

The role of peer influence on oral health knowledge and behaviors among adolescents

Mohammad Hossein Khoshnevisan

Shaheed Beheshti University of Medical Sciences

Seyed Peyman Shariatpanahi

University of Tehran

Maryam Sadeghipour Roudsari (✉ pidra92@gmail.com)

Shaheed Beheshti University of Medical Sciences <https://orcid.org/0000-0003-1171-1484>

Mahshid Namdari

Shaheed Beheshti University of Medical Sciences

Mahsa Malek-Mohamadi

Shaheed Beheshti University of Medical Sciences

Mohammad Hadi Foroughmand

Sharif University of Technology

Research article

Keywords: Oral health, Peer influence, Socio-behavior research, Tooth brushing, Dental flossing, Adolescents

Posted Date: November 4th, 2019

DOI: <https://doi.org/10.21203/rs.2.16744/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background : Although many researchers, in different social sciences fields, are being attracted to the new potential promotional phenomenon, the influence of peer connections, the literature in dental public health is very poor. This article investigates the role of peer influence on individuals' oral health knowledge and behavior among adolescents.

Methods: The purpose of the study was to explore the correlation of secondary school students' oral health behaviors and knowledge within friendship groups. A valid and reliable questionnaire was developed. A total of 421 students (228 boys and 193 girls) aged between 12-13 years old participated in the study. Ordinal regression analysis was used to identify the correlation between an individual's oral health knowledge and behaviors and his/her friends.

Results: The results demonstrated a strong relationship between students' oral health behaviors and their peer connections within their friendship groups at school. Specifically, tooth brushing frequency of a student had a strong correlation with similar behavior of his/her friends. In addition, investigation of the role of the second level connections (friends of one's friend with no direct connection) showed a significant correlation in brushing behavior. However, the results revealed no strong correlation of oral health knowledge among friends within their social network.

Conclusion: This paper highlighted the importance of the role of peer influence on oral health behavior. Understanding the relation between oral health behavior and social network would help policy makers for more cost effective oral health promotion programs among adolescents.

Background

Oral health as an important part of overall health plays a significant role in individuals' well-being and quality of life. There are many different possibilities for improving oral health; most programs are focused on individuals' dental health behavior improvement. Many studies reported on the relationship between dental health behavior and different characteristics of individuals, such as general health (1–3), socio-economical parameters and level of education (4). For instance, results indicate that having medical routine checkups had a relationship with tooth brushing frequency (5). Furthermore, there is a significant relation between 11–15 years old adolescents' tooth brushing habits and their combined effects of social class and migration status in Denmark (6).

Despite all attempts, there still seems to be a long way to fully understand the complex nature of the challenge for better implementations of oral health promotion programs at regional and national levels. Moreover experiences from other public health fields, which deal with similar complex challenges, demonstrated that social networks may introduce new methodological approaches to solve public health problems using community based promotion programs(7, 8). These studies suggest that individuals' health behavior, attitude and beliefs are mainly affected by their peer connections in their social networks.

There are some evidences suggesting positive effects of social connections on different issues in public health (9, 10). Pinqarts et al, have reviewed 286 studies on the influence of social network connections on “subjective well-being later in life”, where most of all, suggest the positive association between social network and health status (11). In addition, evidences suggest that social relations can reduce risk of mortality (12, 13). In another study, a positive relationship between social contacts and mental health was reported (14, 15). Moreover, some investigators have focused on peer influence on health risk behaviors such as smoking behavior and alcohol use within social networks (11, 13). These studies envisioned a promising future for policy makers to use the ever growing potential of social networks to implement health promotion programs (16): A person finds correlation in opinion and behavior with his/her neighbors, in a social network, through the influence of peer connections (17) (9).

Although many researchers, in different public health fields, are being attracted to this new potential promotional tool, the literature in dental public health is very poor. This article investigates the role of peer influence on individuals’ oral health knowledge and behavior which provides a corner stone for future social network analysis. Sampling was conducted from secondary school students. Such groups have very effective social networks influencing their health behaviors (18–21).

Methods

Participants and Setting

A total of 421 students consisting of 228 boys and 193 girls, aged between 12–13 years old, were given a self-administered questionnaire. The designed questionnaire was instructed to be completed by the students at home. This study has been approved by the Ethical Board Committee of Shahid Beheshti Medical University in accordance with the Helsinki Declaration. Written informed consent has been obtained from the parents prior to data collection process and, the data were anonymized before analysis. The questionnaire for this study was developed to assess the relationship between oral health knowledge/behavior and their friendship relations.

A comprehensive literature review in addition to obtaining experts’ opinion on each question was carried out to design the questionnaire and evaluating its face reliability. Finally, test–retest reliability was performed to determine the degree of reliability over time; the interval between administrations of the two questionnaires was at least two weeks. Except for peer influence questions, test–retest reliability was analyzed by Kappa statistics. Acceptable reliability was considered as the values of kappa coefficient greater than 0.75. The reliability of questions related to the peer influence was checked by calculating the proportion of agreement.

In order to control for the socioeconomic status (SES) effects, SES was also assessed by evaluating parental education level and economic status. The higher scores were indicative of better socioeconomic state.

Oral health knowledge was evaluated by using four questions including: child's knowledge about dental caries risk factors, the reasons for tooth brushing, frequency of dental checkups and using fluoridated toothpaste. The computed oral health knowledge scores ranged between zero to nine where higher values represent better knowledge. Oral health behavior was assessed by means of two questions about the frequency of tooth brushing and flossing.

Regarding the peer influence questions, the students were asked to list names of their five close friends. Social network's connections were assessed in two levels. The "first level" considered average score of oral health knowledge and behavior among close friends of each student (direct connections). For the "second level", the average scores of knowledge and behavior of friends of friends were calculated. This task was performed by forming a matrix of friends for each level of friendship. The level 1 friendship matrix (adjacency matrix) consisted of 421 rows and columns, so that there was a specific row and column for each individual. The matrix element x_{ij} , relevant to row i and column j , is 1 if student i has named student j as his/her friend otherwise 0. Second level of friendship matrix is formed by the square of the first level of friendship matrix. Similarly, subsequent levels of friendship matrix can be calculated by subsequent powers of level 1 friendship matrix. It should be noted that the calculations were handled by the "R package" statistical program version i386 3.2.2. Figure 1 demonstrates a schematic of the first and second levels of friendship relations in the social network.

Bivariate analysis of oral health knowledge and behaviors with sex was conducted by Man-Whitney test. The relation between a student's oral health knowledge and his/her SES was assessed by spearman correlation coefficient. The same assessment was used to find any correlation between an individual's knowledge and the average of his/her friend's knowledge. Furthermore, comparing the level of SES and also the average of friends' oral health behaviors (brushing and flossing habits) with adolescents' behaviors was conducted by Kruskal-Wallis tests and spearman correlation coefficient.

For modeling the effects of peer influence on students' oral health knowledge by controlling for the effect of demographic and socioeconomic determinants, linear regression was implemented. Ordinal logistic regression analysis was fitted to measure the effect of friends' (level 1 and 2) flossing and brushing frequency on adolescent's oral habits by adjusting the effect of other interested variables.

As a high correlation was detected between scores of knowledge and oral behavior between pairs of two subsequent friendship relations levels (level 1 and level 2); therefore, in order to avoid multicollinearity in regression analysis, only the first level of friendship was decided to be included in the regression analysis.

Results

The frequency distribution of daily tooth brushing showed that 30.8% of the students brushed their teeth two or more times daily. About 47.5% of students brushed once a day and the rest (21.7%) reported no brushing. Daily dental flossing behavior was reported by 23.6%, and 27.5% of participants reported in frequent flossing as an indication of flossing once or twice a week. In addition, 48.9% reported that they

did not floss at all. The reported oral health knowledge scores ranged between 0 - 9 and the distribution had a median of 6 and interquartile range (IQR) of 5 to 7. The comparison of oral health knowledge between girls and boys are presented in Table 1. A significantly better oral health knowledge was reported by girls compared to boys ($P < 0.01$). In addition, as illustrated in Table 2, girls demonstrated a meaningfully higher level of oral health flossing ($P = 0.006$) and brushing behavior ($P\text{-value} < 0.001$) as well.

A significant difference was detected in levels of socioeconomic status (SES) between groups with different tooth brushing behaviors ($P < 0.01$) while, SES was not significantly correlated with flossing ($P = 0.25$) or knowledge ($P = 0.23$) levels (Tables 1 and 2).

As Table 2 illustrates, there was a positive relationship between student's daily brushing frequency and the average of his/her friends' daily tooth brushing ($P < 0.001$). Flossing frequency was also positively correlated with friends flossing habits ($r_s = 0.25$, $P = 0.008$). In addition, students' daily tooth brushing was significantly related to the average tooth brushing of his/her friends of friends (level 2 of friendship); although such a relationship, was not detected for flossing. It should be noted that for the subsequent levels of friendship (level 3 and more) no relationship was detected. In addition, one's oral health knowledge showed no correlation with the average score of his/her friends' (level 1 and 2) knowledge (Table 1).

Table 3 shows the results of regression analysis for evaluating peer influence, on oral health knowledge and behavior, after controlling for the effect of socioeconomic status and gender. Participants' gender showed a significant association with all evaluated items. Similarly, a significant relationship was found between socioeconomic status and brushing ($P = 0.02$). The correlation between the score of brushing frequency and socioeconomic status showed that socioeconomic status is positively related to brushing behavior. On the other hand, there was no association between socioeconomic status with flossing and oral health knowledge.

After controlling the effect of gender and socioeconomic status, it was shown that friends' brushing habit had a significant positive effect on students' brushing behavior ($P = 0.01$). Furthermore, in the same way, friend's flossing behaviors was weakly affected by the adolescents' flossing behavior ($p = 0.06$). There was no correlation of oral health knowledge among friends.

Discussion

This study analyzed brushing frequency, dental flossing and oral health knowledge among girls and boys within their friendship groups at school. Results showed that girls were more likely to perform brushing and flossing compared to boys. This is consistent with previous results by Langlie (1997) and Ronis (1993) reporting different sex related health behaviors (22, 23) (5). In addition, there was a significant difference between dental knowledge in the two sexes.

Furthermore, it is reported that oral health status is associated with socioeconomic status (24, 25). In line with these investigations, we report the relationship between socioeconomic status and tooth brushing. However, we did not find any relationship between socioeconomic status, oral health knowledge and flossing. This may be due to the fact that the results come from adolescents in public schools where students are mostly coming from families with almost the same low economic status.

The present study aimed to evaluate the peer connection influence on oral health knowledge and behavior of adolescents. We found a correlation of brushing and flossing frequency among friends, which means that students in friendship groups show almost the same oral health behaviors. This result is in agreement with previous studies (26). (26); however, a similar positive relationship was not detected for oral health knowledge. This means that friendship relations play a significant role in dental behavior while it does not impact students' oral health knowledge. This might be due to the fact that students do not talk about their oral health knowledge so much, but unintentionally their oral health status, for example the brightness of their teeth, affects their friends' behavior. Some studies reported that oral health knowledge is not necessarily related to better health behavior (24, 27). This was the same in our study as well. In addition, studies supported the fact that oral health knowledge is not enough to change the behavior (26, 28).

We also found a statistically significant relation between level two friends' (individuals with distance 2 in the social network) brushing frequencies while for higher levels of friendships there is no correlation detectable. This somehow shows a correlation length of 2 in the social network and indicates that the peer connections are so strong that even individuals who are not directly connected, and are connected through a third person, demonstrate similar behaviors. Obviously, this correlation decreases as the friendship distance between the student's increases.

We also found that after adjusting for the 1st level friends, i.e. removing the effect of direct friends, the significant correlation between students and their 2nd level friends' frequency of brushing disappears. This is due to the fact that the second level friends actually impact the individual's behavior indirectly through the first level. Thus, as it is expected, adjusting the first level friends' effect clears the correlation between the second level friends' brushing frequency.

Conclusion

The present study investigates the influence of peer connections among students on their oral health knowledge and behaviors. A significant correlation of oral health behaviors was found among groups of friends at school. Results of this study suggests that in order to plan for cost effective oral health promotion programs among adolescents, one can benefit from the peer influence within friendship networks at school.

List Of Abbreviations

SES: socio-economic status

IQR: interquartile range

Declarations

Ethics approval and consent to participate

This study has been approved by the Ethical Board Committee of Shahid Beheshti Medical University in accordance with the Helsinki Declaration. Written informed consent has been obtained from the parents prior to data collection process and, the data were anonymized before analysis.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable.

Authors' contributions

M. S. R., M.Kh. and M. M. M. designed the study, wrote the draft and did the data collection and the submission. S. P. Sh. and M. H. F. conducted matrix formation and R software analysis. M. N. helped in data analysis. All authors contributed to writing and revising the final manuscript.

Acknowledgements

Not Applicable

References

1. Johnson NW, Glick M, Mbuguye T. (A2) Oral health and general health. *Advances in dental research*. 2006;19(1):118–21.

- 2.Kandelman D, Petersen PE, Ueda H. Oral health, general health, and quality of life in older people. *Special care in dentistry*. 2008;28(6):224–36.
- 3.Sheiham A. Oral health, general health and quality of life. *Bulletin of the World Health Organization*. 2005;83(9):644-.
- 4.Hobdell M, Oliveira E, Bautista R, Myburgh N, Lalloo R, Narendran S, et al. Oral diseases and socio-economic status (SES). *British dental journal*. 2003;194(2):91–6.
- 5.Al-Omiri MK, Al-Wahadni AM, Saeed KN. Oral health attitudes, knowledge, and behavior among school children in North Jordan. *Journal of dental education*. 2006;70(2):179–87.
- 6.Bast L, Nordahl H, Christensen L, Holstein B. Tooth brushing among 11-to 15-year-olds in Denmark: combined effect of social class and migration status. *Community dental health*. 2015;32(1):51–5.
- 7.Kanagarajah AK, Lindsay P, Miller A, Parker D. An exploration into the uses of agent-based modeling to improve quality of healthcare. *Unifying Themes in Complex Systems*: Springer; 2010. p. 471–8.
- 8.El-Sayed AM, Scarborough P, Seemann L, Galea S. Social network analysis and agent-based modeling in social epidemiology. *Epidemiologic Perspectives & Innovations*. 2012;9(1):1.
- 9.García EL, Banegas J, Perez-Regadera AG, Cabrera RH, Rodriguez-Artalejo F. Social network and health-related quality of life in older adults: a population-based study in Spain. *Quality of Life Research*. 2005;14(2):511–20.
- 10.Smith KP, Christakis NA. Social networks and health. *Annu Rev Sociol*. 2008;34:405–29.
- 11.Pinquart M, Sörensen S. Influences of socioeconomic status, social network, and competence on subjective well-being in later life: a meta-analysis. *Psychology and aging*. 2000;15(2):187.
- 12.Berkman LF, Syme SL. Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *American journal of Epidemiology*. 1979;109(2):186–204.
- 13.Orth-Gomer K, Johnson JV. Social network interaction and mortality: a six year follow-up study of a random sample of the Swedish population. *Journal of chronic diseases*. 1987;40(10):949–57.
- 14.Greenblatt M, Becerra RM, Serafetinides E. Social networks and mental health: An overview. *The American journal of psychiatry*. 1982.
- 15.Strawbridge WJ, Shema SJ, Cohen RD, Kaplan GA. Religious attendance increases survival by improving and maintaining good health behaviors, mental health, and social relationships. *Annals of Behavioral Medicine*. 2001;23(1):68–74.
- 16.Umberson D, Montez JK. Social relationships and health a flashpoint for health policy. *Journal of health and social behavior*. 2010;51(1 suppl):S54-S66.

17. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Community Dentistry and oral epidemiology*. 2003;31(s1):3–24.
18. Eggert LL, Thompson EA, Herting JR, Nicholas LJ, Dicker BG. Preventing adolescent drug abuse and high school dropout through an intensive school-based social network development program. *American Journal of Health Promotion*. 1994;8(3):202–15.
19. Ennett ST, Bauman KE. Peer group structure and adolescent cigarette smoking: A social network analysis. *Journal of health and social behavior*. 1993:226–36.
20. Valkenburg PM, Peter J, Schouten AP. Friend networking sites and their relationship to adolescents' well-being and social self-esteem. *CyberPsychology & Behavior*. 2006;9(5):584–90.
21. Voorhees CC, Murray D, Welk G, Birnbaum A, Ribisl KM, Johnson CC, et al. The role of peer social network factors and physical activity in adolescent girls. *American Journal of Health Behavior*. 2005;29(2):183–90.
22. Langlie JK. Social networks, health beliefs, and preventive health behavior. *Journal of Health and Social Behavior*. 1977:244–60.
23. Ronis DL, Lang WP, Farghaly MM, Passow E. Tooth Brushing, Flossing, and Preventive Dental Visits by Detroit-area Residents in Relation to Demographic and Socioeconomic Factors. *Journal of public health dentistry*. 1993;53(3):138–45.
24. Rad M, Shahravan A, Haghdoost AA. Oral health knowledge, attitude, and practice in 12-year-old schoolchildren in Iran. *Journal of International Society of Preventive & Community Dentistry*. 2015;5(5):419.
25. Ravaghi V, Underwood M, Marinho V, Eldridge S. Socioeconomic status and self-reported oral health in Iranian adolescents: the role of selected oral health behaviors and psychological factors. *Journal of public health dentistry*. 2012;72(3):198–207.
26. Koerber A, Graumlich S, Punwani I, Berbaum M, Burns J, Levy S, et al. Covariates of tooth-brushing frequency in low-income African Americans from grades 5 to 8. *Pediatric dentistry*. 2006;28(6):524.
27. Mirza BAQ, IZHAR ASF, KHAN AA. Oral health attitudes, knowledge, and behavior amongst high and low socioeconomic school going children in Lahore, Pakistan. *Pakistan Oral & Dental Journal*. 2011;31(2).
28. Maupome G, McCranie A. Network science and oral health research. *Journal of public health dentistry*. 2015.

Tables

Table 1- Bivariate regression analysis of oral health knowledge with sex, socio economic status (SES) and average of friends

Parameter		Oral health knowledge	
		Score/Correlation coefficient	P-value
Gender	Male	5(4,7)*	0.001
	Female	6(5,7)*	
Socio Economic Status (SES)		0.06**	0.23
Average of friends'	Level1	0.06**	0.24
	Level2	0.02**	0.75

* Mean of oral health knowledge score (Q1,Q3)

** Spearman correlation coefficient

Table 2- Bivariate regression analysis of oral health behavior with sex, socio economic status (SES) and average of friends

Parameters		Flossing				Brushing			
		Once	Frequently	Never	P-value	Twice or more a day	Once a day	Sometimes or never	p-value
Gender	Female Number (Percent)	45 (23.3%)	64 (33.1%)	84 (43.6%)	0.006	78 (40.4%)	93 (48.1%)	22 (11.3%)	<0.001
	Male Number (Percent)	54 (23.7%)	52 (22.8%)	122 (53.5%)		52 (22.8%)	107 (46.9%)	69 (30.3%)	
Socio Economic Status (SES) score		5 (3,7)	5 (3,6)	5 (3,7)	0.25	5 (4,7)	5 (3,7)	5 (3,6)	<0.01
Average of friends' behavior score	Level 1	1.5 (1,1.8)	1.5 (1,2)	1.25 (1,1.75)	0.008	2.25 (2,2.5)	2 (1.8,2.4)	2 (1.25,2.25)	<0.001
	Level 2	2.5 (2.1,2.8)	2.5 (2.1,3.8)	2.4 (2.1,2.8)	0.74	2.2 (1.2,2.5)	2.09 (1.8,2.3)	1.88 (1.62,2.22)	<0.001

Table 3- Regression analysis for evaluating peer influence, on oral health knowledge and behavior, after controlling for the effect of socioeconomic status and gender.

	Parameter	B	Exp(B)	95%CI OR		Sig.level
Tooth Brushing	(Intercept)	-1.541	0.214	0.062	0.736	0.014
		0.736	2.087	0.612	7.114	0.240
	Gender	0.894	2.445	1.432	4.175	0.001
	Socioeconomic status	0.121	1.129	1.019	1.250	0.020
	friends Brushing frequency	0.609	1.839	1.148	2.945	0.011
Flossing	(Intercept)	0.881	2.414	1.085,	5.369	0.031
		2.188	8.915	3.907	20.346	<0.0001
	Gender	0.578	1.783	1.099	2.892	0.019
	social economic status	0.048	1.049	0.948	1.161	0.354
	friends flossing frequency	0.316s	1.371	0.982	1.913	0.063
Oral Health Knowledge	(Intercept)	5.264		4.014	6.513	0.000
	Gender	.418		.009	.827	.045
	Socio economic status	0.011		-0.075	0.096	0.808
	friends Average knowledge	0.055		-0.144	0.254	0.587

Figures

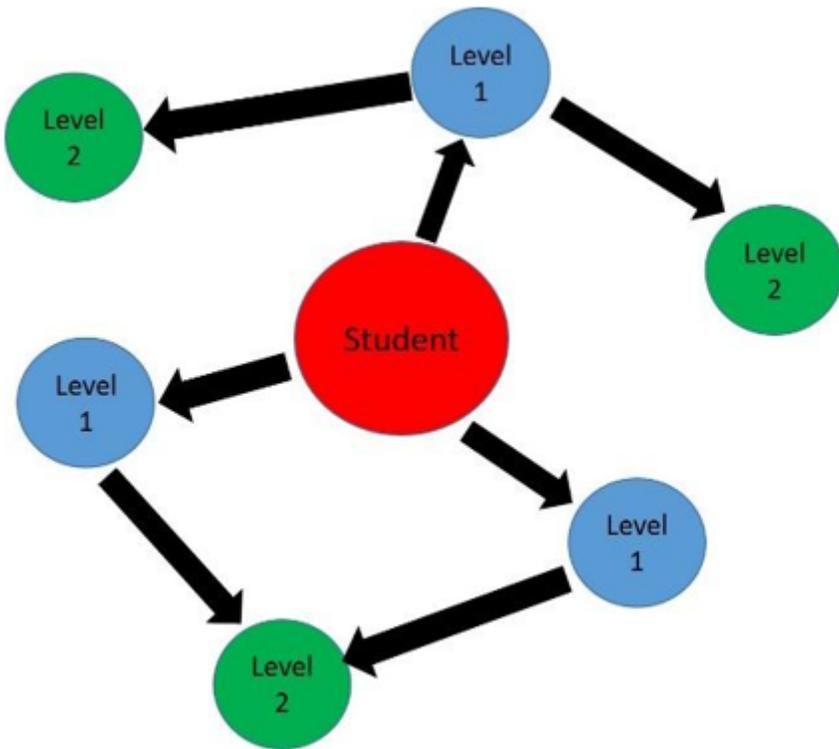


Figure 1

Schematic representing friendship and levels of friendship in a friendship network; for a node labeled as “Student”, its level 1 friends, i.e. direct friends, are marked as blue where level 2 friends, i.e. his/her friends of friends are shown green.