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The Relationship Between Oral and Dental Health Literacy and the Adoption of Dental Caries Preventive Behaviors Among Students: A Cross-Sectional Study in Iran

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Abstract

Introduction: Considering the high prevalence of dental caries and the importance of oral and dental health literacy in planning, teaching, and promoting oral and dental health in society, and considering the role of students in promoting oral and dental health behaviors at the community level, this study aimed to determine the relationship between oral and dental health literacy and adoption of dental caries preventive behaviors among students.

Materials and Methods: In a descriptive-analytical cross-sectional study, 300 students of Qaynat Faculty of Medical Sciences, Iran, were selected to participate in the study through simple random sampling in 2023-2024. The data were collected by demographic and background characteristics, an oral and dental health literacy questionnaire for adults (OHL-AQ), and a tool for measuring dental caries prevention behaviors. The data were analyzed using SPSS software version 23 and descriptive statistics and logistic regression.

Findings: The mean and standard deviation of the oral health literacy score among students was 10.003±2.588 out of 17 and was at an average level. The mean and standard deviation of the score of adoption of dental caries prevention behaviors was equal to 7.666±1.888 out of 14 and was at an average level. According to the results of logistic regression, body mass index, economic status of the family, and oral and dental health literacy were effective factors in the adoption of dental caries prevention behaviors.

Conclusion: The adoption of dental caries prevention behaviors was less common among thin students, who had families with unfavorable economic status, and had insufficient oral and dental health literacy. Therefore, it is suggested to pay more attention to the aforementioned students in designing educational programs to promote the adoption of dental caries prevention behaviors among students.

Keywords: Oral and Dental Health Literacy; Preventive Behaviors; Students; Qaenat; Iran

Introduction

Tooth decay occurs as a result of local dissolution and destruction of the calcified parts of the tooth and is the most common infectious disease [1]. Various factors such as genetics, nutrition, dental anatomy, oral hygiene, oral habits, use and absorption of fluoride, age, gender, quantity and quality of saliva, parental education, and the socio-economic level of the family are effective in the development and progression of tooth decay [2]. Tooth decay is the most widespread human disease, and more than 99% of people are affected by this disease, there are only a very limited number of people who do not suffer from it during their lifetime. Dental caries remains a major problem in dentistry and it is necessary to pay special attention to daily treatments; in addition to restorative measures, preventive measures should be planned to reduce these problems [1].

To show the prevalence of caries in permanent teeth and the intensity of caries in baby teeth, an index called DMFT is used. This index as the most important measure of people's tooth decay rate is a simple, fast, and reliable measure to determine oral and dental health that shows the status of the number of decayed teeth (D), lost due to decay (M) and filled (F) in permanent teeth [2]. Students are one of the important groups in any society. According to the information from the Iranian Statistics Center, the total number of university students studying in Iran is more than 3 million people, which shows that students are a significant part of society. They are in contact with various groups such as family, friends, professors, and classmates, and their level of knowledge and literacy can be manifested in these interactions [3]. Regarding the average DMFT among students, different results have been reported. The results of Momeni et al.'s study showed that the average DMFT index in students of Alborz University of Medical Sciences in Iran was equal to 6.6±3.3 [2]. Also, the results of Idris et al.'s study showed that the average DMFT index among the patients at Al-Farabi Dental School in Riyadh, Saudi Arabia was equal to 13.1 in men and 13.36 in women [4].

Another important factor affecting oral and dental diseases in society is the low level of oral and dental health literacy of community members [5]. In line with the definition of public health literacy, the Healthy People Institute affiliated with the American Dental Association defines oral health literacy as "the ability of people to obtain, process and understand basic oral health information and services needed to make the right decisions related to oral health" [5]. Low oral and dental health literacy is associated with adverse oral health behaviors, untreated caries, biofilm, and dental treatments [6]. People with lower oral and dental health literacy have more pulled teeth and fewer teeth, and the probability of severe periodontitis among them is higher [7]. Sabbaghinejad et al.'s study showed that 81% of the students obtained high grades in the oral health literacy test [3]. According to the results of Rostami et al.'s study, 98.3% of students had sufficient oral and dental health literacy [8]. Matthew and Kabir's study showed that only one out of every four third-level students at Cork University had sufficient oral health literacy [9]. According to the results of Kesavan et al.'s study, the oral health literacy of the studied stu-

dents was at an average level [10].

Considering the high prevalence of dental caries [1,11] and the importance of oral and dental health literacy in planning, teaching, and promoting the oral and dental health of society [8], and considering the role of students in promoting oral and dental health behaviors at the community level [5], this study aimed at determining the relationship between oral and dental health literacy and the adoption of dental caries preventive behaviors among students.

Materials and Methods

This was a descriptive-analytical cross-sectional study, conducted among 300 students of Qayinat Faculty of Medical Sciences in South Khorasan Province, Iran, in 2023-2024. Considering that there were six fields of study in this college, each of the fields was selected as a class. Then, the list of students in each field of study was extracted separately. Then, each student was given a unique code, and taking into account the number of people in each class, simple random sampling was done using a computer from within the classes with entry criteria.

According to the results obtained from the pilot study among 30 students and considering r=0.15 for the correlation between oral and dental health literacy and the adoption of preventive behaviors against tooth decay, as well as using the sample size table for correlational research; The minimum required sample size was estimated to be 175 people [12]. Next, taking into account Design Effect =1.3, the sample size was estimated to be 245 people. Finally, taking into account the possibility of 20% of samples dropping out, 300 people were included in the study.

The inclusion criteria included a willingness to participate in the study, being a student, studying at the Faculty of Medical Sciences, having literacy, and mastering the Persian language. Also, lack of satisfaction to continue working in each stage of the research and incomplete questionnaires were the exclusion criteria.

The data were collected by a two-part questionnaire that was completed by students as self-reports. The first part included demographic and background information which items about age, gender, place of residence, field of study, years of education, body mass index status, marital status, smoking and hookah smoking status, parents' education level, parents' occupation, child's birth rank in the family, number of family members and the economic status of the family.

In the second part, oral and dental health literacy was measured using the Adult Oral and Dental Health Literacy Questionnaire (OHL-AQ) [13]. This questionnaire contained 17 items in four sections: a) reading comprehension section to evaluate reading skills and awareness of oral and dental diseases, b) calculating numbers to evaluate one's reading, writing, and calculating skills regarding prescriptions or health instructions, c) The listening skill section to evaluate the skills of listening, reading, writing, calculating numbers and communication skills of a person regarding an instruction after treatment and d) the decision making section to evaluate the skills of reading, understanding the meaning and making optimal decisions in dealing with oral and dental health problems. This questionnaire evaluated the listening, reading, writing, number calculation, and communication skills of a person and his understanding of meaning and decision-making in dealing with issues related to oral and dental health by 17 items. Therefore, the total number of correct answers of people included a range from 0 to 17. Each of these 17 items has "one correct answer", "one or more wrong answers" and "one answer including I don't know". The scores were classified into three groups: insufficient (0-9), borderline (10-11), and sufficient (12-17). The validity and reliability of this questionnaire, which is designed for Iranian society, is confirmed, because the internal consistency, which was measured by Cronbach's alpha, was equal to 0.72 and its ICC was calculated equal to 0.84 [13].

In this study, the questionnaire was first given to 30 students and Cronbach's alpha coefficient was calculated to be 0.89 for the whole questionnaire.

In the third part, the questionnaire developed by Rashidi and Niknami was used to measure preventive behaviors against tooth decay [14]. This questionnaire included 7 items and its scoring was such that 2 points were assigned to the best answer, 0 points to the worst answer, and 1 point to the average answer. It is worth mentioning that

the behaviors of brushing teeth, using dental floss, using mouthwash, and visiting the dentist were studied. All validity and reliability steps of this tool were done and according to the results, Cronbach's alpha coefficient of this tool was estimated as 0.76 [14]. In the present study, the researchers used this questionnaire and after making corrections due to demographic differences, they tested it in a sample of students for its validity and reliability. It was given to 10 experts to check content validity. After getting their opinions and calculating CVR and CVI, the desired modifications of this group of experts were applied in the questionnaire to obtain a tool with the desired validity, and its CVI and CVR were also calculated as 0.83 and 0.81, respectively. Also, the questionnaire was given to 30 students and Cronbach's alpha coefficient was calculated as 0.82. According to the researchers, the rate of adoption of preventive behaviors was classified into two levels: poor (score less than 50% of the total score) and good (score 50-100%) [15-18] and this was used in the logistic regression.

First, the number of the research project was received from the Vice-Chancellor of Research and Technology of Birjand University of Medical Sciences (with ethics code IR.BUMS.REC.1403.088) and the necessary arrangements were made with the faculty and the dormitories where the students were located. Also, the purpose of this study was explained to the students, and their written consent was obtained. In addition, the completion of the questionnaires was self-reported, in this way, all students were asked to answer the items of the questionnaire with complete honesty. They were also assured that all the information requested in the questionnaire would be used confidentially and without mentioning the names of the people. After collecting, the data were entered into SPSS software version 23 and then analyzed using descriptive statistics and logistic regression tests. In addition, the significance level in this study was considered less than 0.05.

Results

In this study, 300 students were studied (response rate: 100%). Meanwhile, 68% (204 people) of the samples were women, 71.3% (214 people) were living in the dormitory and 40.7% (122 people) were studying nursing. Table one shows other demographic and background characteristics of the students. The mean and standard deviation of the student's age was 22.41±5.601 years. The mean and standard deviation of oral health literacy among students was 10.003±2.588 out of 17 and was at an average level. The mean and standard deviation of the score of adoption of dental caries prevention behaviors was equal to 7.666±1.888 out of 14 and was at an average level.

Table 1: Demographic and background characteristics of the students

Variables	Frequency (n=150)	Percent	Variables	Frequency (n=150)	Percent
Sex			Father's level of education		
Male	96	32	Illiterate and below diploma	120	40
Female	204	68	Diploma	110	7/36
Place of residence			Master's degree or bachelor's degree	44	7/14
Dormitory	214	3/71	Master's degree or higher	26	7/8
Personal house	24	8	Mother's level of education		
Father's house	50	7/16	Illiterate and below diploma	156	52
Independent student house	12	4	Diploma	92	7/30
Field of study			Master's degree or bachelor's degree	36	12
Operating room	36	12	Master's degree or higher	16	3/5

Public health	78	26	Father's job		
Nursing	122	7/40	Employee	40	3/13
Medical emergencies	22	3/7	Worker	48	16
Midwifery	14	7/4	Free	128	7/42
Anesthetic	28	3/9	Retired	48	16
Academic years			Other	36	12
First-year	114	38	Mother's job		
Second year	34	3/11	Housekeeper	258	86
Third year	102	34	Employee	42	14
Fourth year and above	50	7/16	Birth rank in the family		
Body mass index			First	78	26
Skinny	50	7/16	Second	112	3/37
Normal	188	7/62	Third	60	20
Overweight and obese	62	7/20	Fourth and above	50	7/16
Marital status			Number of family members		
Single	125	83.3	Four to six people	246	82
Married	25	16.7	Seven or more people	54	18
Smoking			Economic status of the family		
Yes	26	7/8		30	10
No	274	3/91	Undesirable	194	7/64
Hookah use			On average	76	3/25
Yes	32	7/10			
No	238	3/89			

Table 2: Factors affecting the adoption of dental caries prevention behaviors among the students in the logistic regression model

Variables	Odds (CI 95%)	P
Age	1.09 (0.935 - 1.259)	0.281
Sex		
Male	1.00 (ref.)	
Female	2.18 (1.001 - 4.765)	0.148
Place of residence		
Dormitory	1.00 (ref.)	
Personal house	0.58 (0.16 - 2.087)	0.403
Father's house	1.16 (0.393 - 3.406)	0.792
Independent student house	0.58 (0.1 - 3.352)	0.541

Field of study		
Operating room	1.00 (ref.)	
Public health	0.77 (0.225 - 2.625)	0.675
Nursing	2.22 (0.636 - 7.762)	0.211
Medical emergencies	1.73 (0.273 - 10.974)	0.56
Midwifery	0.96 (0.139 - 6.673)	0.968
Anesthetics	0.96 (0.204 - 4.539)	0.96
Academic years		
First-year	1.00 (ref.)	
Second year	0.88 (0.297 - 2.632)	0.825
Third year	0.76 (0.189 - 3.041)	0.696
Fourth year and above	1.47 (0.459 - 4.732)	0.515
Body mass index		
Skinny	1.00 (ref.)	
Normal	4.31 (1.525 - 12.19)	0.004
Overweight and obese	5.54 (1.483 - 20.683)	0. 055
Marital status		
Single	1.00 (ref.)	
Married	1.26 (0.437 - 3.655)	0.667
Smoking status		
Yes	1.00 (ref.)	
No	0.68 (0.167 - 2.796)	0.595
Hookah use status		
Yes	1.00 (ref.)	
No	1.11 (0.333 – 3.68)	0.868
Father's level of education		
Illiterate and below diploma	1.00 (ref.)	
Diploma	0.25 (0.038 - 1.647)	0.149
Master's degree or bachelor's degree	1.21 (0.513 - 2.862)	0.662
Master's degree or higher	605803066.07 (0 - .)	0.998
Mother's level of education		
Illiterate and below diploma	1.00 (ref.)	
Diploma	0.22 (0.05 - 0.986)	0.248
Master's degree or bachelor's degree	0.68 (0.284 - 1.629)	0.387
Master's degree or higher	0.84 (0.226 - 3.155)	0.801
Father's job		

Employee	1.00 (ref.)	
Worker	0.5 (0.125 - 1.999)	0.327
Businessman	0.75 (0.219 - 2.574)	0.647
Retired	0.96 (0.336 - 2.727)	0.776
Other	1.25 (0.27 - 5.795)	0. 934
Mother's job		
Housekeeper	1.00 (ref.)	
Employee	0.67 (0.093 - 4.842)	0.692
Birth rank in the family		
First	1.00 (ref.)	
Second	0.65 (0.245 - 1.701)	0.376
Third	3.61 (0.707 - 18.469)	0.123
Fourth and above	0.36 (0.09 - 1.445)	0.15
Number of family members		
Four to six people	1.00 (ref.)	
Seven or more people	0.74 (0.261 - 2.077)	0.564
Economic status of the family		
Undesirable	1.00 (ref.)	
Average	0.07 (0.014 - 0.369)	0.102
Desirable	3.97 (0.972 - 16.189)	0. 008
Oral health literacy		
Insufficient	1.00 (ref.)	
Borderline	3.91 (1.526 - 9.956)	0.004
Enough	5.54 (1.483 - 20.683)	0.011

*Data were entered into the regression model using the INTER method.

Table 2 shows the results of logistic regression to determine the factors influencing the adoption of dental caries prevention behaviors among the students. As the results show, body mass index, economic status of the family, and oral and dental health literacy were effective in adopting desirable behavior (P>005); so, the chance of adopting desirable behavior among normal students is 4.31 times more than that of skinny students, the chance of adopting favorable behavior among students who described their family's economic status as favorable was 3.97 times more than that of students who described their family's economic status as unfavorable. Also, the chance of adopting the desired behavior among students with sufficient and borderline oral and dental health literacy was 5.54 and 3.91 times, respectively more compared to students with insufficient health literacy. Meanwhile, other demographic and background variables did not affect oral health literacy (P>0.05).

Discussion

The present study aimed to determine the relationship between oral and dental health literacy and the adoption of dental caries preventive behaviors among students. The results showed that the oral and dental health literacy

of the students was at an average level. Considering the education of participating students in medical sciences, this finding seems relatively logical and reasonable. The results were consistent with the results of Kesawan et al.'s study [10], but not with the results of Rostami et al.'s [8], Sabbaghinejad et al.'s [3], and Matthew and Kabir's [9]studies. Among the possible reasons for this inconsistency, we can point out the difference in the oral and dental health literacy measurement tools in these three studies compared to the present study. Also, one of the reasons for the inconsistency between the results of the present study and the results of Matthew and Kabir's study could be the role of different cultures in observing oral and dental hygiene. Because cultural attitudes, beliefs and practices around oral and dental health may be factors that can even be effective in adopting preventive behaviors through the impact on the levels of oral and dental health literacy. Regarding the inconsistency between the results of the present study and the results of the study by Sabaghinejad et al., we can point to the difference in the educational level of the students between these two studies.

The results also showed that the adoption of dental caries preventive behaviors among the students was at an average level. This average level of adoption of preventive behaviors could probably be caused by their knowledge and average attitude toward tooth decay. Also, the average oral and dental health literacy of the students might be another justification for this finding. In line with this finding, in the study of Safari et al., the adoption of oral and dental preventive behaviors was at an average level [19]. Also, in Ezzati et al.'s study, adoption of oral and dental health behaviors was at an average level [1].

Moreover, the results showed that body mass index was one of the factors influencing the adoption of dental caries prevention behaviors. It can be said that students with a normal body mass index probably had higher self-efficacy to perform physical activity and received a suitable diet for their fitness. Therefore, these students were probably more interested in adopting health and preventive behaviors, such as preventing tooth decay, than other students. In line with this finding, in Hosseinpour et al.'s study, body mass index was one of the factors affecting tooth decay [20].

The results also showed that the economic status of the family was one of the factors influencing the adoption of tooth decay prevention behaviors among students. Probably things like children's access to health care and parents' participation in health education classes were more and as a result it can be concluded that the better the economic status of the families, the more likely their children will be able to adopt some preventive behaviors against tooth decay, such as using mouthwash and going to the dentist. In line with this finding, in Alzeer et al.'s study, financial barriers were one of the effective factors for irregular dental attendance [11]. Also, in the study of Goderzi et al., there was a significant relationship between family income and the adoption of children's oral and dental health behavior [21].

In addition, the results showed that oral and dental health literacy was one of the factors influencing the adoption of dental caries prevention behaviors. It can be concluded that due to the existence of medium levels of oral and dental health literacy and the adoption of preventive behaviors against dental caries in this study and considering the role of health literacy in the adoption of preventive behaviors [15-18, 22-25], the significant relationship between these two variables seemed logical. This finding was consistent with the results of the studies of Sabbaghinejad et al. [3], Shaista et al. [26], and Batista et al. [6]. Also, in Kanupuru et al.'s study, the prevalence of tooth decay among students with low oral health literacy was higher compared to students with high oral health literacy [27].

To our knowledge, the present study was the first study that investigated the relationship between oral and dental health literacy and the adoption of dental caries prevention behaviors among Iranian students. The most important limitation of the present study was the self-report when completing the questionnaire, because the students may have estimated their oral and dental hygiene behaviors less or more than the actual level, and as a result, correct and accurate information might not have been provided to the research team. On the other hand, one of the limitations of this study is the self-report at the time of completing the questionnaire, which might have not provided correct and accurate information to the research team. Also, the small number of samples was another limitation of the present study. Also, this study was conducted only among the un-

dergraduate students of the Faculty of Medical Sciences in Qaynat city; therefore, the results cannot be generalized to students in other parts of the country. It is recommended to conduct this study on a larger scale among the students of this city and other parts of the country, especially among students of non-medical sciences and graduate students. Ignoring the impact of socio-cultural issues such as the impact of family and individual habits on the level of oral and dental health literacy and the quality of oral and dental health of people can be another limitation of the present study. Also, ignoring the cultural backgrounds and background knowledge of people was also another limitation of the present study because the mentioned skills are the skills that should be examined when measuring health literacy. It is suggested that in future studies, the relationship between oral and dental health literacy skills and the adoption of dental caries prevention behaviors be investigated.

Conclusion

Overall, the result indicated that the adoption of dental caries preventive behaviors and oral health literacy among the students were at an average level. Also, body mass index, economic status of the family, and oral health literacy were among the factors influencing the adoption of dental caries prevention behaviors. The adoption of dental caries prevention behaviors was less common among skinny students, who had a family with an unfavorable economic status and had insufficient oral and dental health literacy. Therefore, it is suggested to pay more attention to such students in designing educational programs to promote the adoption of tooth decay preventive behaviors among students.

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Author Contributions

The authors confirm their contribution to the paper as follows: study conception and design: R.P., F.S., and M.A.; data collection: R.P. & M.R.; analysis and interpretation of results: R. P., M.R., F.S., and M.A.; Author; draft manuscript preparation: R. P., M.R., F.S., and M.A. All authors reviewed the results and approved the final version of the manuscript.

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Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval and Consent to Participate

The present study was approved by the research ethics committee of Birjand University of Medical Sciences, IR.BUMS.REC.1403.088.

Competing Interests

The authors declare no competing interests.

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