Educational Program to Improve Quality of Life among Elderly Regarding oral Health

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Original Research Article

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Abstract: The present study aimed to evaluate the effect of educational program on quality of life among elderly regarding oral health. A quasi-experimental pre-test-and-post-test design was utilized to conduct this study. The study was conducted in the geriatric social club in Zagazig City. A purposive sample of 75 elderly subjects who fulfilled the study inclusion criteria. Five tools were used in the present study; Tool I was a structured interview questionnaire to assess elderly's demographic characteristics, medical history, oral health status, periodic examination of the mouth, dietary habits, and smoking habits, Tool II was elderly oral health knowledge structured interview questionnaire, Tool III was elderly oral self-care practices questionnaire and checklist, Tool IV was the Oral Health Assessment Tool (OHAT) For Non –Dental Professional, and Tool V was Oral Health Impact Profile (OHIP-14) Short Version. The results revealed post-program statistically significant improvements in OHRQoL scores, oral health knowledge, oral self-care practices, and oral health assessment (p<0.001). The follow-up phase showed some declines, but still significantly higher compared with the pre- program levels (p<0.01). The educational program is effective in improving the elderly's oral health related quality of life.
Keywords: Educational program, oral health, quality of life, elderly.

INTRODUCTION

Ageing is a natural process; this process is a biological reality which has its own dynamic, largely beyond human control. According to the world health organization (WHO), the global population is increasing at the annual rate of 1.7%, while the population of those over 65 years is increasing at a rate of 2.5% [1]. As long as life expectancy continues to rise, older people will steadily increase as a proportion of the population. One in eight people in the world are aged 60 or over. People aged 60 and older make up 12.3 % of the global population, and by 2050, that number will rise to almost 22 % about 2 billion, up from 900 million in 2015 according to the report of United Nations population fund [2]. However this demographic change produces heavy challenges to health authorities and social planners due to the fast rate burden of chronic diseases including oral diseases among the elderly [3].

According to WHO [4] definition, oral health is "a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing". Oral health is a human right, an integral part of general health and essential for overall wellbeing. The Canadian Dental Association defines oral health as "a state of the oral and related tissues and structures that contributes positively to physical, mental and social well-being and enjoyment of life's possibilities, by allowing the individual to speak, eat and socialize unhindered by pain, discomfort or embarrassment [5].

Dental health of older adults is a basic need that is increasingly neglected with advanced age, debilitation, and limited mobility. The most common oral health problems encountered by the elderly are teeth loss, dental caries, gingivitis, peridontitis, xerostomia, oral lesions, and dental problems [7]. Orodental health is integral to general health. Poor oral health is defined as a risk factor for dehydration and malnutrition, as well as a number of systemic diseases, including pneumonia, joint infections, cardiovascular disease, and poor glycemic control in type 1 and type 2 diabetes [8]. Similarly, systemic diseases and/or the

adverse side effects of their treatments can lead to increased risk of oral diseases, xerostomia, and altered taste sensation [9].

Although oral health problems are rarely a matter of life and death they remain a major public health problem because of its prevalence and there are significant indications that oral health problems have social, economic and psychological consequences, this means that they have impact on quality of life [10]. Nowadays there is a growing interest in recognizing oral health as a component of quality of life, currently the dental research efforts are not only focus on rehabilitating oral-dental diseases, but in exploring the relationship between oral health status and quality of life, in order to evaluate it, improve it and maintain it. In fact, OHRQoL is an integral part of general health and well-being and is recognized by the WHO as an important segment of the Global Oral Health Program [6].

Oral health-related quality of life was defined as a "self-report specifically pertaining to oral health–capturing both the functional, social and psychological impacts of oral disease" [11]. There is another definition that conceptualizes OHRQoL mentioning that it "reflects people's comfort when eating, sleeping and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health" [12].

OHRQoL deals with conditions that vary in intensity and importance, some of them are life-threatening (e.g. oral cancers) some chronic (caries, periodontitis, etc.) some other dealing with aesthetics (fluorosis, dental anomalies, etc) and other are related to oral pain (pulpitis, dental treatments etc) [10]. As OHRQoL oral health related quality of life is highly subjective and has to be assessed within the framework of elderly's conditions, sociocultural environments and own experiences and states of mind: because OHRQoL is related to daily life and is unique to each individual, even elderlies with severe conditions can report having good quality of life. Furthermore, Quality of Life is by itself multi-faceted, showing variation over time for each individual [13].

Nurses play a key role in promoting oral health among the elderly and considered an important component of a successful oral hygiene program. The education and skills of dental hygienists enable them to act as consultants for procedure and program development, identify oral care needs of elderly, develop individualized care plans, provide clinical hygiene treatment, make referrals to dentists, and implement facility oral health programs [1].

Significance of the study

Oral health has a significant impact on general health especially among older adults [14]**.** Poor oral hygiene, tooth loss and diseases from oral pathogens have been linked with other non-communicable diseases such as diabetes, pneumonia and circulatory diseases [15]**.** Therefore, poor oral health can have a significant impact on the quality of life and the ability of an individual to go about their daily routines. As a result of study was conducted in Egypt by the Ministry of Health and population, in collaboration with the WHO country office, highlighted the need to develop a national oral health plan which entails promoting oral health, preventing oral disease, providing equitable access to oral health care, and delivering effective, efficient and equitable services to all Egyptians [16]**.** Hence, the present study was conducted to evaluate the effect of educational program on improving quality of life among elderly regarding oral health.

Aim of the study

The aim of the current study was to evaluate the effect of educational program on quality of life among elderly regarding oral health.

This aim has been achieved through the following objectives:-
- Assess the knowledge of the elderly regarding oral health pre, post, and following the program.
- Assess the oral self-care practices of the elderly pre, post, and following the program.
- Assess the oral health assessment of the elderly pre, post, and following the program.
- Assess quality of life among the elderly regarding oral health pre, post, and following the program.
- Develop and implement educational program to improve quality of life among the elderly regarding oral health.
- Evaluate the effect of educational program on improving quality of life among the elderly regarding oral health.

Research Hypothesis

The quality of life among the elderly regarding oral health will be improved after the implementation of the educational program.

SUBJECTS AND METHODS
Research design

A quasi-experimental pretest-and-posttest design.

Study setting

The study was conducted at the geriatric social club, El-Mohafza Street in Zagazig City. The club consists of one floor which has a wide hall for members' social sitting, a small garden with few chairs and tables, in addition to two rooms: one for the club administration, and the second for praying, and two

bathrooms. It provides some medical care, recreational and social services at low cost for the elderly.

Study subjects:
A Purposive sampling technique was used in the recruitment of 75 elderly for this study according to the following inclusion criteria:

- Age: 60 years and older;
- Independent in performing their daily activity;
- Have no communication problems (speech and hearing problems); and
- Attending the geriatric social club regularly.

Tools of data collection:
Five tools were used for data collection:

Tool I: A structured interview questionnaire:
It was developed by the researcher to collect the necessary data for the study. It composed of five parts:

Part 1: Demographic characteristics of the studied elderly as; age, sex, educational level and income source.

Part 2: History of chronic diseases, medications and oral health status.

Part 3: Data for periodic examination of the mouth as; frequency of dental visit, reason of last visit and causes of infrequent follow up.

Part 4: Dietary habits of the elderly as; following special diet, difficulty in eating, and fluids amount.

Part 5: Smoking habits of the elderly as; history of smoking, number of cigarette/ day, and effect of smoking on teeth.

Tool II: Elderly Oral Health Knowledge Structured Interview Questionnaire to assess the knowledge of the study subjects before and after the implementation of the oral health educational program. This tool was developed by [17].

Scoring system
The total grade was computed out of seventy (71) grades and knowledge was considered adequate if the percent score was 60% or more ($\geq$43grade) and inadequate if less than 60% (< 43grade).

Tool III: Elderly Oral Self-Care Practices [17]. It consisted of two parts:

Part 1: Oral Self-Care Practices Structured Interview questionnaire

It was used to assess the OSCP of the study subjects before and after the implementation of the oral health educational program.

Part2: Oral self-care practice observation checklist
An English form was filled out by the researcher to assess the oral self-care skills of the study subjects before and after the implementation of the oral health educational program. It included four procedures for elderly with natural and artificial teeth (teeth brushing, teeth flossing, denture care and oral cancer self-examination).

The Scoring system
- The total grades were summed to yield twelve grades, brushing practice and teeth flossing were considered adequate if the percent score was 60% or more ($\geq$7) and inadequate if less than 60% (< 7).
- The total grades were summed to yield thirty two grades, denture care practice was considered adequate if the percent score was 60% or more ($\geq$19) and inadequate if less than 60% (< 19).
- The total grades were summed to yield twenty grades, OCSE practice was considered adequate if the percent score was 60% or more ($\geq$12) and inadequate if less than 60% (< 12).

Tool IV: The Oral Health Assessment Tool (OHAT) For Non –Dental Professional.
This tool was developed by Chalmers *et al.*, [18], it was used in English form to assess the oral health status of elderly.

Scoring system
Total scores ranged from 0 to 16; the higher the score ($\geq$10) 60% or more the poorer the elderly oral health.

Tool V: Oral Health Impact Profile (OHIP-14) Short Version
This tool was developed by Slade [19]; it is originally designed to assess the oral health related quality of life of older adults. It was translated into Arabic and approved to be valid and reliable (r = 0.94) by Al-Emam [17].

Scoring system
A total OHIP-14 score was calculated by summing responses over all 14 items, with possible score ranging from zero (0) to fifty six (56) the higher score 60% or more ($\geq$34) indicates the bad of OHRQOL impact.

The preparatory phase:
Construction of the educational program, the first step in construction of this program was to determine the objectives. These objectives were

derived from the assessed elderly's problem of the sample. In addition to extensive review of the past and current local and international literature about oral health related quality of life among elderly using textbooks, web sites, and articles in the scientific periodicals and journals; the researcher prepared a structured interview questionnaire, elderly's oral health knowledge structured interview questionnaire, elderly's oral self-care practices, the oral health assessment tool (OHAT) for non –dental professional, and oral health impact profile (OHIP-14) short version. The review has also helped in a basic framework of the educational program.

Content validity

The tools were reviewed by five experts from the departments of Gerontological Nursing, Community Health Nursing, and Medical Surgical Nursing at the Faculty of Nursing, Zagazig University, and the department of Community medicine at the Faculty of Medicine, Zagazig University. These experts assessed the tools for clarity, relevance, application, and comprehensiveness. This constituted the content validation of tools. All recommended modifications were applied.

Pilot study

A pilot study was carried out on 8 elderly from the study setting 10% of the calculated sample for main study they were selected randomly from geriatric social club in Zagazig City, and were later excluded from the sample of research work to assure stability of the answers. The purposes of pilot were to test the questions for any obscurity, and to assess the practicability and feasibility of using the structured interview questionnaire sheet for the elderly. It also helped the researcher to determine the time needed for filling out the forms (30 to 45 minutes). The tools were finalized after doing necessary modifications according to the pilot study results. The pilot subjects were not included later in the main study sample.

Field work

Once permission was granted to proceed with the study, the researcher started to prepare a schedule for collecting the data. Participants were interviewed by the researcher who introduced herself and explained the aim of the study briefly, and reassured them that information obtained is strictly confidential and would not be used for any purposes other than research. The researcher examined the oral cavity of elderly (lips, tongue, gums and tissues, saliva, natural teeth, dentures, oral cleanliness and dental pain) by inspection with flash light, sterile gloves, sterilized tongue blade, gauze sponge for each elderly separately. In case of detecting any changes from normal, elderly was referred to suitable health services for intervention. The fieldwork was executed in ten months. It extended from June 2016 up to the end of March 2017. The researcher went two days weekly Sunday and Wednesday. This included the phases of assessment, planning, implementation, and evaluation of the educational program.

Assessment phase
The data were collected throughout three assessment phases

The first phase (pre-test) of assessment was done prior to conducting the educational program for elderly using the tools. The second phase (post-test) of assessment was done immediately post educational program using tools. Then the third phase (follow up) was done after three months.

Planning phase: Based on the results obtained from the data analysis of the assessment phase, and in view of the relevant literature about oral health, the researcher developed the oral health educational program and session's content according to the elderly needs and the study objectives. Identified needs, requirements and deficiencies were translated into aim and objectives of the oral health educational program and set in the form of a booklet.

Implementation phase

All groups received the same content using the same teaching methods, media, discussions, and the same booklet.

Evaluation phase

The evaluation of the effectiveness of the OHEP was done immediately after its implementation by a post-test, and after three months a follow up test was carried out .These were done using the same data collection tools of the pre-test.

Administrative and ethical considerations

An official permission for data collection and implementation of the OH educational program was obtained by submission of official letters issued from the Dean of the Faculty of Nursing at Zagazig University to the president of administration council of Assembly of Health Improvement in Sharkia Governorate and to the director of the Geriatric Social Club in Zagazig City. The researcher visited the study setting, met with the director of the club, explained to him the study aim and the importance of the study and its procedures, and asked for his cooperation. A verbal agreement for participation of the informants was taken. Participants was given the opportunity to refuse the participation, and they was notified that they could withdraw at any stage of the data collection interviews; also they was assured that the information would be confidential and used for the research purpose only. The researcher assured maintaining anonymity and

confidentiality of subjects' data. The researcher phone number and all possible communicating methods were identified to the participants to return at any time for any explanation.

Statistical analysis

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables. Cronbach alpha coefficient was calculated to assess the reliability of the developed tools through their internal consistency. Paired Quantitative continuous data were compared using the paired t test. The McNemar test was used to determine if there are differences on a dichotomous dependent variable. The Friedman test is the non-parametric alternative to the one-way ANOVA with repeated measures. It is used to test for differences between groups when the dependent variable being measured is ordinal.

Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. Pearson correlation was used for assessment of the inter-relationships among scales and quantitative variables. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. Statistical significance was considered at p-value $\leq$ 0.05 and highly significant at p-value $\leq$ 0.01.

RESULTS

Table-1 reveals that the participants ' age ranged between 60 and 82 years, with mean 69.25 $\pm$ 7.53 years, with more women (60%). In addition, 52%, 60%, and 41.4% of the studied elderly were married, worked as employees before retirement and had intermediate education respectively. The participants were living in urban (86.7%) with their family (70.7%). Concerning income, 73.3% of the studied elderly had enough income and 81.3% were depending on the retirement pension.

Figure-1 illustrates a statistically significant difference in total score of oral health knowledge of the studied elderly pre and post the educational program (P=0.001). Before the program, total mean score of oral health knowledge was 17.08±8.97 which increased to 40.44 $\pm$ 8.86 at the post program phase, and declined to 32.97 $\pm$ 6.44 at the follow-up phase. These improvements were statistically significant.

Figure-2 displays, statistically significant difference in total score of Oral self-care practice

among the studied elderly pre and post the educational program (P=0.001). Before the program, total mean score of oral self-care practice was 6.47 $\pm$ 6.39. This increased to 35.84 $\pm$ 13.65 at the post program phase, and declined to 24.87 $\pm$ 12.02 at the follow-up phase. These improvements were statistically significant.

Figure-3 shows that the total score of oral health assessment among the studied elderly throughout the study phases decreased steadily and significantly. The total score of oral health assessment among the studied elderly was 10.85 $\pm$ 2.85 before the program; this decreased to 8.19 $\pm$ 1.23 at the post-program phase, and 9.03 $\pm$ 2.08 at the follow-up phase. These improvements were statistically significant.

Figure-4 shows that the total score of OHRQOL among the studied elderly throughout the study phases decreased steadily and significantly. The total score of OHRQOL among the studied elderly was 34.75 $\pm$ 8.5 before the program; this decreased to 23.92 $\pm$ 5.03 at the post-program phase, and 28.01 $\pm$ 5.37 at the follow-up phase. These improvements were statistically significant.

Table-2 shows a statistically significant negative correlation between oral health related quality of life and knowledge, and oral self-care practice where, the total mean score of elderly's OHRQoL is inversely correlated with their OHK and OSCP {the higher (good) OHK score and OSCP score, the lower (good) OHRQoL score}. Also, it shows a statistically significant negative correlation between oral health knowledge, and oral examination findings where, the total mean score of elderly's OHK is inversely correlated with their OEF {the higher OHK score, the better (lower) OEF score} . On the other hand, oral health related quality of life had statistically significant positive correlation with the oral examination findings {the higher (poor) OHRQoL score, the higher (poorer) OEF score}, and oral health knowledge had statistically significant positive correlations with the oral self-care practice.

Table-3 shows that elderly's age, gender, total number of drugs taken per day, teeth condition and smoking had statistically significant negative correlation with their score of knowledge. Meanwhile, the educational level, occupation before retirement, income, and have chronic diseases had positive correlation with this score.

Regarding to elderly's score of oral self-care practice, this score had statistically significant negative correlation with elderly's gender, using denture and number of losing teeth. On the other hand, the educational level, income and period of using denture had positive correlations with this score.

Concerning to elderly's score of oral health assessment, this score had statistically significant negative correlation with elderly's education, occupation before retirement, income and using denture. Meanwhile, age, gender, total number of drugs taken per day, number of losing teeth, period of using denture, and smoking had positive correlations with this score.

As regard for elderly's score of oral health related quality of life, the table reveals that elderly's age, gender, total number of drugs taken per day, having chronic diseases, teeth condition, number of losing teeth, had statistically significant positive correlation with their score of OHRQoL. Meanwhile, the educational level, occupation before retirement, income, using denture and period of using denture had negative correlation with this score.

Table-1: Demographic characteristics of the studied elderly (n=75)

| Demographic characteristics	(n=75)	
	Frequency	Percent
Age group: /year		
60 – 69	59	78.7
70 – 79	14	18.6
80 +	2	2.7
Mean ± SD	69.25 ± 7.53	
(range)	(60 – 82)	
Gender:		
Male	30	40
Female	45	60
Marital status:	39	52
Married	27	36
Widow	9	12
Divorced		
Education:		
Illiterate	3	4
Read & write	7	9.3
Basic education	7	9.3
Intermediate	31	41.4
University/ Post graduate	27	36
Occupation before retirement:	30	40
House wife or not working	45	60
employee		
Residence:		
Rural	10	13.3
Urban	65	86.7
Living with:		
Family	53	70.7
Alone	22	29.3
Income:		
Not enough	12	16
Enough	55	73.3
Enough and exceed	8	10.7
Income source:@		
Pension	61	81.3
Relative help	3	4
Property revenues	37	49.3
Official social assistance	3	4
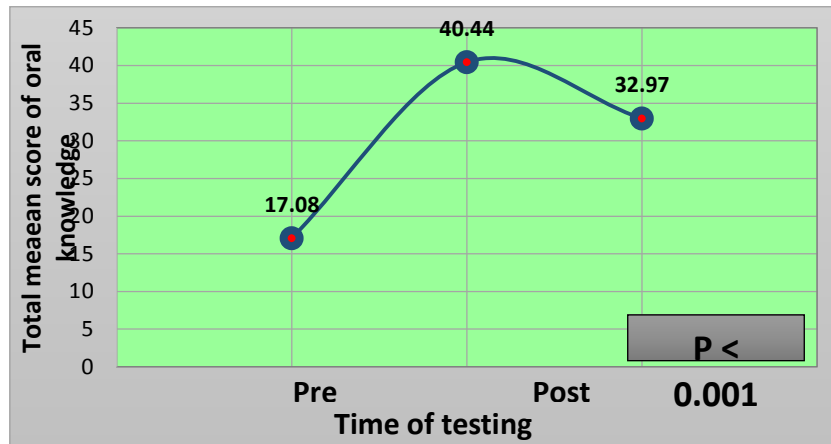
Fig-1: Total score of Oral health Knowledge among the studied elderly throughout the study phases [pre, post and following] (n=75)
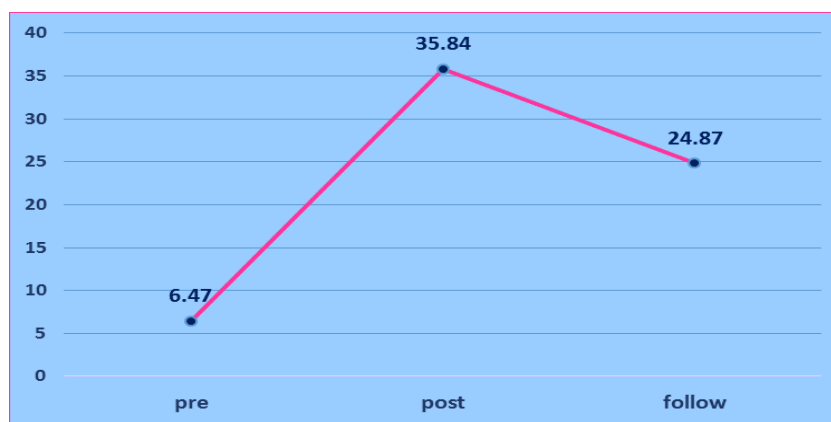

Fig-2: Total score of Oral self-care practice (observational check list) among the studied elderly throughout the study phases [pre, post and follow] (n=75)
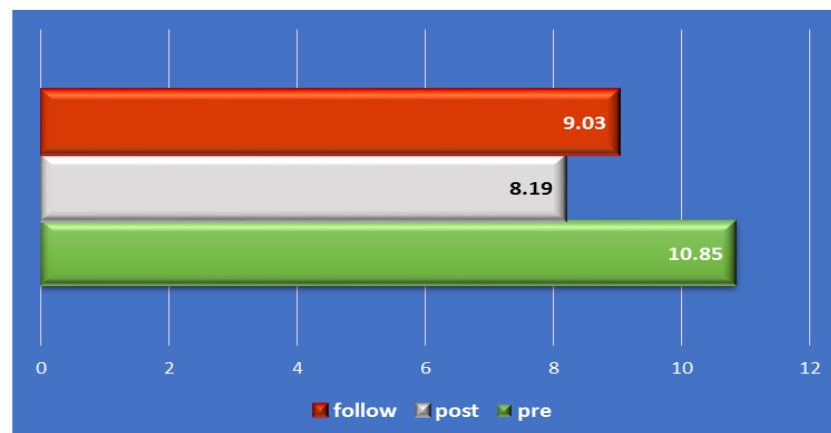

Fig-3: Total score of Oral health assessment among the studied elderly throughout the study phases [pre, post and follow] (n=75)
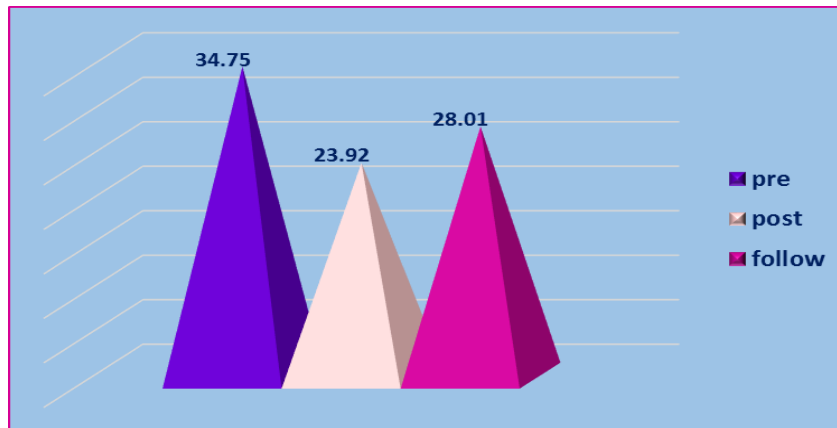
Fig-4: Total score of OHRQOL among the studied elderly throughout the study phases [pre, post and follow] (n=75)

Table-2: Correlation matrix of OHQOL, oral health knowledge, oral self-care practice (observational check list), and oral health assessment [examination findings].

Scores	Spearman's rank correlation coefficient			
	Oral Health Quality of Life (OHQOL)	Oral health knowledge	Oral self-care practice (observational check list)	Oral Health assessment [examination findings]
OHQOL				
Oral health knowledge	-.828**			
Oral self-care practice (observational check list)	-.519**	.608**		
Oral Health status [examination findings]	.667**	-.652**		

(**) statistically significant at p<0.01

Table-3: Correlation between OHQOL, oral health knowledge, oral self-care practice (observational check list), and oral health assessment [examination findings] scores and elderly characteristics

Elderly Characteristics	Spearman's rank correlation coefficient			
	Oral Health Quality of Life (OHQOL)	Oral health knowledge	Oral self-care practice (observational check list)	Oral Health assessment [examination findings]
age	.423**	-.359**	.156	.341**
gender	.271*	-.514**	-.340**	.322**
education	-.745**	.914**	.554**	-.595**
Occupation before retirement	-.329**	.471**	.206	-.399**
income	-.471**	.471**	.257*	-.288*
Have chronic diseases	.340**	.326**	.181	-.167
Total number of drugs taken per day	.302**	-.311**	.146	.362**
Teeth condition	.400**	-.288*	-.005	.157
Using denture	-.247*	.110	-.730**	-.407**
Number of losing teeth	.345**	-.099	-.280*	.323**
Period of using denture	-.265*	-.136	.685**	.318**
Smoking	.135	-.329**	-.220	.273*

(*) Statistically significant at p<0.05   (**) statistically significant at p<0.01

DISCUSSION

Oral health is a critical component of every individual's general health and wellbeing. The World Health Organization recognizes oral health as an integral part of general health and a basic human right.

Poor oral health and untreated oral diseases and conditions usually have a significant impact on the quality of life. Oral disease is common in advanced age. The most common oral health problems encountered by the elderly are teeth loss, dental caries,

gingivitis, peridontitis, xerostomia, oral lesions, and dental problems [7].

Concerning demographic characteristics, the mean age of the elderly in the present study was 69.25 ± 7.53 which is close to the mean reported by Ibrahim *et al*., among elderly in Egypt (66.08 years). Similarly, in Brazil (69. 5 years) [20] and in (Ibadan) Nigeria (69.7 years) [21]. The same point is confirmed by Dable *et al*., [22] in western India who mentioned that the age range was between 60-82 years and the mean age was 69.4 years.

The present study revealed that the plurality was to the women among the study sample. The higher percentages of women may reflect that attendants of the geriatric social club were commonly women, and reflect the higher life expectancy of women in general, and in Egypt as was reported by the Central Intelligence Agency (CIA) where the life expectancy was 70.8 years for male and 76.2 years for female people [23]. The finding is in congruence with many similar previous studies such as, Christensen *et al*., [24] in Copenhagen City, Hernández-Palacios *et al*., [25] in Mexico City , Denmark, and Jang *et al*., [13] in Korea.

The current study findings revealed that slightly less than three quarters of the studied elderly were living with family, while one-quarter of them were living alone. It might be due to that slightly more than half of them were still married and living with their spouses. Moreover, Middle-Eastern cultures are considered to possess more collectivist values where societies tend to encourage interdependence and therefore traditionally provide support and care for older people within their families. In the same context, the results of study conducted in Brazil by Alves da Silva *et al*., [26] who reported that more than half of the elderly were still married and more than three quarters of them were living with family.

The findings revealed very deficient knowledge among studied elderly before the program. This was noticed in all the tested knowledge areas such as the changes associated with aging, oral cancer, and the most common oral problems. The only exception was the part related to the preventive measures, which was known by more than one third of them. This could be explained by the specific instructions on media (TV & Radio) regarding tooth brushing and mouth cleanliness that still, perceived its importance was inconsistent with their demonstrated effectiveness. In support of this, the study results demonstrated that more than half of the studied elderly were depending on TV &Radio as sources of their oral health knowledge.

In agreement with the present study finding, a study in Egypt by Al Imam [17] who found that very deficient knowledge among the study subjects before the program. The author attributed this poor knowledge to the educational level of the study sample where the majority of them were illiterate. Similarly, another study in USA by McQuistan *et al*., [27] revealed that many participants were familiar with basic dental disease prevention and treatment; however, the most participants were unfamiliar with concepts pertaining to periodontal disease, oral cancer, and oral health.

The deficient pre-program knowledge depicted among the elderly in the present study might be attributed to the low level of education among some of them as well as their mental abilities, which could be affected by the aging process. In support of this, the study results demonstrated significantly higher scores of knowledge among those in the younger age group, less than 70 years, those educated and female gender. Moreover, age was negatively correlated to knowledge score, while the educational level was positively correlated to it. The same findings were revealed in logistic regression analysis. In congruence with this, the study of Al-Sharbatti and Sadek [28] in Ajman, United Arab Emirates (UAE) identified a significant association between elderly's knowledge and their age as well as educational level.

On contrast with these findings, a study in Australia revealed that the total oral health knowledge score was examined in relation to the various socio-demographic and oral health. None of these variables yielded a statistically effect on the overall knowledge score [29].

After implementation of the current study educational program, there were statistically significant improvements in elderly's knowledge. This indicates the effectiveness of the program in leading a positive change in their knowledge. Additionally, the educational level of the majority of the studied elderly was high or moderate as well as the majority of them were in 60-69 age group and these factors might play an important role in improving their oral health knowledge. This improvement was accompanied with little declines at the follow-up phase. This is expected given the effect of old age on memory, especially the short-memory.

Similarly, a study in Melbourne, Australia where participants showed statistically significant improvements in participants oral health knowledge (18.4 vs. 23.3; p<0.001) [30]. In agreement with this result, Albrecht *et al*., [31] in Germany concluded that oral health knowledge of elderly improved by one or more oral health educational interventions.

Regarding the oral self-care practices observation checklists, the findings revealed inadequate practice among the studied elderly before the program. This was noticed in all the observed procedures where all of them were unable to manage oral cancer self-examination procedure, the majority of them were unable to manage teeth flossing procedure, about two thirds of them were unable to manage teeth brushing procedure, and one third of them was able to manage only part of denture care procedure. This could be partly due to low knowledge and motivation regarding oral hygiene practices. On the same line, Al-Sharbatti and Sadek [28] in Ajman, UAE, who found that the majority of elderly had inadequate oral self-care practices.

The inadequate pre-program practices shown among the elderly in the present study might be attributed to that the majority of elderly had more than one chronic disease which take the priority in care rather than the oral health. Additionally, the low level of education, insufficient income among some of them as well as their inadequate knowledge regarding the importance of oral health to body health. This finding might be due to that elderly with high level of education are more likely to have sufficient income that enable them to get better access to dental care. In support of this, the study results demonstrated that the score of oral self-care practice had statistically significant positive correlations with elderly's educational level, income and oral health knowledge.

In congruence with this, the study of Al Imam [17] in Egypt identified a significant association between elderly's oral self- care practices and their educational level as well as income. Additionally, Skorupka *et al*., [32] in Southern Poland revealed that the most frequent cause of oral hygiene neglect in the elderly could be the socio-economic conditions, and lack of sufficient health education.

After implementation of the current study educational program, there were statistically significant improvements in elderly oral self-care practices with some declines were revealed at the follow-up phase. This indicates the effectiveness of the program in leading a positive change in their practices. This finding was expected since the procedures were explained in the oral health education program included in the booklet that the researcher distributed it to all of the studied elderly and each procedure was applied individually. Additionally, the educational program was considered as a start point and motivation for the elderly to take care of their oral health like other health concerns.

In the same line, Mariño *et al*., [29] in Australia found that the participants showed significant improvements in self-care oral hygiene practices (p < 0.05). Moreover, Zini *et al*., [33] in Thailand demonstrated that there were statistically significant improvements in elderly's practices total mean score of teeth brushing ,teeth flossing, denture care and oral cancer self-examination with some declines were revealed at the follow-up phase.

Before the program, lips, gums and tissues changed in less than half of the studied elderly, while tongue, saliva, and oral cleanliness changed in more than half of them. Ultimately, natural teeth and denture changed in the majority of studied elderly and dental pain changed in the minority of them. This can be explained by that, the inadequate knowledge as well as inadequate practice and limited dentist visiting among the majority of studied elderly, predict the changing in oral health status. Also, the majority of them were suffering from comorbidity and were depending on multiple medication that affect negatively on oral health.

These findings go in line with that of Compton and Kline [34] in Edmonton, Canada who found that very few elderly had good oral health, where one fifth had healthy oral cleanliness, more than one tenth had healthy tongues; and around two fifth had healthy gums and tissues. On the other hand, categories on the OHAT in which a majority of elderly were deemed healthy were lips, saliva, and pain.

After implementation of the current study educational program, there were statistically significant improvements in elderly oral examination findings with some declines were revealed at the follow-up phase. This indicates the effectiveness of the program in leading a positive change in their oral health status. This finding was expected since the knowledge of oral health and oral self-care practices were improved among the studied elderly which act as a positive predictors for improved oral health status. In support of this, the high score of oral examination findings indicate poor oral health status so, the study results demonstrated that the score of oral examination findings had statistically significant negative correlations with elderly oral health knowledge.

Similarly, Komulainen [35] in Kuopio, Eastern Finland found that oral health status improved in both the intervention group during the study, and especially the positive changes in periodontal health can be considered to be clinically substantial. In agreement with this result, Albrecht *et al*., [31] in Germany concluded that oral health status of elderly was improved by one or more oral health educational interventions.

It was hypothesized that after implementation of the educational program, OHRQoL among the elderly will be improved. This hypothesis was supported by the current study findings which revealed that educational program had an effect on OHRQoL domains scores when comparing pre-program mean scores with post-program mean scores and follow up mean scores, which indicated significant improvement in the elderly oral health related quality of life.

The findings demonstrated generally poor levels of OHRQoL among these elderly before the program. This was especially noticed in the physical pain domain followed by psychological discomfort domain then, physical disability domain. The findings are expected given the negative impact of these three domains on daily life. In agreement with this, a study in Brazil [20] reported that the highest means were registered for physical pain and psychological discomfort. On the same line, a study in Bengaluru, India found that among the seven domains of OHIP, the greatest impact was on physical pain (painful aching, discomfort while eating) [36].

After the implementation of the current study program, a statistically significant improvements were shown in all areas of elderly OHRQoL. However, there were some declines at the follow-up phase. This indicates the success of the program, and leads to acceptance of the research hypothesis. In agreement with this finding, a similar effectiveness of an interventional study in improving the OHRQoL of elderly was reported in Egypt [17]. On the same line, a study in Korea found a statistically significant improvements in the oral health related quality of life score between the elderly (P<.05) [37].

Regarding the correlations between elderly's oral health knowledge and oral self-care practices, the findings of the current study indicated statistically significant positive correlations between the score of OHK and OSCP before and after the implementation of the study program. These findings suggested that the higher oral health knowledge has a direct impact on oral self-care practices by improving the individual's self-awareness, self-protection, and personal hygiene performances. These findings are consistent with a study conducted in Saudi Arabia by Baseer *et al.*, [38] which showed that there was a significant positive correlation between the subjects' knowledge and practice. Also in agreement with the foregoing present study findings, Wahengbam *et al.*, [39] conducted a study in India to evaluate Knowledge, Attitude and Practice (KAP) towards oral health. The findings of this study indicated significant positive correlation between knowledge and practice (r=0.405, p<0.01). The positive correlation reaffirms that better knowledge can lead to good practices.

Concerning the correlations between elderly oral health knowledge and oral examination findings (oral health status), the findings of the current study showed statistically significant negative correlations between oral health knowledge, and oral examination findings, where the total mean score of elderly OHK is inversely proportional with their OEF {the higher OHK score, the lower (better) OEF score}. In agreement with this, the study conducted in India by Chowdary *et al.*, [40] revealed that Oral health literacy scores showed a statistically significant negative correlation with oral hygiene status, dental caries prevalence, periodontal status and prosthetic needs. So, subjects with low oral health literacy had a poor oral hygiene status, high dental caries prevalence, periodontitis, and they were in need for a prosthesis.

Concerning the correlations between elderly's oral health knowledge and their oral health related quality of life, the findings of the current study demonstrated that statistically significant strong negative correlations between oral health related quality of life and oral health knowledge, where the total mean score of elderly OHRQoL is inversely proportional with their OHK {the higher (adequate) OHK score, the lower (good) OHRQoL score}. This result is incongruent with Dahl *et al.*, [41] in Norway who reported that the elderly with higher literacy levels had more natural teeth and better quality of life. Furthermore, a review study by Cunha *et al.*, [42] reported that eleven primary studies were analyzed and showed that poor literacy is associated with poor oral quality of life and in order to promote it, both literacy and oral health should be included in nursing education, research and practice.

Regarding the correlations between elderly oral self-care practice (observation checklist) and their oral health related quality of life, the findings of the current study demonstrated at statistically significant negative correlation between oral health related quality of life and oral self-care practice, where the total mean score of elderly's OHRQoL is inversely proportional with their OSCP {the higher (adequate) OSCP score, the lower (good) OHRQoL score}. In agreement with this present study finding, a study in Kuwait by Alsumait *et al.,* [43] who found significant correlations between oral self-care practices and OHRQoL (p < 0.05).

As regard for the correlation between elderly oral examination findings and their oral health related quality of life, the findings of the current study demonstrated that oral health related quality of life had statistically significant positive correlations with the oral examination findings. In agreement with this present study finding, a study in Greece by Papaioannou *et al.,* [44] clarified that dental and oral

health conditions have a measurable impact on the quality of life of senior citizens.

According to the present study findings, the elderly OHRQoL was influenced by many of their personal as well as their health and disease characteristics. The personal factors with positive impact were younger age, female gender, higher education, as well as employee. All these factors indicated better socioeconomic and psychological status. Moreover, the effects of age, gender, and education were confirmed in correlation analysis. In agreement with this, a study in Babol, Iran reported that subjects with academic educations also had a better oral health status due to the higher cultural level and better care of oral health [45].

CONCLUSION

In the light of the study findings, it can be concluded that, the educational program is effective in improving the elderly's oral health related quality of life. The implementation of educational program is also effective in improving elderly's oral health knowledge, oral self-care practices, and oral examination findings (oral health assessment). Therefore, the educational program is a widely accepted approach in the prevention of oral diseases, a process of transmission of knowledge and skills that are necessary for improvement in oral health and quality of life. The improvement was correlated to female gender, high level of education and income.

RECOMMENDATIONS

- The developed oral health education program should be implemented in the study setting on a long term basis to test its sustainability, and in other settings to confirm its effectiveness and for further improvements.
- It is recommended to replicate this study using a randomized clinical trial design in order to confirm the findings and to provide a higher level of evidence of its findings.
- Further research is suggested to explore the effectiveness of multiple-approach nursing interventions in improving the QoL of elderly with oral problems.

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