



Original Article

The effect of oral healthcare education on caregivers of physically and mentally disabled individuals

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Abstract

Background: Special physical and mental conditions of disabled individuals are burdens to their utilization of proper oral healthcare. Their caregivers can be influential in improving their oral health status. This study sought to assess the effect of oral healthcare education on the knowledge, attitude, and practice of caregivers of physically and mentally disabled individuals.

Methods: This quasi-experimental study evaluated 68 caregivers of physically and mentally disabled individuals selected from disability rehabilitation centers in Tehran by convenience sampling. A validated questionnaire was designed for data collection, including questions on demographics, knowledge, attitude, and practice of caregivers. A brochure was also designed to cover the content of the educational intervention, and the relevant topics were taught to caregivers using the face-to-face method. A pretest-posttest method was used for effectiveness assessment. All the caregivers filled out the questionnaire before and 3 months after the educational interventions. The pretest and posttest scores were compared using the Wilcoxon test and paired *t* test.

Results: Sixty-three caregivers participated in this study, 80% of whom were women and 94% had more than one year of work experience. The results showed that the mean score of their knowledge (from 1.2 ± 0.82 to 4.82 ± 0.35), attitude (from 2.38 ± 0.69 to 5.61 ± 0.75), and practice (from 0.59 ± 0.41 to 4.93 ± 0.65) increased significantly after the intervention, which indicates the effectiveness of the intervention ($P < 0.001$).

Conclusion: Educational intervention can significantly enhance the knowledge, attitude, and practice of caregivers of physically and mentally disabled individuals. This can, in turn, help improve the oral health status of the disabled individuals under their care.

Keywords: Caregivers, Education, Oral health, Disabled person

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Introduction

Disability refers to certain conditions that make it difficult for individuals to perform certain activities or interact with their surrounding environment.¹ "Patients with special needs" is a term for disabled individuals.^{2,3} These individuals comprise a minority with special needs who are not often considered as a priority in strategic planning by the authorities in many countries.¹ The estimated prevalence of disabled individuals was reported as 10% worldwide in 1970; this rate increased by 15% in 2011. Currently, there are about 785 million disabled individuals worldwide, out of whom 110 million have severe disability.⁴ According to the data from the Statistical Center of Iran in 2011, disability prevalence

is around 13 per 10000 population in Iran. Physical and intellectual disability is the most prevalent form. Disability prevalence is higher among men and increases at older ages.⁵

Evidence shows that a strong correlation exists between the level of general healthcare knowledge of caregivers and the general health status of disabled individuals.⁶ However, the evidence is lacking regarding such a correlation in the field of oral healthcare.^{7,8} Dental caries is a common problem in many populations, especially disabled individuals of all age groups, and it is believed that caregivers play an important role in the oral health status of disabled individuals.^{9,10}

Poor oral hygiene is associated with many systemic



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conditions such as cardiovascular, respiratory, and kidney diseases, diabetes mellitus, and many more.¹¹⁻¹³ Disabled individuals often have poorer oral hygiene and higher rates of periodontal problems and dental caries than the general population.¹⁴⁻¹⁶ Poor oral hygiene in disabled individuals is mainly due to the absence of preventive measures and their inability to correctly brush their teeth or use dental floss due to physical or mental limitations. However, their oral hygiene status can be improved if caregivers can provide effective healthcare services to them. In case of efficient provision of optimal oral hygiene and preventive measures, their need for dental restoration or extraction can be greatly minimized. However, it should be noted that provision of oral hygiene for disabled individuals can be difficult due to their physical and mental conditions and behavioral problems in some.¹⁷⁻²⁰

Educational interventions in the field of oral healthcare are expected to reduce dental plaque and gingival bleeding at least in short term.²¹ Studies on the oral health status of disabled individuals who were treated in disability rehabilitation centers are limited. The few available reports have highlighted the need for targeted instructions and training of caregivers in this field.^{17,21,22} Therefore, this study sought to assess the effect of oral healthcare education on knowledge, attitude, and practice improvement in caregivers of physically and mentally disabled individuals.

Methods

This quasi-experimental study evaluated 68 caregivers of physically and mentally disabled individuals selected from 6 disability rehabilitation centers in Tehran before and after the intervention. All caregivers were briefed about the study and they signed informed consent forms before participating in the study. A list of all disability rehabilitation centers in Tehran was obtained. Six centers were then selected by convenience sampling, and 68 caregivers were recruited by convenience sampling. According to similar studies^{22,23} and considering the test power of 90% at $\alpha=0.05$ and standard deviation of 3.25 for detecting the minimum difference of 1.7, using the formula below, the sample size in this study was estimated to be $n=39$.

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2 \times SD^2}{d^2}$$

Inclusion and exclusion criterion

The inclusion criterion was having a minimum of one month of experience as a caregiver. The exclusion criteria included history of receiving oral healthcare education, unwillingness to participate in the study, and unavailability during the study.

Data collection

In this study, a researcher-made questionnaire including demographic information and caregivers' knowledge, behavior and attitude were used to collect information. The questionnaire of caregivers consisted of 18 questions: six questions related to the field of knowledge (minimum daily brushing frequency, regular periodic examinations, oral health care methods, principles of oral health, appropriate action during toothache, and prevention of tooth decay), six questions related to the field of attitude (necessity of caring for primary teeth in children, possibility of tooth decay with sugar consumption, necessity of daily brushing, necessity of brushing permanent teeth, and effect of oral hygiene on general health) and six questions related to the scope of practice (use of fluoride toothpaste, flossing, use of special toothbrushes for the disabled, cleaning the inner surfaces of the teeth, and use of varnish or mouthwash).

In the knowledge section, questions 1, 2, 4 and 5 were multiple choice questions and questions 3 and 6 were given as yes/no questions, with 1 point for correct answers and 0 points for incorrect answers (Score range, 0-6).

In the attitude section, the answers to the questions were designed with three options: "I agree," "I disagree," and "no opinion" (Score range, 0-6).

In the practice section, the questions were designed in a four-item range from "never" (0 points) to "always" (1 point) (Score range: 0-6).

Content validity and face validity of the questionnaire

For assessing the face validity of the questionnaire, the differential item effect method was used. For each question, a 5-point Likert scale was used, which included "totally agree" (5 points), "agree" (4 points), "no opinion" (3 points), "disagree" (2 points), and "totally disagree" (1 point). The questionnaire was then given to 10 caregivers to be filled out. Next, the following impact score formula was used to assess the face validity of the questionnaire²³:

$$\text{Impact score} = \text{Frequency (\%)} \times \text{importance}$$

A qualitative method was used to assess the face validity of the questionnaire. In the qualitative method, 10 caregivers were interviewed to find the level of difficulty, relevance, and clarity of the items in the questionnaire, and their opinions were considered to apply some minor changes in the questionnaire. In this assessment, they were asked to pay special attention to the grammar, use of correct choice of words, the significance of questions, and proper order of questions. Their opinions were collected, and necessary modifications were made to the questionnaire accordingly. To ensure the selection of the most important and most accurate content (necessity of question), the content validity ratio (CVR) was calculated. The content validity index (CVI) was also calculated to

ensure that the questions had an acceptable design. The questionnaire was given to six experts, who were faculty members of SBMU School of Dentistry. The experts were asked to categorize each question into one of the three categories of "necessary," "beneficial but not necessary," or "not necessary." The responses were analyzed using the CVR formula,²³ and the calculated result in this study was 1.

$$CVR = \frac{A - \frac{n}{2}}{\frac{n}{2}}$$

In this formula, *A* indicates the number of respondents, and *n* indicates the total number of participants.

After the calculation of CVR, the questionnaire was again given to six experts who were oral health specialists and faculty members of SBMU School of Dentistry to assess and categorize each question regarding its relevance and clarity using a 4-point Likert scale (1: irrelevant, 2: somehow relevant, 3: relevant, 4: completely relevant). The CVI score was calculated by adding up the positive scores of each item that acquired a score of 3 or 4 (highest scores) and dividing it by the total number of experts. The CVI score for content validity was calculated as 0.84 in this study, and the items were selected based on the CVI score of 0.79 or higher.²³

$$CVI = \frac{A}{n}$$

In this formula, *A* indicates the number of experts who responded with scores 3 and 4, and *n* indicates the total number of participants.

Reliability of the questionnaire

The test-retest reliability method was used to assess the reliability of the questionnaire. Twelve caregivers were asked to complete the questionnaire with a 14-day interval and the questionnaire reliability was 0.84. Values >0.7 were considered acceptable.²³

Educational content and intervention

For educational intervention, a brochure was designed according to the international guidelines regarding oral healthcare.²⁴ The brochure included some information on the necessity of tooth brushing, some instructions on correct tooth brushing by the caregivers for disabled individuals, and measures to enhance oral hygiene maintenance for them. After simplification and classification of the educational content, the brochure was given to oral medicine and community dentistry specialists, who were the faculty members of SBMU School of Dentistry, and some adjustments were made in the brochure according to the provided suggestions.

The brochure was provided to caregivers after they

filled out the questionnaire (pretest). The information in the brochure was transferred to caregivers via a face-to-face interview. After 3 months, they were asked to fill out the questionnaires again for the second time (posttest) for the efficacy of the educational intervention to be assessed.

Statistical analysis

After collecting the data, they were entered into SPSS software version 22. In this study, frequency, percentage, mean, and standard deviation were used for descriptive statistics. The Wilcoxon test was used to compare the ordinal answers to each question before and after the intervention. Paired *t* test was used for statistical analysis to compare the overall mean scores of each domain and the total scores before and after the intervention.

Results

Table 1 presents the demographic information of caregivers. A total of 55 female (80.9%) and 13 male (19.1%) caregivers participated in this study, with 91.2% reporting over 1 year of work experience as caregivers of disabled individuals.

Knowledge questions

The overall knowledge score of caregivers significantly increased after the educational intervention ($P < 0.001$). The knowledge of caregivers regarding the minimum frequency of daily tooth brushing based on dentist recommendations, dentists' recommended regular periodic dental examinations, and oral hygiene instructions and measures significantly increased after the intervention ($P < 0.001$). Regarding the familiarity of caregivers with oral hygiene instructions (no familiarity, some familiarity through books or Internet, colleagues, or workshops), the results showed that the familiarity of caregivers significantly improved after the intervention ($P = 0.001$) such that those who did not have any familiarity became acquainted with oral hygiene measures through the provided brochure (76.5%). Regarding the management of disabled individuals with toothaches (administration of analgesics, antibiotics, referral to a

Table 1. Demographic information of caregivers

Demographics		Number	Percent
Age	<30 years	11	16.1
	≥30 years	57	83.8
Gender	Male	13	19.1
	Female	55	80.9
Shift	Morning	10	14.7
	Evening	5	7.4
	Variable	53	77.9
Work experience as caregiver for the disabled	<1 year	6	8.8
	>1 year	64	94.1

dentist, or none), all caregivers (100%) reported referral of the disabled individuals to the dentist in case of toothache after the intervention, compared with 13.2% before the intervention ($P < 0.001$).

Regarding the prevention of dental caries, 79.4% had no knowledge in this respect before the intervention while 92.6% had this knowledge after the intervention ($P < 0.001$). Table 2 illustrates the knowledge scores before and after intervention.

Attitude questions

The educational intervention enhanced the caregivers' attitudes toward disabled individuals' oral health as well. In some areas, the difference was remarkable: regarding the care for primary dentition in disabled individuals, 73.5% had no opinion on this topic before the intervention while 91.2% agreed with the need for caring for primary dentition after the intervention.

Also, the opinion of caregivers regarding the contagious nature of dental caries significantly changed after the intervention ($P < 0.001$) because at baseline, 79.4% expressed no opinion while, 76.5% recognized that it was not contagious after the intervention. Details on the changes in attitudes toward other areas of dental care are shown in Table 3.

Practice questions

Like the two domains mentioned above, answers to the domain of behaviors improved significantly. The opinion of caregivers regarding health care behaviors like the use of fluoridated toothpastes for disabled individuals, use of dental floss for disabled individuals, use of specific toothbrushes designed for disabled individuals, cleaning the tongue of the disabled individuals during tooth brushing, and use of fluoride mouthwash or varnish for the disabled significantly changed after the intervention ($P < 0.001$). The majority of caregivers (58.8%) reported occasional use of fluoridated toothpaste for the disabled prior to the intervention. However, 73.5% reported that they would always use fluoridated toothpaste after the intervention. Table 4 shows the details on oral healthcare behaviors before and after intervention amongst caregivers.

The mean scores of different domains before and after the intervention are presented in Table 5. Paired *t* test showed that the mean scores of knowledge ($P < 0.001$), attitude ($P < 0.001$), and practice ($P < 0.001$) of caregivers as well as the total score ($P < 0.001$) significantly improved after the intervention compared with the baseline. No significant difference was found between the demographic characteristics of participants and their improved knowledge, attitude, or practice.

Table 2. Answers to questions of the knowledge domain before and after intervention

Question	Answer choices	Before No. (%)	After No. (%)	P value ^a
1. What is the recommendation of dentists regarding the frequency of daily toothbrushing?	I do not know	10 (14.7)	0 (0)	<0.001
	Once	42 (61.8)	7 (10.3)	
	Twice	5 (7.4)	58 (85.5)	
	>2 times	11 (16.2)	3 (4.4)	
2. What is the recommendation of dentists regarding periodic clinical examinations?	I do not know	40 (58.8)	0 (0)	<0.001
	Once a year	12 (17.6)	4 (5.9)	
	Twice a year	6 (8.8)	64 (94.1)	
3. Are you familiar with oral healthcare in the disabled?	Yes	17 (25)	68 (100)	<0.001
	No	51 (75)	0 (0)	
4. How did you gain knowledge about oral care in the disabled?	Not familiar	52 (76.5)	0 (0)	<0.001
	Workshop	0 (0)	62 (91.2)	
	Book or Internet	5 (7.4)	6 (8.8)	
5. What would you do if a disabled individual has a toothache?	Colleagues	11 (16.2)	0 (0)	<0.001
	I give him analgesics	22 (32.4)	0 (0)	
	I give him antibiotics	34 (50)	0 (0)	
	I refer him to dentist	9 (13.2)	68 (100)	
6. Can dental caries be prevented in the disabled?	None	3 (4.4)	0 (0)	<0.001
	Yes	7 (10.3)	63 (92.6)	
	No	7 (10.3)	0 (0)	
	I do not know	54 (79.4)	5 (7.4)	

^a Nonparametric Wilcoxon test.

Table 3. Answers to questions of attitude domain before and after intervention

Questions	Answer choices	Before No. (%)	After No. (%)	P value ^a
1. It is imperative to care for primary teeth in the disabled.	I agree	9 (13.2)	62 (91.2)	<0.001
	No opinion	50 (73.5)	6 (8.8)	
	I disagree	9 (13.2)	0 (0)	
2. Frequent use of sugary substances increases the risk of dental caries.	I agree	42 (61.8)	63 (92.6)	<0.001
	No opinion	21 (30.9)	5 (7.4)	
	I disagree	5 (7.4)	0 (0)	
3. Dental caries is contagious.	I agree	9 (13.2)	52 (76.5)	<0.001
	No opinion	54 (79.4)	13 (19.1)	
	I disagree	5 (7.4)	3 (4.4)	
4. Daily toothbrushing is imperative in the disabled.	I agree	19 (27.9)	68 (100)	<0.001
	No opinion	41 (60.3)	0 (0)	
	I disagree	8 (11.8)	0 (0)	
5. In addition to anterior teeth, it is imperative to brush the posterior teeth.	I agree	14 (20.6)	63 (92.6)	<0.001
	No opinion	37 (54.4)	5 (7.4)	
	I disagree	17 (25)	0 (0)	
6. Oral hygiene status of disabled individuals affects their general health.	I agree	8 (11.8)	66 (97.1)	<0.001
	No opinion	41 (60.3)	2 (2.9)	
	I disagree	19 (27.9)		

^a Nonparametric Wilcoxon test.

Table 4. Answers to questions of behavior domain before and after intervention

Questions	Answer choices	Before No. (%)	After No. (%)	P value
1. Do you use fluoridated toothpaste for the disabled?	Never	10 (14.7)	0 (0)	<0.001
	Occasionally	40 (58.8)	1 (1.5)	
	Most of the time	14 (20.6)	17 (25)	
	Always	4 (5.9)	50 (73.5)	
2. Do you use dental floss for the disabled?	Never	65 (95.6)	0 (0)	<0.001
	Occasionally	3 (4.4)	11 (16.2)	
	Most of the time	0 (0)	37 (54.4)	
	Always	0 (0)	20 (29.4)	
3. Do you use toothbrushes specifically designed for the disabled?	Never	61 (89.7)	0 (0)	<0.001
	Occasionally	7 (10.3)	10 (14.7)	
	Most of the time	0 (0)	42 (61.8)	
	Always	0 (0)	16 (23.5)	
4. Do you clean the tongue of the disabled individuals during tooth brushing?	Never	65 (95.6)	0 (0)	<0.001
	Occasionally	3 (4.4)	1 (1.5)	
	Most of the time	0 (0)	37 (54.4)	
	Always	0 (0)	30 (44.1)	
5. Do you clean the lingual surface of the teeth in the disabled?	Never	30 (44.1)	0 (0)	<0.001
	Occasionally	37 (54.4)	0 (0)	
	Most of the time	1 (1.5)	12 (17.6)	
	Always	0 (0)	56 (82.4)	
6. Do you use fluoride mouthwash or varnish for the disabled?	Never	61 (89.7)	0 (0)	<0.001
	Occasionally	6 (8.8)	8 (11.8)	
	Most of the time	1 (1.5)	54 (79.4)	
	Always	0 (0)	6 (8.8)	

Nonparametric Wilcoxon test.

Table 5. Mean score of different domains before and after the intervention (n=68)

		Mean ± SD	Mean different	95% CI	P value ^a
Knowledge	Before intervention	1.2 ± 0.82	-3.63	(-3.86, -3.39)	<0.001
	After intervention	4.82 ± 0.35			
Attitude	Before intervention	2.38 ± 0.69	-3.23	(-3.49, -2.97)	<0.001
	After intervention	5.61 ± 0.75			
Practice	Before intervention	0.59 ± 0.41	-4.34	(-4.55, -4.13)	<0.001
	After intervention	4.93 ± 0.65			
Total score	Before intervention	4.17 ± 1.18	-11.19	(-11.65, -10.74)	<0.001
	After intervention	15.36 ± 1.22			

^a Paired t test.

Discussion

This study sought to assess the effect of oral healthcare education on knowledge, attitude, and practice of caregivers of physically and mentally disabled individuals. To do so, 68 caregivers were taught about oral healthcare and the results showed noticeable improvement in the knowledge, attitude, and behavior of the caregivers. Oral healthcare education is the most efficient and easiest method for community oral health promotion.^{25,26} A number of factors are involved in the process of oral hygiene instruction and oral health education. Caregivers are responsible for the general and oral health wellbeing of disabled individuals. Their lack of knowledge, incorrect attitude, and poor practice can adversely affect the health status of disabled individuals under their care.

With the growth of population, the number of disabled individuals has increased as well.²⁷ Disabled individuals require costly healthcare services. Thus, educational and preventive approaches targeting this group are among the most cost-effective interventions to promote their oral health status.^{22,26,27}

The knowledge level of caregivers of disabled individuals regarding oral health, the significance of primary teeth, dental caries, caries prevention measures, and oral hygiene instruction plays an important role in the oral health status of disabled individuals.

Poor oral hygiene of disabled individuals has been previously reported, which highlights the significance of proper instruction of their caregivers in this respect.²⁸⁻³⁰ The current study results showed significant improvements in the mean scores for knowledge, attitude, and practice as well as the total score acquired by the caregivers on the questionnaire after the educational intervention compared with the baseline scores.

A review by De Lugt-Lustig et al³¹ in 2013 assessed the knowledge, attitude, and practice of nurses working in a nursing home and showed that education affected the knowledge and attitude of nurses toward oral health of disabled individuals, but the study found no strong evidence about the effect on their practice. This finding may be due to not choosing simple, understandable, and practical educational content for the nurses and

using inexperienced instructors. In the current study, we simplified the educational content and presented the information in the form of a colorful brochure with easy-to-understand pictures. Also, face-to-face training was provided by competent dental students. In 2006, Glassman and Miller³⁰ evaluated the effect of preventive measures, such as tooth brushing or plaque score, provided by the caregivers of disabled individuals on the oral health status of the disabled. They showed that a small number of caregivers had received necessary instructions regarding oral and dental care. They emphasized the need for oral health education of caregivers, which is in line with our baseline findings.

The work experience of caregivers is another important factor that can influence their practice. In 2001, Cumella et al³² reported lack of experience and inadequate knowledge among caregivers in the UK as the main problems in oral health maintenance and promotion in disabled individuals. In the current study, we included caregivers with at least one month of work experience with disabled individuals and provided individual face-to-face instruction to eliminate the effect of these confounders. Faulks and Hennequin³³ provided oral hygiene instructions on oral diseases and their prevention to caregivers of disabled individuals in the form of group instructions in France and confirmed the efficacy of this form of education. In 2018, Zuurmond et al³⁴ reported results similar to Faulks and Hennequin³³ by training parents of disabled individuals in a participatory program in Ghana. We performed face-to-face instruction and the posttest results confirmed the efficacy of this instruction method as significant improvements were noted in the knowledge, attitude, and practice scores after the educational intervention. Faulks and Hennequin³³ reported that a regular program to enhance the knowledge level of caregivers can improve the oral health status of children with disabilities, which agrees with our findings.

The efficacy of educational content was also evaluated in this study, which revealed that the provided instructions significantly enhanced the knowledge level of caregivers. This finding was also in agreement with the results of Fickert et al³⁵ in 2012 in the United States after providing

an educational program on oral healthcare for caregivers of individuals with intellectual and developmental disabilities.

The current results also showed the significance of educational intervention on the improvement of tooth brushing and regular dental visits in disabled individuals. Cleaning the posterior teeth of disabled individuals was considered a major challenge in the review on oral health needs of disabled persons by Tesini and Fenton,³⁶ and Viglid et al,³⁷ in their studies on oral health and treatment needs among disabled patients, reported that caregivers only clean the anterior teeth of disabled individuals and neglect the posterior teeth due to access difficulties, which can cause gingival problems and dental caries. Thus, in the present study, we especially emphasized the cleaning of the posterior teeth, and 92.6% of the caregivers acknowledged the significance of cleaning posterior teeth after the intervention. Also, they were provided with the necessary instructions on how to use specific toothbrushes designed for the disabled to grant easier access to posterior teeth.

Based on the findings of this study, it can be proposed that regular continuing education programs for caregivers, courses on oral health and dental care, and holding conferences on oral health for caregivers of disabled people can promote the oral health status of disabled individuals.

Conclusion

The current results revealed that oral healthcare educational intervention can significantly enhance the knowledge, attitude, and practice of caregivers, with a high impact on providing better care for disabled people and improving their oral health status.

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Not applicable.

Authors' Contribution

Conceptualization: Maryam Sadeghipour, Reza Golpayegani, Mohammad Hossein Khoshnevisan.

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Competing Interests

The authors have declared that there was no conflict of interest.

Ethical Approval

The study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.DCR.REC.1398.092). The informed consent was obtained from all participants. The participants' questions were answered, and they were ensured of the confidentiality of the provided information. They were free to ask any question regarding the questionnaire while completing it. They were also informed that they were free to withdraw from the study at any time if they wished to do so.

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