Review Article

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Periodontal Health-The Gordian Knot in Public Health: The Indian Standpoint

Dentistry Section

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ABSTRACT

Oral health is an inherent part of public health and is intricately related to systemic health. The interdependency of oral health and systemic health merges at the knot called periodontal health. Systemic diseases like cardiovascular diseases, metabolic diseases, and autoimmune diseases affect periodontal tissues and there lies a bidirectional relationship between periodontitis and diabetes mellitus. Taking this into consideration, periodontal health maintainance is essential for better systemic health. With the advancing health complications in the present time and due to spatial disparities, periodontal health is taking the shape of a concerning public health problem. India is facing some definitive challenges in terms of the oral healthcare system. Periodontal health assessment needs introduction of oral health programmes focusing on periodontal assessment, oral health policies and promoting education regarding periodontal health. Continous surveilliance of the disease can help us in determing the prevalence of disease, disease progression, early diagnosis, and treatment. This review aims at finding the existing problems addressing periodontal health as a public health issue, key challenges, and possible ways out of this problem.

Keywords: Oral health education, Periodontitis, Public health practice

INTRODUCTION

Health is defined as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity" [1]. What we understand from it is that health is an idealistic goal rather than a realistic proposition. Oftentimes, the word "health" is used merely as a synonym for disease. The concept of health is variable from person to person, subject to subject, topic to topic [2].

From a public health perspective, no doubt the idealistic concept of sound health, the healthcare system, the different branches and dimensions of health, and community are intricately related to each other [2]. As the human race progress, different chronic diseases are emerging and becoming a burden to this intricate system of various aspects of health and community [3]. This interlink and interdependency of various oral diseases and general health is attributed to factors such as high prevalence and high incidence of oral disorders, distribution of diseases, and available resources [4]. It is important to understand how chronic diseases can have implications and what are the possible ways to resolve the stumbling blocks [5].

While discussing diseases, it is extremely necessary to understand the criteria which act as a determinant to establish whether a disease is an actual threat to the community posing a concern to public health. The various factors include social, psychological, and economic impacts [2]. Although it is imperative to note how the various types of oral diseases are prevalent, its impact on quality of life remains undetermined [6]. Those who get affected, suffer severely from the disease. The key to conclusion is that undoubtedly chronic diseases are a public health concern, the challenge is to recognise the associated issues with it, advocacy for the benefit of patients, act on the issues, and find a solution for them. Tonetti MS et al., illustrated the global burden of periodontal disease with 442 billion USD/year cost for oral diseases and urged for common risk factor approach to disease management [7]. Health is highly dependent on various factors, and it is extremely necessary to link the factors to give or create an optimum health delivery system [2].

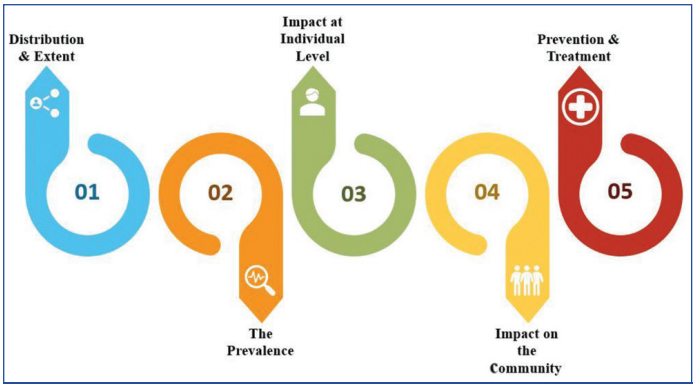
Periodontal health and systemic disease association has been established over decades [8]. In India, lack of oral health education, proper resources, oral health policies, and oral health programmes leads to delay in diagnosis and treatment of periodontal diseases [9]. The progression of periodontal disease can lead to tooth loss eventually which will compromise the eating habits and affect overall nutrition status of an individual. Policies for regular oral health checkup are very limited and according to a recent meta-analysis the prevalence of periodontitis is about 50%, which will mount up over the years if steps are not taken in early diagnosis of the disease and government strategies for oral health promotion [10]. This is a public health issue and should be seriously considered for suitable interventions by health promoters and administrators.

SPHERE OF THE PUBLIC HEALTH PROBLEM

Public health is an action-oriented discipline linked to social sciences in health and organised healthcare, and is defined as the process of mobilising and engaging local, national, and international resources to assure that people can be healthy [11]. It is very important to understand how the concept of public health widened from the late 1800s to recent times. While the global sector was going through revolution, industrialisation, and modernisation, the approach of public health became inclusive of various communicable and non-communicable diseases [12]. At the very same time, cooperation started amongst various nations, communities, and international bodies, that just jointly resulted in the formation of a central health organisation, namely, the World Health Organisation (WHO) in the year 1948, which developed successful ways to fight various public health problems through various measures [13].

As the magnification of modernisation is happening, new diseases are appearing and becoming public health concerns. For example, West African ebola virus epidemic, zika virus epidemic, Coronavirus Disease 2019 (COVID-19) pandemic, etc. Various determinants are there behind the public health problems and these determinants are interdependent [14]. This interdependency leads to the association of other traditional health problems persisting with these emerging public health problems.

It is essential to recognise the concept that when the health of a population is under threat due to some diseases, it is not the sole responsibility of the government to prevent it by executing its powers, but by the combined action of citizens, various organisational bodies, government, and international cooperation [15]. The standards used to determine and establish whether the threat is a public health problem is illustrated in [Table/Fig-1] [16].



[Table/Fig-1]: Benchmarks of public health problem.

The basic conclusion that we can reach is that the aim of public health is not limited to addressing, identifying, implementing, or finding a solution to the disease, but evidence-based intervention for the development of cooperation, which would ultimately help to develop various health programmes and delivery systems [17].

Periodontal Health Posing a Public Health Concern

Periodontitis is a chronic inflammatory disease, polymicrobial in nature which can lead to tooth loss, disability and poor nutritional status, compromising speech and quality of life [18]. Sheiham A and Watt RG, gave benchmarks of public health problems and periodontitis fulfills all of them [19]. According to community periodontal index data, it has been found that adults across the globe suffer from periodontium-associated diseases, more specifically periodontitis by a percentage of 10-15% [19]. It is imperative to note that periodontitis is the sixth most common disease worldwide [20]. Periodontitis is also associated with various other systemic diseases, such as diabetes mellitus, vascular disorders, obesity, metabolic diseases, rheumatoid arthritis, HIV/AIDS, and pregnancy outcomes [21]. The global freight of periodontal disease makes it necessary to explore its new territories in the light of public health.

Our understanding of the disease process itself has transformed over the years. The change has occurred at both global and individual levels. Although periodontitis is an inflammatory disease of polymicrobial nature with altered host immune responses, it has also been indicated that periodontitis is not only a disease itself, but a disease that poses a serious public health concern with its essential component being socio-political repercussions [22]. Considering the case of countries like Brazil, Afghanistan, Indonesia, Somalia, and Sri Lanka that are either developing or have slower economic growth, it has been observed that oral health is a relatively low priority in the health policy of these countries [23]. It is crucial to note that the risk factors remain the same among the population of the developed countries, making them equally vulnerable to the disease [24]. Periodontal disease management depends on various factors associated with patients' awareness, clinician skills, treatment planning, its epidemiology, and health policies targeting the disease control [25].

Present Backdrop of Periodontal Health Problems in India

The population of India is 138 crores as of 2020 and the census of 2011 reported that in 29 states and 7 union territories the female to male ratio is 940 to 1000 respectively. The population living in villages is 65.53% and the population living in urban areas is 34.47% [26]. The various differences that exist in India, plays a major role in influencing the health of the population. Similar differences exist in case of oral health also. It is extremely necessary to note that numerous studies were conducted from 2006 to 2015, based on various parameters of health, specific to oral health. Based on the data of the already conducted studies, it was observed that the dentist to population ratio is dissimilar in urban, rural and coastal areas [27]. 95% of the Indian population is suffering from periodontal infections in terms of oral health [28].

The tribal population existing in India accounts for 50% of the world's tribal population, who get very minimal access to healthcare. It has been seen that they practice their traditional methods for treatment of various ailments, such as diabetes mellitus, rheumatoid arthritis, as well as oral diseases [29]. These are the possible backdrops that are associated with oral health in India, specifically periodontal disease. The prevalence of periodontal disease was found to be 45% even amongst the 15+ years age group [30]. This widespread prevalence needs a call for a plan to act upon. [Table/Fig-2] summarises various studies that suggest the prevalence of periodontal disease is extensively alarming [7,10,26,29-33].

Author	Place and year of study	Study objectives/ population	Summary
Nazir M et al., [31]	World Health Organisation's data bank, 2020	Focused on evaluation of global data of periodontal disease	Distribution of periodontal disease increases with age and in population from high-income countries
Tonetti MS et al., [7]	European Federation of Periodontology, 2017	Global burden of periodontal disease	For early detection and prevention of periodontal disease, individuals, government organisations, policy makers and oral health professionals have to unitedly work for welfare
Chandra A et al., [26]	India, 2016	Risk factors and prevalence of periodontal disease in India	Lack of sufficient data to access overall periodontal disease prevalence and need for strategic development of surverys for periodontal status
Batra M et al., [32]	India, 2014	Assessment of periodontal health among the rural population of Moradabad	Direct effect on the prevalence of periodontal disease and access to healthcare in rural areas
Agarwal V et al., [30]	India, 2010	Determination of prevalence of periodontal disease in India	Strong association exists between the age of the individual and periodontal breakdown
Naheeda ASM et al., [29]	India, 2015	Periodontal status of Konda Reddy tribe in Andhra Pradesh district	Poor oral hygiene and periodontal status was seen among the tribes
Selvaraj S et al., [33]	South India, 2021	Habitual factors associated with periodontal disease	Age group, ethinicity, smoking, alcohol are factors associated with periodontal disease prediction
Janakiram C et al., [10]	India, 2020	Meta-analysis on prevalence of periodontal disease in India	Prevalence of mild to moderate periodontitis was 26.2% and severe periodontitis was 19%

[Table/Fig-2]: Studies associated with prevalence of periodontal disease in different geographic areas of India and globally.

Key Challenges to Oral Health in India

India is a developing country. India currently is undergoing a metamorphosis in the economic, demographic, social, health, and epidemiological sector. It is quite unfortunate to state that these developments come with the cons of disparities at various levels. These disparities are linked with various factors, such as socioeconomic standards, literacy rates, quality of life, mortality rates and gender ratios [34]. It is very evident that while we look forward to providing equal opportunities to access oral health, there are various spatial disparities to be considered beforehand and a feasible solution should be devised [35].

The specific challenges faced by healthcare professionals can be described through a five-pointer [Table/Fig-3] called the Five A's [36].

1. Lack of awareness: A diverse country like India shows diversity in terms of oral health awareness as well. However, the gaps are existing due to inadequate knowledge and other disproportions like

[Table/Fig-3]: The Five A's of healthcare challenge.

socioeconomic factors, various poor healthcare practices, and poor literacy rate. In a study by Gadde P et al., regarding awareness of periodontal disease in West Godavari district of Andhra Pradesh, they found that the highest periodontal knowledge score (9.42±3.12) was observed in the high income group, and the lowest score (7.85±3.08) was found in the low income group [37].

2. Lack of access: The spatial disparity of access is the most basic determinant to achieve equality in oral healthcare. The access is highly dependent on the locality of the population i.e., whether it's urban or rural, or semi-urban. Another important factor in access is infrastructure. Nayak PP et al., in their study suggested lack of access in coastal areas in terms of primary oral care services, six rural areas had only public health centres to cater to their oral health. This data suggests the need for oral health programmes targeting rural and neglected populations [27].

3. Absence of human power: Human resource is the most predominant determinant of oral healthcare access. The lack of personnel workforce, their deployment, and training are a few reasons behind health inequity. Mathur MR et al., highlighted the inadequacy of human power to primary care services for oral health and the need for oral health promotions in rural areas [34].

4. Lack of affordability: It is the cost that comes with access to oral health services. The private healthcare sector plays a prepotent role and it is quite questionable how affordable it is for the population of various economic strata. Kothia NR et al., in their report mentioned the affordability as an important factor as a barrier towards seeking oral care by individuals [35]. The national oral health programme needs to incorporate this issue and work to overcome such barriers by providing minimal cost and effective treatment at primary health centres.

5. Lack of accountability: The lack of professional, political, and governmental accountability is amongst the key components in the existing oral health inequality of India. According to Kasthuri A, accountability is an important factor when we assess disparity in healthcare services and oral health policy is a recently emerging policy. The government and oral healthcare professionals together unitedly have to work for the betterment of patient care [36].

There are successful health models that exist in the developed countries, amongst which Canada, France, Germany and UK have shown how to tackle the disparities through various benchmarks in terms of overall health that they have achieved [38]. The key learnings can be taken from the models of these countries and probable implementation can be done to face the Five A's encountered by healthcare professionals. The key lessons and possibilities of implementation are described in [Table/Fig-4] [38].

Benchmarks	What the health models is like? (Canada, France, Germany, UK) [38]	Possibilities of implementation in India
Coverage	The four nations certainly focus on universal coverage of health for their population and the government pays for the incurred cost through various measures like tax or government acting as a single player.	India can introduce the policy of universal health coverage by shifting from "the out of the pocket model."
Funding	The four countries invest considerably in funding for healthcare and all the countries have different approaches to collecting the funding for example in Germany it is work-based insurance whereas in Canada it is the collected revenue.	India can look forward to the introduction of policies to collect funding and spending that money to develop better health infrastructure.
Costs	The four countries typically focus on providing highly technical services to better diagnosis, prevention, and treatment.	India can concentrate on developing better infrastructure and monitoring services to easy diagnosis, prevention, and treatment of diseases.
Providers	The service providers are mainly in direct contact with the policymakers in the mentioned four nations for negotiation and/or other means.	The approach of India should be to stay in contact with the service providers to understand every nook and corner of Indian healthcare.
Integration	Deploring the fragmentation and integrating various health delivery systems are unitedly advocated by the four countries.	India should unify various health delivery systems for example integration of oral health and systemic health.
Markets	The healthcare market is highly regulated under the laws of the government with quality assurance and a good public information system.	The health market of India should be regulated judiciously.
Analysis	The four countries show a strong focus on evidence-based medicine, technology assessment, and report cards for the health sector.	India should focus on surveys and, analysis of the various implemented policies to find out the existing drawbacks and solutions for them.
Supply	The four countries use proper planning to develop a better supply chain and equal distribution of the human workforce.	India should make apt policies for supply chains and human resource distribution.
Satisfaction	Considering the views, opinions and the satisfaction of the population with the healthcare system is an integral part of the countries.	The Indian policymakers should approach and listen to the views and opinions of the community concerning the healthcare system and services.
Leadership	The centralised care for public health is notable amongst the countries by considering health and medicine as part of the society	In a federal country like India, centralised public care can be provided in terms of subsidy, funding, and new policies.

[Table/Fig-4]: Key Lessons from Health Models of Different Countries.

In India, while there is a saturation of dentists across the country, there is a clear unequal distribution of dentists [18]. A large number of dental surgeons are located in urban or semi-urban areas, while the concentration is low in rural or poor localities [38]. Mostly, for better quality of life and income, the dental surgeons settle in urban/semi-urban areas and clinics are located far from rural areas. The government hospitals provide just basic oral care and advanced periodontal treatments are unaddressed due to unavailability of resources, clinician skills, and time and manpower related issues [39]. This unequal distribution of dentist to population ratio is 1:9992, which often gives rise to the improper ratio of oral health workers and the population [40]. This inequity also creates some barriers to the oral health status of the country that can be described as the following [41]:

1. Lack of proper knowledge and awareness about oral health
2. Lack of access to treatment facilities
3. The cost of the dental treatment
4. Lack of quality dental care in rural and poor areas

It is essential to address these key challenges faced by the Indian population and to find a feasible solution to provide a healthy life.

Overcoming the Barriers-The Way Forward

A. Tackling the barriers of oral health problems in India:

The national oral health system needs an integrated system focusing on oral healthcare, rendering better oral healthcare. To improve oral health access following suggested measures can be considered [42].

Mention steps to aid in the process of identification. Cite examples of specific reforms needed

(i) The most important concern should be identifying the various oral diseases and prevention of those diseases. Proper education and awareness regarding oral diseases can help in early diagnosis and management. National oral health programmes have promoted awareness by adversitements, dental camps and providing oral care at primary health centres [29].

(ii) The second priority should be an investment in the health sector by increasing the health budget, increasing access and allocation for financial resources.

(iii) The third concern should be improving the supply chain and increasing the workforce with equal distribution of healthcare workers. However, a study by Padminee K et al., in their study concluded that the Disability Adjusted Life Years (DALYs) of oral disease burden ranged from 250 to 350. Pearson's correlation showed no association between dental workforce distribution and oral disease burden (p=0.084) [39].

(iv) The fourth priority should be in bringing various new technologies, promotion of health services, and bringing excellence into the healthcare-Ayushman Bharat Digital Mission is a great initiative for integrated digital health infrastructure of the country. Teledentistry can be a great initiative for oral health promotion.

(v) Last but not the least, the priority should be an acknowledgment and looking for policies to improve health equality. Mathur MR et al., suggested in their review the need for improving access and spreading the messages of health promotion across entire spectrum of socio-economic hierarch [34].

B Tackling the barriers of periodontal health problem in India:

As per the national health survey, the chronic diseases burden is concentrated on the diseases like infectious diseases, respiratory diseases, cardiovascular diseases, pulmonary diseases, and cerebrovascular diseases, all of which can be related to oral health [42]. Nazir M et al., stated the global prevalence of periodontitis and distribution of periodontal disease increases with age [31]. Janakiram C et al., found that in India the prevalence rate was 51.0% compiling the 24 studies they had taken into consideration [10]. This data is very alarming and reforms in oral health programme and oral health policies are needed to prevent further progression of periodontal disease.

As we know, periodontal disease is irreversible with loss of periodontal tissue, rehabilitation should be instated early to prevent tooth loss. Periodontal disease symptoms and general term pyorrhoea can be used to educate the population. Oral health policies should target to address reforms to arrest disease progression. Together as a team we can bring changes and quality of life related to periodontal and oral care.

Therefore, it is evident changes and improvement in periodontal health is required which will reflect good oral health also and the following changes are suggested [43].

(i) Promotion and creating awareness about oral health through various collaborative programmes between government and public organisations or corporate and community or school and community. Dental education and school health programmes can be a great initiative targeting this issue. The oral health programmes have started educational programmes but its implementation at primary levels still needs proper planning and management [44].

(ii) Reducing the usage of tobacco or other carcinogenic materials to fight the oral cancers-awareness among individuals regarding effects of tobacco on oral and systemic health and providing counselling for quitting the habit. Training oral health workers for assessing and early management of tobacco related oral health problems through the national tobacco control programme is essential [45].

(iii) Optimally adjusted concentration of fluoride use in community. Dental fluorosis is a major public health problem in India in which 15 out of 32 states are affected by the burden of dental fluorosis [46]. Providing safe and quality drinking water with maximum allowable limit of fluoride at 4 ppm. Community drinking water sources should be assessed regularly for fluoride levels. Also, school water systems should be checked for optimal fluoride levels [46].

(iv) By making dental care accessible and affordable to the population.

(v) By bringing the proper distribution of the human resources and improved budget allocation for oral health.

(vi) By introducing new oral health policies and the introduction of public-private-partnerships (PPP) models for oral health and finally, unification of oral and medical health utilities [47].

CONCLUSION(S)

Public health includes the process of organising and drawing the focus of various resources from local, national and, international bodies. As India is a diverse country in terms of population, policies, and laws by the government, it is important to develop the concept of public health amongst the community both in terms of general health and oral health which should considerably focus on periodontal health.

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