

Oral health care system analysis: A case study from India

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ABSTRACT

Objectives: The health system of Kerala, India has won many accolades in having health indicators comparable to developed countries. But oral health has not received its due importance at the policy level. With the burden of oral diseases on the rise in the state, a critical introspection of the existing system is warranted. The objective of this review was to assess the oral health care system in Kerala to provide policy solutions. **Methods:** This study adopted a mixed methodological approach that gathered information from the primary and secondary sources, which included health facility surveys, key informant interviews, review of published literature, and websites of governmental and non-governmental bodies. The WHO framework of health system building blocks was adapted for the assessment. **Results:** A review of epidemiological studies conducted in Kerala suggests that the prevalence of oral diseases is high with the prevalence of dental caries at the age of 12 years ranging from 37-69%. The state has a dentist population ratio of 1:2200 which is well within the prescribed ratio by WHO (1:7500). Only 2% of dentists in Kerala work with government sector catering to 0.6 million of the approximately 33.4 million population. This point to the absence of oral care in first contact levels like primary health centers. Service delivery is chiefly through the private sector and payment for dental care is predominantly through out-of-pocket expenditure. **Conclusion:** Despite having the best health indicators, the oral health system of Kerala is deficient in many aspects. Reorientation of oral health services is required to combat the burden of diseases.

Keywords: Equity, health systems, oral health

Introduction

Common oral diseases like dental caries, periodontal disease, and oral cancer satisfy the criteria for being considered as a public health problem.^[1-7] Evidence suggests that oral diseases share common risk factors with many other chronic diseases/conditions such as cardiovascular diseases, diabetes, obesity, transient ischemic attacks, etc.^[8-10] The burden of oral diseases is high in both developed and developing nations.^[11] There has

been a steady increase in the burden of oral diseases in India since the last two decades^[12] despite the country producing the highest number of dental graduates per annum. This contrasting observations point a need to evaluate the existing system for its preparedness and ability to combat the rising burden of diseases.

Indian healthcare is organized into a three-tier system catering to primary, secondary, and tertiary levels of care.^[13] In the majority of countries across the world including India, the oral health care system has essentially been a sub-specialty of medicine rather than a unique or separate entity.^[14]

Kerala is a relatively small state situated in the south-western part of peninsular India and constitutes 2.7% of the national

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population. This state is hailed for having one of the best indicators of health, which are often compared to the developed nations globally.^[15] According to the National Census 2011 statistics, the state has the lowest infant and maternal mortality rates. Sex ratio and literacy levels are the highest making it the state with the best Human Development Index. The 'Kerala model of health' has been synonymous with low cost and universal accessibility and availability of health care to all sections of the society.^[16] Despite the best vital health indicators, there has been an increase in the burden of non-communicable and lifestyle diseases.^[17,18] The burden of oral diseases is also on the rise and with oral health being an issue of 'international neglect' by policymakers,^[19] the capacity of the existing health system to overcome these challenges is uncertain.

The issue of political neglect is reflected in fewer number primary healthcare centers offering oral care coupled with the unregulated and highly skewed growth of the private sector into medical and dental care. It is an irony that while 80% of the dentists work in urban areas, around 70% of the Indian population lives in rural areas^[20] making health care a commodity that follows an inverse square law.

To improve the system and bring about a policy change, a systematic analysis of the existing oral health system is necessary. A strong health system ensures that people and institutions, both public and private, effectively undertake core functions to improve health outcomes^[21] and is built on several key attributes outlined by Tomar and Cohen.^[22]

The objective of this review was to assess the oral healthcare system of Kerala with regard to the World Health Organization's core indicators to assess health systems and identify potential strengths, weaknesses, opportunities, and threats.

Methodology

This study adopted a mixed methodological approach wherein data were obtained from various primary and secondary sources. To ensure comprehensiveness, the gray literature sources were solicited from newspaper reports, unpublished university-accepted dissertations, and websites of organizations related to oral care delivery.

The tool for oral health system assessment was based on the WHO's method on "Framework for action" on health systems, which describes six 'Health System Building Blocks' (*viz. service delivery, health workforce, health information systems, access to essential medicines, health financing, and leadership and governance*) that together constitute a complete system [Figure 1].^[23,24] The indicators used for assessing each building block were customized to adapt to the needs of oral health care assessment. Secondary sources included epidemiological studies conducted on oral diseases (dental caries, periodontal disease, malocclusion, dental fluorosis, and oral cancer) in Kerala retrieved from MedLine and Google Scholar database, data from National Oral Health Survey and Fluoride Mapping (2002-03), and official websites of Ministry of Health

and Family Welfare, Government of India, Directorate of Health Services and Medical Education, Government of Kerala, Dental Council of India and Indian Medical Association, Kerala State.

Primary data involved collection of information referring to the objectives of the study by undertaking healthcare facility survey of a representative sample of public sector institutes offering oral care, survey of a sub-sample of pharmacies in the state, Key Informant Interviews (KII) with dentists employed in these centers and office bearers of professional associations related to oral care in Kerala for obtaining secondary data and by means of Right To Information Act (RTI) from the central and state governments.

Oral health system assessment tool

The customized WHO health system assessment tool utilized the indicators given in Table 1 for analyzing the six building blocks of oral health systems.^[24] *Access to essential medicines* was assessed using an essential drug list incorporating the first-line drug constituted for common dental conditions like aphthous ulcer, dental pain/inflammation, dental infections, dental decay, and dental hypersensitivity. The indicators used were the availability and median price for one unit of the lowest-priced equivalent drug available in the pharmacy. The median price was calculated from the reference prices obtained from the international drug price indicator guide.^[25]

Healthcare Facility survey was undertaken to get secondary data regarding the delivery of oral care across the state. With prior official sanction, a sample of nine centers offering dental care in public and private sector (one primary health center, community health center, taluk (sub-district) hospital, district hospital, general hospital, and four private dental clinics) were surveyed for assessing various aspects of oral care delivery (manpower, infrastructure, patient attendance, treatments done, cost of treatment, prevention-related activities). The assessment was done in the form of KIIs using semi-structured interview guides for collecting data from their records. The key informants were the dentists working in these health centers.

Oral health outcomes

The oral health status, expressed in terms of the prevalence of oral diseases (dental caries, periodontal diseases, malocclusion, oral cancer, and dental fluorosis) was obtained through population-based oral health studies conducted in the state for the past 25 years in Kerala (1990-2015). The combined prevalence was calculated according to WHO index age groups (5, 12, 15, 35-44, and 65-74) for oral diseases where sufficient data were available.

Dental education

An appraisal of the dental education system in the state was done using desk review. Information was obtained on the number and annual intake of colleges offering undergraduate, postgraduate, and allied courses in dentistry. Data for the same were obtained from the Dental Council of India website.



Figure 1: Building blocks of health systems

Strengths, weaknesses, opportunities, and threats (SWOT) analysis

A SWOT analysis was carried out based on the obtained information after deliberations among the authors.

Results

Kerala is divided into 14 districts having a total population of 33,406,061^[26] and a population density of 860/sq.km. The state contributes 3.78% of the national gross domestic product.^[27] Agriculture and related industries form the major occupation of the people of this state.

Health system in Kerala

The state has a three-tier-system of health care—the Primary Health Centers (PHC), Community Health care Center (CHC), Taluk and District hospital and Medical Colleges evenly distributed in the rural and urban areas. Apart from this, there is an extensive network of medical care institutions practicing homeopathy and Ayurveda in government, voluntary, and private sectors.^[16] One of the characteristics of the private medical sector in Kerala is that it is comprehensive in nature and there has also been substantial growth in institutions that cater to traditional medical systems like Ayurveda.^[28] Each sub-center caters to around 6000 people, one PHC to 40,000 people, one CHC to 1,45,000 people, and 1 taluk hospital to 4,22,000 people. This almost adheres to the recommended structure proposed by the Govt. of India^[29-31] and can be well established that the government has well been able to reach out to the population in terms of the availability of healthcare institutes. This achievement is significant compared to the scenario that exists in other states of the country.^[32]

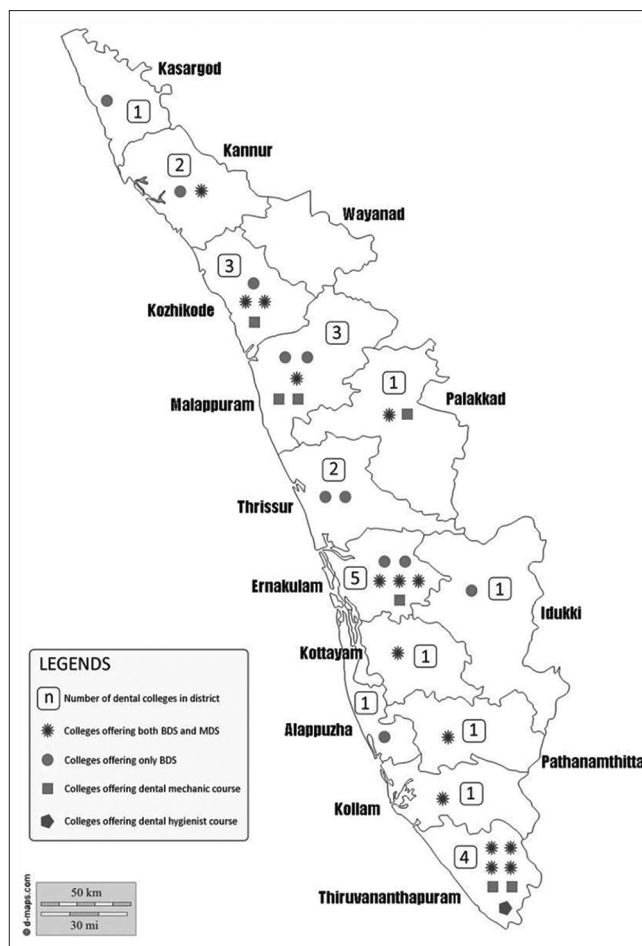


Figure 2: Overview of dental education in Kerala

The delivery of oral care in Kerala is basically through institutions administratively headed by Directorate of Health Services (public sector hospitals), Directorate of Medical Education (government dental colleges), and private sector (self-funded dental colleges and private hospitals and clinics).

Oral health system assessment

The summary of indicators used to assess the six building blocks and its results are described in Table 1.

Dental education

In Kerala, dental education in the government sector is managed by the Directorate of Medical Education, which works under the Department of Health and Family Welfare. The state has five government and 21 private dental schools with a combined output of 2100 graduates and postgraduates [Figure 2]. Dental hygienist certificate and dental mechanic certificate courses were the allied and supplementary dental courses offered in one and seven dental schools, respectively.

Oral health outcomes

The burden of common oral diseases estimated from various population-based studies is summarized in Table 2.

Table 1: Summary of key oral health system assessment indicators of Kerala

Sl. No.	Indicators	Figures
Service delivery indicators		
1	Number of government sector hospitals offering dental care	112
2	Number of government hospitals for 1 lakh population	0.3
3	Number of private clinics per 1 lakh population	4.9
4	Predominant service delivery method	Private
Oral health workforce indicators		
5	Number of dentists working in government sector (DHS and DME)	286
6	Proportion of dentists working in government sector	2%
7	Number of dentists registered with Kerala Dental Council (Dec 2015)	15183
8	Number of dentists registered with Indian Dental Association (Kerala)	4209
9	Number of dentists per 1 lakh population	4.54
10	Dentist population ratio	1:2200
11	Number of dental colleges	Government Private
		5 21
12	Number of BDS seats per year	1880
13	Number of MDS seats per year	201
14	Annual number of dental graduates per 1 lakh population	6.22
15	Number of dental hygienists	509
16	Number of dental mechanics	743
17	Hygienist to dentist ratio	0.03
18	Technician to dentist ratio	0.05
Access to essential medicines		
19	Average availability of essential medicines for dentistry in pharmacies	60%
	Median consumer price ratio	3.26
Health financing indicators		
20	GDP spent on health care (India)	1.04 (2011)
21	Oral health expenditure as a percentage of total health expenditure	NA
22	Predominant mode of payment for dental services	OOP
23	Coverage for dental procedures in state government schemes	Nil
Health information system indicator		
24	Health Information System (Reporting of dental procedures through HMIS)	Present

Discussion

Globally, oral health has not been accorded a priority in the healthcare system.^[19] In India, the majority of health programs are designed to focus on control of infectious diseases and improving reproductive and child health. It does not provide resilience to deal with other newer epidemics like non-communicable diseases, mental health, oral health etc., Oral health, probably due to its low mortality levels, has failed to gather enough attention among policymakers.^[33] Except for a few isolated epidemiological studies, reliable data in oral disease burden is still deficient. Moreover, studies on the oral health system, considered as a social institution by itself, are lacking. Vital health indicators of the state are at par

with many of the developed countries across the world facilitating worthy comparisons.^[15]

The strengths of this study lie in its comprehensiveness of data achieved by the process of data triangulation wherein information was collected from multiple sources including the RTI Act. To observe the functioning of public sector institutes offering dental care, primary data were collected through a health facility survey, which added more credibility to the findings. A SWOT analysis summarized the oral health care system in Kerala [Table 3].

Service delivery

Though public sector institutes (government hospital and dental teaching institutions) are offering affordable oral care services in Kerala, the lack of dental care at primary levels of care (PHC) is denying the people an opportunity to avail dental care. This translates to a situation where people are forced to consult a general health practitioner or private oral healthcare facility to meet their dental needs causing an escalation in treatment costs. A situation is akin to other developing countries like Nigeria where the private sector predominates over the public sector and services are directed towards the provision of curative and rehabilitative care.^[34] This is in contrast to countries like United Kingdom, which offers all types of oral care through the National Health System to all its citizens.^[35] Oral care in public sector (56.4%) is also well established in Malaysia.^[34] With Kerala having a well-organized network of public sector hospitals both in number and distribution, integrating oral health into these services is only a matter of political will.

The contribution of the private sector in health care in India has been phenomenal considering its growth from 8% during independence (1947) to 80% in 2012. Though health care in the private sector has also grown substantially in Kerala, its coverage (63%) has been below the national average.^[36] However, in contrast, 98% of dental care is offered by the private sector and the services in the public sector are virtually non-existent (2%). The demand for superior quality of services has increased in private care whereas economic considerations seem to be the major reason for choosing government services.^[37] But, these centers have focused their attention on providing secondary and tertiary oral care services limiting the beneficiaries to a minority who can afford the high treatment costs. Contrary to other disease conditions, the presence of civil societies in facilitating oral care has been minimal.

Thus, it can be summarized that the basic foundations of equitable health care; viz. accessibility and affordability are challenged in the oral healthcare system of the state.

Workforce

The precise estimation of the total number of professionally active oral healthcare workforce in any country is an onerous task. The data from the central registries like the Dental Council of

India (licentiate to practice) is not an accurate predictor of the active oral health workforce due to the lack of real-time monitoring of the practitioners. Kerala's dentist population ratio (DPR) is 1:2200, which is higher than the national average (India) of 1:10,000^[38] and recommended ratio by WHO (1:7500).^[39] This figure could be an overestimation due to the effects of cross-cutting problems like migration, retirement, voluntary withdrawal from service, multiple job holdings, absenteeism, and ghost workers.^[40] Contrary to China, which has an annual reporting system of health workers in both public and private sectors, India's database is largely deficient.^[41] The largest professional non-governmental body for oral health (Indian Dental Association, Kerala state) reports an active workforce of 4209 as of 2015. Only 2% of the dentists work in the public sector, which is very low compared to countries like South Africa and Denmark (20%).^[42,43] The figures are comparable with Belgium where less than 5% of dentists work in public sector but with compulsory social insurance for all its citizens, dental care is more affordable. A comparison of oral health indicators of Kerala with few developed and developing countries around the globe is given in Table 4.

Health information systems

The absence of a surveillance system for oral diseases is probably due to its perceived low mortality levels. While oral cancer surveillance is done through hospital and population-based cancer registries, other oral diseases have not been deemed

notifiable making estimation of its burden difficult. However, district-wise website-based reporting of number of dental treatments carried out in government sector hospitals gives a fair indication of the health-seeking behavior of the people.

Access to essential medicines

The Millennium Development Goals mention access to essential medicines as one of its indicators [MDG 8, Target 17].^[44] This study undertook a survey of a sub-sample of pharmacies using an essential medicine list for dentistry developed by the authors. The average availability of essential medicines was 60% in the pharmacies whereas the median consumer price ratio was 3.26. Such a list was being used for the first time in the assessment of health systems due to which comparisons were not possible. Provision of essential antibiotics and analgesics was free of cost in pharmacies attached to public sector hospitals making oral care affordable to its beneficiaries.

Health financing

India spends less than 2% of its gross domestic product (GDP) on healthcare. Data were unavailable for the share of oral health from the total healthcare expenditure. Developed countries like the United States of America, the United Kingdom, and France spend close to 4% of their total expenditure on oral health whereas developing countries like Brazil and Malaysia spend less than 1% of their health budget on oral health. The absence of any organized program for oral health in Kerala also limits the budget allocated to oral activities. Though the National Oral Health Care Program has been piloted in various states since 1999 across the country including Kerala, information on fund allocation for the same is not available. Without adequate funding, access to effective healthcare cannot be ensured.

In the context of payment for dental services, it was observed in the present study that the cost of dental care in a private health facility is almost 40 times the cost in the public health sector. The major mode of payment is the traditional out-of-pocket/

Table 2: Summary of burden of oral diseases in Kerala

Condition	Category	Prevalence
Dental caries	12 years	37-69% (combined prevalence-40%)
Periodontal disease	35-44 years	65.3-78.6%
Malocclusion	15 years	53.3-80.4%
Oral cancer	Males	16.4-21.6
(Incidence/1 lakh population)	Females	6.4-9.1
Dental fluorosis	Endemic areas	35-39%
	Other areas	< 5%

Table 3: SWOT analysis

STRENGTHS	WEAKNESS
Organized healthcare system	Absence of oral care in grass-root levels (sub-center, PHC)
Mention of oral health in state's health policy	Limited government hospitals offering oral care (approximately 8%)
Affordable oral care in PSU's	Meager financial allocation for oral health activities
Essential medicines provided free of cost in PSU's	No government sponsored oral health programs
Approx. 15,000 registered dentists	Uneven distribution of dentists and private dental facilities and high costs
25 dental teaching institution with an output of 2000 dentists/year	Low perceived need for oral care
Healthy DPR-1:2200	
THREATS	OPPORTUNITIES
Low priority of oral health in health system	Appointing a dentist in every PHC-effective use of large manpower
Rising burden of oral diseases	Planning a comprehensive school oral health program
Lack of political will to employ dentists in primary levels of care	Training allied workforce
Poor knowledge and attitudes of oral health among public	Introduction of public dental health insurance
Absence of an Oral Health Policy at national level	Effective utilization of dental teaching institutions as centers for oral health promotion
Lack of vertical oral health programs	Enhancing community participation

fee-for-service. Only treatments requiring hospitalization are insured by private firms.

Leadership and governance

There is no oral health policy at the state or national level. Isolated attempts have been made in introducing the same but no substantial progress has been made. A mention of oral health has been made in the draft of the state's health policy 2013 but implementation is far from adequate.^[45] Under the National Health Mission, there has been financial allocation for National Oral Health Program in several states.^[46] The details of the Kerala state were not available on request. Ayushman Bharat, India's flagship and world's biggest health reform, aims to provide families in India with an annual insurance cover of INR 500,000 for covering secondary and tertiary care in empanelled public and private hospitals.^[47] The silver lining, however, is that oral health does find a mention in the list of services/packages provided under this scheme. Yet, the lack of protection for outpatient services or expenditure for medicines would negatively impact oral health services, most frequently outpatient care.^[48]

Social service and cause-oriented organizations have an important role to play in the healthcare delivery system of India. Few non-governmental organizations have been associated with oral care in India. These 'third sector' organizations usually share distinct characteristics; they possess an internal administrative structure, are structurally separate from the government, and are not profit-oriented.^[49] But most of these voluntary organizations work for restoring oral health with limited importance for preventive care.

With a theoretically healthy dentist population ratio but still having accessibility and affordability issues coupled with the threat of unemployment looming large for fresh graduates, this paper calls for the creation of dental posts in the wide network of public healthcare establishments offering primary care (primary health centers and community health centers).

Mostafa *et al.* in their paper discuss that oral health policy issues need to be analyzed more comprehensively and recommend

researchers undertaking oral health system analysis among others to answer policy-learning questions.^[50] Likewise, authors of this study propose the need to develop validated indicators for the assessment of oral health system to facilitate effective comparison between other states and countries. The findings of this research could be useful in providing baseline data to appraise policymakers regarding ramifications of poor oral health of people and also provide directions for future research on oral health systems.

Conclusion

Kerala has matched international standards in most of the health indicators. However, as far as oral health is concerned, this state has a long way to go with regard to oral health literacy, provision, access, and utilization of oral care. As per the existing data available, it is evident that the presence of dentists in government-run healthcare establishments is largely inadequate. Hence, the first effective point of contact for oral health in the state becomes secondary and tertiary care hospitals rather than the primary health care facility. The lack of oral care in public sector hospitals has paved the way for the expansion of a highly skewed and unregulated private oral care compromising on equity issues like accessibility and affordability.

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Author contribution

1. Chandrashekar Janakiram: Concept, design, definition of intellectual content, data analysis, manuscript editing, manuscript review
2. R. Venkitachalam: design of study, definition of intellectual content, literature search, data acquisition, data analysis, manuscript preparation, manuscript review
3. Joe Joseph: design of study, definition of intellectual content, data acquisition, manuscript editing, manuscript review

Table 4: Comparison of oral health systems of various countries across the world

Name of country	DPR (per 10000 popln)	TOHCE as a % of THCE	Prevalence of caries at age 12	Finance	Coverage	Predominant service delivery
United States of America	6	4	59.1	PI	PI	Pri
United Kingdom	5	4.1	33.4	OOP	PUI	Pub
France	6.7	4.6	-	OOP	PUI	Pri
Canada	5.9	7.4	38.7	OOP	PI	Pri
Belgium	8	0.3	-	PUI	PUI	Pri
Denmark	8	0.19	-	PUI	PI	Pri
South Africa	0.8	-	-	OOP	PUI	Pri
Nigeria	0.2	0.61	30	OOP	PUI	Pri
Brazil	11.4	1.8	-	OOP	PUI	Pri
China	1	0.3	-	OOP	PUI	Pub
Malaysia	1.9	0.2	90.3	OOP	PUI	Pri
Kerala	4.5	-	40	OOP	NC	Pri

PI-private insurance; PUI-public insurance; OOP-out-of-pocket; Pri-Private sector; Pub-Public sector; NC-No coverage. TOHCE: Total Oral Health Care Expenditure

- Krishnakumar K: design of study, definition of intellectual content, data acquisition, data analysis, manuscript review

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Conflicts of interest

There are no conflicts of interest.

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