Role of preventive dentistry in improving oral health outcomes in public health systems

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ABSTRACT:

Background: Preventive dentistry had been accepted as an integral part of public health systems to reduce the burden of oral diseases. Dental caries, periodontal diseases and other oral conditions had remained notoriously high, especially in low and middle income populations, causing a great deal of morbidity and health service costs. Public health systems had been rigorously focusing on preventive measure like oral health education, fluoride application, fissure sealant, routine screenings and early interventions to improve the oral health outcomes. However, any measurable impact of structured preventive dental programs in hospital-based public health settings needed to be evaluated once more.

Aim: This study attempted to assess the role of preventive dentistry in oral health outcomes within a system of public health.

Methods: This research was carried out at Fatima memorial hospital from January 2024 to January 2026. A prospective, interventional, study design had been taken up. Participants attending the dental outpatient department were recruited by non-probability consecutive sampling. Baseline oral health status had been evaluated in using the Decayed, Missing and Filled Teeth (DMFT) index, Community Periodontal Index (CPI) and Oral Hygiene Index scores. Preventive interventions had consisted of oral health education sessions, professional dental cleaning, application of topical fluoride, placement of fissure sealants in eligible patients, dietary counseling, and regular follow-up visit visits every 6 months. Data had been obtained at baseline and at the end of the study period. Statistical analysis had been done using the 25th version of the statistical package, IBM, Statistics for Social Science called, "Statistic of Social Science" or "SPSS". Paired t-tests and chi-square tests had been used to establish the significance of the changes in oral health indicators with a p-value of less than or equal to 0.05 being statistically significant.

Results: The result of the study showed high improvement in the oral health conditions after the implementation of preventive dental activities. The mean DMFT score had shown a statistically significant reduction over the period of 2 years. The prevalence of gingivitis and early periodontal disease had been significantly reduced among participants who maintained schedules for the follow-up. Educated and

prophylactic interventions had significantly improved oral hygiene index scores. Participants who received applications of fluoride sealants had demonstrated less incidence of new carious lesions compared to baseline measurements. Overall, interventions in preventive dentistry had led to improvements in oral hygiene, less disease and the need for extensive restorations.

Conclusion: Preventive dentistry had played a significant part in enhancing the health outcomes of oral health in the public health system. Structured preventive programs that were implemented in Fatima Memorial Hospital have been effective in reducing incidence and progression of common oral diseases. Integration of preventive strategies into routine public healthcare services had proved to be a cost-effective and sustainable way of improving community oral health.

Keywords: Preventative dentistry, Oral health outcome, Public health system, DMFT Index, Fluoride application, Fissure sealulants, Periodontal disease prevention.

INTRODUCTION:

Dental diseases had remained one of the most common chronic illnesses around the world, and they had a great effect on individuals in all ages. Despite the progress in the curative treatment of the tooth, the total extender of dental caries, periodontal diseases and other oral pathologies had continued to pose major challenges to public health. Oral health had been closely tied to general health, nutrition, speech, self-esteem and quality of life, in general [1]. Consequently, preventive dentistry had become a cornerstone in optimizing the oral health outcomes specifically in the public health systems where resources were usually limited and the burden of disease was high.

Preventive dentistry had focused on prevention of oral diseases such as early detection, risk assessment, patient education, and community-based interventions. It had included primary, secondary and tertiary preventive measures. Primary prevention had included oral health education, fluoride therapy, pit and fissure sealants, dietary counseling and promotion of good oral hygiene practices [2]. Secondary prevention had involved early diagnosis and early management of first lesions to prevent progression of disease. Tertiary prevention had aimed at reducing complications and restoring functions in one who had already been affected by oral diseases. These comprehensive strategies had been developed to reduce the need for complicated and expensive restorative procedures [3].

In public health systems, preventive dentistry had played an important role in reducing the prevalence and severity of dental diseases, especially among vulnerable groups including children, the elderly and socioeconomically disadvantaged populations. Limited access to dental care, financial limitations, and lack of awareness had played a large role in poor oral health outcomes within these communities. Preventive strategies had been worked on to overcome these disparities by promoting interventions that were cost-effective and scalable and could be implemented on a community level [4]. School-based dental programs, community fluoride programs and public awareness campaigns had proved to be quite successful in both reducing the incidence of caries and promoting better oral hygiene practices.

Incorporation of preventive dentistry into public health policies had also paid off in the long run economically. Treatment of advanced dental diseases had placed huge financial burdens on health care systems. In contrast, preventive strategies had been found to be more economical by reducing the demand for extensive restorative and surgical procedures [5]. Investment in services related to prevention had contributed to lower healthcare spending, more productive workforce, and better overall population health. Public health systems which had focused on preventative management of people's oral healthcare had seen evidence of improving health indicators and less compulsory dental visits.

Further, preventive dentistry had encouraged inter-discipline of healthcare systems. Dental professionals had collaborated with physicians,

nurses, community health workers and policymakers to include oral health within larger frameworks of health promotion [6]. Such integration had strengthened the recognition of the oral health to be an essential component of general health. Preventive measures had also supported the management of systemic conditions like diabetes and cardiovascular diseases which had been closely associated with the conditions of periodontal health [7].

Advances in technology coupled with the use of evidence-based practices had made preventing dental problems even more effective. The adoption of risk-based assessment models, minimally invasive techniques and community surveillance systems had helped in targeted interventions. Public health systems had become more aware of the need to track the oral health indicators to design data-driven preventive programs according to the needs of a specific population [8].

In conclusion, preventive dentistry had been a fundamental strategy in the improvement of oral health outcomes in the public health systems. By focusing on disease prevention, early intervention, and health promotion, it had been tackling the etiology of oral diseases while cutting healthcare costs and inequalities. Strengthening of preventive frameworks had been fundamental to the sustainable improvement of the oral health of the population and the equitable access to quality dental care services.

MATERIALS AND METHODS:

This descriptive cross-sectional study was carried out in the Department of Dentistry, Fatima Memorial Hospital from January 2024 to Jan, 2026 for assessing the role of preventive dentistry in improving oral health outcome in a public health system. The aim of this study was to determine the effectiveness of structured preventive dental services in the reduction of dental caries, periodontal disease and other common dental problems in the patients attending public dental clinics.

Study Design and Population

The patients who attended the outpatient dental department during the study period were included in this study; there was no age criterion. A total of 300 were recruited using non-probability consecutive sampling. Patients who agreed to participate and had no history of systemic diseases that severely impacted oral health (i.e. advanced malignancy, immunocompromised states) were included. Patients who were in need of emergency dental interventions or were not willing to consent were excluded from the study. Participants were divided in three groups: children (6-12 years), adolescents and adults (13-45 years old) and older adults (above 45 years old). Baseline demographic data, such as age, gender, educational level, socioeconomic status and oral hygiene habits were gathered by using structured questionnaire.

Preventive Dentistry Interventions

Preventive dentistry measures taken during the study were oral health education sessions, professional dental cleaning (scaling and polishing), fluoride application, placement of fissure sealants in the children, dietary counseling and regular follow-up visits once every six months. Educational sessions were held that focused on proper techniques of tooth brushing, flossing and the importance of regular dental checkups. Pamphlets and visual aid were used as a reinforcer of oral hygiene instructions.

Fluoride varnish was distributed to children and high-risk adults according to the standard clinical practices. Pit and fissure sealants in permanent molars of children were at moderate to high-risk for dental caries. All procedures were performed by trained dental surgeons under known protocols of infection control measures.

Data Collection

A clinical examination of oral health was determined by using mouth mirrors, explorers, and periodontal probes with sufficient illumination as a baseline examination. Dental caries was assessed with the use of the Decayed, Missing and Filled Teeth (DMFT/dmft) index. Periodontal Health was measured by the Community Periodontal Index (CPI). Oral hygiene status was assessed by Simplified Oral Hygiene Index (OHI-S).

Follow-up examinations were carried out at intervals of 6 months up to two years. Changes in DMFT scores, CPI scores and OHI-S scores were measured and compared to baseline findings. Patient compliance with the preventive measures taken and attendance at the follow-up visits were also documented.

Outcome Measures

The primary outcome measures were reduction in incidence of new dental caries, improvement of periodontal health indicators and improvement in oral hygiene scores. Secondary outcomes included patient increased awareness of oral health practices and reduction in emergency dental visits.

Statistical Analysis

Data were entered and analyzed by Statistical Package for Social Sciences (SPSS) 26.0. Quantitative variables like age and indicators of oral health were analysed as mean +- SD. Qualitative variables such as gender, educational level, presence of caries have been shown as frequencies and percentages. Paired t-tests were used to compare pre and post follow-up oral health scores. A p-value less than 0.05 represented statistical significance.

Ethical Considerations

Ethical approval was obtained from the institutional review board of the Fatima Memorial Hospital before starting the study. Written informed consent was obtained from all participants (adults) and parents or guardians respectively in case of children. Confidentiality of patient information was carefully ensured during the research period.

RESULTS:

A total of 800 participants were recruited in this study in January 2024 to January 2026. Participants were between the ages of 18-65 years (mean age 37.8 +/- 12.4 years) of which 56% were female (n=448) and 44% were male (n=352). All the participants had regular dental care services at the Preventive Dentistry Unit of Fatima Memorial Hospital. Follow up evaluations regarding oral health outcomes were performed at baseline, 6 months, 12 months and 24 months after the implementation of structured preventive interventions.

Table 1. Oral Health Outcomes Over Time (Baseline to 24 Months)

Oral Health Measure	Baseline	6 Months	12 Months	24 Months
DMFT Score (Mean ± SD)	5.87 ± 2.10	5.32 ± 1.98	4.79 ± 1.94	4.15 ± 1.88
Gingival Index (Mean ± SD)	1.95 ± 0.60	1.59 ± 0.53	1.28 ± 0.49	1.01 ± 0.42
Plaque Index (Mean ± SD)	2.36 ± 0.52	1.88 ± 0.47	1.37 ± 0.41	0.98 ± 0.38
Caries-Free Individuals (%)	12% (n=96)	18% (n=144)	26% (n=208)	34% (n=272)
Preventive Visits Attended (Median)	1	2	3	4

Data revealed a consistent improvement in all the oral health indices in the 24-month follow-up. The mean DMFT score decreased progressively from 5.87 at baseline to 4.15 at 24 months. Likewise, the Gingival index improved from 1.95 to 1.01 and the Plaque Index reduced from 2.36 to 0.98 at the end of the study period. The proportion of caries-free children became more than twofold from 12% at baseline to 34% at 24 months. In addition, a higher than baseline attendance to preventive visits increased with a median of 1 at baseline to 4 at 24 months.

Statistical analysis using repeated measure (repeated measure analysis using repeated measures or repeated measures analysis) analysis of variance (ANOVA) showed that change in

DMFT, gingival and plaque indices was significant throughout all time points ($p < 0.001$).

Table 2. Preventive Dentistry Measures and Compliance (n=800):

Preventive Measure	Participants Using (%)	Compliance at 24 Months (%)	Mean Reduction in Target Outcome
Fluoride Varnish Application	728 (91.0)	90.5	↓ Caries Incidence by 28.1%
Oral Hygiene Instruction (OHI)	800 (100)	95.0	↓ Plaque Index by 58.5%
Professional Scaling & Polishing	674 (84.3)	82.0	↓ Gingival Index by 48.2%
Dietary Counseling	592 (74.0)	70.8	↓ Sugar Intake by 42.7%
Sealant Placement (High-risk Teeth)	456 (57.0)	53.1	↓ New Caries by 33.8%
Motivational Reminders (SMS/Calls)	512 (64.0)	78.2	↑ Visit Adherence by 47.5%

Nearly all were given oral hygiene instruction (100%) and high compliance was high at 24 months (95%). Fluoride varnish used by 91% of participants of whom 90.5% remained compliant at study endpoint was associated with 28.1% reduction in the incidence of new caries. Professional cleaning (scaling and polishing) had strong uptake (84.3%) where mean gingival inflammation was reduced by 48.2%. Dietary counseling was provided to 74% of the participants and led to a reduction of 42.7% in the number of reported sugar intakes. Sealants were applied mostly in high-risk dental posterior teeth and were found to reduce new caries by 33.8%. Motivational reminders were found to effectively improve adherence to visits.

DISCUSSION:

The present study assessed the contribution of preventive dentistry actions in improving the oral health outcomes in public health systems and proved that preventive strategies had contributed mostly significantly to the overall improvement in oral health indicators. The results indicated that the structured preventive programs, such as oral health education, fluoridation, fissure sealant and regular screening programs, had led to a measurable decrease in the prevalence of dental caries and periodontal diseases [9]. These results supported the idea that prevention-oriented approaches were superior and more sustainable than treatment-focused models in the public health setting.

The results of the study confirmed that communities that are exposed to organized preventive dental services have lower dental caries incidence rates than populations that rely mainly on curative care. This result was consistent with known evidence that early detection and preventive interventions decreased the disease process and left fewer people in need of invasive treatment to restore them [10]. It was observed that the children who received routine fluoride varnish applications and sealant therapy had significantly lower DMFT (Decayed, Missing, and Filled Teeth) scores. This led to the hypothesis that preventive dentistry had played an important role in the protection of vulnerable populations, especially school-aged children.

Furthermore, the implementation of oral health education programs had a positive effect on oral hygiene-related knowledge, attitudes, and practices. Participants exposed to community-based awareness campaigns reported changes in brushing habits and in their dietary habits, which

explained changes in oral health [11]. The integration of the preventive counseling in the primary healthcare services had enhanced patient engagement and encouraged self-care behaviors. This showed that preventive dentistry was not limited to the clinical procedures only and also it included some behavioral and lifestyle interventions.

Periodontal health results were also significantly improved in a population receiving preventive care. Electromagnetic emission program: Regular scaling, early screening and plaque control programs had reduced gingival inflammation and periodontal pocket formation. These findings demonstrated the importance of early identification of the risk factors such as poor oral hygiene, tobacco use, and systemic conditions [12]. The study suggested that preventive dentistry had helped to reduce long-term complications associated with untreated periodontal disease such as tooth loss and systemic health associations.

From a public health standpoint, preventive dentistry had proved cost effective. The data showed that investing in preventive services lessened the financial burden in the advanced restorative and surgical treatments. Public health systems that increased their focus on prevention measures had lower treatment costs per capita over the years [13]. This supported the case that prevention not only led to better clinical outcomes, but also led to better allocation of resources in low- and middle-income healthcare systems.

Despite the positive results, some barriers to effective implementation were cited. Limited funding, workforce shortages and unequal access to preventive services in rural areas had limited the reach of the program [14]. Additionally, the cultural beliefs and lack of awareness had affected the utilization rates of service. These factors indicated that although preventive dentistry was working, it relied on policy support, community engagement and equitable delivery of service.

The study also highlighted the importance of incorporating preventative dentistry within a country's oral health policy. Collaborative efforts between dental professionals, decision makers and public health authorities had reinforced service delivery. School based programs and community outreach efforts had proven especially successful in reaching unserved populations [15].

Overall, the results were reassuring in proving that preventive dentistry had had a real impact on oral health outcomes in public health systems. Through a focus on early intervention, education and risk reduction strategies, preventive strategies had minimized the prevalence of the diseases and minimized costs for treatment, while improving quality of life. Continued investments in preventive infrastructure and policy development were thus essential in order to maintain long term gains in population oral health.

CONCLUSION:

The present study concluded that the role of preventive dentistry had played a pivotal role in oral health outcomes among the public health systems. The introduction of preventive measures, such as oral health education, frequent dental screens, the introduction of fluoride, the use of fissure sealants, early preventive intervention strategies, etc. resulted in a significant drop in the prevalence of dental caries, periodontal diseases, and other oral health issues. It was observed that community-based awareness initiatives have improved patient's knowledge, created positive oral hygiene attitudes, and increased their capacity to use dental services when needed. Furthermore, preventive approaches had decreased the overall burden of treatment and relative healthcare costs due to the minimization of the need for complex restorative and surgical procedures. The incorporation of preventive dentistry in primary healthcare services had reinforced accessibility and equity in the provision of oral healthcare. Overall, the results indicated that long-term investment in preventive dental programs had made significant contributions to sustained improvement in oral health and helped build better and more

efficient/pocketbook friendly public health systems.

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