

Pinch of Prevention in Pounds of Troubles: Utilization of Preventive Oral Health Care Services by High-Risk Children and Other Target Groups Amidst Covid- 19 Milieu

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Abstract

Introduction: COVID-19 global pandemic caused suspension of routine and preventive dental treatment whilst prioritizing emergency care. Preventive oral health care services contribute to oral health improvements among high-risk children and pregnant women. We, therefore, aim to investigate the impact of COVID-19 on utilization of preventive oral health care services targeted for high-risk groups provided by a premier tertiary care public dental hospital in Sri Lanka.

Methods: A retrospective cross-sectional study on performance statistics of the Preventive Oral Health Unit of National Dental Hospital (Teaching) Sri Lanka was conducted for the periods from 1st January to 30th November 2020, pertaining to pre-COVID- 19 period (baseline), 1st Wave of COVID-19, transition period and on-going second wave. Comparisons were done on mean numbers of selected preventive treatment episodes performed and risk groups attended using independent sample t-test, one-way ANOVA and Kruskal-Wallis's test. Relative contributions of emergency visits for total visits were assessed for the given period. Data were entered and analysed by using SPSS-21 statistical package.

Results: Significant declines was evident in preventive dental care episodes provided for high-risk toddlers and pregnant mothers during the first and on-going second waves of COVID-19 compared to pre-COVID- 19 and transition periods($p<0.05$). In contrast, substantial increases detected in relative contribution of emergency visits for total number of visits among children for symptomatic dento-alveolar infections during two waves of COVID-19 compared to pre-COVID- 19 and transition periods.

Conclusions: COVID-19 has negatively impacted on preventive oral health care service utilization by high-risk groups, whilst raising the proportion of emergency visits due to aggravated dental diseases. Providing preventive care becomes essential to reduce the burden of aggravated late sequel of dental caries among high risk children. Novel models of preventive oral health care services for high-risk low socio-economic groups could be a way-forward in COVID-19 milieu.

Keywords: Preventive Oral Health Care; high risk groups; low socio-economic groups; COVID-19; emergency visits; Sri Lanka

Introduction

Corona virus disease (COVID-19) global pandemic caused by SARS-Cov-2 virus presaged an indelible public health catastrophe impacting individuals, families, countries, economies, and health

systems across the globe [1]. The global epicenters of highest spread and burden of COVID-19 comprised the USA, Italy and Brazil at the beginning presently concentrated to Indian sub-continent and

neighboring countries in South Asia. The pandemic revolutionized the landscape of health services from primary to tertiary care, firstly to become scrambled to ensure safety of service providers while being connected to service recipients [2], but lately to develop innovation and resilience underpinned by timely transformations [3,4]. Oral health services were strained by the high-risk status of COVID-19 transmission attributed to face-to-face contact and constant exposure to blood and saliva of patients compounded by aerosol generation procedures inherent to dental treatment procedures [5,6]. Consequently, COVID-19 induced dental practice modifications became the new normal underpinned by meticulous adherence to infection control informed by explicit evidence-based technical guidance [7-10]. Accordingly, routine and non-urgent dental treatment procedures were deferred, and treatment care services were streamlined for emergency services strengthened by patient triaging and risk stratification [11]. However, access to basic oral health care services is considered to be a human right [12] as it allows people to perform daily vital activities as eating, speaking, smiling, sleeping and socially interacting without pain, suffering and discomfort.

Despite availability of cost-effective preventive strategies, untreated dental caries in permanent teeth recorded the most prevalent condition according to global burden of oral diseases affecting 2.4 billion people, and untreated caries in deciduous teeth was the 10th most prevalent condition, affecting 621 million children across the globe [13]. Indeed, dental caries among children below 6-years of age known as early 'childhood dental caries' has become the most common chronic childhood disease [14]. Moreover, untreated dental caries accounts for the largest unmet health need among preschool children compounded by late sequel of pain, swelling and infection thus increasing the incidence of emergency dental visits [15]. Pregnant women are at high risk of dental caries and periodontal diseases compounded by oral health effects of pregnancy associated life-style-changes and hormonal changes [16]. Therefore, pregnant women, toddlers and preschool children are among high risk groups for poor oral health. Targeting preventive oral health care services for those high risk groups become fundamental in reducing their oral disease burden [17]. Nevertheless, COVID-19 induced oral health service modifications have resulted in serious impediments and limitations in providing preventive oral health care services [18]. The first case of COVID-19 community transmission in Sri Lanka was reported on 11 March 2020. One of the unique features of Sri Lanka's response to the first wave of COVID-19 pandemic was its stringent enforcement of community lockdown: closure of schools, public and private offices; introducing work from home strategies; social/physical distancing; closure of supermarkets, retail shops; and imposing a country-wide quarantine curfew [19]. This resulted in curtailing indigenous community transmission of the infection and limiting the death toll to 13 as for 24 September 2020, attributed to COVID-19 [20].

However, a sinister second wave of COVID-19 emerged since 3rd October 2020 originated from the workforce of supply chain of

the country has expanded to 28,580 cases and 142 deaths as per 8th December 2020. Despite possessing an efficiently pro-poor, unique public health care delivery model extended up to the grass root level that played a pioneering role in successful control of first wave of COVID-19 [21], the country was grappling with many challenges in flattening the persistently high epidemic curve of the second wave [22]. In contrast to stringently imposed island wide lock down in the first wave, the second wave has witnessed locally imposed lock downs with travel restrictions yet continuation of near normalcy in the country with health safety measures. Oral health care services are closely integrated into the public health care delivery model in the country and routine oral health care has been suspended during the first wave [23,24] and ongoing second wave of the COVID-19 infection in the country. However, the National Dental Hospital (Teaching) Sri Lanka, the premier multi-specialty public dental hospital continued to provide emergency and essential services [23]. Preventive Oral Health Unit of this hospital exclusively caters to socially disadvantaged, culturally diverse high risk groups in the Colombo Municipal Council region [25-28] which became the epicenter in COVID-19 community clusters and infection transmission in Sri Lanka. Therefore, navigating preventive oral health care services to target groups deemed increasingly challenging in that present context. Against this backdrop, we aim to investigate the impact of COVID-19 on utilization preventive oral health care services of Sri Lanka's National Dental Hospital with potential implications on the need for such services targeted for high risk groups and communities during global pandemic by mitigating many constraints and challenges.

Methods

A retrospective cross-sectional study was conducted to assess the performance statistics on preventive oral health care services delivered to high risk urban priority groups for the periods pertaining to pre-COVID 19, 1st Wave of COVID -19, transition period and ongoing second wave of COVID-19 in Sri Lanka.

Study setting

Preventive Oral Health Unit (POHU) of National Dental Hospital (Teaching) Sri Lanka was the study setting. This unit provides preventive oral health care services for high risk targets groups of toddlers, preschool children, primary school children, pregnant women and diabetic patients underpinned by a geographically targeted need and demand based model of Colombo Municipal Council (CMC) region. As revealed by previous findings, they belonged to low socioeconomic status and multi-racial backgrounds [25].

Data sources

Performance statistics data of the preventive dental clinic conducted by POHU for the year 2020 from 1st January to 30th November was accessed from the data base. Data on total number of visits and total number of episodes of given categories of preventive oral health treatment offered per given month were collected.

Collected data on selected treatment procedures comprised of total number of oral hygiene instructions and dietary counselling for parental care givers of children, pregnant women and diabetic patients, Glass Ionomer Cement (GIC) fillings, fluoride varnish applications, fluoride gel applications, scaling and emergency management of dento-alveolar infections (prescribing antibiotics and analgesics). Moreover, total numbers of each category of target groups: toddlers (children \leq 3-years), Pregnant women and patients with diabetes accessed preventive oral health care services in each month were obtained.

Statistical analysis

Comparisons were made on mean selected indicators of treatment categories and dental patients over 4-time periods namely:

- Pre-COVID 19 period (January & February 2020),
- 1st Wave of COVID-19 (March to May 2020),
- Transition period (June to September 2020) and
- On-going 2nd Wave of COVID-19.

Selected dental treatment episodes were preventive care comprised of oral hygiene advice with dietary counselling, fluoride varnish and gel applications, fissure sealant applications, GIC fillings and scaling. Percentage contributions of emergency visits to total visits were compared from January to November 2020. Distributions of variables were assessed for normality by using Kolomogorov-Smirnov and Shapiro-Wilk tests. Independent sample t-test, one-way ANOVA and Kruskal-Wallis tests were used to compare means at the statistical significance of $p < 0.05$. Data were entered and analysed by using SPSS-21 statistical package.

Results

During the pre-COVID 19 period (baseline), a total of 2807 visits which included both first visits and recall visits were made by high risk groups of toddlers, preschool children, primary school children, pregnant women and patients with diabetes to the POHU. Whilst there were 912 total visits during first wave of COVID-19 which overlapped a stringently imposed island wide lock down from mid-March to May 2020. There was a total of 3846 visits for the 'transition' period extended from June to September that recorded exit from stringent lockdown with "0" community cases of COVID-19 in Sri Lanka that continued over a period of 4-months, however, ended up by emergence of a second wave of COVID-19 since October 2020 which is on-going. This resulted in a spectacular decline in total visits limiting to 60 until end of November.

Table 1 illustrates the comparison of mean numbers of selected preventive dental treatment episodes: oral hygiene advice and dietary counseling, fluoride varnish application, fluoride gel application, fissure sealant applications provided by POHU from January to November 2020 that overlapped 4-trajectories of COVID-19 in Sri Lanka from pre-COVID- 19 to on-going second wave. As demonstrated in Table 1, clearly discernible reductions were evident in preventive dental treatment episodes comprised of fluoride applications, fissure sealant applications and GIC fillings during two COVID -19 waves compared with pre-COVID 19 (baseline) and transition periods. Those differences were statistically significant ($p < 0.05$). However, there were no significant differences in mean episodes of oral hygiene advice and dietary counseling as well as scaling treatment despite overall reductions in treatment episodes during two waves of COVID-19. Moreover, significant reductions in total number of visits in two COVID-19 waves were evident compared with transition and baseline periods ($p < 0.05$).

Table 1: Comparison of mean episodes of preventive dental treatment and emergency treatment.

Treatment Category	Pre-COVID19 period	1st Wave of COVID 19	Transition Period	On-going 2nd wave of COVID-19	p-value
Preventive Dental Treatment					
Oral hygiene advise & dietary counseling	1836	544.67	1928	398	0.192*
Fluoride varnish applications	78	25	81.75	12	0.003*
Fluoride gel applications	638.5	146.67	499.25	109.5	0.002*
Fissure sealant applications	152	20.33	74.5	17	0.001*
GIC fillings	311	84	373.25	48	0.021*
Scaling	29	7	27.75	0.00¶	0.108**
Total visits	1403.5	304	961.5	199	0.006*

*One-way ANOVA test **Kruskal-Walli's test ¶ no scaling done

Table 2: Comparison of mean numbers of high risk groups treated at POHU.

High Risk Group	Pre-COVID19 period	1 st Wave of COVID 19	Transition period	On-going 2 nd wave of COVID-19	p-value
Toddlers aged ≤ 3-years	202	39	143.75	30	0.008*
Pregnant women	23	3.67	78.25	7	0.032**
Patients with diabetes	25	7.67	8	4	0.271**

*One-way ANOVA **Kruskal-Wallis Test

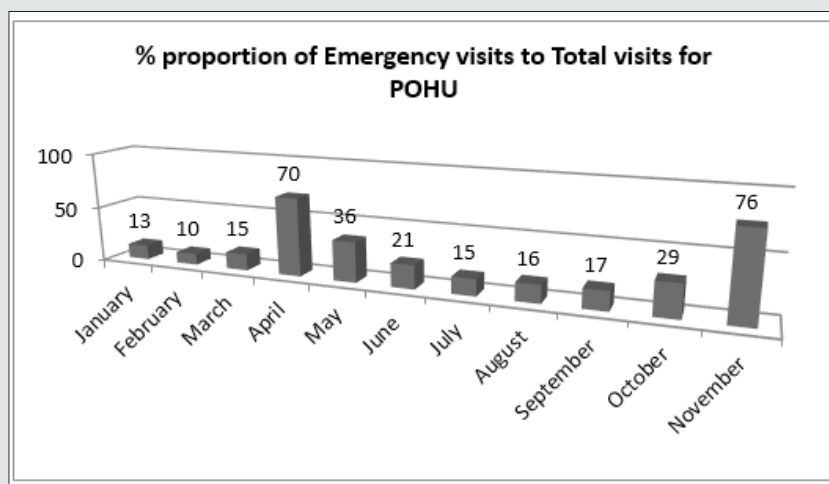


Figure 1: Relative contribution of emergency visits to total visits (January to November 2020).

* 99% of emergency visits were made by children.

Figure 1 depicts the % contribution of emergency visits to total visits made to POHU from January to November 2020. It shows a significant peak in October 2020, accounted for 76% of total visits superimposed on second wave of COVID-19. Similar peak was evident in April 2020, accounted for 70% of total visits, which overlapped the first wave of COVID-19. During the transition period there were notable reductions in % proportion of emergency visits. As illustrated in Table 2, remarkable reductions in attendance of toddlers during waves of COVID-19 compared with pre-COVID-19 (baseline) and transition period was observed that were statistically significant ($p < 0.05$). Similarly, there were significant reductions in pregnant women who received preventive oral health care during COVID-19 waves compared to baseline and transition period that marked an increased attendance over baseline. A notable reduction of patients with diabetes accessing preventive oral health care was evident in the first wave of COVID-19 compared to baseline level which had continued through to transition period and on-going second wave. However, those differences were not statistically significant over four time periods ($p > 0.05$).

Discussion

COVID-19 pandemic continues to affect health status of people by heavily impacting on health systems and health workers across the globe. Hence, countries need critical consideration on alternative models of health care provision for prioritized health

needs of people [23]. As deferment of routine dental treatment with exclusive emergency/urgent dental care was the norm of COVID-19 induced dental practice modifications [29], studies have reported increase in emergency dental visits to tertiary care hospitals in many countries [30]. Furthermore, delaying dental visits especially for checkups, planned treatment as well for bothering issues among adults attributed to COVID-19 has been reported [31]. Moreover, an array of studies highlighted the impact of COVID-19 pandemic on oral health care services ranging from oral & maxillofacial practices, dento-alveolar/oral & maxillofacial injuries [32,33], oral oncological services [34] and Paediatric dental services [35,36]. Despite, the common notion on notable restrictions, it is not known how COVID-19 specifically impacted on preventive oral health care services. Therefore, present study addressed this information gap pertaining to preventive oral health care services of a tertiary care public dental hospital in Sri Lanka, a lower-middle-income developing country. As emerged from the findings, there were significant reductions in preventive dental treatment episodes delivered to high risk toddlers and pregnant women. Moreover, there were substantial reductions in attendance of children and patients with diabetes for routine preventive oral health care. Deferment of routine and non-urgent dental treatment such as fluoride and fissure sealant applications and GIC fillings seemingly impacted on increased incidence of emergency visits among children, accounted for almost three fourths of total visits in two

COVID-19 waves. Despite offering oral hygiene and dietary advice for high risk children and their parental caregivers at emergency visits with symptomatic dento-alveolar infections, it is not clear how well they complied with those advice. The Colombo Municipal Council region, the terrain of current geographically targeted preventive oral health care model for high risk groups became the epi-centre of second wave of on-going COVID-19 in Sri Lanka. Therefore, lock-down scenario of locals of this region compounded by oral health service restrictions resulted in discernible reductions in attendance of toddlers, pregnant women and diabetic patients during COVID-19 waves.

The unprecedented challenges encountered by Paediatric dentists at present providing services for children have been well documented. The uncertainty of COVID-19 infectious status of children who are predominantly asymptomatic has created a dilemma [37]. Moreover, gaining cooperation of toddlers and children having dental anxiety becomes difficult as they could cough and cry generating more aerosols thereby possibly increasing the risk of COVID-19 transmission [38]. However, non-invasive, preventive dental treatment procedures such as fluoride applications garnered better cooperation from high risk children combined with non-pharmacological behavioural management techniques [28]. Given the high burden of advanced dental caries among high risk children, that give rise to frequent painful dento-alveolar infections, compounded by absence of aerosol generating pulp therapy and near absence of extraction of non-restorable pulp-exposed deciduous teeth under general anaesthesia, minimal intervention dentistry (MID) provides a viable option [38]. Clinical preventive dental treatment is underpinned by MID which involves no, or selective carious tissue removal accomplished by hand instruments [39] complimented by brushing and dietary advice, fluoride and fissure sealant applications. Therefore, current recommendations highlight the importance of practicing minimally invasive dental caries management techniques for high risk children as COVID-19 continues to impact paediatric dentistry practice [38,40].

High contribution of emergency visits of children having symptomatic pulp exposed teeth to total number of visits was clearly evident in our findings pertaining to two waves of COVID-19. Furthermore, prescribing antibiotics and analgesic for children presented for the emergency of dento-alveolar infections were complimented by brushing and dietary advice and fluoride applications. Those complied with the international guidelines on paediatric dentistry that emphasized triaging and exclusive treatment for emergency cases by minimizing aerosol generation procedures underpinned by case-base selection of biological, non-invasive or minimally invasive treatment methods [40]. However, increased incidence of symptomatic dento-alveolar infections of high risk children warrants further investigations. Breakdown of preventive oral health care with regular follow-up visits could have substantially impacted on their oral health status. This could have been mediated by cariogenic dietary patterns and less optimal brushing habits. A recent study conducted in Brazil

reported those changes in dietary habits of children as perceived by parents and their fears in accessing dental care for the children except for urgent visits [41]. Therefore, such factors could have contributed for patterns of utilization of preventive oral health services observed in this study during COVID-19 waves. Moreover, our findings demonstrated significant reductions in attendance for preventive oral health care by pregnant women during COVID-19 waves whilst showcasing a relatively high attendance during transition period that lasted between two subsequent COVID-19 waves. As the pregnant women were predominantly referred from geographically targeted ante-natal clinic based oral health programs conducted in Colombo Municipal Council region [26], termination of those during COVID-19 waves could have plausibly contributed to significant reductions in their attendance. Further, termination of aerosol generating ultrasonic scaling treatment during COVID-19 waves as shown in our results, could have contributed to reductions in the attendance of pregnant women and vice-versa as this treatment was mostly provided to them. This speculation could have been valid for patients with diabetes as well, since most of them received scaling treatment to improve their oral hygiene and periodontal disease status. However, provision of routine scaling is fraught with criticism pertaining to lack of evidence-base and cost of resources [42]. Furthermore, diabetes has garnered recognition for poor outcomes in COVID-19 especially among older adults [43,44] who opted to refrain utilizing routine health care services. That could have contributed to persistent low attendance of patients with diabetes (predominantly comprised of older adults and elderly) since the first wave of COVID-19 as evident from our findings. Nevertheless, it is not known how inability in accessing preventive oral health care services both by pregnant women and patients with diabetes impacted on their oral health status. This becomes important to investigate in the light of evidence on the possible connection of poor oral hygiene with severity of SARS-CoV-2 infection especially among older adults and elderly having non-communicable diseases such as diabetes [45].

The COVID-19 pandemic the unprecedented global public health conundrum, demonstrated high-virulence transmission compounded by heterogeneity in patterns of vulnerability [46]. Therefore, it became important to understand the country-wise dynamics of COVID-19 vulnerability. Undoubtedly, the COVID-19 pandemic has challenged health professions and systems, having evoked success and failures in flattening the epidemic curves while ensuring continuous access to health care by needy people across the globe. Moreover, it posed a significant challenge for dentistry as there is an elevated risk of cross infection among patients and dental practitioners [6]. In this backdrop, the roles of preventive oral health care professionals in preventing the transmission of COVID-19 while engaging in pro-active and reformed dentistry [47,48] catering to children and other vulnerable groups have become a cause for concern. As populations disproportionately affected by COVID-19 carried a higher risk for oral diseases whilst becoming susceptible for oral health disparities [49] compounded by deepening child oral health inequities [50], ensuring access to preventive oral health care services has become an ethical and

moral imperative. In light of evidence of current recommendations on employing dynamic suppression interventions for pragmatic control COVID-19 transmission [50], encouraging high risk groups to access preventive oral health care during relaxation periods become important.

Conclusions

Our findings provided some deep insights into how COVID-19 milieu heavily impacted on a preventive oral health care service delivery model of a tertiary care public dental hospital. It was well-known that accessing preventive oral health care services reached an almost standstill across the globe concomitant to COVID-19. However, little was known about accessing preventive oral health care services by high risk low-socioeconomic groups in a developing country context. As evident from the findings, the impact of COVID-19 milieu was not only pervasive but multifaceted pertaining to utilization of preventive oral health services and preventive dental treatment episodes. Increased incidence of emergency visits in waves of COVID-19 that superimposed on severe constraints in delivery of comprehensive preventive oral health care package indirectly indicated its effectiveness in preventing and controlling emergency dental visits of high risk children having multiple dental caries. This notion was further supported by flattening of proportion of emergency visits to total visits almost to the baseline level during transition period in which the delivery of the comprehensive preventive oral package was resumed. Providing preventive oral health care while addressing the symptomatic dento-alveolar infections became useful in reducing the burden of aggravated late sequel of dental caries among high risk children. Moreover, innovative models of preventive oral health care services for high risk low socio-economic groups dominated by children could be a way-forward in COVID-19 milieu and in similar pandemics in future..

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Conflicts of Interest

The authors declare no conflict of interest.

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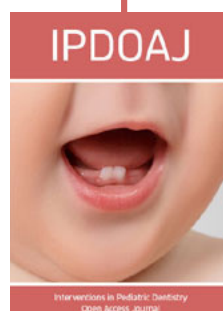
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