Original Article

Effective Factors on Oral Health Behaviors of 12-year-old Children in Cities and Villages of Iran: a Path Analysis

Maryam Rad [1], Arash Shahravan [2], Ali Akbar Haghdoost [3]

[1] Kerman Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran.
[2] Endodontology Research Center, Kerman University of Medical Sciences, Kerman, Iran.
[3] Research Center for Modeling in Health, Institute of Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran.

KEY WORDS
Behavior;
Oral Health;
Children;

Received January 2017;
Received in Revised form October 2017;
Accepted November 2017;

ABSTRACT

Statement of the Problem: Oral and general health status depends on several factors such as the individual's personal attributes, behaviors, and perceptions.

Purpose: This study aimed to evaluate the factors affecting the oral health-related behaviors in 12-year-old children.

Materials and Method: This cross-sectional study was based on the data obtained from 1554 students being 12 years old and from five provinces in Iran. The data were collected with a culturally adapted questionnaire about the students' demographic characteristics, knowledge, attitudes, and practice (KAP). Path analysis was conducted to evaluate the effect of these factors on oral health-related behaviors in urban and rural areas.

Results: Based on the findings, 61.1% of the samples resided in urban and 38.9% in rural areas. The mean scores were relatively good for knowledge (74.1±21.1%) and attitudes (72.6±21.1%), but unsatisfactory for oral health practice (51.8±12%). Having measured the correlation between the independent variables and oral health-related behaviors, the province of residence and the parents' education and job had the most significant correlations. Behavioral biases were seen in all dimensions of practice such as brushing habits, dental visits, and diet. In urban areas, 30% and in rural areas 49% of oral health behaviors were directly related to knowledge and attitudes. All of the calculated effects exhibited significant differences from zero ($p< 0.0001$).

Conclusion: Path analysis identified some direct and indirect factors influencing the children's oral health-related behaviors. Factors included in this model could only justify a part of oral health behaviors. Thus, other educational models should be considered based on the psychology or social learning theories.

Corresponding Author: Haghdoost AA., Research Center for Modeling in Health, Institute of Futures Studies in Health, Kerman University of Medical Sciences, Kerman 76175531, Iran.
Tel: +98-3431325809 Email: ahaghdoost@gmail.com

Cite this article as: Rad M., Shahravan A., Haghdoost AA. Effective Factors on Oral Health Behaviors of 12-year-old Children in Cities and Villages of Iran: a Path Analysis. *J Dent Shiraz Univ Med Sci.,* 2018 September; 19(3): 225-231.

Introduction

The high prevalence and undeniable social impact of dental caries make it a public health problem. [1-2] Generally, children and adolescents with 10-19 years of age ,according to the WHO criteria [3], are particularly at higher risk for dental caries. [4] Dental caries can cause pain, sleeping, eating, and behavior problems that affect the children growth and development, [5-6] and consequently reduce the quality of life. [1]

Most oral diseases including dental caries are directly related to lifestyle. [1, 4] The people's views, perceptions, and behaviors are generally affected by

their life experiences, age, gender, culture, attitudes, values, motives, goals, and expectations. Knowledge is an important prerequisite for health-related behaviors, and 12-year-old children have basic knowledge about prevention of dental caries; nonetheless, Smyth *et al.* in Spain, [1] Surabha *et al.*, [4] and Harikiran *et al.* in India [7] showed that many children fail to brush their teeth effectively and tend to consume cariogenic foods. Therefore, the oral health practices are not fully justified by knowledge.

As previously mentioned, the oral health behaviors, knowledge, and attitudes are related to factors, namely, socioeconomic status, habits, and lifestyle. Determining the effects of these factors on oral health behaviors can help design educational programs that are more effective and improve the oral and general health. [1, 4]

The rate of dental caries has been shown to be high in 12-year-old Iranian adolescents. [8] Despite their fairly good level of knowledge, their oral health-related behaviors are not satisfactory. [9] Therefore, the aim of this study was to evaluate the factors that affect the behaviors related to oral health in 12-year-old adolescents.

Materials and Method

This study used the data of a cross-sectional study (Code of ethics IR.KMU.rac.1394.26) which was conducted on 1554 students studying in the sixth grade (12 years old) in various schools of five provinces of Iran (seven urban and eight rural areas), from January to September 2014. [9]

The sample size was determined based on the World Health Organization (WHO) guidelines about oral cavity diseases. [10] Accordingly, to get a sample representing the national population, considering the expected incidence and severity of disease (dental caries in this study), 4 clusters from the capital, two clusters from two large cities (overall 4 clusters), and one cluster from four villages in different parts of the area were selected. Each cluster consisted of 25-50 individuals. Given the high prevalence of caries, seven urban and eight rural areas were considered in five provinces including the capital (Tehran), Khorasan in the north-east, Isfahan in the center, Hormozgan in the south and Kerman in the south-east, Iran. Then, multistage stratified cluster random sampling was performed per province and cluster (school). From each stratum, a certain number of schools were selected; and from each school, a random sample of sixth grade students were selected proportional to the number of students per school.

The students' demographic data, as well as their knowledge, attitudes and practice (KAP) were collected through a questionnaire with 33 closed-ended questions, which was designed based on a systematic review of related articles. [11] The questionnaire was translated in the standard method from English into Persian. [12] The reliability and validity of the final version of the questionnaire were confirmed to be at an acceptable level; i.e., the consistency rate of responses between two intervals was over 80%, and α Cronbach for practice questions was 0.78. Finally, the Persian version of the designed questionnaire included demographic data (such as sex, age, parents' job and education, and area), in addition to the questions about oral health knowledge, attitude, and behaviors.

The variable "knowledge and attitude" took a value of 0-20 depending on the answers to the 17 related questions. The most important knowledge questions addressed the factors that could influence the dental caries and the effects of carbohydrates consumption. Meanwhile, the most prominent questions about attitude were about the fear of dentist and importance of natural teeth.

To analyze the knowledge and attitude questions, the highest score was given to the best answer, and score zero was given to the wrong and "don't know" answers. Therefore, the variable "knowledge and attitude" took a value of 0-20. Regarding the oral health behavior, three areas of diet, brushing and dental visits were evaluated. This variable took a value 0-60 depending on the answers to the 14 questions related to brushing habit, aids used for brushing, brushing frequency, the frequency of use of cariogenic (chocolate, cake, toffee, sugared tea, milk, etc.) and non-cariogenic foods (fresh fruit and raw vegetables) within the preceding week, and visiting a dentist. The best answer received the highest score, and wrong and "don't know" answers received zero score. Finally, the score of all areas were measured percent.

The present study considered oral health behaviors as the dependent variable; while, other factors that af-

fected oral health behaviors such as knowledge and attitude, parents' education and job, province of residence, and sex were considered as independent variables. First, the correlation between independent variables and oral health behaviors was measured. Subsequently, those with significant correlation were selected including knowledge and attitude, province of residence and the parents' education and jobs. They were evaluated and different effects were calculated by using path analysis in urban and rural areas. Then, in order to evaluate the oral health behaviors, the difference between the knowledge and attitude scores and practice scores were classified into two groups (low and high difference) to be compared.

Having obtained the school principals' and the students' consent, the students received a full explanation for completing the questionnaires and completed them at school under the teacher supervision. Based on the students' answers to the questions on specific behaviors, three practice areas were constructed including brushing, diet, and visiting the dentist. The subjects were categorized according to the scores on each component of health related behavior. Data analysis was done by using SPSS software, version 21.

Descriptive statistics were measured including mean and standard deviation for quantitative data, and frequency and percentage for qualitative data. The dependent variable was oral health-related behaviors. T-test was used to find the differences between the binary qualitative variable (residence in a city or village). ANOVA followed by Tukey's post-test were used to calculate the differences among the groups regarding education, job, and province of residence. The correlation between the quantitative variables (knowledge and attitude) was evaluated by using Pearson's Correlation test. Multiple linear regressions were evaluated for path analysis. p Values< 0.05 were considered to be statistically significant.

Results

The current study evaluated 1554 students out of which, 49.6% were males (n=770) and 61.1% (n=950) resided in urban areas. Around 46.3% of mothers (n=721) and 40.4% of fathers (n=629) had education levels less than 12 years of formal education. Moreover, 68.2% of mothers (n=1060) were homemakers and others were employed. Table 1 displays the demographic characteristics of the subjects in urban and rural areas.

The students' mean score was 74.1±21.1% in knowledge, 72.6±21.1% in attitudes, and 51.8±12% in practice. The score of oral health behaviors in urban students (54.3±10.5%) was significantly higher than that in students in rural areas (48±13%) (p= 0.0001).

Despite the significant associations between knowledge and attitudes on one hand and practice on the other hand, the correlation coefficient was quite low (r=0.27). In addition, the results showed that knowledge and attitudes were relatively good, but the oral health

Table 1: Demographic characteristics of subjects in urban and rural areas

Variable	Urban areas Frequency (%)	Rural areas Frequency (%)
Sex		
Boy	465(48.9)	305(50.5)
Girl	485(51.1)	299(49.5)
Province		
Tehran	252(26.5)	------
Isfahan	193(20.3)	91(15.1)
Kerman, Hormozgan, Khorasan	505(53.2)	513(84.9)
Mothers' education		
<12 classes	319(33.6)	402(66.6)
12 classes or more	631(66.4)	202(33.4)
Fathers' education		
<12 classes	272(28.6)	355(58.8)
12 classes or more	678(71.4)	249(41.2)
Mothers' jobs		
Homemaking	612(64.4)	448(74.2)
Employees	338(35.6)	156(25.8)
Fathers, jobs		
Specialized manual jobs*	584(61.5)	485(80.3)
Specialized non-manual and Managerial jobs**	337(35.5)	110(18.2)

* Such as worker, farmer, tailor
** Such as teacher, staffer, manager, doctor

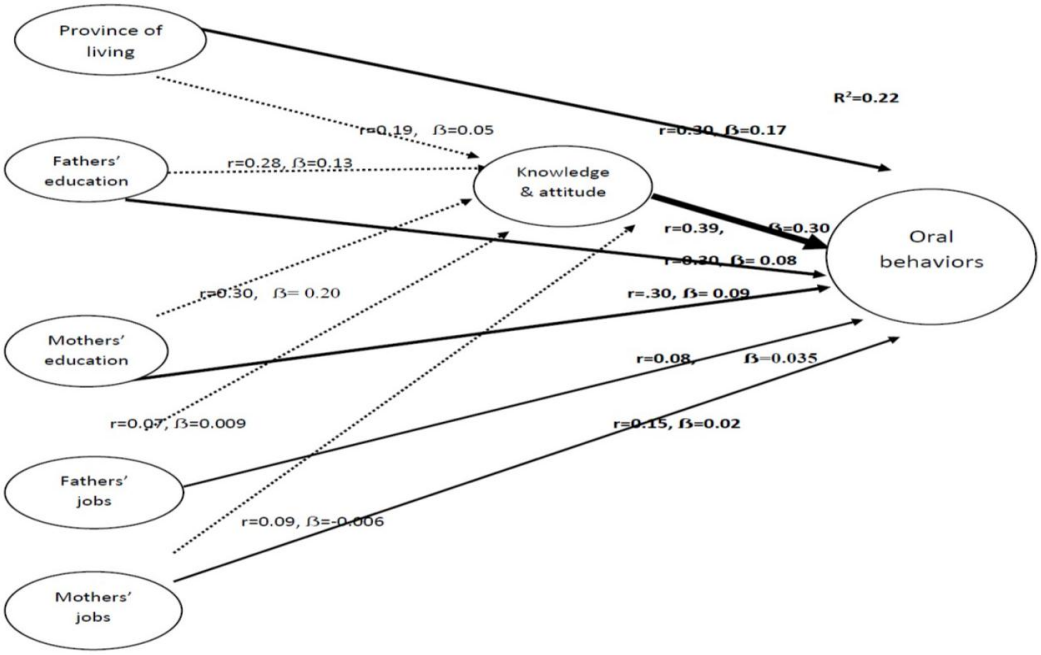

Figure 1: Path model depicting the various variables affecting the oral health behaviors in urban areas

practice was not satisfactory. Behavioral biases were obvious in all dimensions of practice (brushing habits, dental habits, and diet). As mentioned before, path analysis was used to measure the correlation between the dependent (behaviors on oral health) and independent variables (knowledge and attitude, province of residence, parents' education and job) and finally to fed into the model. Figure 1 and 2 shows the coefficient of the effect of each variable on oral health behaviors in students from urban and rural areas.

T test and ANOVA followed by Tukey post test showed significant statistical differences between the effects of knowledge and attitudes, province, and parents' education and job on the oral health-related behaviors in urban areas. Based on Figure 1, the oral health-related behavior was most affected by knowledge and attitudes (total effect=0.39, direct effect= 0.30), followed by province of residence (total effect=0.30, direct effect=0.17). Although the total effect of parents' education was similar to that of the province of residence, the direct effects were low (direct effect for mothers= 0.09 and for fathers=0.08). The parents' jobs had the le-

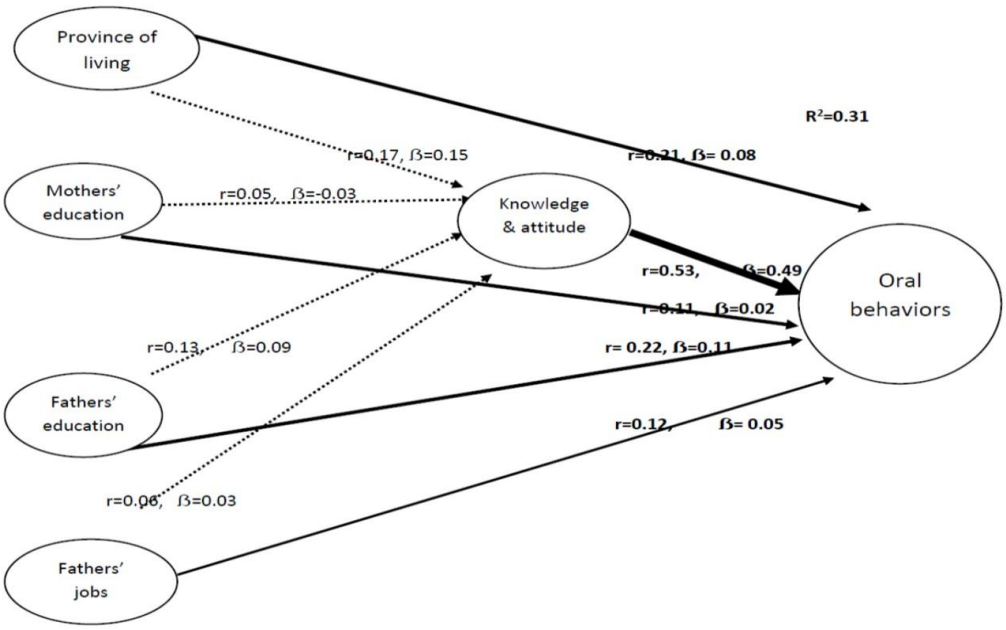

Figure 2: Path model depicting the various variables affecting the oral health behaviors in rural areas

Table 2: Comparison of the demographic characteristic between the two groups (high and low differences obtained by subtracting knowledge and attitude with behaviors scores)

Variable		Low difference Frequency [%] (1-35%)	High Difference [%] (36-72%)	*p* Value
Sex	Boy	522[49.2)	139[45.9)	0.31
	Girl	540[50.8)	164[54.1)	
Area	Urban	664[78.2)	185[21.8)	0.64
	Rural	398[77.1)	118[22.9)	
Province [urban areas) Tehran*		230[92.7)	18[7.3)	
Isfahan		129[74.6)	44[25.4)	0.0001
Kerman, Hormozgan, Khorasan		305[71.3)	123[28.7)	0.0001
Province [rural areas) Isfahan**		67[78.8)	18[21.2)	
Kerman, Hormozgan, Khorasan		331[76.8)	100 [23.2)	0.78
Mothers' education<12 classes		442[75.4)	620[79.6)	0.047
12 classes or more		144[24.6)	159[20.4)	
Fathers' education<12 classes		377[75.2)	685[79.3)	0.051
12 classes or more		124[24.8)	179[20.7)	
Mothers' jobs	Homemakers	726[76.1)	336[81.8)	0.021
	Employees	228[23.9)	75[18.2)	
Fathers' jobs Specialized manual jobs		730[78.8)	303[74.4)	0.08
Specialized non-manual and Managerial jobs		196[21.2)	104[25.6)	

*In urban areas, Tehran is the reference and *p* Value indicates the difference between Tehran and other provinces.
**In rural areas, Isfahan is the reference and *p* Value indicates the difference between Isfahan and other provinces.

ast effect on the children's oral health-related behaviors. The coefficient of determination (R2) was calculated to be 0.22 in urban areas, indicating that only 22% of oral health behaviors could be justified by the independent variables in this model.

T test and ANOVA followed by Tukey post test showed that in rural areas, the children's oral health related behaviors were significantly correlated with their knowledge and attitudes, province of residence, parents' education and father's job; however, the mother's job had no significant correlation with oral health behaviors. In rural areas the effect of knowledge and attitude (total effect=0.53, direct effect=0.49) was higher than that in urban areas, but the effect of province of residence was lower (total effect=0.21, direct effect=0.08). As Figure 2 shows, the effects of father's education (total effect= 0.22, direct effect=0.11) and father's job (total effect= 0.12, direct effect=0.05) were higher than that of the mother's education (total effect=0.11, direct effect= 0.02). The R square in rural areas was calculated to be 0.31.

All of the calculated effects showed a significant difference from zero. In urban areas, the *p* value was <0.0001 for all the variables, except for the father's job (*p*= 0.017). In rural areas, the *p* value was <0.0001 for all the variables except for the father's job (*p*= 0.024) and the mother's education (*p*= 0.026).

This study also calculated the difference between the scores of knowledge and attitude on one hand and practice on the other hand. The behavior score was higher than the knowledge and attitude in only 12.2% of the subjects (n=189). The behavior score of the rest of subjects was lower than the knowledge and attitudes scores, which were classified into two groups (a difference of 1-35% as low, and a difference of 36-72% as high). The knowledge and attitudes scores were significantly different from the behaviors scores in approximately 22.2% of the students.

Table 2 shows the relationship between demographic variables in the two groups. Accordingly, the children living in Tehran whose mothers were employed and those whose parents had higher education were significantly more abundant in the group with lower difference between knowledge and attitude and behaviors.

Discussion

Since it is difficult to control the oral health-related behaviors, it is not possible to identify all contributing factors. Yet, path analysis can help detecting and controlling the variables with the highest effects on the oral health-related behaviors. This study compared the residents of urban and rural areas in terms of oral health-related behaviors through assessing the effects of five variables including knowledge and attitudes, province of residence, mother's education, father's education, and parents' job. The knowledge was detected to have the greatest effect on oral health in both areas.

It is natural that oral health behaviors are related to knowledge and attitudes, normally, a higher knowledge level and more positive attitude about oral health can trigger better behaviors. However, many studies showed that this relationship is not as simple as it seems, and that it depends on many factors. [1, 4, 11, 13] However, in the present study, although knowledge and attitudes had the most influence on behaviors, their impact was less than half of the total effects on oral health behaviors.

This study observed significantly higher oral health-related behaviors in urban students than the rural students did. It was consistent with the results of studies conducted by Zhu *et al.* in China, [13] Diwan *et al.*, [14] Punitha *et al.* in India, [15] and Varenne *et al.* in Burkina Faso. [16] Having observed lower oral health-related behaviors in rural areas, those studies attributed the difference to factors such as socioeconomic status, lifestyle, and poorer coverage of the oral healthcare programs. The current results also noted higher impact of knowledge and attitudes in rural areas (direct effect of 49% versus 30%).

The present study evaluated the province of residence as an influential factor in oral health-related behaviors. In urban areas, the capital residents showed better oral health-related behaviors, presumably, due to the higher authorities' attention and more training programs. The province of residence had less effect in rural areas. However, the students from villages closer to the capital (Isfahan) had better oral health-related behaviors; yet, the direct effect on behaviors was low in these areas. Accordingly, in rural areas the most important effect from the province of residence was an indirect effect on knowledge and attitudes.

In a study conducted in China, Zhu *et al.* showed that the province of residence affected the knowledge, attitudes, and practice of oral health. [13] Seemingly, the provincial health authorities should been encouraged to implement school-based educational programs not only for the students but also for parents and teachers.

Ahmad *et al.* [17] and Rajab *et al.* [18] showed that the parents' educational level had a significant relationship with KAP about oral health. In this study, the parent' education ranked fourth after knowledge, attitudes and province of residence in relation to the effect on oral health-related behaviors. Although the overall effect of parents' education in urban areas was higher than that in rural areas, the direct effect of this variable was minor. In rural areas, the father's role was more effective than the mother's was. It might be due to the fewer number of highly educated mothers in rural areas compared with that in urban areas.

In the present model, the parents' job had the lowest effect in urban areas; implying that the parents' jobs had no significant impact on oral health-related behaviors. Nonetheless, in these areas, employed mothers had a greater share than fathers did in relation to the children's oral health-related behaviors. In rural areas, the mothers' job had no significant effect on the oral health behaviors, whereas, the fathers' job had more significant effects than the mothers' education on the oral health-related behaviors. Moreover, the fathers with specialized non-manual and managerial jobs contributed little share in their child's oral health behaviors. One reason might be that women in rural areas are mostly homemakers.

The results of path analysis partly justified the results of comparison of the two groups, low and high difference between the scores of knowledge and attitude, with behaviors on oral health. The results showed that in approximately 22.2% of the children, knowledge and attitude were significantly different from the oral health-related behavior.

Considering limitations, since the data on oral health knowledge, attitudes, and practice were gathered through questionnaire, there is the possibility of overestimation of positive behaviors (such as frequency of dental visit or tooth brushing) and underestimation of negative behaviors (such as consumption of sugar). Furthermore, the possibility of recall bias should be considered regarding the past dental visits and diet history.

Conclusion

This study identified some direct and indirect factors influencing the children's oral health-related behaviors. Although the variables included in this model were significantly associated with the oral health-related behaviors, the low R2 value implied the necessity of consideration of other factors. It should also be noted that some of the factors affecting the oral health-related behaviors were different between the residents of urban and rural areas. This study showed that although these variables,

especially knowledge and attitude, were important prerequisites, oral health-related behaviors cannot be fully explained by this model. Seemingly, the existing educational programs on oral health in schools are not effective and sufficient. Thus, other models of education should be considered based on the psychology or social learning theories, which can change the individual behaviors and sustain them for a longer period.

Acknowledgments

This work was supported by Kerman Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran. The authors would also like to thank Dr. Sudabeh Lotfi, Dr. Razieh Sedaghat, Dr. Ashkan Faryad, Dr. Siavash Faryad, Mrs. Aminzadeh, and Mrs. Naghdi for their assistance in the implementation of data collection.

Conflict of Interest

The authors disclose no potential conflicts of interest.

References

[1] Smyth E, Caamano F, Fernández-Riveiro P. Oral health knowledge, attitudes and practice in 12-year-old schoolchildren. Med Oral Patol Oral Cir Bucal. 2007; 12: E614-E620.

[2] Hysi D, Droboniku E, Toti C, Xhemnica L, Petrela E. Dental Caries Experience and Oral Health Behaviour Among 12-Year- Olds in the City of Tirana, Albania. Oral Health Dent Manag Black Sea Ctries. 2010; 4:229-235.

[3] Granville-Garcia AF, Fernandes LV, Simões Farias de TS, D'Ávila S, Leite Cavalcanti A, Menezes VA. Adolescents' knowledge of oral health: a population-based study. Rev Odonto Ciênc. (Online). 2010; 25: 361-366.

[4] Suprabha BS, Rao A, Shenoy R, Khanal S. Utility of knowledge, attitude, and practice survey, and prevalence of dental cariesamong 11- to 13-year-old children in an urban community in India. Glob Health Action. 2013; 6: 20750.

[5] Vakani F, Basaria N, Katpar S. Oral hygiene KAP assessment and DMFT scoring among children aged 11-12 years in an urban school of Karachi. J Coll Physicians Surg Pak. 2011; 21: 223-226.

[6] Jürgensen N, Petersen PE. Oral health and the impact of socio-behavioural factors in a cross sectional survey of 12-year old school children in Laos. BMC Oral Health. 2009; 9: 29.

[7] Harikiran AG, Pallavi SK, Hariprakash SA, Nagesh KS. Oral health-related KAP among 11- to 12-year-old school children in a government-aided missionary school of Bangalore city. Indian J Dent Res. 2008; 19: 236-242.

[8] Pakshir HR. Oral health in Iran. Int Dent J. 2004; 54(6 Suppl 1): 367-372.

[9] Rad M, Shahravan A, Haghdoost AA. Oral health knowledge, attitude, and practice in 12-year-old schoolchildren in Iran. J Int Soc Prev Community Dent. 2015; 5: 419-424.

[10] World Health Organization Geneva 1997. Oral health surveys. Basic Methods 4th edition. Available at: http://apps.who.int/iris/handle/10665/41905

[11] Rad M, Shahravan A, Haghdoost AA. A systematic review of questionnaires used on oral health knowledge, attitude, and practice in 12-year-olds. J Oral Health Oral Epidemiol. 2016; 5: 1-12.

[12] Rad M, Shahravan A, Haghdoost AA. Designing a Valid Questionnaire on Oral Health Related Knowledge, Attitude and Practice in 12-year Old Children in Iran. J Mazandaran Univ Med Sci. 2015; 25: 132-135.

[13] Zhu L, Petersen PE, Wang HY, Bian JY, Zhang BX. Oral health knowledge, attitudes and behaviour of children and adolescents in China. Int Dent J. 2003; 53: 289-298

[14] Diwan S, Saxena V, Bansal S, Kandpal SD, Gupta N. Oral health: Knowledge and practices in rural community. Indian J Community Comm Health. 2011; 22: 29-33.

[15] Punitha VC, Sivaprakasam P. Oral hygiene status, knowledge, attitude and practices of oral health among rural children of Kanchipuram District. Indian Journal of Multidisciplinary Dentistry. 2011; 1: 115-118.

[16] Varenne B, Petersen PE, Ouattara S. Oral health behaviour of children and adults in urban and rural areas of Burkina Faso, Africa. Int Dent J. 2006; 56: 61-70.

[17] Ahmed NA, Astrøm AN, Skaug N, Petersen PE. Dental caries prevalence and risk factors among 12-year old schoolchildren from Baghdad, Iraq: a post-war survey. Int Dent J. 2007; 57: 36-44.

[18] Rajab LD, Petersen PE, Bakaeen G, Hamdan MA. Oral health behaviour of schoolchildren and parents in Jordan. Int J Paediatr Dent. 2002; 12: 168-176.