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Review Article

Oral Health Status of Prisoners in India: A Systematic Review

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Abstract: Poor oral health can be a precursor to serious diseases including oral cavity and oral cancers. However, oral health assessments and screenings are largely neglected in vulnerable populations, such as prisoners in developing countries. Little efforts have been made to address this public health problem. The purpose of this systematic review is to provide an overview of oral health status of prisoners in India. Following PRISMA-P (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols), 13 studies were selected that assessed the oral health status of prisoners in India and were published in English between January 2010 and May 2016. The review indicated that prisoners have a high prevalence of dental caries, missing teeth and filled teeth score ranging from 2.7 to 5.7, poor periodontal status (60-90%), and high prevalence of oro-mucosal lesions (as high as 60%). The poor standards of past oral care and virtual absence of oral health care facility necessitates policy amendments to improve the oral health of prisoners. It is important to not only assess and treat the diagnosed oral diseases but also to develop preventative measures for this relatively isolated and vulnerable population. This is the first systematic review to assess oral health among prisoners in India. This study will encourage policy makers to develop appropriate preventative and treatment programs for oral health of the prisoners.
Keywords: Oral health, oral hygiene, prison, prisoners, India, public health.

INTRODUCTION

Prisoners in India face serious public health challenges, especially poor oral health [1]. Most of the prisoners come from disadvantaged backgrounds and have many unmet oral health needs [2, 3]. Several studies have reported precarious oral health status of prison populations in India, including high prevalence of dental caries, oro-mucosal lesions, precancerous lesions, poor periodontal status, dental fluorosis, and missing teeth [1, 4-6]. The prison population in India exceeds 400,000, housed in 1,387 prisons spread across the country. More than 14% of prisons are either overcrowded or at maximum capacity [7].

Despite carrying a higher burden of disease compared to general population, prisoners have very limited access to healthcare services [8]. Prevention and treatment of oral health in the prison system is daunting due to a variety of reasons. First, prisons are mostly understaffed for general healthcare and seldom have dental services [9, 10]. As a result, prisoners report a disproportionately high prevalence of oral diseases [1]. Second, the availability of alcohol, illegal drugs, and tobacco products, including cigarette smoking in the prisons worsen inmates' oral health [1]. Third, dental health practitioners prefer not to work in prisons due to low remuneration, safety concerns, and lack of dental equipment and materials [11, 12].

Addressing early symptoms of oral diseases can prevent expensive treatment procedures and limit more devastating prognosis such as oral cancer in future [13]. Usually, only serious oral health issues are addressed among prisoners by referring them to nearby government or private dental colleges where dental students handle these cases as charity and/or dentists who are in training. This systematic review aims to provide an overview of oral health status among prisoners in India and to discuss its public health significance. This paper will inform policy makers the need for oral health prevention and treatment of the prison population and urgency of allocating appropriate resources to address this public health issue in the prison system.

METHODOLOGY

This research was guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses Protocols (PRISMA-P) [14]. In this systematic review, we included studies that assessed the oral health status of prisoners in India and were published in English between January 2010 and May 2016. The review involved a systematic search of the

six journal indexing databases: CINAHL, PUBMED, MEDLINE, SCOPUS, PSYCINFO, and Web of Science. Each database was searched for relevant articles using the following key terms: (Oral health OR Dental health) AND (Prison OR Jail OR Correction OR incarceration) AND India.

The initial search of the six databases resulted in 329 references which were then, pooled into a spreadsheet to identify duplicates (Diagram 1). This resulted in 34 duplicate records and 295 references were further reviewed to determine their relevance to this systematic review. Articles were reviewed by two reviewers (both part of the authorship team) to ensure that they met the inclusion criteria of examining oral health status among prisoners in India. Five additional articles were found during cross-referencing the articles. If there was a discrepancy at any of the article selection, two of the co-authors discussed the reasons for discrepancies and reached a consensus. In case the two primary reviewers did not agree on an article's eligibility, a third co-author was consulted to undertake a full review of the article and to help decide to include the study in the review or not. At the end, reviewers identified 13 articles relevant to the topic of interest. Diagram 1 illustrates the flowchart of literature search process of how the final 13 studies were selected for this systematic review. The reviewers read these 13 articles carefully and compiled the results in a tabular format. The following information was extracted for final presentation in Table 1: authors, year of study, geographical location, study population, assessment measure, and findings.

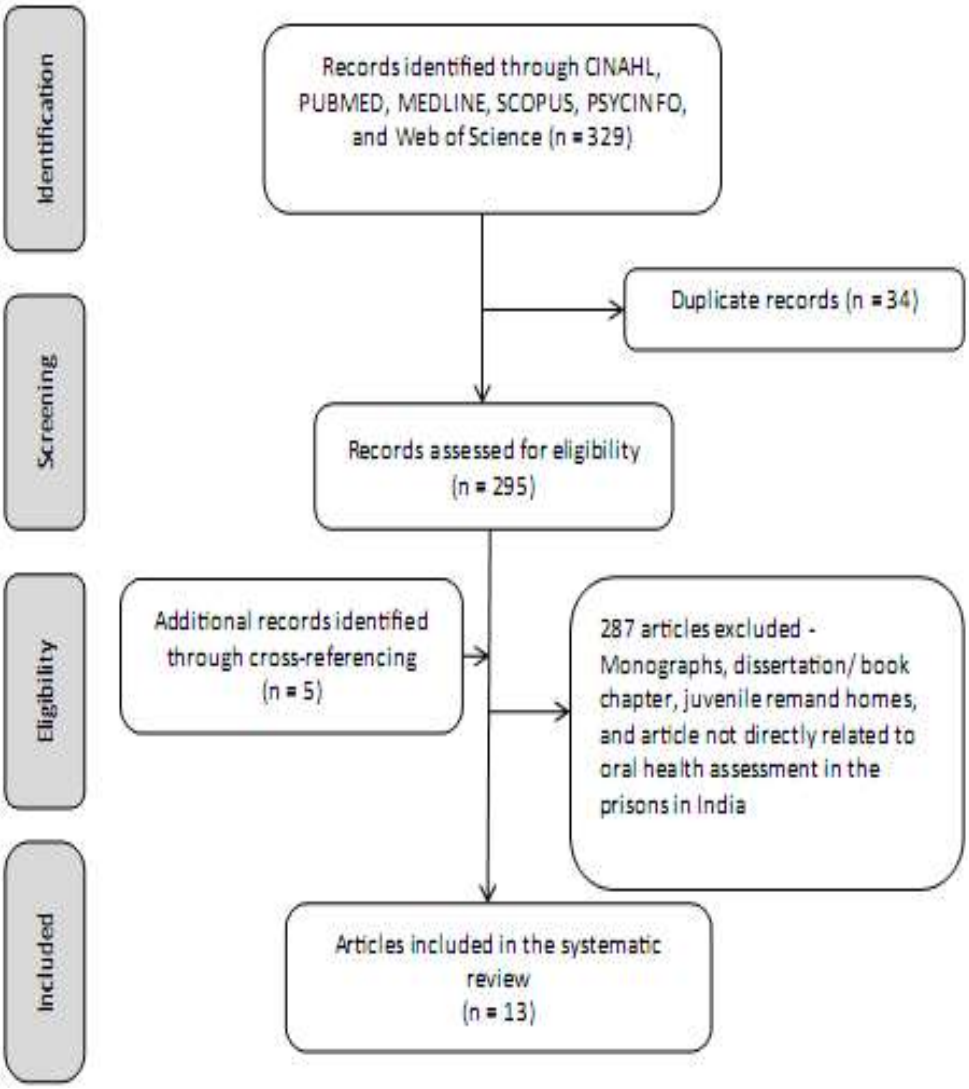

Fig-1: Flowchart of Literature Search for Oral Health Status of Prisoners in India

Table 1:

Sl. No.	Authors and Year	Geographical location and Study Population	Assessment measure	Findings
1	Agrawal *et al.*, 2014	Central prison, Aligarh (N=847; males-782, females-65, mean age=40.23 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 5.3 (± 2.71) - mean Decayed Missing Filled Teeth (DMFT) score; ▪ 57% - overall prevalence of Oro-mucosal lesions; ▪ 50% - inmates had calculus; ▪ All the study participants required oral hygiene instructions; ▪ 53% - required complex periodontal treatments; ▪ 24% - required prostheses.
2	Anup *et al.*, 2014	District prison, Jaipur (N=870; males-805, females- 65, 18-85 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 87% - received no dental care during imprisonment; ▪ 54% - never visited a dentist in their lifetime; ▪ 60% - had oro-mucosal lesions; ▪ 50% - moderate amount of calculus; ▪ 79% - dental caries with mean DMFT of 4.79.
3	Bansal *et al.*, 2013	State prison, Haryana (N=1,393; mean age 35.26 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 53% - teeth lost due to dental caries; ▪ 44% - partially edentulous; ▪ 0.8% - completely edentulous; ▪ 49% - edentulous only in posterior region; ▪ 7% - wearing some prostheses; ▪ 54% - needed prosthesis in maxillary arch; ▪ 78% - needed prosthesis in mandibular arch.
4	Dayakar *et al.*, 2014	District prison, Mangalore (N=260; males-250, females-10, 18-60 yrs)	Community periodontal index (CPI) and loss of attachment from modified WHO Oral Health Assessment Questionnaire (1997)	▪ 98% - prevalence of periodontal disease; ▪ Majority had Community Periodontal Index scores (CPI) of 2 and 1; ▪ 35% - loss of attachment more than 3 mm.
5	Dhanker *et al.*, 2013	District prison, Mathura (N=870; males-805, females-65, 18-85 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 79% - dental caries with mean DMFT of 4.79; ▪ 60% - oro- mucosal lesions; ▪ 27% - periodontal pockets more than 3mm; ▪ 87% - received no dental care during imprisonment.
6	George, 2013	Central prison, Chennai (N=1060; males-1025, females- 35, 19-74 yrs)	Customized questionnaire to assess prosthetic status	▪ 2.3% - males had bridge, 1.2% had partial denture in the upper jaw; ▪ 0.8 % - had bridge and 0.4% had partial denture in the lower jaw; ▪ 8.6 % - females had partial denture in the upper jaw; ▪ 5.7 % - females had partial denture in the lower jaw.

7	Nagarale *et al.*, 2014	District prison, Dharwad (N=256; males-226, females-30, 18 yrs and above)	WHO Oral Health Assessment Questionnaire (1997)	▪ 99% - periodontal disease prevalence ▪ 82% - dental caries prevalence; ▪ 98% - did not receive any kind of dental treatment in the prison; ▪ 67% - needed one surface filling ▪ 19% - needed two surface filling; ▪ 11% - pulp care necessary; ▪ 32% - required extraction of teeth; ▪ 43% - needed replacement of missing teeth.
8	Reddy *et al.*, 2012	Central prison, Mysore (N=800; males-722, females-78, 19-76 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 98% - dental caries; ▪ 5.26 - mean (DMFT); ▪ 22% - at least one sextant with a CPI score of 4; ▪ 41% - loss of attachment; ▪ 9% - denture wearers; ▪ 10% - had oral sub mucous fibrosis; ▪ 97% - needed oral hygiene instruction; ▪ 88% - needed restoration; ▪ 62% - needed extraction of teeth; ▪ 32% - required prostheses.
9	Shetty and Garcha, 2011	District prison, Yerawada, (N=108; females only, 21-73 yrs	WHO Oral Health Assessment Questionnaire (1997)	▪ 68% - dental caries; ▪ 100% - unhealthy periodontium; ▪ 45% - presence of calculus
10	Singh *et al.*, 2012	Central prison, Lucknow (N=1011; males- 826, females- 185, Mean age- 37.3 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 25% - para functional habits-bruxism (22.6%); ▪ most common required dental procedure was restorations and extractions.
11	Singh *et al.*, 2015	Central prison, Ferozepur (N=338; males-256, females-82) Mean age =33.5	WHO Oral Health Assessment Questionnaire (1997)	▪ 90% - inmates had either caries, filling or missing teeth ▪ Decayed teeth (DT) were present in 93% prisoners; missing teeth (MT) in 25%, and filled teeth (FT) in 20%; ▪ 3.08±2.04- Mean decayed teeth; ▪ 0.28±0.65 - Mean number of missing teeth; ▪ 0.19±0.53 - Mean number of filled teeth; ▪ 4.3% - prevalence of root caries.
12	Sode *et al.*, 2011	District prison, Nellore (N=128; males only, 18-78 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ Mean Number of Sextants for bleeding 1.3 ± 0.06, calculus 1.1 ± 0.7; ▪ 2.2% inmates had Leukoplakia and 3.3% had Erythroplakia.
13	Uma and Hiremath, 2011	Central prison, Bangalore (N=1309; males- 1212, females- 97, 18-74 yrs)	WHO Oral Health Assessment Questionnaire (1997)	▪ 5.8% - prevalence of oral mucosal lesions; ▪ 2.8 (± 3.7) - Mean DMFT score; ▪ 38.4% - needed some prostheses; ▪ 95% - Prevalence of periodontitis.

RESULTS

The 13 studies in this review included 11,340 prisoners from various central and district jails of India. There were 10,278 men (90.6%) and 1,062 women (9.4%) in these studies and age ranged from 18 to 85 years. Very little information regarding ethnicity or socio-demographic characteristics of study population was available. However, prisoners in India come mostly from lower socio-economic backgrounds [15]. The majority of the studies followed the World Health

Organization (WHO) Oral Health Assessment Questionnaire (1997), the most commonly used instrument to assess oral health in global context. This questionnaire gathers data on dental caries, periodontal conditions, oro-mucosal lesions, and other oral health conditions. Almost all studies reported following standard protocols for oral health examination. Because of a broad set of oral health status findings, we classified these findings into: decayed, missing, and filled teeth (DMFT); periodontal status; oro-mucosal lesions; prosthetic status; and other outcomes (e.g., parafunctional habits, temporomandibular joint disorders, cleft lip/palate, etc.).

Decayed, missing, and filled teeth (DMFT)

Nine studies [1, 3-5,10,11,16-18] assessed dental caries. Prevalence of dental caries varied from 48% to 90% in most studies. For example, the prevalence of dental caries was around 79% with a mean DMFT score of 4.8 in one study [17] which was lower compared to another study with a very high prevalence of 97% dental caries and DMFT score of 5.6 [1]. According to another study, the high number of dental extractions might be due to fewer dental healthcare provisions available to conserve teeth in the prison system [19]. Though most studies had higher male prisoners in prisons than females, yet females had higher (67%-93%), number of decayed and filled teeth compared to males [3, 11, 18]. Overall, the prevalence of dental caries was as high as 92% in one study [11] and 79% in another [17]. Some of the difference in the prevalence of dental caries could be attributed to the regional differences in diet patterns [11].

Dental caries is primarily accounted for loss of teeth among many prisoners [1, 4]. However, two studies reported a higher number of missing teeth among prisoners [5, 11]. Missing teeth and dental caries might interfere with an individual's psychological, social and functional aspects. It is generally observed that restoration of teeth is the most common solution, whether it is one surface or two surface followed by extraction [19]. These dental health needs among prisoners were reported to be much higher compared to the general population [5, 10, 11, 16, 17, and 20-20]. One study reported higher level of unmet treatment needs among prisoners: 48% needing one surface filling, 39% needing two or more surface fillings, and 62% needing extraction [1]. It was suggested that prisoners required complex treatments due to the absence of regular dental health services in prisons [1].

Periodontal status

Ten studies reported periodontal status of prisoners [1, 3, 5, 6, 10, 16-18, 21, 22]. In one study, approximately 21% of prisoners had at least one sextant with a high Community Periodontal Index (CPI) score at 4 [1]. Mean number of sextants for calculus and bleeding were 1.3 and 1.1, respectively [22]. Two studies [3, 6] reported approximately 98% prevalence of periodontal disease among prisoners and they were diagnosed with loss of attachment with 35% of them having more than 3 mm loss of attachment [6]. Similarly, many prisoners had poor periodontal conditions and it was found that about half of prisoners had calculus or hardened plaque deposits on their teeth [17]. It was also observed that all study participants required oral hygiene instructions and 53.1% required complex periodontal treatments that include placement of grafts or surgical procedures [16].

Oro-mucosal lesions

Oro-mucosal lesions included leucoplakias, Lichen planus, candidiasis, white lesions, red lesions and any other precancerous lesions. Several studies in this review reported prevalence of oro-mucosal lesions among 57% to 60% of the prisoners [5, 6, 17]. Oral cancer was diagnosed in 0.1% in one of the studies [24]. Other oral conditions reported were ulcerations, abscess, oral sub mucous fibrosis, and smoker's melanosis. One study also reported 4% of the prisoners with candidiasis, 2.9% with acute necrotizing gingivitis, and a small percentage (0.2%) having an abscess [17].

Prosthetic status

Five studies assessed the prosthetic status and number of teeth present among the prisoner [1, 2, 4, 10]. Among females, 8.6% had partial denture in the upper jaw while it was found in 5.7% in the lower jaw [2]. In one study, 3.8% had prostheses either in the upper or lower jaw and 24% required prostheses [16]. In the Haryana study [4], it was reported that 49.4 % prisoners in state prisons had edentulous areas in posterior region, of whom 7.1 % were using prosthesis. With respect to dental arch wise prosthetic need, 54.3 % required prosthesis in maxillary arch and 78% required prosthesis in mandibular arch [4]. Another study suggested a great need for prostheses (38.4%) among the prisoners, of them 1.4% needed complete dentures; 18.1% needed prosthesis in the upper jaw, and 20% needed in lower jaw [1]. Surprisingly one study also found a very high need of 32.2% prisoners needed prosthesis [10].

DISCUSSION

This systematic review of 13 studies among 11,340 prisoners provides a comprehensive overview of the status of oral health conditions in prison population in India. The pattern of the oral health conditions among the study populations varied based on the prison system, food habits, and access to dental and medical services, if any. This review strongly suggests that the majority of prisoners, regardless of gender and age, have high prevalence of dental caries and periodontal diseases. According to a national oral health survey in India, the prevalence of dental caries in the general population was found to be 50%, 52.5%, 61.4%, 79.2%, and 84.7% in 5, 12, 15, 35-44, and 65-74-year age groups respectively and the prevalence of periodontal conditions was 57%, 67.7%, 89.6% and 79.9% among

the 12, 15, 35-44 and 65-74-year age groups [20]. However, the prison population reported higher levels of dental caries and poor periodontal conditions compared to general population.

High DMFT scores, periodontal, and gingival health issues were of equal concern. In one study, 2.3% of males had bridge and partial denture (1.2%) in the upper jaw, 0.8% had bridge and partial denture (0.4%) in the lower jaw [2]. This is comparable to findings from other international locations [23] where females had higher number of decayed teeth compared to men and the chances of restoration were more among females as observed in these studies [1,19]. Most of the studies show a glaring apathy towards replacing lost teeth [1, 2, 4]. These oral health problems require immediate restorations and professional scaling or cleaning at the earliest.

Dental caries could be prevented to great extent using inexpensive fluoride products like toothpastes and most of the periodontal problems can be averted by regular oral hygiene visit [24]. Since the prisons are mostly understaffed and seldom there are dental services available, this is always challenging to maintain oral hygiene practices [9]. It results into prisoners bearing huge burden of oral and dental disease without any treatment. Also, the frequent use of illicit drugs, chewable tobacco products, and cigarette smoking exacerbate this problem. Moreover, prisons lack adequate dental equipment and dental practitioners are less motivated to provide services in prison environment.

It is observed that most of the prisoners in India were less educated [8], and in general, people from lower socio-economic strata have lower utilization of preventive dental services [1]. Despite the likelihood that there are differences in the prevalence of various oral health disorders in different prison situations, overall, majority of prisoners have some oral and dental health issue. A previous study has called for special attention from various government and voluntary health organizations to address the oral health needs of this vulnerable population [1]. The high rate of convictions and the inability of the prisoners to secure a bail have resulted in overcrowding the prisons in India. Therefore, conducting screening and dental health care programs are difficult and challenging for public health and dental practitioners in this population [25].

Oral health disorders are substantially higher among prisoners compared to the general population in India. Our findings suggest that the overall burden of treatable oral health problems among prisoners is a grave public health concern. Given limited number of personnel and resources in most prisons, especially in the developing countries, it is difficult for prisoners to receive routine and appropriate oral health care. Furthermore, the understanding of oral health issues among prisoners in India is minimal. Furthermore, difficulties in obtaining permission to conduct screening, examinations, treatment, and clinical studies in prisons underscore the need for greater oral public health research in India. More awareness and research is needed to identify factors that affect oral health of the prison population, not only in India but in the developing world. It is equally critical to understand whether the high rate of oral health problem is exacerbated due to imprisonment or other systemic factors. Oral hygiene maintenance along with treatment of oral diseases and rehabilitation of lost teeth can be accomplished by establishing dental care facilities in the prisons and involvement of local health care entities.

LIMITATIONS

One of the main limitations of this systematic review is the sample size of prisoners, which varied across various studies. Even though the studies in this review were conducted in prisons in India, data came from various parts of the country allowing for selection of a rather heterogeneous sample in terms of geographical distribution. The prevalence of oral health conditions might, therefore, have been expected to vary substantially due to differences in prison systems, availability of dental professionals, dietary practices, and differences in data collection methodologies. In addition, all studies included in this review were based on observational data.

SUMMARY AND CONCLUSION

These findings might have several significant clinical implications. Prisons present an opportunity to treat individuals with limited access to healthcare. This group is often neglected and limited efforts have been made to address this public health problem. A pragmatic solution to overcome the burden of oral diseases in prisons would be for the government and private medical and dental colleges to include prisons for health care delivery as part of their outreach programs. The promotion of oral health education and sound oral hygiene practices among the long-term prison inmates will be a suitable model for improving the oral health in the prison systems. We hope that our systematic review will serve as a reference point for future studies on assessing oral health status and would also assist in planning for appropriate preventative and treatment programs for oral health of the prisoners. The poor oral care practices and virtual absence of oral health care facilities necessitate policy amendments to improve the oral health of prisoners in India.

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