Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol.14 , Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Smiling for the Future: How School-Based Dental Initiatives Boost Oral Health in Pakistan

Preh Ayub Abro[1], Durr-e-Sadaf[2], Muhammad Bilal[3], Naseer Ahmed[4], Haris Rehman[5], Farrukh Imran[6]

[1]BDS, MSPH, MSHPE, Lecturer Department of Oral Medicine, Bibi Aseefa Dental College, SMBB Medical University, Larkana, Pakistan

[2]Assistant Professor Oral Medicine, Army Medical College Rawalpindi, Pakistan

[3]Assistant Professor, Department of Dental Materials**,** University Medical and Dental College, Faisalabad, Pakistan

[4]Department of Community & Preventive Dentistry, Altamash Institute of Dental Medicine, Karachi, Pakistan

[5]Assistant Professor, Community and Preventive Dentistry**,** University Medical and Dental College Faisalabad, Pakistan

[6]Principal and Professor of Prosthodontics, University Medical and Dental College Faisalabad, Pakistan

Corresponding Author:

Naseer Ahmed,

Department of Community & Preventive Dentistry,

Altamash Institute of Dental Medicine, Karachi, Pakistan

Email: drnaseerahmed.t@gmail.com

Cite this paper as: Preh Ayub Abro, Durr-e-Sadaf, Muhammad Bilal, Naseer Ahmed, Haris Rehman, Farrukh Imran (2025) Smiling for the Future: How School-Based Dental Initiatives Boost Oral Health in Pakistan. Journal of Neonatal Surgery, 14, (32s) 10827-10833

ABSTRACT

Introduction: Oral health problems, particularly dental caries and poor hygiene, are highly prevalent among school-going children in Pakistan. School-based interventions offer a practical approach to promote preventive oral health behaviors and reduce disease burden at an early age.

Methodology: A quasi-experimental study was conducted among 300 children aged 6–12 years in selected schools of Karachi, Pakistan. A multistage sampling technique was used. Baseline data on oral hygiene practices and clinical parameters (DMFT/dmft and OHI-S indices) were collected, followed by a 3-month school-based dental intervention including oral health education, supervised toothbrushing, and screening. Post-intervention assessment was conducted using the same measures. Data were analyzed using SPSS version 26. Descriptive Statistics, Paired t-test, and Chi-square test were applied, with $p<0.05$ considered significant.

Results: Significant improvements were observed in oral hygiene practices, with the proportion of children brushing twice daily increasing from 38% to 76% ($p<0.001$). Use of fluoride toothpaste increased, while sugary snack consumption decreased significantly ($p<0.001$). Mean DMFT/dmft scores reduced from 2.84 ± 1.12 to 2.10 ± 1.05, and OHI-S scores improved from 2.35 ± 0.76 to 1.42 ± 0.68 ($p<0.001$younger There was an increased improvement of behavior in children ($p=0.041$).

Conclusion: School based dental programs have shown to be effective in enhancing oral-hygiene behavior and clinical outcomes among children and needs to be incorporated into the public health initiatives in Pakistan.

Keywords: Oral health, school-based intervention, dental caries, DMFT, OHI-S, Pakistan, children

INTRODUCTION

Dental health is a part and parcel of the general health and wellbeing as it affects nutrition, oral speech, interpersonal communication and quality of life [1]. Oral diseases like caries of the teeth, gingivitis and periodontal diseases are some of the most common health issues in the world, especially in low and middle-income nations, yet they are mostly preventable. School-aged children are particularly susceptible because of the lack of effective oral hygiene practices, excessive consumption of sugary food, and access to preventive dental services. Childhood oral health issues may result in pain, infection, eating and learning difficulties, and chronic problems that may continue into adulthood [2].

The oral diseases prevalence among children are substantial and underreported in Pakistan. Dental caries and bad oral hygiene habits in school-going children have been demonstrated to be high in various community-based studies [3]. Some of the factors include ignorance concerning oral health, social economic differences, scarcity of dental care facilities, and little focus on preventive dental services in the public health system. The problem is also exacerbated by cultural practices, dietary habits and lack of parental guidance. Also, oral health is often given second priority to other health priorities thus causing late diagnosis and treatment [4].

Schools offer a strategic and effective point of implementation of health interventions since a significant number of children can be accessed in their formative years in schools [5]. School-based dental programs such as oral health education, routine dental screenings, fluoride applications, and guided toothbrushing programs have been much acknowledged as cost-effective interventions to enhance oral health outcomes [6]. Such programs do not only encourage healthy practices but also enable early diagnosis and treatment of dental issues. Experience in several other countries indicates that oral health programs implemented in the school environment can help greatly in curbing dental caries and also help in improving oral health behavior among the children [7].

In Pakistan, there are certain dental programs in schools which are carried out by governmental and non-governmental organizations, but their coverage is small and irregular [8]. There is a lack of standardized policies, structured implementation, and long-term evaluation of such initiatives. In addition, the majority of the current research is on prevalence of oral diseases and not effectiveness of preventive measures provided in schools [9]. This evidence gap limits the capacity of policymakers to develop and scale up effective oral health programs [10].

Research Gap and Objective

Since there is little data on the effect of school-based dental interventions in Pakistan, systematic assessment of the programs is essential to understand their effectiveness in enhancing oral health outcomes among children. This research paper will attempt to evaluate the impact of school based dental programs on oral health practices and alleviation of the burden of dental diseases among Pakistani school going children. The aim is to produce evidence that would enable the creation of sustainable, preventive oral health initiatives in the school system and shape the policy of the population health.

Methodology

Study Design and Setting

This was a quasi-experimental study that was interventional and school-based to determine how dental health interventions affected the oral health of school-going children in Pakistan. The research was conducted in a number of chosen schools (both public and private) in Karachi within six months. Schools were selected to reflect the different socioeconomic backgrounds to make the results generalizable. Pre-intervention baseline data were recorded before the intervention, and school-based dental programs were implemented, and post-intervention assessments were conducted.

Study Population

The population of the study was school going children between the age of 6 and 12 years. This age group was chosen as it is a critical age at which oral hygiene habits and permanent teeth eruption are developed. Students that were available during the period of data collection and whose parents and guardians gave informed consent were part of the study. Children that had a systemic illness, that is, oral health, or in ongoing dental treatment were excluded in order to confound the results.

Sample Size Calculation

The sample size was determined with the formula relating proportions in the interventional studies. Using the assumption of dental caries prevalence among school children in Pakistan of 60% and assuming a 15 percent decrease after the intervention, a confidence level of 95 and power of 80, the minimum sample size was estimated at 246 individuals. A 20% added to cover the possible non-response and attrition, making the final sample of about 300 participants.

Sampling Technique

There was a multistage sampling method. The schools were first of all chosen through stratified random sampling according to the type (public and private). Thereafter, simple random sampling of classes registers was used to select students of each of the selected schools. This was a strategy that guaranteed representation of the various education and socioeconomic layers.

Intervention

The intervention involved a wide-ranging school-based dental health program. This involved formal oral health education on correct brushing of teeth, the value of oral hygiene as well as dietary advice to lower down sugar intake. Visual aids were used to demonstrate proper brushing techniques. Further, the students were also given fluoride toothpaste and toothbrushes and weekly toothbrushing sessions were conducted. Primary dental check-ups were also carried out and kids who needed additional treatment referred to the local dental clinics.

Data Collection

Measurement of data occurred at two stages; baseline (pre-intervention) and three months of intervention (post-intervention). The information about demographic characteristics, oral hygiene practices, and dietary habits was collected using a structured and pre-tested questionnaire. Trained dental professionals provided clinical oral examinations using standardized parameters, such as Decayed, Missing, and Filled Teeth (DMFT/dmft) index and Oral Hygiene Index-Simplified (OHI-S). Examinations were conducted under sufficient lighting conditions to ensure consistency and all instruments were sterilized.

Outcome Measures

The main outcome measures were the change in oral hygiene practices, decreased plaque scores, and the improvement of DMFT/dmft and OHI-S indices. Secondary outcomes were the development of greater oral health awareness and implementation of preventive measures like brushing teeth regularly and decreased intake of food rich in sugar.

Data Analysis

Statistical package of social sciences (SPSS) version 26 was used to enter and analyze data. Demographic variables and baseline characteristics were determined using descriptive statistics like mean, standard deviation, frequencies, and percentages. Mean scores of DMFT/dmft and OHI-S indices at pre-intervention and post-intervention were compared by using paired sample t-tests. Chi-square (χ^2) test was used to examine alterations in categorical variables like brushing frequency and dietary habits before and after the intervention. χ^2 tests were utilized to support the relationship between categorical variables. P-value below 0.05 was taken to be statistically significant.

Results

The study involved a total of 300 school-going children, and there was full information of pre- and post-intervention data. The participants mean age was 9.2 ± 1.8 years of age with the ratio of males and females being almost equal. The baseline characteristics displayed a varied sample with regard to socioeconomic and educational backgrounds and hence representativeness.

Table 1: Baseline Demographic Characteristics of Participants (n = 300)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
6–8	110	36.7
9–10	95	31.7
11–12	95	31.7
Mean Age ± SD	9.2 ± 1.8	—
Gender		
Male	152	50.7
Female	148	49.3
Type of School		
Public	170	56.7
Private	130	43.3
Mother's Education		
No formal education	78	26.0
Primary	96	32.0
Secondary	82	27.3
Higher	44	14.7
Socioeconomic Status		
Low	120	40.0

Middle	130	43.3
High	50	16.7

The oral hygiene practices at the baseline indicated that a high percentage of children had poor oral care practices. Only three out of five participants said that they brushed their teeth twice a day, with 62% brushing once a day or occasionally.

Table 2: Comparison of Oral Hygiene Practices Pre- and Post-Intervention (n = 300)

Variable	Pre-Intervention n (%)	Post-Intervention n (%)	Test Statistic	p-value
Brushing twice daily	114 (38.0)	228 (76.0)	$\chi^2 = 96.12$	<0.001
Use of fluoride toothpaste	132 (44.0)	255 (85.0)	$\chi^2 = 110.45$	<0.001
Frequent sugary snack intake	201 (67.0)	120 (40.0)	$\chi^2 = 72.36$	<0.001
Rinsing mouth after meals	98 (32.7)	210 (70.0)	$\chi^2 = 88.50$	<0.001

The analysis showed that there was a statistically significant change in oral hygiene practices after the intervention. The percentage of children who brush their teeth twice a day grew significantly, and the number of children consuming sugary snacks decreased significantly. There was also significant improvement in clinical parameters of oral health following the intervention. Paired sample t-tests were used to compare the mean DMFT/dmft scores and OHI-S scores.

Table 3: Comparison of Mean DMFT/dmft and OHI-S Scores Pre- and Post-Intervention (n = 300)

Variable	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	Mean Difference	Test Used	t-value	p-value
DMFT/dmft Score	2.84 ± 1.12	2.10 ± 1.05	-0.74	Paired t-test	t = 12.36	<0.001
OHI-S Score	2.35 ± 0.76	1.42 ± 0.68	-0.93	Paired t-test	t = 15.48	<0.001
Gingival Index	1.78 ± 0.60	1.05 ± 0.52	-0.73	Paired t-test	t = 14.02	<0.001

Both the DMFT/dmft and OHI-S scores declined, and the difference was statistically significant, which means that the overall oral health status and hygiene were improved due to the school-based dental program. Subgroup analysis was further performed to find the difference in terms of type of school. The results indicated that the intervention was beneficial to both public and private school students, but the improvements were slightly greater in case with the public school students.

Table 4: Comparison of Mean OHI-S Scores by School Type (n = 300)

School Type	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	Mean Difference	Test Used	t-value	p-value
Public	2.48 ± 0.79	1.40 ± 0.70	-1.08	Paired t-test	t = 13.92	<0.001
Private	2.18 ± 0.72	1.45 ± 0.66	-0.73	Paired t-test	t = 10.85	<0.001

The improvement of both groups was statistically significant, proving the effectiveness of the intervention in various learning

environments. The Chi-square test was used to determine the relation between the improvement in oral hygiene and demographic factors. There was a strong correlation between age group and the change in brushing frequency with age with younger children (68 years) demonstrating a slightly better practice of the improved practices after intervention.

Table 5: Association between Age Group and Improvement in Brushing Frequency

(n = 300)

Age Group (years)	Improved n (%)	Not Improved n (%)	Total	Test Used	χ^2 value	p-value
6–8	95 (86.4)	15 (13.6)	110	Chi-square		
9–10	78 (82.1)	17 (17.9)	95	Chi-square		
11–12	72 (75.8)	23 (24.2)	95	Chi-square	$\chi^2 = 6.32$	0.041

The Chi-square test revealed that the correlation between age and changes in oral hygiene practices were statistically significant, which implies that younger children could be more responsive to behavioral changes. In general, the findings showed that the school-based dental program resulted in great changes in both behavioral and clinical oral health. The similarity in the results of various statistical analyses supported the efficacy of school-based, structured oral health programs to decrease the dental disease burden among children in Pakistan.

DISCUSSION

The results of this research indicate that school-based dental programs had a profound betterment of oral hygiene behaviors and clinical oral conditions of school-going children [11]. The percentage of children who had taken up healthy habits like brushing twice a day and fluoride toothpaste and the percentage of children who took up sugary foods decreased significantly [12]. Clinically, it could be noted that DMFT/dmft and OHI-S scores considerably reduced, which is evidence of a better oral health status and a lower disease burden due to the intervention [13]. Such findings emphasize the effectiveness of prevention, education-based, and structured interventions provided in the school-based programs.

The increase in oral hygiene and clinical indices are in line with other existing literature, which indicates that school-based oral health program is effective in promoting behavioral change and decreasing dental caries in children [14]. Similar research in similar environments has found higher awareness, improved brushing habits, and great decreases in plaque retention and caries prevalence following instructional and preventive interventions. This decrease in the OHI-S scores is consistent with other studies that have revealed that under the supervision of oral health education, the control of plaque dental hygiene can be significantly enhanced [15]. Similarly, the DMFT/dmft scores decrease is indicative of the trends in intervention based research studies where early preventive interventions helped reduce caries incidence [16, 17].

Moreover, the relevant correlation between age and enhancement of oral hygiene practices in this study is also justified by the evidence that is already present and implies that younger children are more flexible to behavior change and more beneficial to structured instruction and supervision [18,19]. The outcomes of the intervention in both the public and the private schools are consistent with the existing literature that suggests that school-based interventions can be beneficial across all schools irrespective of socioeconomic variations, as long as the interventions are effectively designed and implemented consistently [20].

Limitations

In spite of the promising results, this study has its weaknesses. The quasi-experimental design that lacks a control group makes it impossible to determine definite causality. The period of the research was quite short and might not be able to determine long-term sustainability of the behavioral changes and the improvements in the clinical status. There is a risk of reporting bias in self-reported oral hygiene practices. The study was also carried out over a small geographical region which can influence the application of the findings to other parts of Pakistan.

Future Suggestions

Randomized controlled trial designs might be the way to go in future studies in order to have a better causality evidence. The study should be followed up in the long term to determine the durability of the improvements. Generalizability would be increased by expanding the research to various regions with larger and more diverse populations. The effectiveness of interventions could be enhanced by the inclusion of parental involvement and community-based elements. The policymakers are advised to contemplate the inclusion of organized oral health to national school health system so that the impact and reach is much broader and long-lasting.

CONCLUSION

Dental programs in schools showed a great deal of improvement in dental care practices and the load of dental diseases among Pakistani school-going children. The results help to prove the effectiveness of preventive interventions based on education provided in schools and their possible application in large scale to achieve improved oral health outcomes.

REFERENCES

[1] Ahmed J, Ayoub R, Abbasi AJ. Smiles beyond Clinics: Linking Oral Health with Social Development Goals in Pakistan. Journal of Medical & Health Sciences Review. 2026 Jan 21;3(1):103-14.https://doi.org/10.65035/ys3sey35

[2] Mirza AJ. Addressing the Crisis of Pediatric Dental Care in Pakistan: Call for Action-Pediatric Oral Health Burden. Journal of Women and Child Health. 2025 Mar 27;2(1):3-5.https://doi.org/10.62807/jowach.v2i1.2025.3-5

[3] Mirza AJ. Addressing the Crisis of Pediatric Dental Care in Pakistan ttps://doi.org/10.62807/jowach.v2i1.2025.3-5.

[4] Memon S, Memon P, Maqbool A, Al Absi MA, Irfan N, Memon ZN, Ahsan S, Ejaz M. The Impact of School-Based Caries Prevention Programs on DMFT Scores and Oral Health Behaviors in School Children: School-Based Caries Prevention Programs on DMFT Scores. Pakistan Journal of Health Sciences. 2024 Sep 30:261-9.https://doi.org/10.54393/pjhs.v5i09.2069

[5] Afsana DI. Public Health Interventions for Oral Disease Prevention in Bangladesh: Effectiveness, Challenges, and Future Strategies. Challenges, and Future Strategies (December 08, 2024). 2024 Dec 8.http://dx.doi.org/10.2139/ssrn.5140785

[6] Chandio KA, Ikram Ullah A, Farrukh M, Anas M, Zubair Y, Hamad Jaber Amin J. Oral health awareness and hygiene practices among Pakistani children: a cross-sectional survey. Frontiers in Oral Health. 2025;6:1709750. doi10.3389/froh.2025.1709750

[7] Surani N, Figueiredo R, Gokiert R, Perez-Garcia A, Amin M. Integrating oral health in school health programs in Alberta, Canada: perspectives of health promotion professionals. Health Promotion International. 2026 Feb;41(1):daag023.https://doi.org/10.1093/heapro/daag023

[8] Zehra H, Kabir R. Systematic Review on Oral Health Knowledge, Practice and Attitude in Pakistan. Asian Journal of Public Health and Nursing. 2024 Jan 1.https://doi.org/10.62377/qhd8wn77

[9] Molete MM, Malele-Kolisa Y, Thekiso M, Lang AY, Kong A, George A. The role of community health workers in promoting oral health at school settings: A scoping review. Journal of Public Health Dentistry. 2024 Jun;84(2):175-86. https://doi.org/10.1111/jphd.12612)

[10] Chandio, N., Micheal, S., Tadakmadla, S.K. et al. Barriers and enablers in the implementation and sustainability of toothbrushing programs in early childhood settings and primary schools: a systematic review. BMC Oral Health 22, 242 (2022). https://doi.org/10.1186/s12903-022-02270-7

[11] Elsadek, Y.E., Edwebi, S., Turner, A. et al. A systematic review of school-based student peer-led oral health interventions to promote the oral health of school children. BMC Oral Health 23, 742 (2023). https://doi.org/10.1186/s12903-023-03482-1

[12] Grasveld, A.E., Bonifácio, C.C. & van der Veen, M.H. Exploring schoolchildren's perspectives on oral health in a disadvantaged neighbourhood in The Hague - a participatory action research project. BMC Oral Health 25, 946 (2025). https://doi.org/10.1186/s12903-025-06347-x

[13] Opoku, P., Salu, S., Azornu, C.K. et al. Oral health knowledge, practice and associated factors among Junior High School students of Koforidua, Ghana: a cross-sectional study. BMC Oral Health 24, 449 (2024). https://doi.org/10.1186/s12903-024-04148-2

[14] Geda, Z.T., Asefa, K.Z., Gonfa, A.N. et al. Oral health-related knowledge, attitudes, and practices among high school students in Robe Town, Ethiopia: a cross-sectional study. BMC Public Health 25, 3848 (2025). https://doi.org/10.1186/s12889-025-25169-8

[15] Ballouk, MH., Dashash, M. Caries prevalence and dental health of 8–12 year-old children in Damascus city in Syria during the Syrian Crisis; a cross-sectional epidemiological oral health survey. BMC Oral Health 19, 16 (2019). https://doi.org/10.1186/s12903-019-0713-9

[16] Al-Worafi, Y.M. (2024). Dental Care in Developing Countries: Achievements and Challenges. In: Al-Worafi, Y.M. (eds) Handbook of Medical and Health Sciences in Developing Countries . Springer, Cham. https://doi.org/10.1007/978-3-030-74786-2_289-1

[17] Al-Worafi, Y.M. (2024). Oral Health in Developing Countries. In: Al-Worafi, Y.M. (eds) Handbook of Medical and Health Sciences in Developing Countries . Springer, Cham. https://doi.org/10.1007/978-3-030-74786-2_288-1

[18] Abbas T. Oral Health self-care practices among people with Type 2 Diabetes Mellitus (T2DM) seeking care in hospitals of Islamabad, Pakistan (Doctoral dissertation, University of Wollongong).https://doi.org/10.53350/pjmhs22167525

[19] PARVEEN S, ASLAM S, MEMON J, ZAIDI SA, SIDDIQUI TA, QURESHI NR. Knowledge and Practices Regarding Oral Hygiene Among School Children: A Survey Based Study. dentist.;36:33-

.https://doi.org/10.53350/pjmhs22167525.

[20] Gaffar B, Schroth RJ, Foláyan MO, Ramos-Gomez F, Virtanen JI. A global survey of national oral health policies and its coverage for young children. Frontiers in Oral Health. 2024 Apr 5;5:1362647.https://doi.org/10.3389/froh.2024.1362647.