

Public oral primary preventive measures: An Indian perspective

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Abstract:

India, a developing country where there is a considerable rise in the burden of oral problems like dental caries, periodontal disease and oral cancer which ultimately results in deprived quality of life. This urges the need for implementation of various primary preventive measures at public level under the co-ordinated efforts from various sectors of the country to have a successful program. Hence, the decision makers should encroach upon the various oral primary preventive measures and their applicability in India and also to assess the ongoing program for their future buttress.

Key words: Primary prevention, Oral diseases, Dental health education, Dental health promotion

Introduction:

India is primarily a rural community with 72.2% of its population being the village occupants and the rest 27.8% are residents of urban area ^[1]. In perspective of oral health, most of the Indian populace is affected with the common oral problems like periodontal disease being 90-95% followed by dental caries affecting nearly 60-80% of children, malocclusion about 30% and oral cancer which accounts for almost 30-35% of the total diagnosed cancer cases. However, most of the Indian studies have shown that, greatest burden of all these oral problems is on the disadvantaged and socially marginalized people ^[2].

The reasons for such greater sheer magnitude of oral problems are not known, but these oral problems are known

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for their unique disposition of being progressive in nature leading to lack of remission or termination if left untreated, need for technically demanding, expensive and time consuming professional treatment^[3]. Further, these oral problems are significantly associated with pain, agony, functional and esthetic problems; also loss of working man-hours. These adverse features in a long run will have a substantial amount of negative impact on quality of life at biological, psychological and social levels^[4]. Hence, oral problems are considered to be one of the few categories of diseases emerging as a public health problem in India^[5, 6].

This necessitates for a return to primary health care principle of focus on prevention. Application of various preventive measures could be one of most cost-effective tool in the prevention of oral problems in enhancing the individuals and the community to lead a socially and economically productive life^[7]. However, in India most common approach to combat these oral problems at the population level is of curative in nature which does not appear to be cost-effective as compared to preventive approach^[8]. Where as in developed countries like Scandinavia, there was a considerable decline in the prevalence and severity of dental caries following implementation of preventive strategies at the public level^[9]. Application of preventive approach is further strengthened by the World Health Organization (WHO) where the emphasis was given to prevention in setting global oral health goals for the year 2020^[10].

The term prevention takes its origin from a Latin word "*praevenire*" which denotes to stop something from happening in the field concerned^[11]. When the strategies of prevention are applied to a group of people at an early stage for the benefit of health constitutes public primary prevention. Prevention has been categorized into four levels namely: primordial, primary, secondary and tertiary levels. However, due importance is given to the primary level of prevention where the action taken prior to the onset of the disease so that the disease exists no longer^[12].

Hence, the purpose of the current review is to give an overview of applicability of various primary preventive measures for oral diseases at public/community level in India (Table. 1). This can help in choosing the best possible methods of primary prevention for India and also assists in developing the policies which could enhance the future trends in rising utilization of primary preventive measures.

Public primary prevention of dental caries:

Dental caries is a slowly progressive, irreversible microbial disease of multi-factorial nature affecting the calcified tissues of the teeth, characterized by demineralization of inorganic portion and destruction of organic portion leading to cavity formation. Further, caries is proven to be sugar dependent infectious disease of the teeth. It is the one of the most prevalent chronic oral disease which persists permanently in the form of restoration or tooth loss^[13]. This can be prevented at public level through:

a) Health education and dental caries:

Dental health education should aim at altering the public's perception and their behavior towards decay free dentition. This should provide more emphasis on sugar consumption by advising in reducing the amount and restricting frequency to no more than three times a day. Further, public should be motivated to use of fluoride containing tooth pastes and also should encourage them to use correct method of tooth brushing for effective removal of dental plaque. This education should not only direct the adult population but also school children and parents. Special concern should be given to the mothers on infant dental care and on early child hood caries^[13].

However, Kay EJ, Locker D in their systematic review on dental health education have shown that, health education can have only a small positive, but temporary effect on plaque accumulation; no discernible effect on caries increment and a consistent positive effect on knowledge levels^[14]. Similar limitations are encountered in India too as a result desirable changes in caries trend cannot be achieved only through health education. This can be overcome through periodic reinforcements and

application of effective methods of motivation techniques which can help the public in adopting the healthier practices in the prevention of dental caries.

b) Use of fluorides:

Over fifty years of extensive research in the field of fluorides were carried over throughout the world. Reports have consistently demonstrated the safety and efficacy of optimal fluoride level (1ppm) in preventing dental decay. The scientific basis for the use of fluoride and its safety has been accepted by numerous scientific bodies, expert groups and government agencies ^[15]. Hence, benefits of fluoride can be administered at a public level through various forms like: community water fluoridation, school water fluoridation, salt fluoridation, milk fluoridation, fluoride mouth rinse programs.

Community water fluoridation is a population based method of primary prevention for dental caries. It provides low concentration of fluoride to the teeth over a long period as it circulates through the blood stream and gets incorporated in the developing teeth and bones. After teeth erupts fluoride contacts directly through salivary secretions. Hence, it has both pre-eruptive and post eruptive effects on the teeth. Most of the studies have shown that, community water fluoridation can effectively reduce the caries by 50-65% ^[16]. Further, the efficacy is greatest for the deciduous dentition, with a range of 30-60% less caries in fluoridated communities ^[17]. Taking this into consideration, current estimates of mean DMFT among 12-14 years Indian children of 2.3 will be reduced to nearly 1.1 in the future years if India avails community water fluoridation.

Thus, community water fluoridation is found to be safe, most effective, efficient, economical, environmentally sound, and socially equitable public health measure to prevent dental caries and thus bringing the benefits of fluoride to whole community ^[18, 19]. Truman et al mentioned that fluoridation of drinking water has been the basis for primary caries prevention for more than five decades and has been recognized as one of the ten great achievements in public health ^[20].

Further, Pizzo G et al reported that water fluoridation can be one of the relevant public health measures in poor and disadvantaged populations ^[21].

Despite of its enormous benefits over dental caries, it has got limited applicability in India. This is mainly due to the lack of complete coverage of communal water supply to all the citizens of India. However, implementation of such supply systems requires extensive economic input and the public should be motivated to use only the treated water for drinking and cooking purpose. Further, there is no political eye view in support and establishment of water fluoridation plants in low fluoride zones of India ^[22].

An alternative to community water fluoridation program is school water fluoridation as the major benefits of fluoridation accrue to children whose teeth are in the process of formation. Thus public health agencies of India should seek ways to bring the benefits of water fluoridation to children residing in areas without central water systems. In this program it is recommended to fluoridate water at 4ppm than the optimum level of fluoride, because children remain in school only 4 to 5 hours a day and in a year there are only about 200 working days ^[23, 24]. However, literature reviews have shown that, this method of fluoridation is known to have an approximate of 40 % reduction in caries rates among the school going population ^[25]. According to Jacovone and Lisanti (1960) "Even the small amounts of fluorides consumed at school when no fluorides are ingested at home resulted in a definitely lower caries incidence" ^[23]. Based on the confirmed benefits of school water fluoridation, this can be recommended as one of the best approach for Indian school children.

But, the main drawback is, extra budget which is required for the installation of fluoridation plant in the schools and the recurring expenses, also requirement of trained personnel. Despite of the technical problems encountered in the establishment of this plant, a major obstacle is the number of school going children in India who are still in the stages of up growth which entails the

fact that hardly very few children will be availing the benefits of fluoride. Thus, school water fluoridation has limited applicability in developing countries like India. Moreover, this approach has minimal pre-eruptive benefits on the teeth as compared to community water fluoridation^[8].

Salt fluoridation is of the public measures in the control of caries and it confers a reduction of caries prevalence on a community level similar to that of water fluoridation. This method utilizes a controlled addition of 200-350ppm of fluoride to the domestic salt and has an added advantage of being safe and cheap with easy maintenance^[26]. In India, the salt fluoridation is viable and feasible method of fluoride supplementation as its supply can be banned for endemic belts which require no supplemental fluoride. But, there is no precise control over the program as some people eat more salt and some very less and there are international efforts to reduce sodium intake to control hypertension^[27].

Further, milk was considered as a suitable vehicle for supplementing children's fluoride intake in areas with fluoride deficient water supplies. But, majority of children population living in rural and urban areas of India cannot afford milk daily and there doesn't exist a central milk supply systems in these areas thus restraining the benefits of fluoridated milk in India^[27].

Apart from these, fluoride mouth rinsing program is indicated where water fluoridation is not possible or has not been implemented on daily basis and fortnightly in schools. The practical applicability of fluoride mouth rinses in India is very high as water fluoridation has not been implemented even in areas where piped water supply is available to the population. But, the major draw back for its success is compliance of the patient^[27].

Alternate to the above mentioned other dietary fluoride supplement programs like fluoride tablets, lozenges, oral rinses and mouth washes, drops and fluoride-vitamin preparations, fluoride tooth pastes etc can be supplied to the public at affordable cost. But, India has not modernized in use of fluoride supplements^[27].

c) Dental sealants:

Dental sealants, a thin coating bonded into the pit and fissures of the chewing surface of teeth, are nearly 100 % effective in preventing tooth decay. When properly placed and retained, dental sealants are a highly effective primary preventive measure towards tooth decay by creating a physical barrier between the teeth and decay causing bacteria. Sealants also stop cavities from growing and can prevent the need for expensive fillings^[28].

Moreover, school based sealant programs are most effective means to reduce dental caries but, they are not cost-effective to our Indian situation and its application is urged to be more technique sensitive which demands the requirement of proper isolation without which retention of sealants are questionable. Further, such community based sealant programs requires periodic evaluation to assess the success or failure of the program.

d) Promotion of research:

This helps us to fountain the knowledge on the risk factors related to dental caries, also helps to generate the innovative and the best approaches of primary prevention for caries involving the social networks or communities^[29]. But in India research hold a delicate part as, scientific training, funds, inter-sectorial interaction, confidence, material availability are in a state of meager^[30].

e) Lobby efforts:

There are a lot of industries whose products might be detrimental to oral health and these industries might wield considerable strength. For instance, confectionary industries play a major role in promoting consumption of sugar and sugar containing products. These industries are very powerful and advertise heavily to maintain or increase sales and market share. We should not be surprised at this, since this is what their shareholders expect of them. That does not mean that the health professionals should approve and accept their action. It is very reasonable that the dental profession seeks to minimize advertising and sales of these products to vulnerable people and educate the public the role of sugars in the causation of dental caries^[31]. But in India, there is no as such a strong lobby effort towards the

confectionary industries which necessitates mounting of the lobby efforts against dental caries.

Public primary prevention of periodontal diseases:

Prevalence of periodontal disease in India has been reported close to one-hundred percent and of greater severity as compared to advanced countries [2]. Also, strong correlation between the state of oral hygiene, as determined by the plaque and calculus accumulations has been established. Hence following approaches can be best adopted for Indian scenario:

1. Health education and regular oral prophylaxis:

This should aim at providing dental health education programs, stressing on the plaque control measures with repeated instructions and demonstrations to maintain oral hygiene. According to Chawala TN et al frequent professional scaling and regular tooth brushing are the main public health measures available for preventing and controlling periodontal disease. However, more intensive measures (quarterly prophylaxis) will further improve the periodontal health and lessens the calculus accumulation [32]. Tewari A et al of India recommended that, attempts should be made to increase awareness and utilization of oral hygiene care services through mass education programs. But for many populations it is totally unrealistic economically to propose regular scaling on a population basis. Scarce resources would be the most predominant factor in developing countries like India to better apply these preventive public health services [33].

2. Promotion of research efforts:

While there is adequate information to commence programs for the primary prevention of gum disease in India, but research is needed to better inform policies and strengthen programs. Research must also identify economic and acceptable methods by the public for utilizing the primary preventive dental services. It is also important to focus on the interventional programs towards tobacco control as it is one of the promoting factors for gum diseases. The researches

must also aim at periodically to evaluate the community based programs. Further, efforts should also be made to formulate the dentifrices which are effective in controlling plaque and gingivitis. Still there are immense researches in the microbiological aspect of periodontal disease and results of which have been demonstrated in the availability of various over the counter products. But as mentioned earlier there are problems faced by the research field in India [30].

3. Lobby efforts:

It is the role of dental and other allied members to influence the government and other agencies to initiate the programs against the agents that are detrimental to oral health. Efforts should be made to prohibition of tobacco and its products which are harmful to periodontal health. Hence, there is a need for positive lobby efforts towards tobacco cessation and other agents which are detrimental to periodontal health [34].

4. Provision of oral hygiene aids:

Oral hygiene aids are the tools used in the mouth to remove food residue and plaque, a bacterial film that causes dental caries, periodontal disease, and halitosis. Toothbrush, dental floss and mouth rinse containing fluoride are the primary oral hygiene aids for this process. Hence, programs at public level should target the populations at high risk for gum diseases who cannot maintain or prevent these such as handicapped, medically compromised, people of poor socio-economic status, remote communities, also school children, should be provided with the necessary oral hygiene aids [35].

This requires timely funding and supply of oral hygiene products through co-ordinated efforts from the government and non-government agencies. It also requires training of staff in the form of a comprehensive, practically oriented program addressing areas such as oral diseases, oral screening assessment and hands-on demonstration of oral hygiene techniques and the way to use these oral hygiene aids will have a positive impact in the prevention and maintenance of gingival health [35].

India, poses a major limitation for program as, there is no extensive data related to oral hygiene

needs of the population in India; programs that are implemented are not successful due to lack of adequate and timely funding also, due to no long term co-ordinated efforts by the government and non-government agencies^[32].

5. Supervised school tooth brushing programs:

For some children daily tooth brushing in the class room may be needed and desirable as well. School teacher can play a vital role in correct brushing method in class room. Other than preschool teachers, very few school teachers are willing to incorporate daily tooth brushing in their class room schedule. There is a need for hygienic storage and continued replacement of worn out and lost brushes, and this might pose problems for a teacher. Unless replacement of the tooth brushes are made available to the children without cost and also providing facility like water supply and sinks, daily tooth brushing schedule as a class room activity cannot be accomplished^[36].

Public primary prevention of oral cancer:

The term *oral cancer* is used to describe any malignancy or neoplasm that arises from oral tissues. It is considered to be one of the ten leading cancers in the world and in India; it is the one of the common cancers and has come into view as an important public health problem^[37].

Primary prevention has been estimated to be the most cost-effective method of preventing oral cancer^[38]. Preceding studies have shown poor public awareness of oral cancer. Up to three-quarters of oral cancer could be prevented by avoiding environmental factor, notably the consumption of tobacco and excess alcohol^[39]. At a public level, educational, regulatory or service approaches are deemed to benefit the individuals to be off from oral cancers. Health education should be imparted to masses with the help of various communication media like television, radio, newspapers, films, posters, folk dramas and lecture demonstration series^[12]. It should include the following: a) show the debilitating effects of the disease b) explain the sequel of the advanced oral cancer c) assure the public regarding the curability of the disease if detected earlier d) demonstrate the techniques for early/self detection and diagnosis by

the patient and the dentist^[40]. Nevertheless this is the most cost-effective method for Indian scenario, but due to lack of definite approach desirable changes are not in a streamline.

In regulatory approach, the ruling government promulgates acts in the interest of public, designed to challenge unhealthy behavior. Government of India has introduced many acts, laws and policies towards tobacco use like The Cigarette Act of 1975, banning of smoking in public places, ban of guthka and likewise many more were operated in different states of India^[41]. However, not all the regulatory approaches are successful because they are not target towards the behavioral changes and cause of disease cannot be eliminated by legislation. Thus universally this approach has no thoughtful control over the population^[12].

Service approach which mainly includes screening and early detection of high risk groups for oral cancer, precancerous lesions or conditions and established lesions. Thus, detection of oral cancer in its earliest stage assumes its prime importance with an improved quality of life. In India with the exception of the Kerala study, no controlled trials have been under taken recently to demonstrate the effect of oral cancer screening on mortality or on interim outcomes^[12].

Public primary prevention of malocclusion:

Malocclusion is not a disease in the way that dental caries and periodontitis are, it is more a reflection of the natural variation that occurs in the biological system. True prevention of malocclusion is difficult to envisage, as there is strong genetic component in the make up of most malocclusions. Preventive measures may be effective in dealing with environmental factors, but are unlikely to influence the outcome in cases where genetic background is one of the more important determining factor. However, only a way to approach this at public level is through health education programs concerning both the parent and the patient. Results of the health education program will be effective when they are aided with models, charts, etc^[8].

Public primary prevention of dental trauma:

Dental trauma is regarded as one of the most traumatic experiences one may have to encounter in his childhood days. The repercussion can be many ranging from distorted esthetics, compromised function (mastication, speech), and of course not to forget the pain and the trauma it leaves behind on the face of the child. Children, more so, boys during the growing period are more prone for such injuries due to number of causes including accidental falls, automobile accidents, blow during fights, contact sports activities etc^[42]. Because of the multi-factorial etiology it is what makes it difficult to implement proper preventive measures. Perhaps a multipronged approach has to be used to prevent these injuries by providing safe play ground surface, mouth guards and regulatory approach^[43]. Because not all the mouth guards are cost effective for Indian sport men, thus their use is imperfect apart from its benefit. Further most of the public are not aware about the mouth guards and their role in prevention of dental trauma.

Regulatory approach formulated by government of India like safety traffic rules, compulsory use of seat belts, helmets for prevention of oro-facial trauma. But, not all the people are following these approaches may be due to higher levels of negligence, leading to increased levels of morbidity of oro-facial structures.

Public primary prevention of dental fluorosis:

Dental fluorosis is a specific disturbance of tooth formation caused by excessive fluoride intake. Major cause of dental fluorosis is consumption of water, containing high levels of fluoride, by infants and children during the first 6 years of life. Although both primary and permanent dentition is affected, tends to be greater in permanent teeth^[44]. Moreover, dental fluorosis is an endemic disease in geographic areas where the content of fluoride ion in drinking water exceeds 2ppm.

India is one among the 23 nations around the globe where health problems have been reported due to excessive fluoride in drinking water. An estimated 62 million people in India in 17 out of 28 states are affected with dental, skeletal

and/or non-skeletal fluorosis. At a public level this can be prevented by following approaches: using alternate water sources, improving the nutritional status of population at risk and using different defluoridation techniques such as Nalgonda method^[44]. However, removal of excessive fluoride from drinking water is difficult and expensive. The preferred option is to find a supply of safe drinking water with safe fluoride levels. Further, health education regarding appropriate use of fluorides and mothers in affected areas should be encouraged to breastfeed since breast milk is usually low in fluoride^[45]. In India, central and local authoring body should take due responsibility in choosing the appropriate methods for prevention of dental fluorosis.

Public primary prevention of oro-facial disorders:

Most common congenital disorders of oro-facial region which are obvious at birth are cleft lip and plate. They can be prevented to a limited range at community level by encouraging the pregnant women for prenatal diagnosis (alpha fetoprotein, ultrasound, amniocentesis, chorionic villi sampling), discouraging further reproduction after birth of a malformed child, avoidance of consanguineous marriages, identification and removal of teratogens. Further, physicians and health care workers should educate the mothers about the role of healthy diet including the importance of folic acid in the prevention of facial clefts^[46]. But in India, malnutrition, infectious diseases during child bearing age being one of the major public health problems, further illiteracy and poor socio-economic conditions play a dramatic role in the developmental defects. Moreover, most of the mothers are unaware of the causes for birth defects and their prevention.

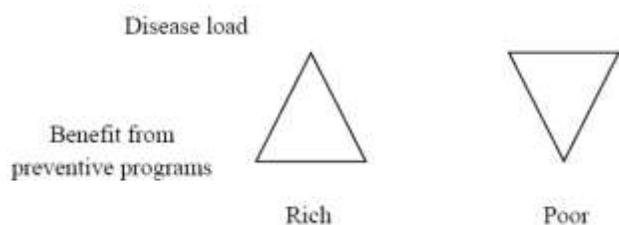
Inverse Care Law:

The Inverse care law is the principle which states that, availability of good medical or social care tends to vary inversely with the need of the population served. This was proposed by Julian Tudor Hart in 1971^[47]. A similar comparison of

Table No. 1: An over view of the oral primary preventive measures at public/community level.

	Health promotion	Specific protection
Dental caries	1. Oral health education program 2. Promotion of research efforts 3. Lobby efforts	1. Community or school water fluoridation 2. School water mouth rinse program
Periodontal disease	1. Dental health education program 2. Promotion of research efforts 3. Lobby efforts 4. Provision of oral hygiene	Supervised school brushing program
Oral cancer	1. Dental health education program 2. Promotion of research efforts 3. Lobby efforts	Avoidance of known irritants
Oro-facial defects, malocclusion and trauma	1. Dental health education program 2. Promotion of protective care	1. Prenatal care 2. Mouth guard program 3. Safety of children toys.
Dental fluorosis	1. Dental Health education program	Defluoridation of water

inverse care law can be made with preventive approach and rich and poor categories of Indian population.



Likewise, there exists a difference in the applicability of various public oral primary preventive measures in developed and developing nations and the oral health. For example, in developing countries like India, Pakistan, Sri Lanka, Bangladesh, Indonesia, African countries etc, where there is an economic transition, there is a rising trend of oral problems especially dental caries^[48]. Whereas in industrialized/ developed countries like United States, Republic of Ireland, Great Britain, there is a decline in caries nearly by 40% in the past 10 years^[49]. This is mainly attributed to the widespread availability and use of fluoride supplements like fluoride tooth paste. But in developing countries, it is difficult to afford a tooth paste and in particular fluoridated tooth

paste^[50]. Current details demonstrated that, implementation of Affordable Fluoridated tooth paste (AFT) in developing countries can be one of the best caries preventive measure^[51]. Further certain developed countries like in Finland, the application of pit and fissure sealants at free of cost to their public is one of the ongoing public health program under the public sector^[52]. This compels that, in developing nations the applicability of any public oral primary preventive measure with up hilling costs are not feasible. Further in these nations, the application of field-based self-reliance programs with maximum community participation and integration of oral health care delivery system with prevention and health education as priorities in the existing primary health care approach can be one of valuable aid for public oral primary preventive measures.

Thus, the applicability of the public oral primary preventive measures vary from developed and developing countries with regard to the cost of implementation, man power and the allied requirements, importance given for oral health by the nation, socio-economic status of the population, affordability, accessibility and acceptability of these services.

Recommendations for successful public oral primary preventive program:

1. India, a culturally diverse country which necessitate the development of oral primary preventive strategy towards “culture free” concept without which no preventive measures can be sustainable for a long term.
2. A major hurdle in the success of utilization of any preventive program is lack of public sensitization. Hence, before the start of any preventive program public should be positively “sensitized” regarding the benefits and feasibility of the preventive program lacking which none of the preventive program will be successful. This can be achieved through mass media or by neighborhood communication.
3. At times it is required to demonstrate the “dual entity” which represents at one end a successful individual (positive) who have availed the oral primary preventive service and leading a productive life as compared to the other end who is burdened with oral problems (negative). Thus, periodic reinforcements of such cases can further aid in improved sensitization of the public and promote the operation of primary prevention.
4. Any preventive program requires continuous scrutiny of all those factors which describes the need for its improvement or to find out the alternative modes for its success and also to know the reasons for its failure.
5. Appropriate planning of the preventive program which should probe into the matters of choosing pertinent primary preventive methods, taking into consideration of money, materials and manpower for the program implementation.
6. Further, it is recommended to incorporate the oral primary preventive as a “Best Fit into School” as a regular activity. This ensures the long term carry on effect of preventive behavior in the individual’s life.
7. Public sector should recognize oral problems as on of the emerging public health problems in India. This should be followed by separate

budget allocation for oral health which is currently zilch.

Conclusions:

In India, regardless of hoist number of limitations, barriers and challenges to applicability of various oral primary preventive measures at public level, still the goal of zero oral problems can be achieved only if there is community and professional’s participation along with the positive political will. Further, no single method of primary prevention can eradicate the oral problems which implies for permutation of various preventive measures to achieve the targeted goals for oral health.

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