	0.469

*The data was presented by mean and standard error.

[†]*p*–value was determined by one–way ANCOVA adjusting for covariates: socioeconomic factors (age, gender, age of father, age of mother, educational attainment of father, educational attainment of mother, household size and number of minors in the household).

[‡]0.05<*p*–value was determined by post hoc Sidak test with Dentist group

4. Discussion

Oral health remains to be a major problem in the Philippines. This is because oral health is not considered as a principal health concern, particularly in the rural areas. According to the World Health Organization South–East Asia Regional Office (WHO SEARO) where the oral health database was retrieved, among 12–year–old children, the mean DMFTs in the Philippines were 4.48, 2.9 and 3.3 by the year 1998, 2006 and 2011 respectively.²¹ In line with this, the Philippine Country Report on School Health Promotion Programme reported that toothache is a common ailment among students and is the primary cause of absenteeism from school which greatly affects students’ academic performance and in turn, may affect future endeavors.²² These oral health problems are more prominent in the communities and rural areas due to the scarcity of dentists. The usually trusted healthcare providers present are the CHWs who seek to alleviate the communities’ general and oral health problems as much as they could. These CHWs can be considered as extensions of dentists in

the communities and are considered as the community's basic healthcare providers. When they are informed and accorded with more responsibilities, particularly in developing decision-making skills and have control over the training development, they can play an indispensable role not only for oral health promotion but also as visible vital agents for improvement.

Results showed that CHWs with higher educational attainment were considered to be as effective as the dentist in delivering oral health promotion. This was also in line with previous studies relating teacher effects and student performance demonstrating that experience in teaching is the sole observed teacher attribute that accounts for student performance.^{36,37,38} In a study on the evidence of a relationship in between teacher quality and student achievement from a sample of Dutch twins, the twins who were taught by more experienced teachers performed better. Teacher quality is the primary focus of the paper. They found that in terms of the students' performance, the most essential characteristic is the experience of the teacher. It was the sole observed

teacher attribute that is related to student performance.¹⁴ This result was similar to other earlier studies that dealt with teacher influence.^{36,37} They found out that in a study of twins, the twins who were under the supervision of teachers with more training or higher educational background, performed better, substantial effects could be observed specifically in children from kindergarten and early grades. Some account for parallel results from their analysis. They utilized the data from a class size reduction experiment. From these studies, their results also suggested that aside from the importance of experience in teaching in primary stages, teacher experience in later years or career stages was also essential for student performance and achievement.^{39,40}

The researchers, through the assessment of the participants' oral health knowledge, as well as their KASA, unsurprisingly, found a significant difference on the secondary school students' pretest and posttest results ($p < 0.001$). The present study results were acquired in a context of comparison to the Dentist' s performance and the two groups of CHWs' performance. Statistically significant difference was observed

in dentist versus the CHWs on the pretest and posttest results except for the CHW 1 (Tables 3 and 4). As expressed on the pretest and posttest results, the secondary school students who were supervised by the Dentist performed significantly better than those who were handled by the CHW2 ($p < 0.001$). On the other hand, the students who were supervised by CHW1 presented no significant difference as compared with those of the Dentist's students (Tables 3 and 4). The students who were supervised by CHW2 did not have a significant difference with CHW1 for the pretest, however, showed a significant difference for the posttest results. This was a verification that CHW1 performed better than CHW2 even without the Dentist for comparison. The result could be explained by the fact that CHW1 not only is a health worker but also a secondary school teacher in Science. Hence, CHW1 has more experience in teaching the students compared with CHW2, who did not receive a formal college education. After adjusting for the covariates, still, a similar trend in results emerged in the posttest. Even after adjusting for the covariates, the students' posttest scores significantly increased versus their pretest scores. This provided the evidence that the oral health educators were

effective in the improvement of oral health knowledge among the students, and that the educational background of the educators could play an essential part in teaching. In a study, similar results also emerged, those who were asked to teach a concept on the students and had a higher educational background performed better than those who did not.³⁷

For the outcome of the KASA survey, there were no observed results showing significant differences between the students supervised by the dentist versus those who were handled by the CHWs. An exception was found for the Knowledge part (Tables 5 and 6) wherein the students under the CHW1 had more positive answers (Strongly Agree) than those supervised by the dentist (Agree). The two groups (CHW1 and CHW2) were more effective in motivating the students on providing information and strongly believing in what was taught.

The results showed that CHW1 is the most effective promoter of oral health based on KASA scores. Although positive scores and feedback from the oral health knowledge test and KASA survey were also obtained from CHW2, a preference for those who have higher educational

attainment particularly in the field of education was considered. The results presented that CHW1, a college graduate with less experience as a community health worker, outperformed the CHW2 group who did not take up a tertiary level of education despite their lengthier experience as community health workers. For the KASA results, all students who were supervised by the three health educators performed well. After adjusting for the covariates, a similar trend emerged from ANCOVA in comparison with ANOVA (Tables 5 and 6). In both tables, the CHW1' s students significantly performed better than the Dentist and CHW2 groups.

In order to improve the CHW2's performance, a retraining program for CHW2 might be of help for retention of the previously acquired knowledge and skills in hopes of achieving similar results with the dentist and CHW1. For all the target participants of the oral health promotion, a refresher course will also be of help. It was found in a review of CHW training for the conditions relating to the mother and child' s health ²³ and mental health, ²⁴ that without a refresher, skills and knowledge that are attained are unable to be recalled over time. According to some studies, the need

for altered time intervals for the refresher course was ascertained to be effective in the retention ability and performance of CHWs, as well as the results of the tests to the participants for target teaching. Monthly, quarterly, and yearly refresher trainings for the CHWs were provided in order to secure a consistent performance.^{25,26}

In contrast with the educational attainment of the CHWs, the participants' socioeconomic status did not present a significant influence on the outcomes of the posttest and KASA survey. This may be due to the fact that there are a huge number of other factors that could possibly influence a student' s knowledge such as health (e.g. students with poorer vision have disadvantages in the classroom in terms of seeing the educational materials, blackboard, and/or the teacher), family income, housing, parental involvement (parenting style).^{41,42,43} An increase in the duration of the study would also help in examining whether these socioeconomic factors could evidently influence a student' s knowledge.

High educational attainment or a university degree is not a requirement in order to be considered as a community health worker. According to the

World Health Organization (WHO)'s definition, a requirement for community health workers is that they should be members of the communities where they are assigned, and be coming from or supported by a verified health system. WHO also set criteria for CHWs such as individuals who are not considered as formally trained nurse aides, medical assistants, physician assistants, paramedical workers in emergency and fire services and others who are auxiliaries, mid-level workers, and self-defined health professionals or health paraprofessionals. Also excluded in the criteria are traditional, faith and complementary healers, as well as traditional birth aides, as these important groups have an independent and detailed category.²¹ Though WHO does not require a high educational attainment or a university degree, at least, the results of this study demonstrated that a CHW with a higher educational background (CHW1) outperformed, in terms of oral health education, those having lower educational attainment despite the years of experience in community health work.

In line with WHO' s definition, community health work activities in the Philippines are concentrated on reinforcing the involvement in between the community, health and the services that can be offered since CHWs are considered as suitable contributors to a more effective health promotion, disease prevention, and government or non-government-supported activities. A number of works regarding CHWs' roles and their influence on the community have been published.^{27,28,29} Studies investigating CHW job characteristics, as well as their work effect, and their parts portrayed as an official health care representative and a community worker have been published.^{30,31,32} In the Philippines, however, limited articles on the topic of community health workers are present.³³

Aside from becoming a viable part of the oral health team for the community oral health improvement, the CHWs also have a role in other areas of health which can reinforce the community' s approach towards health and management of determinants in terms of health and disease.³⁴ The present findings indicated the function of CHWs not only in stimulating affirmative oral health shift but also in increasing the students'

self-efficacy through newly-acquired knowledge, attitudes, skills and aspirations (KASA). The advantage of CHWs is that they tend to foster a deeper relationship and understanding with the community, which helps people leave old customs and accept new principles, standards and practices. According to some studies, higher mastery in terms of health or acquiring more health information and knowledge may boost health behavior changes in attitude and motivation, manifesting independence and improvement of skills and as a consequence, would result in more health promotion interventions. ³⁵ According to Frazao and Marques, some community health activities in Brazil incorporating oral health have unsatisfactory team capacity building and ineffective motivational strategy for community cooperation and proper evaluation.¹⁷ Improvement in knowledge and positive feedback from KASA results in the study provides evidence on the fundamental role of CHWs for oral health promotion in the community. Positive reactions from KASA facilitate program participants in obtaining the knowledge, attitudes, skills, and aspirations. The level of their interest and involvement in the activities was observed to be directly

proportional to the likelihood of the participants in acquiring the targeted KASAs.⁹

In the Philippines, there is insufficient oral health data particularly in the rural areas where there is an inadequate number of dentists³³ to educate the public, to promote the importance, and address the problems on oral health. This eventually leads to poorer oral health conditions since data are inadequately recorded and the impacts of poor oral health particularly on rural areas cannot be properly evaluated. Along with the lack of accessible dental services, this may lead to low levels of oral health behavior among rural school children which, in turn, would result to poorer oral health status.³⁵

4.1 KASA model and program development:

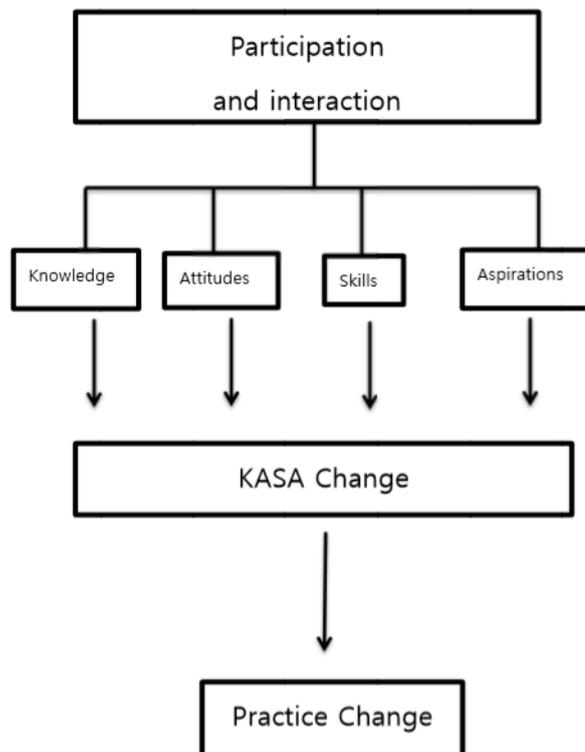


Figure 2. KASA modified framework based on TOP (Targeting Outcomes of Programs) model

The KASA was derived from Targeting Outcomes of Programs (TOP) model⁹ which is a widely-used model. The interaction from the program participants and resources, as well as anticipation of some other external factors such as environmental factors, would affect or contribute to the Knowledge, Attitudes, Skills and Aspirations which could cause a change in KASA. This will, in turn, may cause a change in the participants' behavior or practice. This model is dynamic since the innate link between each component is still not clear⁴⁷ but could be a more appropriate model to represent KASA change towards practice change.

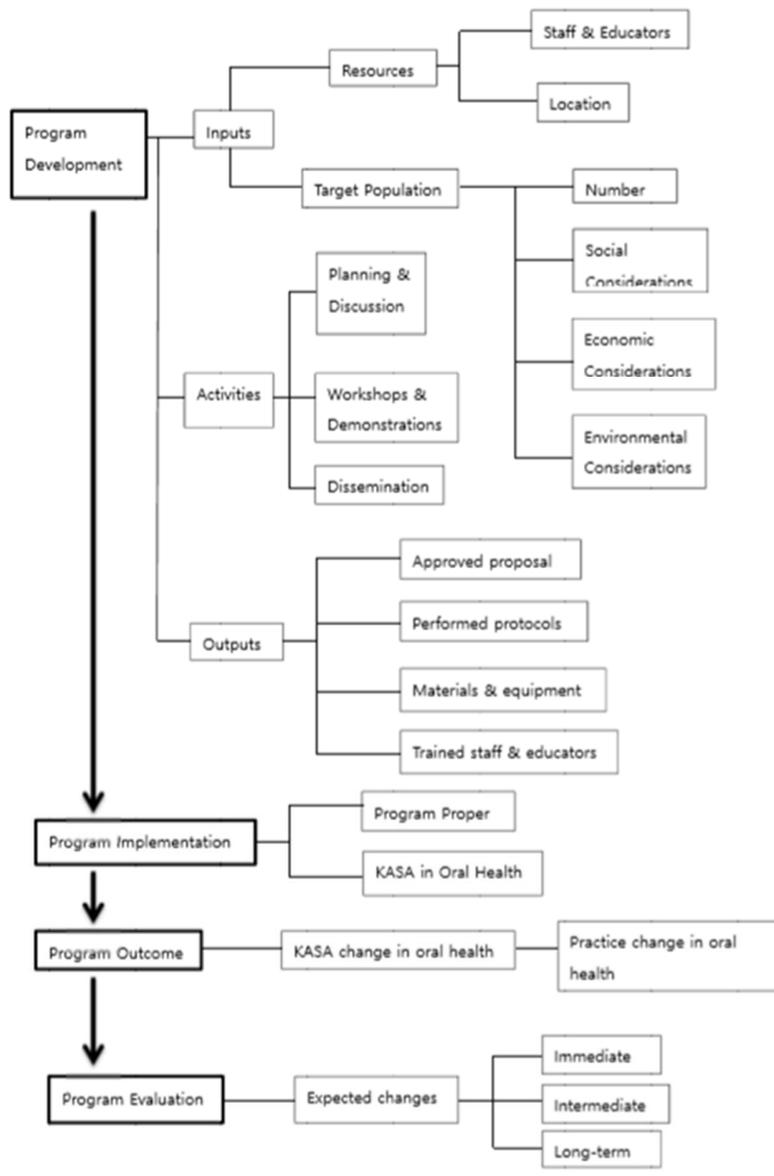


Figure 3. Program development framework

Figure 3 shows a sample program framework from its development to evaluation. This may help by serving as a framework or guide for other future programs.⁴⁸ In this study on oral health promotion, the inputs, activities, and outputs made up the first stage which is Program Development. The inputs were the resources such as the staff from the organizations, as well as the educators, in this case, the dentist and the CHWs. The location was the setting of the program which was in the three public secondary schools. The target population usually includes the number, social, economic and environmental considerations. Social factors could include social integration towards peers, the community or family circumstances. Economic factors could include income, expenses, debt, financial support received by the family, etc. Safety, housing, transportation could be included in environmental factors. Activities for inputs could involve planning and discussion of the program to be launched, workshops and demonstrations and dissemination. The planning and discussion is broad and may include subtopics such as resources and community needs assessment, data collection, data analysis, sustainability plan, etc. Most of these topics may overlap and a proper communication is

needed in all the stages of the program. Workshops and demonstrations are essential in order to ensure the readiness of the staff involved. For this study, a Training of Teachers (TOT) program was held for the CHWs three times prior to the oral health program itself. Effective program dissemination should also be included in the activities. In terms of program outputs, the approved proposal, protocols consideration, materials and equipment needed, and trained staff and educators are the results of adequate planning and discussion.

After Program Development is the Program Implementation. This includes the particular planned program. In this study's case, it is the execution of oral health promotion for oral health knowledge and KASA in which the specifics could be read in the Materials and Methods section of this paper.

The third is Program Outcome or the effect of the program. For this study, it was the KASA change in oral health that could further influence practice changes towards a more positive oral health outlook.

Last is the Program Evaluation which is connected with Program

Outcome. This includes the assessment of the outcomes whether or not the planned objectives were successfully met. It could be short-term or immediate, intermediate, long-term or all three. The short-term outcome could include an improvement in oral health knowledge test scores after the program. An intermediate outcome example is an increase in oral health awareness of the participants. An example of a long-term outcome is the behavior change brought about by the program or intervention.

4.2 Limitations of the study:

The study was not able to verify the effectiveness of oral health knowledge retention of the oral health promotion in the secondary school students. Also, an increase in duration, as well as the number of CHW volunteers of various educational backgrounds for the study, would be more appropriate. In addition, randomized controlled trials of the CHWs should include their characteristics, advancement of the curriculum, details of the teaching provided, as well as the impact and cost, if possible. The training should consider the educational attainment and if prior

training was received, the target tasks of the CHWs and whether the training will be fit for them. The training for CHWs should comprise of demonstration, return demonstration, and if possible, an on-site supervision. This will help the CHWs in increasing their confidence levels with their newly-learned skills from their training. The training for CHWs should provide them with the skills to transform their communities' incorrect social norms and behaviors while encouraging the correct ones. Their manner of communicating with the members of their communities will be critical in developing a good rapport and relationship with them.

44,45

4.3 Points to consider:

Community health workers' duties include a deeper understanding of the communities' health needs which, in turn, will provide, if not free, reasonably-priced treatment or services, and will strongly encourage resourcefulness and self-sufficiency within the community. Since the CHWs are more readily reachable to the population, they are the ones who can be directly involved in the community and have the potential to bring

positive outcome and better health care access particularly to those in the poorer sectors of the community. However, this assessment still needs further studies since there is a limited amount of available data in relation to the cost-effectiveness of CHW programs. ¹⁴The scarce studies available demonstrate the contributing value of CHWs in the community health care system in comparison with other healthcare delivery approach.

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A focus on the Filipino community's oral health needs, socioeconomic status, particularly in the rural areas should be incorporated in the training programs. ²² Taking Brazil's dental training program, for instance, these do not take into consideration the needs of Brazilian people especially in the community setting since trainings are based on imported technology that is incompatible to Brazil's community oral health needs. ⁴⁶ It is highly recommended for the CHWs to undergo regular training, to be involved in oral health promotion projects, and to acquire a deeper understanding of oral health through educational and hands-on activities as an essential part in the community oral health team in order to aware of

current oral health needs, particularly in their own localities.^{32,33} This, in turn, will provide better and more realistic interventions for promoting better quality of life through oral health.

It will be beneficial if the CHWs could help aid in oral health promotion. This has the possibility to be cost-effective though further analysis will be needed for validation. Moreover, the dentists will be able to focus more on dental services and treatment in the community since a huge number cannot afford the private clinic. Difficulties of the CHWs in being accepted into the prevailing health care structure still exist. However, in order to be effective, these difficulties need to be addressed.⁴⁹

Further Philippine studies are also needed to provide reliable evidence about the effectiveness and cost-effectiveness of training programs for promoting oral health. In addition, a more advanced study is necessary for the assessment of the sufficient interval for the subsequent training. This will ensure an effective and lasting enhancement in knowledge which, in turn, would initiate improvement in the community's oral health status. This is essential in evaluating the oral health promotion training that may,

later on, be implemented in communities and schools where there are insufficient numbers of dentists or other dental professionals.

5. Conclusions

The study demonstrated the significance of dentists and CHWs in promoting oral health amidst the limited information about CHW training for oral health promotion in the Philippines. CHW1 was found to be as effective as the dentist in enhancing the students' oral health knowledge. The educational background of CHWs played a fundamental role in terms of effectiveness which is reflected in the test results. The CHW' s level of education was more crucial than the years of experience as a CHW since CHW1 outperformed CHW2 in the students' test results. The results suggested that CHWs have the potential to be trained effectively for oral health promotion in the public setting, particularly those with a teaching background. Socioeconomic factors included in this study did not play a vital role in the outcomes of test and survey results.

References

1. Philippines country profile. Library of Congress Federal Research Division (March 2006). This article incorporates text from this source, which is in the public domain.
2. World Health Organization, (2009) Oral health: Action plan for promotion and integrated disease prevention. Report by secretariat. Documents A60/16.
3. World Health Organization. WHO's Global School Health Initiative. Available at www.who.int/school_youth_health/media/en/92.pdf. Accessed 19 November 2012.
4. Petersen PE. Oral health. In Kris Heggenhougen K, Quah S (ed) International Encyclopedia of Public Health. San Diego: Academic Press; 2008. p. 677–685.
5. Blaggana, A., Grover, V., Anjali, Kapoor, A., Blaggana, V., Tanwar, R., Haneet, R. K. (2016). Oral Health Knowledge, Attitudes and Practice Behaviour among Secondary School Children in Chandigarh. Journal of Clinical and Diagnostic Research : JCDR, 10(10), ZC01–ZC06.
6. Al–Ansari, J., Honkala, E., & Honkala, S. (2003). Oral health

- knowledge and behavior among male health sciences college students in Kuwait. *BMC Oral Health*, 3, 2.
7. Bennette, C. (1975). Up in the hierarchy: *Journal of Extension* [Online] (March/April). Available at:
<http://www.joe.org/joe/1975march/1975-2-a1.pdf>.
 8. Freeman, D. (1989) Teacher training, development and decision making: a model of teaching and related strategies for language teacher education. *TESOL Quarterly* vol 23, No 1.
 9. Rockwell, K., & Bennett, C. (2004). Targeting outcomes of programs: A hierarchy for targeting outcomes and evaluating their achievement. Faculty publications: Agricultural Leadership, Education & Communication Department.
<http://digitalcommons.unl.edu/aglecfacpub/48/> (March 2016).
 10. Philippine Standard Geographic Code (PSGC): City of San Jose Del Monte.
<http://nap.psa.gov.ph/activestats/psgc/municipality.asp?muncode=031420000®code=03&provcode=14>. Retrieved June 17, 2018.
 11. Bhutta ZA, Lassi ZS, Pariyo G, et al. Global experience of community health workers for delivery of health related millennium development goals: a systematic review, country case studies, and recommendations for integration into national health systems. *Global*

- Health Workforce Alliance 2010;1:249–61.
12. Census of Population (2015). "Region III (Central Luzon)". Total Population by Province, City, Municipality and Barangay. PSA. Retrieved 20 June 2016.
 13. Xin, T., Xu, Z., & Tatsuoka, K. (2004). Linkage between teacher quality, student achievement, and cognitive skills: A rule–space model. *Studies in Educational Evaluation*, 30(3), 205–223. doi:10.1016/j.stueduc.2004.09.002
 14. Gerritsen, S., Plug, E., & Webbink, D. (2016). Teacher Quality and Student Achievement: Evidence from a Sample of Dutch Twins. *Journal of Applied Econometrics*, 32(3), 643–660. doi:10.1002/jae.2539
 15. Hanushek EA, Rivkin SG. 2006. Teacher quality. In Handbook of Economics of Education, Vol. 2, Hanushek E, Welch F (eds.). Elsevier: Amsterdam; 1051–1075.
 16. Harris DN, Sass TR. 2011. Teacher training, teacher quality and student achievement. *Journal of Public Economics* 95: 798–812.
 17. Frazão P, Marques DSC. Influência de agentes comunitários de saúde

- na percepção de mulheres e mães sobre conhecimentos de saúde bucal. *Cienc Saude Coletiva*. 2006;11(1):131–44.
18. Abdel–All M, Putica B, Praveen D, et al Effectiveness of community health worker training programmes for cardiovascular disease management in low–income and middle–income countries: a systematic review *BMJ Open* 2017;7:e015529. doi: 10.1136/bmjopen–2016–015529
 19. Dino Balabo (August 8, 2013). "San Jose del Monte declares moratorium on relocation projects". *The Philippine Star*. Retrieved July 13, 2018.
 20. CAMP Asia. <http://icamp.asia/>. Retrieved July 7, 2018.
 21. World Health Organization: *Oral Health Surveys, Basic Methods*. 4th edition. Geneva: World Health Organization; 1997.
 22. Department of Education, Health and Nutrition Center (2008). *National Oral Health Survey 2006*. Manila, Philippines
 23. Piovesan C, Tomazoni F, Del Fabro J, et al. Inequality in dental caries distribution at noncavitated and cavitated thresholds in preschool children. *J Public Health Dent* 2014;74:120–126.

24. Armstrong G, Kermode M, Raja S, et al. A mental health training program for community health workers in India: impact on knowledge and attitudes. *Int J Ment Health Syst* 2011;5:17.
25. Petersen PE, Aleksejuniene J, Christensen LB, Erikse HM, Kalo I. Oral health behavior and attitudes of adults in Lithuania. *Acta Odontol Scand* 2000;58:243–8
26. Chen MS, Andersen RM, Barmes DE, et al: Comparing oral health care systems: a second international collaborative study. Geneva: World Health Organization; 1997
27. United Nations Development Program (UNDP). Human Development Report 2015. New York: the United Nations Development Program; 2015. p. 210.
28. Kluthcovsky ACGC, Takayanagui AMM. Community health agent: a literature review. *Rev Lat Am Enfermagem*. 2006;14(6):957–63. DOI: 10.1590/S0104-11692006000600019.
29. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion Int*. 2000;15(3):259–67. DOI: 10.1093/heapro/15.3.259.
30. Stenberg P, Hakansson J, Akerman S. Attitudes to dental health and

- care among 20 to 25-year-old Swedes: results from a questionnaire. *Acta Odontol Scand* 2000;58:102–6.
31. Lin HC, Wong MC, Wang ZJ et al. Oral Health Knowledge, attitudes and practices of Chinese adults. *J Dent Res* 2001 80:1466–1470.
 32. Jiang H, Petersen PE, Peng B, Tai B, Bian Z: Self-assessed dental health, oral health practices, and general health behaviors in Chinese urban adolescents. *Acta Odontol Scand* 2005, 63:343–352.
 33. Torresyap V, Hoover J, Torresyap M, Karunanayake C. Prosthodontic and periodontal status and needs in a selected population of urban poor in the Philippines. *Int J Prosthodont Oper Dent* 2013;3(4):136–142.
 34. Priya M, Kanagharekha D, Deepti A, et al. Oral health attitudes, knowledge and practice among school children in Chennai, India. *J Educ Ethics Dentistry* 2013;3:26–33.
 35. Dragheim E, Petersen PE, Saag M. Dental caries in schoolchildren of an Estonian and a Danish municipality. *Int J Pediatr Dent* 2000. p. in press.
 36. Staiger DO, Rockoff JE. 2010. Searching for effective teachers with

- imperfect information. *Journal of Economic Perspectives* 24(3): 97–117.
37. Rivkin SG, Hanushek EA, Kain JF. 2005. Teachers, schools and academic achievement. *Econometrica* 73(2): 417–458.
38. Rockoff JE. 2004. The impact of individual teachers on student achievement: evidence from panel data. *American Economic Review* 94(3): 247–252.
39. Jassem. Al-Ansari, Eino. Honkala, Sisko. Honkala Oral health knowledge and behavior among male health sciences college students in Kuwait. *BMC Oral Health*, 3 (2003), p. 2
40. Ernesto. Smyth, Francisco. Caamaño, Paula. Fernández-Riveiro. Oral health knowledge, attitudes and practice in 12-year-old schoolchildren. *Med Ora Patol Oral Cir Bucal*, 12 (2007), pp. 614–620
41. Elrashid, A. H., Al-Kadi, R. K., Baseer, M. A., Rahman, G. S., Alsaffan, A. D., & Uppin, R. B. (2018). Correlation of Sociodemographic Factors and Oral Health Knowledge among Residents in Riyadh City, Kingdom of Saudi Arabia. *Journal of Oral Health and Community Dentistry*, 12(1), 8–13. doi:10.5005/jp-journals-10062-0018
42. Haque, S. E., Rahman, M., Itsuko, K., Mutahara, M., Kayako, S.,

- Tsutsumi, A., Mostofa, M. G. (2016). Effect of a school-based oral health education in preventing untreated dental caries and increasing knowledge, attitude, and practices among adolescents in Bangladesh. *BMC Oral Health*, 16(1). doi:10.1186/s12903-016-0202-3
43. Harikiran, A., Pallavi, S., Hariprakash, S., A., & Nagesh, K. (2008). Oral health-related KAP among 11- to 12-year-old school children in a government-aided missionary school of Bangalore city. *Indian Journal of Dental Research*, 19(3), 236. doi:10.4103/0970-9290.42957
44. Becker, Bronwyn E., and Suniya S. Luthar. "Social-Emotional Factors Affecting Achievement Outcomes Among Disadvantaged Students: Closing the Achievement Gap." *Educational Psychologist* 37.4 (2002): 197-214. Web.
45. Carter, Prudence L., and Kevin G. Welner. "Building Opportunities to Achieve." *Closing the Opportunity Gap-What America Must Do to Give Every Child an Even Chance* (2013): 61-75. Oxford University Press. Web.
46. Narvai PC. *Odontologia e saúde bucal coletiva*. São Paulo: Hucitec; 1994
47. Morford, S, Kozak, R, Suvedi, M and Innes, J. (2006). 'Factors Affecting Program Evaluation Behaviors of Natural Resource Extension Practitioners--Motivation and Capacity Building'. *Journal of Extension* [On-line]. 44(3). Available at:

<http://www.joe.org/joe/2006june/a7p.shtml> [Accessed date: July 1, 2018].

48. SafeWell Practice Guidelines: An Integrated Approach to Worker Health / Version 2.0 [PDF]. Center for Work and Health. Harvard University. (n.d.).
49. Herman, AA. Community health workers and integrated primary health care teams in the 21st century. *J Ambul Care Manage.* 2011; 34: 354–361.

Appendix A



Seoul National University
Graduate School of Dentistry
Department of Preventive Dentistry

Agreement to Participate in
“Oral health education effectiveness on secondary school students by the dentist in comparison with community health workers (CHWs) of different educational backgrounds in Bulacan, Philippines”

Researcher: Mary Delia Z. Bondoc, DMD

Professor: Dong-Hun Han, DDS, Ph.D.

Your son/daughter is being asked to participate in a research study. The researcher will ask for your participation after explaining the concepts of the research. You will be asked to sign this agreement which states that the study has been explained, that your questions have been properly answered, and that you agree for your child to participate.

The researcher will explain the purpose of the study, how it will be carried out, and what you are expected to do as a participant. The researcher will also explain the possible risks and benefits of being included in the study. You are welcome to ask the researchers on your inquiries about any of these things before you decide to let your child to join the research study as it is very important that you clearly understand it.

This form will also explain the research study. Please read it carefully and do not hesitate to approach the researcher about any questions you may have. After you have decided to allow your child to be included in the study, please sign and date this form in front of the researcher who explained the study to you.

Thank you very much.

Participant

Signature over Printed Name: _____
Date: _____

Authorized Representative

Relation: _____
Signature over Printed Name: _____
Date: _____

I hereby confirm that I have fully explained to the research participants the outline of the study and all the matters related to participation in the study.

Research Supervisor/Researcher:

Signature over Printed Name: _____
Date: _____

Appendix B



Seoul National University
Graduate School of Dentistry
Department of Preventive Dentistry

Explanation for Consent to Participate in Research

“Oral health education effectiveness on secondary school students by the dentist in comparison with community health workers (CHWs) of different educational backgrounds in Bulacan, Philippines”

- 1. Nature and Purpose of the Study**

The objective of this study is to assess the effectiveness of community health worker (CHW) oral health promotion training program based on the improvement of oral health knowledge of the students. The study will also assess the effectiveness of community health worker (CHW) oral health promotion training program based on the tests and survey of the oral health program. You are being asked to allow your son/daughter to be part of the study since he/she is included in the official list of enrolled students from which the study was proposed for.
- 2. Explanation of Procedures**

The community health worker will carry out a presentation on oral health in class. In line with this, a pre-test, post-test, and survey will be given in order to assess as well as to evaluate the effect of the oral health promotion.
- 3. Discomforts and Risks**

The possibility of risk/s to occur is very minimal since the research is questionnaire-based and neither physical contact nor clinical exam needed. However, in circumstances where these risks and discomfort may arise, proper management will be done immediately.
- 4. Benefits**

It would be beneficial for you to understand the importance of oral health as well as the proper oral hygiene procedures through the presentation. Results of the procedures will also help you to recognize the role of community health workers in oral health promotion.
- 5. Confidentiality/Records-Keeping**

All the records and the information that the researcher will gather will be strictly confidential. Only the supervising professor and the researcher will have access to the records. Participants will not be identified, in any way, during the reporting of the scientific paper as codes will be assigned for each participant. The records shall be kept, for three years, in a secure place (sealed container placed in a locked cabinet) provided by the researcher. Furthermore, all coded files will be secured by a password.
- 6. Refusal / Withdrawal**

Participation in the research project is voluntary. You may opt to let your child join or not. You may also decide to let him/her join now and quit later without stating your reasons. If you decide not to allow your child to participate or if you make him/her quit the research study, it will not be held against you. Your child may be exempted to join if the researcher or the teacher feels that it is in your child's best interest not to participate. They may pull him/her out at any time before the completion of the study.
- 7. Rights and Complaints**

The researcher will inform you of the developments on the study. You have the right not to include your personal information in this study if you deem so. If you have any complaints about your child's participation, or if you have questions and concerns regarding the research study, please contact Dr. Mary Delia Z. Bondoc (marydeliabondoc@yahoo.com).

You may also contact Dr. Mary Delia Z. Bondoc at the Department of Preventive Dentistry, Seoul National University, Room 320 (☎02-740-8733).

I hereby confirm that I have fully explained to the research participants the outline of the study and all the matters related to participation in the study.

Research Supervisor (or Researcher)

Signature over Printed Name: _____
Date: _____

Appendix C

Date:
Ma'am _____
Principal of School
Address:
Marangal National High School
Minuyan National High School
Towerville National High School

RE: Permission to Conduct Research Study

Dear Ma'am _____

I am writing to request permission to conduct a research study at your institution. I am currently enrolled in the Department of Dentistry at Seoul National University in Seoul, South Korea, and am in the process of writing my Master's Thesis. The study is entitled *"Oral health education effectiveness on secondary school students by the dentist in comparison with community health workers (CHWs) of different educational backgrounds in Bulacan, Philippines."*

I hope that the school administration will allow me to recruit around 100 secondary students from each school (an estimate of 300 students are needed for the study) to attend to the oral health education program and complete a pre-test, post-test, socioeconomic status (SES), and Knowledge, Attitudes, Skills and Aspirations (KASA) survey questionnaires (copy enclosed). Interested students, who volunteer to participate and are below 18 years old, will be given a consent form to be signed by their parent or guardian (copy enclosed) and returned to the primary researcher at the beginning of the oral health education process.

If approval is granted, student participants will listen to the oral health education program and complete the survey in a classroom or other quiet setting on the school site in their most convenient time as recommended by the adviser. The oral health education and survey process should take no longer than 1 hour. The survey results will be pooled for the thesis project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your school/center or the individual participants.

Your approval to conduct this study will be greatly appreciated. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. You may contact me at my email address: marydeliabondoc@yahoo.com

If you agree, kindly sign below and return the signed form in the enclosed self-addressed envelope. Alternatively, kindly submit a signed letter of permission on your institution's letterhead acknowledging your consent and permission for me to conduct this survey/study at your institution.

Sincerely,

Mary Delia Z. Bondoc, DMD
Master's Student,

Department of Preventive Dentistry
Seoul National University

Enclosures

cc: Dong-Hun Han, DDS, PhD, Research Supervisor, SNU School of Dentistry

Approved by:

School Principal's Name

Signature

Date

Appendix D

ORAL HEALTH KNOWLEDGE QUESTIONNAIRE

Serial Number:

Gender:

Age:

Grade and Section:

Date:

Kindly encircle the letter of your answer.

1. How often should you brush your teeth?
 - A. Once a day
 - B. Twice a day
 - C. Thrice a day
 - D. More than thrice a day.
2. How long should you brush your teeth?
 - A. Less than 1 minute
 - B. 1 minute
 - C. 2-3 minutes
 - D. 4-5 minutes
3. What type of bristles is the best when choosing a toothbrush?
 - A. Soft bristles
 - B. Medium bristles
 - C. Hard bristles.
4. How much toothpaste should you use in toothbrushing?
 - A. Smear
 - B. Pea-size
 - C. All bristles are covered.
5. When you are brushing, there are times when gum bleeding occurs. What does gum bleeding mean?
 - A. Healthy gum
 - B. Inflamed gum
 - C. Gum recession
 - D. I do not know
6. How do you protect yourself from gum bleeding?
 - A. Using toothbrush, paste and dental floss
 - B. Eating soft food such as porridge, bread
 - C. Eating food that are rich in vitamin C such as oranges,
 - D. All of the above
 - E. I do not know
7. What does dental plaque mean?
 - A. Soft debris on the teeth
 - B. Staining on the teeth
 - C. Hard debris on the teeth
 - D. I do not know
8. What does dental plaque primarily lead to?
 - A. Inflammation of the gum
 - B. Staining on the teeth
 - C. Dental caries
 - D. All of the above
 - E. I do not know.
9. Why does a tooth become carious?
 - A. Because of the presence of *dental plaque*
 - B. Because of the sugars in the diet
 - C. Because of the tooth form
 - D. Because of the length of time that the tooth is not cleaned or exposed to sugar
 - E. All of the above
10. Sweets affect the teeth adversely.
 - A. Yes
 - B. No
 - C. I do not know.
11. Fizzy drinks affect the teeth adversely.
 - A. Yes
 - B. No
 - C. I do not know.
12. Using fluoride strengthens the teeth
 - A. Yes
 - B. No
 - C. I do not know.
13. Regular visits to the dentist are necessary
 - A. Yes
 - B. No
 - C. I do not know.
14. General health has a relationship to oral health and oral diseases.
 - A. Yes
 - B. No
 - C. I do not know.
15. Smoking causes
 - A. Stained teeth
 - B. Plaque build-up
 - C. Bad breath
 - D. Gum disease and Tooth Loss
 - E. All of the above

Appendix E

SATISFACTION SURVEY

Serial Number:
Gender :
Age:

Grade and Section:
Date:

Kindly answer the items below based on how much you disagree or agree with the statement. Please place a check mark on the box which corresponds to your answer the most.

I. KNOWLEDGE

		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1.	Lecture Information provided has been helpful to increase my knowledge in oral health.					
2	The oral health status in the Philippines is alarming.					
3	Smoking causes diseases not just for the general health but for the oral health as well.					
4	Sugary food and drinks cause tooth decay.					

II. ATTITUDES

		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1.	In general, I am satisfied with the process of the program.					
2.	The program has made me realize the importance of having a good oral health.					
3.	Oral health prevention should be given more emphasis than treatment.					
4.	The topic was relevant to my country's health needs.					

III. SKILLS

		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1.	Knowledge obtained from the program will be helpful in enhancing my capacity to achieve good oral health.					
2.	I will follow the proper tooth brushing and flossing technique.					
3.	I will not smoke/ will quit smoking.					
4.	I will minimize my sugar intake.					

IV. ASPIRATIONS

		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1.	I wish to be a good role model on oral health in my community.					
2.	I am looking forward to sharing this information to my family, friends, etc.					
3.	The presenter inspired me to become an oral health advocate.					
4.	I hope that the oral health status in the Philippines will improve in the near future.					

Appendix F

SOCIOECONOMIC STATUS QUESTIONNAIRE (FOR STUDENTS)

Serial Number:

Gender:

Age:

Grade and Section:

Date:

1. Age of Father:

2. What is the highest degree he earned? Please select from the choices below.

- A. Elementary school diploma or equivalency
- B. Secondary/High school diploma or equivalency
- C. Associate degree (junior college) or vocational degree/license
- D. Bachelor's degree
- E. Post Graduate degree
- F. Professional (MD, JD, DDS)
- G. None of the above, please specify other: _____

3. Age of Mother:

4. What is the highest degree she earned? Please select from the choices below.

- A. Elementary school diploma or equivalency
- B. Secondary/High school diploma or equivalency
- C. Associate degree (junior college) or vocational degree/license
- D. Bachelor's degree
- E. Post Graduate degree
- F. Professional (MD, JD, DDS)
- G. None of the above, please specify other: _____

5. How many people are currently living in your household, including yourself? __

6. Of these people, how many are children <18 years old? __

국문초록

서로 다른 구강보건 교육자에 의한 필리핀
블라칸 지역 중등학교 학생 구강보건교육
효과 평가

서울대학교 치의학대학원 치의과학과 예방치학전공

(지도교수 : 한동헌)

성 명: BONDOC, MARY DELIA

1. 목적

이 연구의 목적은 구강건강증진활동을 수행한 후 구강건강지식 평가결과를 바탕으로 학생들의 구강건강지식이 향상되었는지 평가하는데 있으며, 학생들의 사회경제적 요소들과 지식, 태도, 기술, 포부(KASA) 조사결과를 고려하였다.

2. 방법

3인의 보건종사자가 구강건강지식에 대한 단면조사연구에 참여하도록 무작위로 선정되었고, 학생들의 KASA평가가 이루어졌다. 이 연구는 Bulacan 내 San Jose Del Monte에 살고 있는 12-21세 중등학교(7-12학년) 학생 324명(남성 34.90%, 여성 65.10%)을 대상으로 수행하였다. 학생들은 학급 상황에 따라 선정되었고, 각각 보건 인력과 치과 의사에 무작위로 배정되었다.

Community Health Worker1(CHW1)은 대학을 졸업한 반면 Community Health Worker2(CHW2)군은 학사학위를 받지 못한 군이다. 먼저, 학생들에게 사회경제적상태(SES) 설문지와 사전평가지를 나누어주었다. 각 학급은 치과 의사, CHW1 그리고 CHW2로 명명한 세 교육자에게 무작위로 배정되었다. 구강보건교육과 올바른 칫솔질 시범이 이루어진 후 사후 평가와 KASA설문을 수행하였다. 구강건강교육자들의 학생들 사이에서 사회-인구학적 요인들을 비교하기 위해 범주형 변수들은 카이제곱 검정(Chi-square test)을 실시하였고 연속형 변수들은 일원배치분산분석(ANOVA)을 실시하였다. 사전 평가와 사회경제적 요소(연령, 성별, 아버지의 연령, 어머니의 연령, 아버지의 교육 성취도, 어머니의 교육 성취도, 가족 구성원 수, 가족구성원 중 미성년자 수)를 보정하고, 세 군간의 비교를 위해

ANOVA와 일원분류분산분석(ANCOVA)을 실시하였다. 사전평가결과와 사후평가결과를 비교하기 위해 ANOVA, ANCOVA로 분석하였고 사후분석(Scheffé, Dunnett T3, Sidak)을 실시하였다. 그리고 KASA조사결과분석에는 Scheffé, Sidak 사후분석을 실시하였다.

3. 연구결과

대응 표본 t검정 결과 그룹들 사이에 사전평가 및 사후평가 점수에 유의한 차이가 있었다($p < 0.001$). ANCOVA를 통해 공변량을 조정한 후 분석했을 때 세 교육자군(치과의사, CHW1, CHW2)사이에 학생들간 사후평가 점수가 통계적으로 유의한 차이를 보였다($p < 0.001$). 특히 ANCOVA에서 Sidak사후분석결과 CHW1과 CHW2($p < 0.001$)뿐만 아니라 치과의사와 CHW2군($p < 0.001$)사이에 유의한 차이를 보였다. KASA의 경우 공변량 조정 후 ANCOVA결과 지식 부분의 차이($p < 0.001$)를 제외하고는 세 군간의 모든 비교에서 유의한 차이가 없었다. 특히 ANCOVA에서 Sidak사후분석결과 치과의사 군은CHW1군과 유의한 차이가 있다는 것이 나타났다($p < 0.001$).

4. 결론

구강건강증진을 수행하고 난 후 학생들의 구강건강지식의 향상이 관찰되었다. CHW1 은 학생들의 구강건강지식을 강화하는데 있어서 치과의사만큼 효과적일 수 있다는 것이 밝혀졌다. 사후 평가에서 나타난 효과성에 관해서는 지역사회

보건인력들의 교육적인 배경이 중요한 역할을 하였다. KASA 종합적인 결과들은 세 군 사이에서 비슷한 결과를 나타내었다. 하지만 사회경제적 요인들의 영향력은 명확하게 드러나지 않았다.

주요어 : 구강 건강 교육, 구강 건강 지식, 지역사회 보건인력, 필리핀, KASA

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