



June 2022

Socioeconomic Inequalities in Self-Perceived Oral Health Among College-Going Students in Karachi, Pakistan

Ghulam Kubra Kubra Rind

The Aga Khan University, kubrarind18@hotmail.com

Nadia Shah

Dow University of Health Sciences, nadia.shah@duhs.edu.pk

Sumera Inam

Dow University of Health Sciences, sumera.inam@duhs.edu.pk

Follow this and additional works at: <https://nsuworks.nova.edu/ijahsp>



Part of the [Social and Behavioral Sciences Commons](#)

Recommended Citation

Rind GK, Shah N, Inam S. Socioeconomic Inequalities in Self-Perceived Oral Health Among College-Going Students in Karachi, Pakistan. *The Internet Journal of Allied Health Sciences and Practice*. 2022 Jun 29;20(3), Article 19.

This Manuscript is brought to you for free and open access by the College of Health Care Sciences at NSUWorks. It has been accepted for inclusion in *Internet Journal of Allied Health Sciences and Practice* by an authorized editor of NSUWorks. For more information, please contact nsuworks@nova.edu.

Socioeconomic Inequalities in Self-Perceived Oral Health Among College-Going Students in Karachi, Pakistan

Abstract

Background: Oral health inequalities are becoming a major threat to public health, and they excessively burden disadvantaged communities, especially within low and middle-income countries. This study explored the socioeconomic inequalities in self-perceived oral health behaviors among college-going students in Karachi, Pakistan. **Methods:** A cross-sectional study was conducted among 328 college-going students using a convenient sampling technique from three different socioeconomic groups including urban slums, middle, and rich class neighborhoods. Oral health was assessed using three measures: daily tooth brushing, weekly sweet consumption, and substance abuse. Socio-economic inequalities were measured using binary logistic regression (odds ratios), relative index of inequality, and slope index of inequality. **Results:** Out of 328 participants, 56.4% perceived their oral health as fair, 24.1% good, 14.9% poor, while only 4.6% had an excellent perception of oral health. Significant inequalities were found regarding oral health behaviours with fraternal income, occupation, and education level. Education-related absolute inequalities among college-going students were 1.28 (95% CI -2.19, -0.36) p-value. **Conclusions:** In Pakistan, data among college-going students regarding oral healthcare is scarce. Significant inequalities were found in oral health behaviours among college-going students. Thus, there is a need to design equity-based health system provisions specifically to address the needs of poor segments of society.

Author Bio(s)

Ghulam Kubra Rind MPH, BSMT is the Senior Research Assistant at Aga Khan University Hospital.

Nadia Shah M. Sc (Economics), MPhil (Applied Economics) | Lecturer Health Economics | Research Coordinator Masters Program, School of Public Health, Dow University of Health Sciences

Sumera Inam MSc. Biostats is the senior Lecturer & Biostatistician at the School of Public Health, Dow University of Health Sciences

Acknowledgements

None

Socioeconomic Inequalities in Self-Perceived Oral Health Among College-Going Students in Karachi, Pakistan

Ghulam Kubra Kubra Rind¹
Nadia Shah²
Sumera Inam²

1. The Aga Khan University
2. Dow University of Health Sciences

Pakistan

ABSTRACT

Background: Oral health inequalities are becoming a major threat to public health, and they excessively burden disadvantaged communities, especially within low and middle-income countries. This study explored the socioeconomic inequalities in self-perceived oral health behaviors among college-going students in Karachi, Pakistan. **Methods:** A cross-sectional study was conducted among 328 college-going students using a convenient sampling technique from three different socioeconomic groups including urban slums, middle, and rich class neighborhoods. Oral health was assessed using three measures: daily tooth brushing, weekly sweet consumption, and substance abuse. Socio-economic inequalities were measured using binary logistic regression (odds ratios), relative index of inequality, and slope index of inequality. **Results:** Out of 328 participants, 56.4% perceived their oral health as fair, 24.1% good, 14.9% poor, while only 4.6% had an excellent perception of oral health. Significant inequalities were found regarding oral health behaviours with fraternal income, occupation, and education level. Education-related absolute inequalities among college-going students were 1.28(95% CI -2.19, -0.36 p-value<0.01), -1.34(95% CI -2.16, -0.52, p-value<0.01), -1.43(95% CI -2.70, -0.15, p-value<0.01) with tooth brushing, high sweet consumption, and substance abuse respectively. Similarly, income and occupation-related absolute inequalities were also existent. **Conclusions:** In Pakistan, data among college-going students regarding oral healthcare is scarce. Significant inequalities were found in oral health behaviours among college-going students. Thus, there is a need to design equity-based health system provisions specifically to address the needs of poor segments of society.

Keywords: college students, oral health inequalities, oral health behaviors, socioeconomic factors, self-perception.

INTRODUCTION

Oral health inequalities are becoming a major threat to public health in Pakistan, and they excessively burden disadvantaged communities, especially within low and middle-income countries.¹ Nearly 4 billion people suffer from oral diseases globally.² Treatments for oral health are expensive and oral diseases are frequently not been included in universal health coverage.² The World Health Organization (WHO), along with other international organizations, has been evaluating the inequalities worldwide for the past decades.³ In low and middle-income countries, and also in many of the high-income countries, the treatment of oral diseases remains unaffordable and inaccessible for large segments of society, mainly disadvantaged groups.⁴ Like other countries, the proportion of oral complications is high in Pakistan, and the Pakistan dentist-to-population ratio is very low (1: 10 850) in comparison to the WHO recommended level (1: 7500).⁵ Lack of oral health coverage between the rich and poor Pakistani population led to inequalities in oral health care, and to make matters worse, the available dentists are not affordable and accessible by the general population.⁵

The self-perceived oral health identifies the person's physical and psychosocial perspective regarding health, and it not only helps the healthcare providers in the utilization of services, but also contributes to the improvement of oral health care.⁶ Hence, oral health has a strong influence on one's general health and quality of life.⁷

Evidence suggests that factors related to socio-economic inequalities in health are socio-demographic factors that include education, occupation, a person's social status, and access to health care services.⁸ Conducive oral health practices and behaviours can prevent a person from oral diseases and dental caries.¹ Several studies regarding socioeconomic differences in oral health had been conducted worldwide. One study revealed that adolescents who belong to low socioeconomic status (LSES) have reported negative or bad oral health-related quality of life.⁹ Literature reveals that people who belong to high socioeconomic status (HSES) have a better perception of their oral health.¹⁰ Another study on self-perceived oral health revealed that socioeconomic disparities existed among individuals of the lowest income.¹¹ A study on socioeconomic inequalities in oral hygiene behavior showed that participants who belonged to LSES groups had a low prevalence of tooth brushing and poor oral health behavior in comparison to others.¹² Evidence suggests that 60% of poor oral health existed because of a lack of access to dental care services.¹³ This has challenged public health policy not only because these inequalities are present, but by overcoming oral health problems of deprived groups, revised health policies will have an impact on the average health of the whole population.¹⁴

The proportion of dental caries is estimated to be 50-70% in Pakistan, and oral health cancer is at its peak.⁵ Little data is available regarding oral health as it is not given much recognition for contributing to the development of other diseases, whereas the limited availability of oral health services and unmet needs are well documented.¹⁵ In addition, data among college-going students regarding oral healthcare is scarce, and as adolescence is the transitioning period, intervention at this stage would be beneficial and may lead to the development of better oral health for all.⁵ Studies have also reported that the behaviours formed in adolescent age last through one's entire life.¹⁶ Further, in Pakistan, research is neglected on the socioeconomic factors that are related to the disease and is more focused on the health feature¹⁷. Hence, the objective of the present study is to determine socioeconomic inequalities in self-perceived oral health behaviors among college-going students of Karachi Pakistan.

METHODS

A cross-sectional study was conducted among college-going students of Karachi, Pakistan. Data was collected from Aug 2017- to Dec 2017. The inclusion criteria included college-going students of Karachi aged 18-24 years.¹⁸ The exclusion criteria included students less than 18 years of age, those who were not willing to participate, those who were currently receiving dental treatment, and those had some known systematic illness.¹ A convenient (non-probability) sampling technique was used to collect data and the sample size was determined using a 34.6% prevalence of poor oral hygiene among middle-class individuals with a 95% confidence level and 5% margin of error.¹⁹ The total sample size was calculated to be 348. To reduce biases, the sample size was increased by 10%.

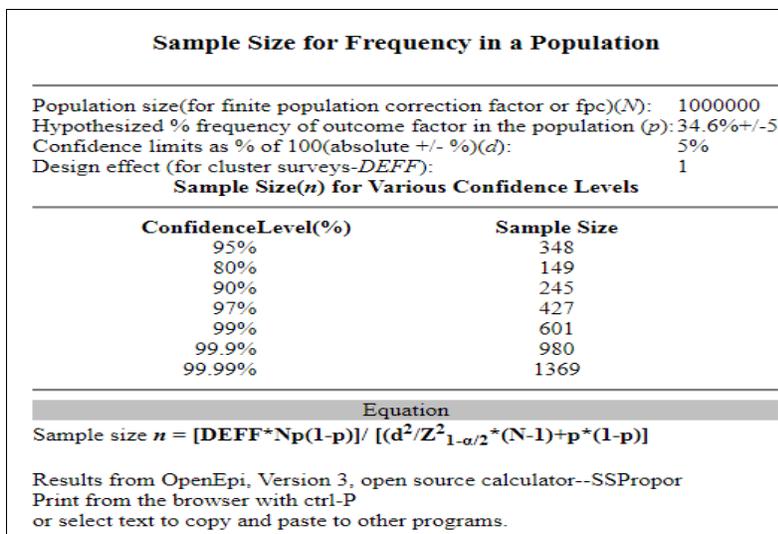


Figure. Sample Size for Frequency in a Population

Self-perception of oral health was observed among participants with the intention to describe their oral health conditions. The sample was selected from urban slums, middle-class, and rich-class neighborhoods. The main objective of selecting different groups was to document the differences in oral health perception among young adults' status living in extreme poverty (urban slums) and the degree to which this differs from the middle and rich classes.

A self-structured questionnaire was used to collect information on socio-demographic characteristics of respondents and their parents that includes age, sex, number of children, employment and education, the income of parents, numbers of cars owned, and type of house. Self-perceived oral health was assessed by the participant's overall oral health perception by using the Oral Health Impact Profile 14 (OHIP-14) questionnaire (Appendix). After a complete explanation of study aims and objectives, written informed consent was taken prior to data collection from the participants.

Socio-economic status (SES) was assessed by the wealth, occupation, and education levels of the participants' parents. For education level information related to the highest level of education obtained by parents, the following categories were constructed: *No education*: Participant confirming never attending school. *Primary*: Education completed up to class 5. *Secondary*: Education completed up to class 10. *Higher*: Referred to class 11 and above. Self-perceived oral health behaviours were measured by tooth brushing frequency, substance abuse, and weekly sweet consumption. However, self-perceived oral health was assessed by using the question "How would you rate your oral health?" Response options were based on a five-point Likert scale and categorized as excellent, good, fair, and poor²⁰.

Ethical Considerations

The ethical approval for this study was obtained from the School of Public Health, Dow University of Health Sciences (Reference No: DUHS/SPH/2017-11-1075). Informed consent was taken prior to data collection from the participants and trained staff administered the questionnaire. Participants were assured that their privacy and confidentiality would be maintained throughout the study.

Statistical Analysis

Regarding the measure of socio-economic dimensions of inequality, the Relative Index of Inequality (RII), and the Slope Index of Inequality (SII) were used as measures of oral health-related inequalities in the population.¹² RII was interpreted as the prevalence ratio between two ends of the education and wealth ranking, whereas the SII was interpreted as an absolute difference in the probability of reporting poor oral health (outcome variable) between the group with the lowest and the highest education and wealth ranks. RII was computed by using estimates from the logistic regression. The ranking was observed among participants according to their wealth index and education. A numerical measure of ranking between 0 and 1 was used for socioeconomic variables including level of education, occupation, and wealth index; transformed categorical data into continuous characteristics. Later, those ranked variables entered into the logistic regression model as continuous covariates with "poor oral health" as the outcome, adjusted for age. SPSS-software was used for data analysis. A Chi-square test was used to determine the association between

variables. Frequency and percentages were reported for categorical data. Socio-economic inequalities were measured using Logistic regression (Odds Ratios (OR)), RII, and SII on poor oral health.

RESULTS

Table 1 (in Appendices) defines the baseline characteristics of respondents and the association of oral health behaviours. The study was conducted among 328 college-going students aged 18-24, out of which 58.5% were females and 41.5% were males, with an average age of $21 \pm sd$ years. According to results, 56.4% rated their oral health as fair, whereas 24.1%, 14.9%, and 4.6% reported good, poor, and excellent perception of oral health respectively. Concerning SES, 59.8% of participant fathers had completed higher education, whereas 7.9% were found to be illiterate. A larger group (27.7%) of respondents fell under the quintile I category being the lowest of income groups, whereas 41.7% were above the quintile IV. Of all, 36.9% of respondents' fathers were skilled/unskilled, 32% were labourers, and 13.1% were unemployed.

Of the total participants, 100% reported brushing their teeth as recommended. Among all, males were found brushing their teeth < 2 times a day as compared to females (75 % vs 41.7%). Increasing age reduced the practice of brushing teeth: 56.6% of participants aged <20 years were brushing their teeth <2 times a day in comparison to students >22 years of age.

A significant association was found between weekly sweet consumption and participants' father income, education, and occupation (p-value<0.001): 32.8% of females were more likely to consume sweets weekly than 27.2 % of males. A significant association was found between substance abuse and gender: 19.9% of males were more likely to indulge in substance abuse in comparison to 6.8% of females (p<0.001).

Table 2 (in Appendices) defines the regression analysis between oral health behaviours and adolescent characteristics. Significant associations were found between tooth brushing behaviour in relation to respondent's gender, participants' father income, education, and occupation (p-value<0.001) respectively.

Univariate analysis showed that males were significantly more likely to brush teeth less number of recommended times than females (OR 4.2, 95% CI 2.59-6.80, p-value<0.001). Similarly, participants belonging to the low-income group (quintile I) (OR 4.24, 95% CI 2.15-8.35, p-value<0.001) were significantly less likely to brush teeth than quintile II and quintile IV (OR 4.02, 95% CI 1.88-8.60, p-value<0.001), (OR 3.74, 95% CI 1.84-7.62, p-value<0.001) respectively. Respondents' parents that were laborers were significantly (OR 7.68, 95% CI 2.95-19.97, p-value<0.001) times more likely to brush their teeth <2 times a day. The result of multivariate analysis showed that the odds of less tooth brushing were significantly associated with gender only. Males were (AOR 3.93, 95% CI 2.21-7.00, p-value<0.001) more likely to brush teeth less frequently in comparison to females as recommended.

Results of the univariate analysis showed that odds of sweet consumption were significantly associated with gender, males were (OR 0.21, 95% CI 0.11-0.39, p-value <0.001) times less likely to consume sweets weekly than females. For participants whose fathers had primary education, the odds of sweet consumption among them were (OR 0.09, 95% CI 0.03-0.30, p-value <0.001) times than other educational groups. Further, findings of sweet consumption were significant with participants of quintile I only (OR 0.07, 95% CI 0.02-0.29, p-value <0.001) times less likely to have weekly sweet consumption than other quintile categories. The results of the univariate analysis showed that males (OR 3.41, 95% CI, 1.68-6.89, p-value<0.001) were more likely to abuse substances than females.

Table 3 (in Appendices) defines the logistic regression-based crude and adjusted relative and absolute indices of inequality for oral health behaviours. Significant relative inequalities were found between tooth brushing and father's income SII -1.14(95% CI -1.94, -0.34p-value<0.01) RII 3.23(95% CI 2.43,4.03p-value<0.01), occupation SII-1.15(95% CI -1.97, -0.33p-value<0.01) RII2.97(95% CI 2.15,3.79p-value<0.01), and education SII-1.28(95%CI -2.19, -0.36 p-value<0.01), RII2.48(95% CI 1.56,3.39p-value<0.01). Similarly, we found relative significant inequalities between high sweet consumption and participant's father's income SII -1.16(95% CI -1.90, -0.434p-value<0.01), RII 6.43(95% CI 5.70,7.17p-value<0.01), occupation SII -0.76(95% CI -1.50, -0.03p-value<0.01) RII 2.93(95% CI 2.20,3.67p-value<0.01)], and education SII -1.34(95% CI -2.16, -0.52p-value<0.01) RII 3.77(95% CI 2.95,4.59p-value<0.01). In substance abuse, relative significant inequality was found only with participant's father education SII -1.43(95% CI -2.70, -0.15p-value<0.01) RII 1.56(95% CI 0.29, 2.87p-value<0.01) showing that participants with uneducated father were significantly at more risk of substance abuse than educated ones.

DISCUSSION

Our study indicated the existence of socioeconomic inequalities in self-perceived oral health among college-going students of Karachi, Pakistan. The participants with poorer and less educated fathers were most disadvantaged. Socio-demographic factors and socioeconomic inequalities were independently associated with poor oral health practices. Wealth-related inequalities among the urban population were still existent and it affected negatively healthcare utilization.

The prevalence of poor and fair self-perceived oral health in college-going students in the present study (14.9 and 56.4%) is similar to one of the study conducted among students (53.6%).²¹ By contrast, a study showed 75.1% of individuals rated their oral health as excellent/very good/good and only 24.9% as fair to poor,²² while another study showed 83.2% of young adults rated their oral health as excellent/good/v good while 16.8% rated their oral health as fair/poor.²⁰ Another study among adults showed that 13.7% of the participants reported their dental health as poor.⁶

We found that less than 50% of the participants were brushing their teeth ≥ 2 times a day. The prevalence estimates remained almost similar, as one of the study showed that 46.6% of study participants were brushing teeth >2 times a day.¹ Contrary to the present study, a study conducted among children showed that 12.8% of respondents were brushing their teeth twice a day, while 43.7% of children brushed their teeth once a day.²³ While another study showed a similar percentage of young adults (42.9%) brushing teeth >2 times a day while 57.1% of participants were brushing teeth <2 times a day.²⁰ Unlike that, a study conducted among school children showed that 8.3% of participants were brushing teeth <2 times a day while 91.7% were brushing teeth >2 times a day.²⁴

Literature has revealed that parental education has a strong impact on the healthy behaviour of their children. As the adolescence period began, the parental influence was found to diminish probably because children started to spend more time with their colleagues and friends and ultimately share the same traits and characteristics. It has been reported that the behaviours formed in adolescent age possibly last through whole life.¹⁶ Evidence suggests that the environment has an impact on adolescents' perception and the behaviour regarding oral health.⁹ Therefore, it is suggested that behavioural change interventions should target school-age children regarding healthy practices such as oral health behaviours.

The objective of the study was to examine any existent disparities in oral health concerning wealth. We found a direct relationship between the SES of the participants and tooth brushing behaviour; the participants who belonged to LSES were more than 4 times less likely to brush teeth than high-income groups. This could be probably due to a lack of insufficient resources to afford dental care. Similar findings were found in a study that showed respondents who belonged to high-income Quintile were brushing teeth more than twice in comparison to lower-income Quintile.¹² Also, in the present findings, the odds of brushing teeth <2 times a day were 7 times higher among labourer children than businesspersons. Another study confirms the findings of the present study and found a significant association between tooth brushing and SES in both genders.¹² A study among adolescents revealed that those who belonged to LSES had poor oral health/hygiene behaviour and were not brushing teeth regularly in comparison to other categories.¹² The same study showed children from LSES lately brushed their teeth and were less frequent in tooth brushing.¹²

Another study showed that tooth brushing was consistent with the SES, i.e., those who belonged to HSES were brushing teeth regularly in comparison to LSES.²⁵ One of the studies showed a direct relationship between SES, cognitive ability, and oral health -- those who belonged to LSES had the poor cognitive ability and poor oral health.²⁶ The poor DMF in lower socioeconomic groups may be because major forms of health insurance do not cover dental services, meaning that patients have high out-of-pocket payments; besides, complementary health insurance is not available to lower socioeconomic groups. As far as parental education-related disparities are concerned, we found that parental education played an important role in the oral health status and oral hygiene of participants. Higher levels of mother or father's education reduce oral health inequalities. The participants of the illiterate father were more than two times likely to brush teeth less than in comparison to participants' fathers who had higher educational levels. Similarly, another study showed a significant association between tooth brushing and father education.¹ Literature suggests that a fathers' education has a strong impact on their children's oral health.¹⁶ Studies showed that lower maternal education also demonstrated lower the tooth brushing frequency among adolescents, and low household income along with low maternal education has a direct impact on oral health-related quality of life of an adolescents' respectively,^{9, 24} while in the present study, fraternal education was found to be associated with tooth brushing frequency among young adults.

In the present study, poor tooth brushing behaviour was less prevalent among girls in comparison to boys. Boys were 4 times less likely to brush their teeth twice in comparison to girls. Similarly, a study showed that females were more likely to brush their teeth more than once a day in comparison to males.¹ Another study also found girls to be more likely to brush their teeth in comparison to boys.²⁴ In addition, another study showed females were 2.31 times more likely to brush teeth in comparison to boys.¹² Kawamura and colleagues associated girls' better oral health and brushing frequency with their strong feeling of wanting to have better teeth.¹⁶ A study from Brazil also confirms similar findings.⁹ Unlike the present study, a study conducted in Karachi showed that males were more likely to brush their teeth daily in comparison to females and had better oral health/hygiene, but the findings were not statistically significant.²⁵ This is probably because females are more conscious about oral hygiene, health, and physical appearance compared to males.

Results of RII and SII also confirmed inequalities in SES and self-perceived oral health behaviours among participants. The outcome showed significant inequalities between SES and tooth brushing along with sweet consumption and substance abuse (negative SII and positive RII), disadvantaging the ones who belong to LSES. Similar findings were found in one of study showing an SII Coefficient of -0.24 (95% CI $-0.34, -0.14$) was adversely associated with oral health behaviours. Study participants that showed that poor oral health behaviours/practices were more common in those who belonged to LSES.¹² Similarly, another study showed a statistically significant mean behaviour score difference between the type of participant's college and their oral health behaviours, which showed a significant association between oral health behaviours and SES.¹ Unlike the present study, one of study found participants from LSES had more oral health diseases and had (non-replaced extracted teeth) but no significant association was found regarding their socioeconomic position and perceived oral health.⁷ It has been evident that education, marital status, income, and employment have a remarkable impact on self-rated oral health. Those who belonged to HSES are less affected by oral health problems and are better on the preventive care regarding their oral health, and the ones who belonged to LSES are less likely to visit a dental care provider due to their low earnings. Therefore, there might be a chance that income inequalities are the main contributor behind oral health inequalities¹⁰.

Several studies regarding socioeconomic differences in oral health have been conducted worldwide. One of study found 60% of poor oral health existed because of a lack of access to dental care services. Another study on self-perceived oral health among adults showed that socioeconomic disparities existed among individuals of the lowest income.¹¹ This is because of lack of resource allocation -- those who have high SES had good knowledge of health and they spend accordingly, while those who belonged to LSES had limited earnings to cover their basic necessities of daily life and are not able to spend on health, especially on oral health. Thus, there is a dire need to provide adequate oral health education and training to the population to highlight the issue and ultimately to improve the oral health of the people. Resources should be used in a manner that provides equal health opportunities for all. Hence, public health interventions are needed to educate people regarding oral health and to improve its accessibility and affordability to the general population⁵.

Limitations

Our study had various limitations. First, because of the cross-sectional nature of the study, we failed to find temporal/causal relations. Data regarding oral health behaviours might be biased because it was perceived subjectively, not clinically/objectively. Another limitation was the convenience-sampling method that might lead to under-reporting of the actual population who had no better oral health practices and behaviours. While the limited studies regarding socioeconomic inequalities in self-perceived oral health among young adults had been done; our findings provided significant data on SES and its relationship with self-perceived oral health behaviours of young adults of Karachi Pakistan. This study can also contribute to the public policy construction focused on oral health care, especially for people with low and medium incomes.

CONCLUSION

The study concluded that significant inequalities existed in oral health behaviors among young adults of Karachi Pakistan, disadvantaging the illiterate, poor, and ones that belonged to the low-income quintile. The study also highlights the lack of access to dental health among individuals who belong to low socioeconomic status, as the public sector does not provide adequate resources to the individuals, and they are unable to afford the expenditure of the private sector. Thus, there is a need to design an equity-based health system specifically to address the needs of poor segments of society. Future research is recommended for theoretically examining the relationship between dental health and socioeconomic inequalities on clinical findings of the masses along with temporal/causal relations.

References:

1. Rajesh G, Seemanthini S, Naik D, Pai K, Rao A. Disparities in Oral Health Behaviour among Young Adults in Mangalore, India: A Psychosocial Perspective. *Journal of Clinical and Diagnostic Research: JCDR*. 2017;11(4):LC17.
2. Duijster D, Oude Groeniger J, Van Der Heijden GJ, van Lenthe FJ. Material, behavioural, cultural and psychosocial factors in the explanation of socioeconomic inequalities in oral health. *The European Journal of Public Health*. 2018;28(4):590-7.
3. Yfantopoulos J, Oulis CJ, Yfantopoulos P, Papaioannou W. Socio-economic inequalities in oral health: the case of Greece. *Health*. 2014;6(16):2227.
4. Timiş T, Dănilă I. Socioeconomic status and oral health. *policy*. 2005;7:8.
5. Basharat S, Shaikh B. Primary oral health care: a missing link in public health in Pakistan. *EMHJ-Eastern Mediterranean Health Journal*. 2016;22(9):703-6.
6. Pengpid S, Peltzer K. Self-rated oral health status and social and health determinants among community dwelling adults in Kenya. *African Health Sciences*. 2019;19(4):3146-53.

7. Ghorbani Z, Ahmady AE, Ghasemi E, Zwi A. Socioeconomic inequalities in oral health among adults in Tehran, Iran. *Community Dent Health*. 2015;32(1):26-31.
8. Kim N, Kim C-y, Shin H. Inequality in unmet dental care needs among South Korean adults. *BMC Oral Health*. 2017;17(1):80.
9. Sfreddo CS, Moreira CHC, Nicolau B, Ortiz FR, Ardenghi TM. Socioeconomic inequalities in oral health-related quality of life in adolescents: a cohort study. *Quality of Life Research*. 2019;28(9):2491-500.
10. Assari S. Socioeconomic status and self-rated oral health; diminished return among hispanic whites. *Dentistry Journal*. 2018;6(2):11.
11. Gallego F, Larroulet C, Palomer L, Repetto A, Verdugo D. Socioeconomic inequalities in self-perceived oral health among adults in Chile. *International Journal for Equity in Health*. 2017;16(1):23.
12. Safiri S, Kelishadi R, Heshmat R, Rahimi A, Djalalinia S, Ghasemian A, et al. Socioeconomic inequality in oral health behavior in Iranian children and adolescents by the Oaxaca-Blinder decomposition method: the CASPIAN-IV study. *International Journal for Equity in Health*. 2016;15(1):143.
13. Molarius A, Engström S, Flink H, Simonsson B, Tegelberg Å. Socioeconomic differences in self-rated oral health and dental care utilisation after the dental care reform in 2008 in Sweden. *BMC Oral Health*. 2014;14(1):134.
14. Timiş T, Dănilă I. Socioeconomic status and oral health. 2005.
15. Basharat S, Shaikh B. Primary oral health care: a missing link in public health in Pakistan. *Eastern Mediterranean Health Journal*. 2016;22(9):703.
16. Jung S-H, Kim M-H, Ryu J-I. Inequalities in oral health among adolescents in Gangneung, South Korea. *BMC Oral Health*. 2018;18(1):68.
17. Khalid T, Mahdi SS, Khawaja M, Allana R, Amenta F. Relationship between Socioeconomic Inequalities and Oral Hygiene Indicators in Private and Public Schools in Karachi: An Observational Study. *International Journal of Environmental Research and Public Health*. 2020;17(23):8893.
18. Mishra SK, Sachdev S, Marwaha N, Avasthi A. Study of knowledge and attitude among college-going students toward voluntary blood donation from north India. *Journal of Blood Medicine*. 2016;7:19.
19. Mathur MR, Tsakos G, Parmar P, Millett CJ, Watt RG. Socioeconomic inequalities and determinants of oral hygiene status among U rban I ndian adolescents. *Community Dentistry and Oral Epidemiology*. 2016;44(3):248-54.
20. Do L. Oral health status and perception of oral health of young Australian adults. *Australian Dental Journal*. 2012;57(4):515-7.
21. Drachev SN, Brenn T, Trovik TA. Oral health-related quality of life in young adults: a survey of Russian undergraduate students. *International Journal of Environmental Research and Public Health*. 2018;15(4):719.
22. Kotha SB, Chaudhary M, Terkawi S, Ahmed M, Ghabban SN, Fernandez RAA. Correlation of perceived self-rated oral health status with various dental health and awareness factors. *Journal of International Society of Preventive & Community Dentistry*. 2017;7(Suppl 2):S119.
23. Soltani R, Eslami AA, Akhlaghi N, Sharifirad G, Alipoor M, Mahaki B. Toothbrushing frequency among 4–6-year-old Iranian children and associated maternal attitude and sociobehavioral factors. *Dental Research Journal*. 2017;14(1):50.
24. Freire MdCM, Jordão LMR, Malta DC, Andrade SSCdA, Peres MA. Socioeconomic inequalities and changes in oral health behaviors among Brazilian adolescents from 2009 to 2012. *Revista de Saude Publica*. 2015;49:50.
25. Waseem FS, Hussain A, Maqsood A, Sultan M. Socioeconomic status and oral health care attitudes: A snapshot of Karachi based teaching hospital. *Pakistan Oral & Dental Journal*. 2015;35(1).
26. Karnam RR, Kumar NS, Eshwar S, Deolia S. Cognitive ability as a determinant of socioeconomic and oral health status among adolescent college students of Bengaluru, India. *Journal of Clinical and Diagnostic Research: JCDR*. 2016;10(12):ZC62.

APPENDICES

Table 1: Association Between Oral Health Behaviour and Socio-Demographic Characteristics of Study Population (N=328)

Characteristics	Total		Daily Tooth Brushing		p-value*	Weekly Sweet Consumption			p-value*	Substance abuse		
	N	(%)	< 2 times	≥ 2 times		Never	Low	High		No	Yes	p-value*
			N (%)	N (%)		N (%)	N (%)	N (%)		N (%)	N (%)	
Gender												
Male	136	41.5	102(75.0)	34(25.0)	<0.001	64(47.1)	35(25.7)	37(27.2)	<0.001	109(80.1)	27(19.9)	<0.001
Female	192	58.5	80(41.7)	112(58.3)		23(12.0)	106(55.2)	63(32.8)		179(93.2)	13(6.8)	
Age												
<20	205	62.5	116(56.6)	89(43.4)	0.85	62(30.2)	85(41.5)	58(28.3)	0.283	185(90.2)	20(9.8)	0.005
20-22	94	28.7	51(54.3)	43(45.7)		17(18.1)	44(46.8)	33(35.1)		83(88.3)	11(11.7)	
>22	29	8.8	15(51.7)	14(48.3)		8(27.6)	12(41.4)	9(31.0)		20(69.0)	9(31.0)	
BMI												
Underweight	105	32	53(50.5)	52(49.5)	0.447	23(21.9)	46(43.8)	36(34.3)	0.244	93(88.6)	12(11.4)	0.064
Normal weight	191	58.2	111(58.1)	80(41.9)		59(30.9)	78(40.8)	54(28.3)		171(89.5)	20(10.5)	
Over weight	25	8.5	18(56.2)	14(43.8)		5(15.6)	17(53.1)	10(31.2)		24(75.0)	8(25.0)	
Income(Rs)												
Quintile I	91	27.7	57(73.1)	21(26.9)	<0.001	40(44.0)	30(33.0)	21(23.1)	<0.001	74(81.3)	17(18.7)	0.012
Quintile II	55	16.8	35(63.6)	20(36.4)		17(30.9)	23(41.8)	15(27.3)		51(92.7)	4(7.3)	
Quintile III	45	13.7	26(57.8)	19(42.2)		16(35.6)	10(22.2)	19(42.2)		40(88.9)	5(11.1)	
Quintile IV	71	21.6	45(53.6)	39(46.4)		11(15.5)	35(49.3)	25(35.2)		69(97.2)	2(2.8)	
Quintile V	66	20.1	21(31.8)	45(68.2)		3(4.5)	43(65.2)	20(30.3)		54(81.8)	12(18.2)	
Father Education												
No	26	7.9	21(80.8)	5(19.2)	<0.001	15(57.7)	6(23.1)	5(19.2)	<0.001	19(73.1)	7(26.9)	0.005
Primary	35	10.7	24(68.6)	11(31.4)		21(60.0)	10(28.6)	4(11.4)		27(77.1)	8(22.9)	
Secondary	71	21.6	46(64.7)	25(35.2)		15(21.1)	35(49.3)	21(29.6)		61(85.9)	10(14.1)	
Higher	196	59.8	91(46.4)	105(53.6)		36(18.4)	90(45.9)	70(35.7)		181(92.3)	15(7.7)	
Father Occupation												
Class 0	43	13.1	22(51.2)	21(48.8)	<0.001	14(32.6)	16(37.2)	13(30.2)	<0.001	37(86.0)	6(14.0)	0.069
Class I	105	32	32(84.2)	6(15.8)		23(60.5)	9(23.7)	6(15.8)		28(73.7)	10(26.3)	
Class II	121	36.9	17(81.0)	4(19.0)		6(28.6)	12(57.1)	3(14.3)		19(90.5)	2(9.5)	
Class III	38	11.6	68(56.2)	53(43.8)		23(19.0)	52(43.0)	46(38.0)		110(90.9)	11(9.1)	
Class IV	21	6.4	43(41.0)	62(59.0)		21(20.0)	52(49.5)	32(30.5)		94(89.5)	11(10.5)	

Daily Tooth Brushing (<2 times : 55.5% ; ≥2 times 44.5%), Weekly Sweet Consumption (Never: 26.5%, Low: 43%, High:30.5%) , Substance Abuse???

***Chi-square test of Association, level of significance <0.05**

Table 2: Regression Analysis Between Oral Health Behaviours and Adolescent Characteristics

Characteristics	Tooth Brushing < 2 times/day				High Sweet Consumption				Substance abuse			
	OR(95% CI)	p-value	A.OR(95% CI)	p-value	OR(95% CI)	p-value	A.OR(95% CI)	p-value	OR(95% CI)	p-value	A.OR(95% CI)	p-value
Gender												
* Male	4.20(2.59-6.80)	<0.001	3.93(2.21-7.00)	<0.001	0.21(0.11-0.39)	<0.001	0.34(0.17-0.68)	0.002	3.41(1.68-6.89)	<0.001	3.92(1.61-9.54)	0.002
Female	1		1		1				1			
Age												
<20	1.21(0.55-2.65)	0.811	-		0.83(0.30-2.30)	0.722	-		0.24(0.09-0.59)	0.002	0.24(0.08-0.68)	0.007
20-22	1.10(0.48-2.54)	0.622			1.72(0.60-4.95)	0.338			0.29(0.10-0.80)	0.017	0.44(0.13-1.41)	0.168
>22	1				1				1			
BMI												
Under	1		-		1		-		1			
Normal	1.36(0.84-2.19)	0.206			0.58(0.30-1.10)	0.100			0.90(0.42-1.93)	0.799	-	
Over	1.26(0.56-2.79)	0.567			1.27(0.38-4.21)	0.687			2.58(0.95-7.02)	0.063		
Income												
Quintile I	4.24(2.15-8.35)	<0.001	1.02(0.38-2.72)	0.962	0.07(0.02-0.29)	<0.001	0.27(0.06-0.28)	0.007	1.03(.45-2.34)	0.937	0.24(0.06-0.91)	0.036
Quintile II	4.02(1.88-8.60)	<0.001	1.51(0.62-3.67)	0.363	0.13(0.03-0.53)	0.004	0.22(0.05-0.97)	0.046	0.35(0.10-1.16)	0.087	0.10(0.02-0.47)	0.003
Quintile III	2.62(1.19-5.77)	0.016	1.23(0.50-2.98)	0.645	0.17(0.04-0.71)	0.014	0.28(0.06-1.18)	0.083	0.56(0.18-1.72)	0.314	0.26(0.07-0.97)	0.045
Quintile IV	3.74(1.84-7.62)	<0.001	3.48(1.64-7.40)	0.001	0.34(0.08-1.39)	0.133	0.38(0.09-1.57)	0.183	0.13(0.02-0.60)	0.009	0.11(0.02-0.55)	0.007
Quintile V	1		1		1				1			
Education												
No	4.84(1.75-13.37)	0.002	2.73(1.73-10.20)	0.013	0.17(0.05-0.50)	0.001	0.30(0.08-1.11)	0.072	4.44(1.61-12.25)	0.003	4.37(1.08-17.70)	0.038
Primary	2.51(1.16-5.42)	0.018	2.18(1.12-4.23)	0.020	0.09(0.03-0.30)	<0.001	0.17(0.04-0.62)	0.007	3.57(1.38-9.23)	0.008	3.68(1.00-13.49)	0.049
Secondary	2.12(1.20-3.72)	0.008	1.29(0.47-3.54)	0.611	0.72(0.33-1.56)	0.406	1.00(0.43-2.32)	0.994	1.97(0.84-4.63)	0.116	2.39(0.85-6.67)	0.096
Higher	1		1		1				1			
Occupation												
Class 0	1.51(0.74-3.08)	0.257	1.75(0.72-4.28)	0.213	0.17(0.06-0.49)	0.001	-		3.05(1.17-7.93)	0.022	-	
Class I	7.68(2.95-19.97)	<0.001	4.32(1.30-14.36)	0.016	0.60(0.23-1.55)	0.298			1.38(0.47-4.02)	0.548		
Class II	6.12(1.92-19.48)	0.002	6.90(1.82-26.20)	0.004	0.32(0.07-1.45)	0.143			0.90(0.18-4.39)	0.895		
Class III	1.85(1.09-3.14)	0.022	2.08(1.14-3.80)	0.016	1.31(0.62-2.76)	0.473			0.85(0.35-2.06)	0.726		
Class IV	1		1		1				1			

Level of significance <0.05

Table 3: Logistic Regression-Based Crude and Adjusted Relative and Absolute Indices of Inequality for Oral Health Behaviour

Characteristics	Tooth Brushing < 2 times/day		High Sweet Consumption		Substance abuse	
	Crude (95% CI)	Adjusted(95% CI)	Crude (95% CI)	Adjusted(95% CI)	Crude (95% CI)	Adjusted(95% CI)
Income(Rs)						
RII	3.23(2.43,4.03)	1.27(0.16,2.38)	6.43(5.70,7.17)	2.59(1.71,3.47)	1.22(0.04,2.41)	1.69(-0.03,3.42)
SII	-1.14(-1.94,-0.34)	-0.27(-1.38,0.83)	-1.16(-1.90,-0.434)	-0.39(-1.27,0.49)	-0.39(-1.58,0.78)	-1.27(-3.01,0.45)
p-value	<0.001	0.521	<0.001	<0.001	0.384	0.048
Father Education						
RII	2.48(1.56,3.39)	1.72(0.61,2.82)	3.77(2.95,4.59)	2.98(2.03,3.94)	1.56(0.29,2.87)	1.88(0.14,3.62)
SII	-1.28(-2.19,-0.36)	-0.77(-1.87,0.32)	-1.34(-2.16,-0.52)	-0.87(-1.83,0.07)	-1.43(-2.70,-0.15)	-1.79(-3.53,-0.049)
p-value	<0.001	0.037	<0.001	<0.001	<0.001	0.002
Father Occupation						
RII	2.97(2.15,3.79)	1.82(0.81,2.83)	2.93(2.20,3.67)		1.35(0.14,2.56)	
SII	-1.15(-1.97,-0.33)	-0.93(-1.94,0.07)	-0.76(-1.50,-0.03)		-0.72(-1.92,0.49)	
p-value	<0.001	0.019	<0.001		0.133	