Prevalence of Dental Caries and Periodontal Disease in a Rural Area of Faridabad District, Haryana, India

Abstract
An oral health survey was conducted in 829 individuals in different age groups in Ballabhgarh, Haryana, India, to estimate the prevalence of Dental caries and Periodontal diseases. A survey tool was modified from WHO's STEPwise approach to surveillance and Oral Health Assessment form 2013 from recently released WHO Oral Health Survey: Basic Methods (5th Edition) keeping in mind the South East Asian region. Out of 28 villages, six villages were randomly selected. A random list of study participants (Age-sex specific) was generated from the pooled list of these 6 villages. Local health works helped in inviting the specific subjects to one centralized location within each village/locality. The subjects were examined by trained dental surgeons and recordings were done by trained assistants. The prevalence of dental caries in 5-7 year, 12-15 year, 35-44 year and 65-74 year was 33.2%, 31.3%, 64.9% and 50.1% respectively. The prevalence of Periodontal Disease in 35-44 year and 65-74 year found to be 65.2% and 90.4% respectively. Only 37 participants had mucosal lesions, of which leukoplakia and tobacco pouch keratosis was seen in majority. Using the adopted tool, the prevalence of dental caries was found to be highest in 35-44 year (64.9%) age group and the prevalence of periodontal disease was found to be high in 35-44 year (65.2%) age group and highest in 65-74 year (90.4%) age group. Oral health promotion efforts are required to prevent oro-dental diseases in the studied population.

Keywords: Dental health survey, dental caries and periodontal disease, epidemiology, prevalence

Introduction
Oral diseases are considered important public health problems[1] because of their high prevalence, cost of treatment, associated pain and suffering, loss of man-days, and its impact on quality of life.[2-4] Dental caries and periodontal diseases affect all populations across the globe. India is no exception in having a high prevalence of both these oral diseases.

So far, only one National Survey in 2003[5] and a multicentric study in 2007[6] have been reported at national level in India. The results of these two reports vary widely as the areas covered were probably different. Oral health surveys provide a sound basis for assessing the current oral health status of a population and its future need for oral health care. It is also useful to policymakers to plan and strengthen oral health-care delivery system and oral health promotion activities. In addition, it allows international comparisons and opportunities to exchange experiences and to learn lessons from each other.

It helps to generate awareness and empower local communities to become actively involved in efforts to promote their own oral health.[7]

The WHO encourages countries to conduct standardized oral health surveys that can be used to compare oral health data between different regions and among different countries.[8] Thus, it was felt that a survey needs to be conducted with a robust methodology with the following objectives:

To estimate the prevalence of:
- Dental caries among four representative index age groups (i.e., 5–7, 12–15, 35–44, and 65–74 years)
- Periodontal disease among three representative index age groups (i.e., 12–15, 35–44, and 65–74 years).

Methods

Study area
The Comprehensive Rural Health Services Project (CRHSP), Ballabhgarh,
Faridabad district, Haryana, India, has a Health and Demographic Surveillance System (HDSS), as well as a rural health-care delivery model for primary- and secondary-level care, under the administrative control of the tertiary care institute. The health-care delivery system includes a subdistrict hospital at Ballabhgarh, two primary health centers (PHCs), and a network of 12 subcenters that, as of December 2014, catered a population of around 95,000 residing in its 28 villages. The Health Management Information System (HMIS) is in existence since 1988. It is being updated for health-related data every month.

Sample size

Multistage cluster random sampling with probability proportionate to size at each step was done using the population database of the Ballabhgarh HDSS. The study sample included males and females in the age groups of 5–7, 12–15, 35–44, and 65–74 years. The sample size with anticipated 20% nonrespondents was estimated to be 120 participants in each age and sex strata.

Anticipated prevalence of dental caries = 50% (p)

Absolute precision = ± 10% (d)

Level of confidence = 95%

\[
n = \left( \frac{4 \times p \times (100 - p)}{d^2} \right) = \frac{4 \times 50 \times 50}{10^2} = 100\text{ in each age and sex strata}
\]

Total = 100 × 8 = 800

Anticipated nonresponse = 20% (160)

Total participants to be recruited - 960

Ethical considerations

Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was obtained from the participant/accompanying parent/guardian. Verbal consent was also obtained from the participating children.

Training and calibration

Three research fellows and three field assistants were trained and calibrated for the present study. The training was carried out in two modules; first the preliminary training, followed by intensive field training. The preliminary training was carried out at the institute. This included lectures and conducting oral examination on the dental chair among outpatients of the various departments of the center. Subsequently, field training at various fields such as construction sites and slum areas for simulation practice, standardization, and calibration was carried out. The interview process, dental examination, and data entry processes were standardized. The training exercise was performed under the direct supervision of investigator/co-investigators. A dry run of the study tools was performed to evaluate the efficacy and tentative time taken per examination, interview, and data entry process, etc. Satisfactory evidence of intra- and inter-examiner reproducibility was obtained for all parameters (k > 0.8). Periodic supervisory visits were carried out by investigator/co-investigators during the operationalization of the survey.

Study tools

The WHO South-East Asia Region (SEARO) meeting held at New Delhi discussed about adaptation of an oral health-related optional part of the WHO’s STEPSwise approach to the surveillance of NCDs and Oral Health Assessment form 2013 from the WHO Oral Health Survey: Basic Methods (5th Edition, 2013). This meeting was attended by experts from seven SEARO regional countries and the WHO. They discussed on adoption of the STEPs tools for the regional and oral health promotion for the countries. After arriving at consensus on the survey tools during the meeting, some modifications were accepted for the region. The age group of 5–7 years was added and age group of 12–15 years was clubbed together for operational convenience.

Sampling strategy and data collection

Out of the 28 villages, six villages, namely, Chandawali, Chhainsa, Dayalpur, Garkhera, Jawan, and Sahupura were randomly selected. A pooled list (age and sex specific) for these six villages was generated using the HMIS maintained at CRHSP, Ballabgarh. A random list of the study participants (age and sex specific) was generated from the pooled list using population proportion to size method.

Data collection was performed by three study teams. Each study team consisted of a research fellow, a field assistant, and a local health worker. The study was conducted at various identified study sites in each of the villages. An area-specific approach was adopted at each study site. In collaboration with the local health workers, a PHC/anganwadi/subcenter/ choupal/school/temple, etc., was identified. Scheduling of the study participants was done with each study team targeting 15–20 participants/day. The local health workers helped in initiating contact and maintaining communication with the selected study participants. They carried an invitation slip to all the selected participants in the vicinity of the study site, clearly stating preferable time for their visit.

If the participant could not come to the study site due to any reason, the survey team made a house visit. In case the selected participant was unavailable, all possible attempts were made to contact him/her and fix-up another appointment. If the house was found locked, a second attempt was made the next day. For the working class, special visits were made on Sundays. Participants who refused to give consent or who could not be contacted even after a second attempt were marked as nonresponsive.
Examination

Data collection was conducted by every study team in well-illuminated, well-ventilated, and noise-free area. The field assistant was seated beside the research fellow in such a manner that the codes could be properly heard and the code entry could be supervised by the research fellow. The study participants were comfortably seated on a chair opposite to the research fellow for oral examination.

Data were collected during a period of 3 months (June–August 2015). Dental examination was conducted under sufficient natural/artificial yellow light (in case sufficient natural light was unavailable). Presterilized and packed mouth mirror and a Community Periodontal Index (CPI) probe were used. Guidelines as specified in the WHO Oral Health Assessment form 2013 were used for making the recordings.[11]

Oral health education for the study participants was provided. Referrals were made to the tertiary care institute for treatment, whenever necessary.

The bio-medical waste was segregated by the study team at the study site and transferred to the nearest PHC in sealed color-coded plastic bags every day. This waste was disposed thereafter per the PHC waste management protocol. Random checks were performed by the supervisors during data collection to ensure the quality of data generated.

Data entry and analysis

Data were collected onto paper sheets in the field and were transferred onto computer. A data entry template was generated into Epi-Data (The EpiData Association, Denmark) and the entries were made by the research fellow, assisted by the field assistant. Double data entry and software-based data checking were undertaken to ensure accuracy in data entry process.

The data were subjected to statistical analysis using Epi-Data 7 (CDC, USA) and Stata 12.1 software (StataCorp., College Station, Texas, USA), using appropriate weights. Weights were assigned to individual strata. The respective weights were further used for calculating the weighted prevalence using Stata-based survey commands and were analyzed.

\[ W_{t1} = \frac{n_{s1}}{N_{s1}} \times \left(\frac{6}{28}\right) \]

Where:

\[ W_{t1} = \text{Weight assigned to strata 1} \]

\[ n_{s1} = \text{sample size of strata 1} \]

\[ N_{s1} = \text{population size of strata 1} \]

No. of villages selected = 6, total no. of villages = 28.

Results

Out of the total selected participants, 829 could be available for the study. One hundred and thirty-one (13.6%) individuals were unable to participate due to one or more of the following reasons; shifted to other location, traveling, engaged in regular work, or refused to give consent.

The prevalence of dental caries in the age groups of 5–7, 12–15, 35–44, and 65–74 years was 33.2%, 31.3%, 64.9%, and 50.1%, respectively [Table 1]. Dental caries experience (decayed and filled teeth [DMFT]) is shown in Table 2.

The prevalence of periodontal disease in the age groups of 35–44 and 65–74 years was found to be 65.2% and 90.4%, respectively [Table 3]. The CPI score was calculated in the three age groups; in the 12–15 years’ age group 72.5% had calculus. Periodontal pocket depth of 4–5 mm in the age groups of 35–44 years and 65–74 years was 54.9% and 60.34%, respectively [Figure 1]. Loss of attachment (LOA) of 4–5 mm in these age groups was 32.5% and 39.1%, respectively [Figure 2].

Discussion

The data were collected specific to index age–sex strata (5–7 years, 12–15 years, 35–44 years, and 65–74 years) representing the WHO index age groups for early childhood, adolescent, young, and elderly population, respectively.

According to the DCI National Survey 2002, the prevalence of dental caries among the age group of 12–15 years varied between 40% and 80% among various states in the country.[5] In the multicentric survey (2007), however, the prevalence was found to be 45%–55% in Delhi, Rajasthan, and Uttar Pradesh.[6] The compilation by the WHO-Country/Area Profile Programme (WHO-CAPP) 1995 showed prevalence of dental caries in 12-year-old individuals in India (Delhi) to be around 36%.[12] In the present study, dental caries prevalence was 31.3% (95% confidence interval [CI]; 21.2%–41.6%) in 12–15 years’ age group [Table 1]. The upper bound in the present study estimate (41.6%) covered the estimate of 36% reported by the WHO-CAPP 1995.[12]

The DMFT score in the same age group in the WHO-CAPP[12] data was reported as 0.86, whereas in
In the present study, the DMFT in 12–15 years’ age group was 0.63 (± 1.10) [Table 2]. The global DMFT computed for 12-year-old individuals was 1.61, which is higher than the findings of the present study. The estimate of the WHO for SEARO region was 1.12, which is lower than the global average. The findings are lower than the compiled averages presented in the NCMH (National Commission on Macroeconomics and Health) report 2005,[13] which were 1.6 for 12-year-old and 1.37 for 15-year-old individuals. The upper bound of DMFT for 12–15-year-old individuals in the present study was 1.63, which compares well with the figures reported in the literature.[6,13] The primary objective of the study was to estimate the prevalence of disease and not the severity, therefore the sample size was

### Table 2: Mean deft and DMFT scores and range among four age groups by sex

| Age group (years) | Sex | dt | et | ft | dfet |
|------------------|-----|----|----|----|------|
| 5-7              | Male| 0-7| 0-0| 0-1| 0-7  |
|                  | Range | 0.72±1.52 | 0±0 | 0.01±0.1 | 0.73±1.52 |
|                  | Female | 0-7 | 0-1 | 0-1 | 0-7  |
|                  | Range | 0.94±1.68 | 0.01±0.1 | 0.01±0.1 | 0.96±1.71 |
|                  | Mean±SD | 0.83±1.6 | 0.0±0.07 | 0.01±0.1 | 0.84±1.6 |

### Table 3: Prevalence of periodontal diseases by age group and sex*

| Sex   | Weighted prevalence (95% CI) |
|-------|-----------------------------|
|       | 35-44 years (%) | 65-74 years (%) |
| Male  | 63.8 (51.4-76.2) | 92.2 (85.6-98.8) |
| Female | 66.3 (48.4-84.2) | 88.0 (81.3-94.2) |
| Total | 65.2 (51.0-79.3) | 90.4 (83.6-97.3) |

*Periodontal disease was calculated as present for individuals with CPI score >2 and/or LOA score >0. CPI=Community Periodontal Index, LOA=Loss of attachment, CI=Confidence interval

the multicentric survey, it was found to be 1.15 (in Delhi region).[6] In the present study, the DMFT in 12–15 years’ age group was 0.63 (± 1.10) [Table 2]. The global DMFT computed for 12-year-old individuals was 1.61, which is higher than the findings of the present study. The estimate of the WHO for SEARO region was 1.12, which is lower than the global average. The findings are lower than the compiled averages presented in the NCMH (National Commission on Macroeconomics and Health) report 2005,[13] which were 1.6 for 12-year-old and 1.37 for 15-year-old individuals. The upper bound of DMFT for 12–15-year-old individuals in the present study was 1.63, which compares well with the figures reported in the literature.[6,13] The primary objective of the study was to estimate the prevalence of disease and not the severity, therefore the sample size was

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In the present study, prudent strategies were used to ensure a robust method of data collection. It included precise sampling, in-depth training and calibration of the researchers, and duplicate data entry. These steps ensured the validity and reliability of the study results. The study design was, therefore, appropriate and reliable for the estimation of prevalence of dental caries. However, similar to any other study, the present study too had a few limitations. The findings may be representative of only the studied population; extrapolation of the data would require careful consideration of the population characteristics.

Conclusion

Using the adopted tool, the prevalence of dental caries was found to be highest in 35–44 years’ (64.9%) age group and the prevalence of periodontal disease was found to be high in 35–44 years’ (65.2%) age group and highest in 65–74 years’ (90.4%) age group.

The study also provided evidence that the survey design was feasible to implement under field conditions. Hence, in the future, a nationally representative oral health survey can be conducted using this study design. The prevalence rates for various oral and dental diseases/conditions may be useful for calculation of the required sample size.

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Conflicts of interest

There are no conflicts of interest.
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