



Assessment of Periodontal Status among Slums Residing In Bhopal City, Madhya Pradesh,India: A Cross Sectional Study

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Abstract

Aims: The present cross-sectional study assesses the periodontal status of slums dwellers of Bhopal city, Madhya Pradesh, India.

Settings and Design: Cross-Sectional Study

Methods and Material: The present study employed stratified cluster sampling technique which included most important subgroups of the population i.e. 5, 12, 35-44, and 65-74 age groups. For national pathfinder survey, WHO recommends 10-12 sampling sites (clusters) for both urban and rural areas. Since the present study was carried out in Bhopal city, 6 sampling sites (clusters of slums) was identified and selected proportionately representing the urban slums of Bhopal city. The WHO oral health assessment proforma, 1997 along with 6 item questionnaire was used for the periodontal health examination.

Statistical analysis used:

1. Chi-Square (χ^2) Test

2. Analysis of Variance (ANOVA)

3. Spearman's Correlation:

Results: A total of 937 subjects were distributed into 4 groups out of which 49.1 % were males and 50.58% were females. The difference was not statistically significant ($p=0.618$). 17.6 % of the slum population had a gingivitis characterized by bleeding gums and 33.61% had periodontitis. A positive correlation was seen between the use of finger and periodontal disease.

Conclusions: C Slum dwellers present with poor oral health due to use of indigenous oral hygiene practices. Oral health awareness was very feeble, attitude towards oral health is comparatively negative thus the



dental treatments seeking among them were low and so were the dental care facilities. Thus there is a distinct need for strengthening organised preventive and curative, promotive programs of oral health promotion of slum populations.

Keywords Oral Health Status,Periodontitis

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INTRODUCTION

Globalization of urbanization is seen as one of the most important social changes of the 20th Century.¹ There are marked differentials in the level of urbanization between developed and developing countries. More than three-quarters of the population in developed countries live in urban areas, compared with less than half of the population in developing countries.¹ Over the last two decades, many urban areas have expanded dramatically owing to many reasons, including rapid population growth, urban migration, and continued global economic integration².

The United Nations Expert Group in 2002 operationally defined 'slum' as a human settlement that has the following characteristics: 1) inadequate access to safe water, 2) inadequate access to sanitation and other infrastructure, 3) poor structural quality of housing, 4) overcrowding, and 5) insecure residential status. In 2007, the term 'slum' included 43% of all urban populations in all developing countries, and 78% of the urban population in the least developed countries.³

As elsewhere in the world, the increasing concentration of population in slums in urban areas in India is seen as an indication of increasing urban poverty. Recent data on the level and trend of poverty in India show that although there has been a decline in rural poverty at the national level, the urban poverty level has increased.¹

It is reported that more than one billion people live in slum areas, mostly in developing countries. Recent reports have shown that the urban population which was

3.29 billion in 2007 will become 4.58 billion by 2025. Globally, the slum population is set to grow at the rate of 27 million per year during the period 2000-2020. In response to these projections, the Millennium Development Goals established a target to significantly improve the lives of at least 100 million slum dwellers by the year 2020 (Target 11) (United Nations Millennium Project, 2005). Although the concentration of slum dwellers is highest in African cities, in numbers alone Asia accounts for about 60 percent of urban slum residents in the world.¹ It is well known that large percentage of population of any Indian city belongs to lowest economic strata; majority of this urban poor population belongs to people who have migrated from the nearby rural areas in search of work and employment². This rapid population growth has caused a host of serious problems, including crowding, degradation of the environment, the development of slums, disparities in living conditions and access to services, and increasing vulnerability of the urban population, particularly the urban poor, to diseases and poor health. The concepts of slums and its definition vary from country to country depending upon socioeconomic conditions of each society. The term slums (squatter) describe a wide range of low income settlements or poor living conditions. Slum as its simplest is a heavily populated area characterized by substandard housing and squatter. The census of India 2001 registered slum population of 480,000 in Bhopal city. The most recent survey conducted by Bhopal Municipal Corporation in November 2005 reports 384 slums. Poor people in urban

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areas of developing countries face a daily struggle to meet their basic needs for shelter, food, water, education, and health¹ Rapid urban growth resulted into mushrooming of slums of varying sizes in the towns. Undoubtedly, slums have become the most vulnerable and blighted areas of towns/cities. There appears to be no improvement in their basic level of living and health status.⁴ Previous studies conducted on slum population have reported unacceptable levels of hygiene, health and deprivation of essential service, financial instability and living in adverse conditions.^{3,5}

Oral health is an integral part of general health. Slum dwellers are a distinctive group with poor living condition and inadequate access to safe water, sanitation and other infrastructure that need immediate attention. Oral health reflects the overall well-being of an individual. Exploration of the existing literature revealed a very scarce data on the oral health issues of the slum dwellers of various cities in India. Hence the present study is undertaken to report the periodontal health status among slum dwellers of the Bhopal city.

SUBJECTS AND METHODS:

Study design and settings:

A cross sectional study was conducted among the slum dwellers of Bhopal city, Madhya Pradesh, India. The WHO oral health assessment proforma, (1997) was used for this purpose.⁶

Source of data:

Study participants consisted of slum dwellers of Bhopal city.

Sampling design and sample selection:

Bhopal is the capital city of Madhya Pradesh with a population of 1.43 million (2001 census) in an area of 284.9 sq km. An estimated 8.81% of Bhopal's population lives in notified slums.

Bhopal Municipal Corporation is divided into 66 wards with 209 locations notified as

slums along with 171 irregular colonies or un-notified slums, amounting to total of 380 poverty pockets, out of which 9 slums were selected randomly.

The present study employed multistage stratified cluster sampling methodology. At first stage 6 zones were randomly selected from Bhopal city. Out of which 9 clusters of slums were randomly selected from different zones based on the slum population and from each cluster of slum most important subgroups of the population 5, 12, 35-44, and 65-74 age groups were included.

Following slums were included in the study.

1. Bajpai Nagar
2. Shakti Nagar
3. Rajeev Nagar
4. 100 Quarters
5. Gautam Nagar
6. Bag Sevaniya
7. Bag Mugaliya
8. Pipliya Pende Khan
9. Anna Nagar

For national pathfinder survey, WHO recommends 10-12 sampling sites (clusters) for both urban and rural areas. Since the present study was carried out in Bhopal city, 9 sampling sites (clusters of slums) was identified and selected proportionately representing the urban slums of Bhopal city.

Based on the pilot survey. It was found that the prevalence of oral disease among slum dwellers was low. As WHO recommended that if more than 20% in a group are caries free, the caries prevalence is low.⁶

So the sample was fixed as 25 individuals each index group at each sample site. The tentative sample size for a cluster was estimated to be 100 individuals. Hence the total sample size of all clusters combined (9 clusters × 100 study subjects = 900) and to avoid any sample error 5% increase in sample was considered and total 937 individuals were included in the study based on the inclusion criteria.



Selection criteria:

Inclusion criteria:

1. Inhabitants residing in location notified as slums by Bhopal Municipal Corporation.
2. Individual residing in the slums (squatter)/low-income settlements or poor living conditions
3. Slum dwellers belonging to below poverty line (BPL) category as assessed by Bhopal Municipal Corporation.
4. Slum dwellers with basic interest and willingness to participate.

Exclusion criteria:

1. Subjects with history of any systemic diseases.
2. Subject not willing to participate in the study.

Information about study areas:

Sample size:

A cross sectional descriptive study was conducted among total of 937 urban slum dwellers residing in the city of Bhopal, Madhya Pradesh, India.

Ethical clearance:

The detailed study protocol was submitted and approved by the ethical committee of Peoples Dental Academy, Bhopal.

Informed consent:

A brief study protocol was explained and written informed consent was obtained from each study subject before the oral examination.

Schedule of the survey:

A survey was systematically scheduled to cover all the identified areas of the Bhopal city. The survey period extended for a period of three months i.e, from May to July to 2014. A detailed monthly schedule was prepared well in advance by informing and obtaining a verbal consent from the leader of respective localities. Although a detailed schedule plan was prepared meticulously, few adjustments and changes were called for while working it out practically.

Training and calibration of examiner:

To ensure uniform interpretation, understanding and application by the examiner, of the codes and criteria for the various diseases and conditions to be observed and recorded in the proforma used, the examiner was priorly calibrated and trained in the Department of Public Health Dentistry, People's Dental Academy before the commencement of the study. The recorder participated in the study was also priorly trained in the department. The calibration procedure was performed on a group of 20 subjects belonging to different age groups, which were excluded in the study.

Duplicate examination was performed after two days on the same group of subjects to ensure the reliability of the examiner.

Pilot study:

A preliminary examination was conducted on 100 slum dwellers on days 24-28 January 2014. The study was done to know the practical and communication difficulties while examining oral cavity of this group of subjects.

Method of collection of data:

WHO oral health assessment proforma (1997) was used to collect the information about the oral health status and treatment needs of slum dwellers.

Assessment & structure of a questionnaire:

To assess the oral health behavior and type of housing of study subjects an interviewer based, predesigned, structured, close-ended 7 item questionnaire was used. The interview was conducted in regional language (Hindi). The questionnaire consisted of general information like year of residence and migration status. The subjects were asked to respond to each item according to the response format provided in the questionnaire. The investigator recorded the responses of the subjects in the printed format. The completed response format was carefully checked by the investigator.



The details of the questionnaire are as follows:

a. **Oral health behavior:** oral health behaviour was assessed with 5 questions.

b. **Housing, shelter and Migration status:** was assessed with 4 items.

Details of the clinical examination:

The clinical examination through the survey was carried out by the investigator himself. A recording clerk was trained to assist in the recording procedure throughout the survey. The examiner visited the identified localities on the predetermined dates as according to the schedule. The recorder recorded the general information and the clinical examination finding as dictated by the examiner. The recording assistant was allowed to sit close enough to the examiner, so that instructions and codes could be easily heard and the examiner could see that findings were recorded correctly.

Clinical examinations were carried out in the living environments; Clinical examination was performed by using a plane mouth mirror, explorer and CPI probe under adequate natural light (Type III examination). Subjects were seated on a comfortable chair during examination. The chair was placed in front of a well-lighted window, but not in direct sunlight, with the subject facing the window. No artificial illumination was used. Subjects who were present at the time of the examination of that particular period were only recorded. To ensure accuracy, each form was checked at the end of the day by the examiner.

Details of the armamentarium used:

The following instruments were used for the clinical examination of subjects:

- Plane mouth mirror
- WHO probe
- Tweezers
- Kidney trays
- Cotton holders

- Disposable mouth masks
- Sterile gloves
- Endomax (Disinfectant)
- Savlon
- Sanitizer
- Patient drape
- Enamel trays
- Camera
- Artificial light source
- Instrument containers.

The pre-sterilized instruments were properly packed and carried to the localities in sufficient numbers to avoid the interruption during examination.

Infection control:

Examiner wore disposable mouth masks and gloves during examination. For instruments chemical method of disinfection was followed using Endomax solution (Glutaraldehyde 2.45%) which was activated by adding a powdered activator vial into the solution. The activated solution can be used for 14 days at 25° C. The high level of disinfection was achieved in 20 minutes.

Clinical assessment proforma:

The clinical assessment of the study subjects was done by using a proforma prescribed by oral health survey – Basic methods, W H O (1997) which was designed for collection of all the information needed for planning oral care services and thorough monitoring and re-planning of existing care services.

CPI:

The **Community periodontal index** was selected for assessment of periodontal condition. The highest reading in a sextant was recorded.

Indicator: Three indicators of periodontal status were used for the assessment:

1. Presence or absence of gingival bleeding
2. Supra-and sub-gingival calculus,
3. Periodontal pockets-subdivided into 4-5 mm and > 6 mm



Sextants: The mouth was divided into sextants defined by tooth numbers 18-14, 13-23, 24-28, 38-34, 33-43 and 44-48. A sextant was examined only if there were two or more teeth present, which are not indicated for extraction.

Index Teeth: The teeth examined were 17, 16, 11, 26, 27, 37, 36, 31, 46 and 47 while for subjects who were under the age of 20 years, only 6 index teeth were examined 16,11,26,36,41,46 in order to avoid the scoring of deepened sulci associated with eruption as periodontal pockets. A sextant was examined only if there were two or more teeth present and these were not indicated for extraction. When only one tooth remained in the sextant, it was included in the adjacent sextant. When children under the age of 15 were examined, pockets were not recorded; only bleeding and calculus were considered.

The two molars in each posterior sextant were paired for recording and, if one was missing there was no replacement. If no index teeth or tooth was present in a sextant qualifying for examination, all the remaining teeth in that sextant were examined and the highest score was recorded for that sextant. In this case distal surface of third molars was not scored.

Examination and Recording: The index teeth, or all remaining teeth in a sextant where there was no index teeth, were probed and the highest score was recorded in the appropriate box.

The codes (sextant scores) were:

- 0- Healthy,
- 1- Bleeding observed, directly or using a mouth mirror, after probing,
- 2- Calculus detected during probing,
- 3- Pocket 4-5 mm, (gingival margin within the black band on the probe),
- 4- Pocket 6 mm or more, (black band on the probe not visible),
- X- Excluded sextant (less than two teeth present),
- 9- Not recorded.

Loss of Attachment Index (LOA):

Information on loss of attachment was collected from index teeth in order to obtain an estimate of the lifetime-accumulated destruction of the periodontal attachment. This permits comparisons between population groups but is not intended to describe the full extent of loss of attachment in an individual.

The most reliable way of examining for loss of attachment in each sextant was to record this immediately after recording the CPI score for that particular sextant. The highest scores for CPI and Loss of Attachment may not necessarily be found on the same tooth in a sextant.

Probing pocket depths gives some indication of the extent of Loss of Attachment. This measurement was unreliable when there was gingival recession, i.e. when the cemento-enamel junction was visible. When the CEJ was not visible and the highest CPI score for a sextant was less than 4 (probing depth less than 6 mm), any Loss of Attachment for that sextant is estimated to be less than 4 mm (Loss of Attachment = 0).

The following codes and criteria were used:

- 0- Loss of Attachment 0-3 mm (CEJ not visible and CPI score 0-3).
- 1- Loss of Attachment 4-5 mm (CEJ within the black band).
- 2- Loss of Attachment 6-8 mm (CEJ between the upper limit of the black band and the 8.5 mm ring).
- 3- Loss of Attachment 9-11 mm (CEJ between the 8.5 mm and 11.5 mm ring).
- 4- Loss of Attachment 12 mm or more (CEJ beyond the 11.5 mm ring).
- X- Excluded sextant.
- 9- Not recorded, (CEJ neither visible nor detectable).

Statistical Analysis:

All the data obtained (including the pilot survey) was subjected to statistical analysis with the consult of a statistician.



The statistical procedures were carried out in 2 steps:

1. Data compilation and presentation
2. Statistical analysis

In the 1st step, the data obtained was compiled systematically. A master table was prepared and the total data was subdivided and distributed meaningfully and presented as individual tables along with graphs.

In 2nd step, the statistical analysis was done using Statistical Package for Social Science (SPSS Version 20; IBM, USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Quantitative variables were compared using mean values and qualitative variables using proportions. Significance level was fixed at $P \leq 0.05$.

Statistical tests employed in our study:

1. Chi-Square (χ^2) Test:

2. Analysis of Variance (ANOVA):

3. Spearman's Correlation:

Courtesy reporting

This survey finding was reported to local authorities, report included the summary of number of subjects examined and the observation regarding dental caries and periodontitis among 5,12,34-45,64-75 years of age, this report was delivered personally on the spot to the concerned head of the population.

RESULTS:

RESULTS

Table 1, graph 1 &2 shows the distribution of subjects according to gender and age groups. A total of 937 subjects were distributed into 4 groups out of which 49.1% (n=463) were males and 50.58%(n=474) were females. The difference was not statistically significant ($p=0.618$). 17% (n=158) children belonged to age group of '5' years in which 8.75% (n=82) were males, 8.11% (n=76) were females. 29% (n=274) children were of 12 years of age out of which 14.08% (n=132) were males and

15.15% (n=142) were females. 28% (n=258) belonged to age group 35-44 years out of which 12.91% (n=121) were males and 14.62% (n=137) were females. Rest of the 26% belonged to 65-74 years age group in which 13.66% (n=128) were males and 12.70% (n=119) were females.

Table 2- Shows the prevalence of periodontal disease among study population based on CPI. Based on the highest CPI score obtained the prevalence of gingivitis was 17.6% (165) and periodontal disease was 33.6% (315) among the study subjects. The sum of subjects with shallow pocket (n=176; 18.8%) and deep pockets (14.8%) was used to determine the overall prevalence of periodontitis.

Majority of children in the age groups of 5 years. Were free of gingivitis (male=67.0%; female=65.78%). The prevalence of gingivitis was 18.29% among male children and 21.05% among female children aged 5 years. Calculus was detected in 14.63% of males and 13.15% (n=10) in females aged 5 years.

Majority of children in the age groups of 12 years were free of gingivitis (male=48.48%; female=43.66%). The prevalence of gingivitis was 33.33% among male children and 36.61% among female children aged 12 years. Calculus was detected in 18.18% of males and 19.71% (n=28) in females aged 12 years.

Majority of subjects in the age groups of 35-44 years had shallow pocket (male=38.10%; female=37.95%). Followed by deep pocket (18.18% males; 26.27% females) The prevalence of gingivitis was 12.39% among males and 21.05% among females. Calculus was detected in 14.04% of males and 5.1% (n=7) in females aged 35-44 years. There was a significant difference ($p=0.037$).

Majority of subjects in the age groups of 65-74 years had deep pocket (male=36.71%; female=37.95%), followed by shallow pocket (32.81% males; 30.25% females).



The prevalence of gingivitis was 5.4% among male and 5.05% among females. Calculus was detected in 13.28% of males and 15.96% (n=19s) in females aged 65-74 years. There was no significant difference.

Table 3- Shows the distribution of mean number of sextants affected by periodontal diseases.

Index age 5 years: The mean number healthy sextant among males found to be 4.048 ± 1.641 and among females was 3.921 ± 1.632 . The mean number sextant with bleeding among male children was 1.073 ± 3.230 , and female children were 1.223 ± 3.101 . The mean number of sextant with calculus was 0.78 ± 2.724 among males and 0.855 ± 2.614 among females. The difference among the genders was statistically significant [F=28.512; df=5; p=0.000].

Index age 12 years: The mean number healthy sextant among males found to be 2.893 ± 2.561 and among females was 2.619 ± 2.432 . The mean number sextant with bleeding among male children was 1.884 ± 2.481 , and female children were 2.197 ± 2.537 . The mean number of sextant with calculus was 1.121 ± 1.559 among males and 1.18 ± 1.613 among females. The difference among the genders was statistically significant [F=14.464; df=5; p=0.000].

Index age 35-44 years: The mean number healthy sextant among males found to be 1.033 ± 1.016 and among females was 1.386 ± 1.981 . The mean number sextant with bleeding among males was 0.727 ± 1.312 , and females were 0.445 ± 1.185 . The mean number of sextant with calculus was 0.892 ± 1.993 among males and 0.299 ± 1.901 among females. The mean number of sextant with shallow pocket was 2.363 ± 1.114 among males and 2.277 ± 1.243 . The mean number of sextant with deep pocket was 1.818 ± 0.953 among males and 1.591 ± 0.813 among females. The difference

among the genders was statistically significant. [F=34.045; df=9; p=0.000].

Index age 65-74: The mean number healthy sextant among males found to be 0.6715 ± 1.574 and among females was 1.226 ± 1.612 . The mean number sextant with bleeding among males was 0.343 ± 1.486 and female was 0.3277 ± 1.345 . The mean number of sextant with calculus was 0.789 ± 1.259 among males and 0.932 ± 1.314 among females. The mean number of sextant with shallow pocket was 1.953 ± 1.896 among males and 1.789 ± 1.754 . The mean number of sextant with deep pocket was 2.195 ± 1.081 among males and 1.726 ± 1.235 among females. The difference among the genders was statistically significant. [F=26.733; df=9; p=0.000].

Table -4. Shows the distribution of number and percentage of sextants with loss of attachment. The total prevalence of destructive periodontal disease characterized by loss of attachment among the population aged (35-44 years and 65-74 year) was 47.32% (n=239) of which 20% LOA was 4-5 mm, 12.2% LOA of 6-8mm, 8.9% of LOA with 9-11 mm and 6% LOA with >12 mm in measurement.

Age group 35-44 years.

LOA with 4-5 mm depth was observed among 21(17.35%) males and 29(21.26%) females. LOA with 6-8mm depth was observed in 8(6.61%) males and 18(13.13%) females. LOA with 9-11 mm depth was observed in 8(6.61%) males and 8(5.83%) females. LOA with 12mm was observed in 6(4.95%) males and 10(7.29%) females. The differences were not statistically significant.

Age group 65-74 years.

LOA with 4-5 mm depth was observed among 33(25.78%) males and 15(10.8%) females. LOA with 6-8mm depth was observed in 24 (18.75%) males and 12(10.8%) females. LOA with 9-11 mm depth was observed in 13(10.15%) males



and 16(13.44%) females. LOA with 12mm was observed in 6(4.68%) males and 9(7.67%) females. The differences were not statistically significant.

Table -5. Shows mean number of sextants with loss of attachment among study subjects. Age group 35-44: The mean of sextant with LOA 4-5 mm in depth observed among males was 0.173±1.123 and 0.2116±0.932 among females. The mean number of sextant with LOA 6-8 mm in depth among males was 0.066±1.312 and females was 0.1313±0.918. The mean number of sextant with LOA with 9-11 mm was 0.066±0.9891 among males and 0.0583±0.929 among females. LOA more than 12 mm depth was observed among 0.0494±0.761 males and 0.072±0.813 females. Mean of 0.016±0.812 and 0.021±0.915 sextant were excluded from males and females sextant respectively. These differences among the genders were not statistically significant. {f=0.506;df=7;p=0.831}.

Age group 65-74: The mean of sextant with LOA 4-5 mm in depth observed among males was 0.2578± 0.857and 0.990±0.910 among females. The mean number of sextant with LOA 6-8 mm in depth among males was 0.1875± 0.868and females was

0.1008±1.9813. The mean number of sextant with LOA with 9-11 mm was 0.1015±0.893 among males and 0.008±1.1832 among females. LOA more than 12 mm depth was observed among 0.0468±0.732 males and 0.07±1.763 females. Mean of 0.015±0.615 and 0.025±1.831 sextant were excluded from males and females sextant respectively. These differences among the genders were not statistically significant. {f=0.535;df=7;p=0.808}.

Table- 6. Shows the correlation between residence status, migration status, oral hygiene and dietary practices, periodontal disease and mucosal condition. A positive correlation was seen between the use of toothbrush, toothpaste and periodontal disease. The difference was statistically significant.

A positive correlation was seen between the use of finger and periodontal disease. The difference was not statistically significant.

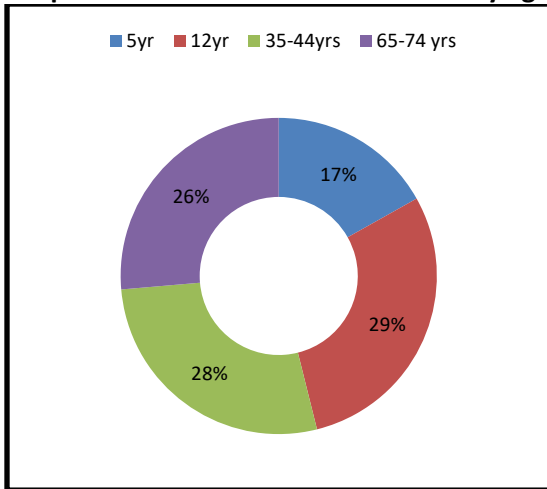
A negative correlation was seen between use of datoon, frequency of sweet consumption, type of shelter (kuchha /pucca) and periodontal disease. The difference was not statistically significant.

Table 1- Distribution of study subjects by age and gender

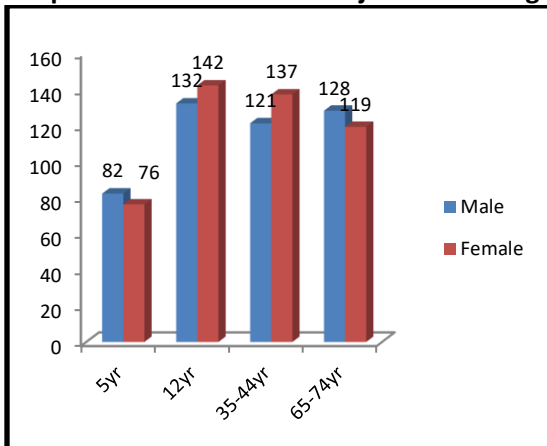
Age	Male N (%)	Female N (%)	Total N (%)
5 Years	82 (8.75 %)	76 (8.11 %)	158(17%)
12 Years	132 (14.08 %)	142 (15.15 %)	274(29%)
35-44 Years	121 (12.91 %)	137 (14.62%)	258(28%)
65-74 Years	128 (13.66 %)	119 (12.70%)	247(26%)
Total	463(49.41%)	474(50.58%)	937
Statistical Inference	X ² =1.78 df=3 P=0.618		



Graph-1 Distribution of slum dwellers by age



Graph – 2 Distribution of subjects according to gender



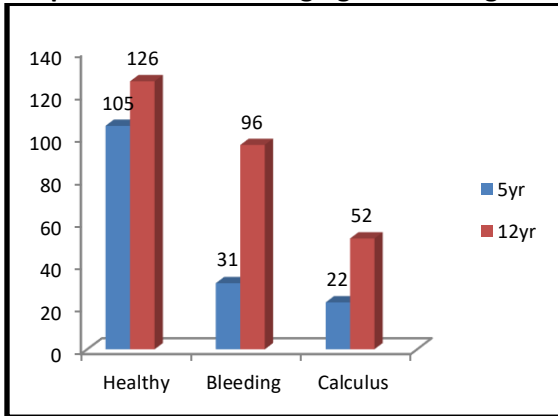
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Table 2. Prevalence of periodontal disease among study population based on highest CPI score

Gender/ Age groups (Years)		Healthy N (%)	Bleeding N (%)	Calculus N (%)	Shallow pocket N (%)	Deep pocket N (%)	Total	Statistical inference
5 Years	M	55(67.07%)	15(18.29%)	12(14.63%)	-	-	82	X ² =0.225 df=2 P=0.894
	F	50(65.78%)	16(21.05%)	10(13.15%)	-	-	76	
12 Years	M	64(48.48%)	44(33.33%)	24(18.18%)	-	-	132	X ² =0.642 df=2 P=0.725
	F	62(43.66%)	52(36.61%)	28(19.71%)	-	-	142	
35-44 Years	M	21(17.35%)	15(12.39%)	17(14.04%)	46(38.10%)	22(18.18%)	121	X ² =10.2 df=4 P=0.037
	F	32(23.35%)	10(7.29%)	7(5.1%)	52(37.95%)	36(26.27%)	137	
65-74 Years	M	15(11.71%)	7(5.4%)	17(13.28%)	42(32.81%)	47(36.71%)	128	X ² =4.49 df=4 P=0.344
	F	24(20.16%)	6(5.04%)	19(15.96%)	36(30.25%)	34(28.57%)	119	
Total Prevalence		323(34.47%)	165(17.6%)	134(14.3%)	176(18.78%)	139(14.85%)		

Graph -3- Prevalence of gingivitis among 5 and 12 years children



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Graph -4- Prevalence of periodontal disease among study population based on CPI score.

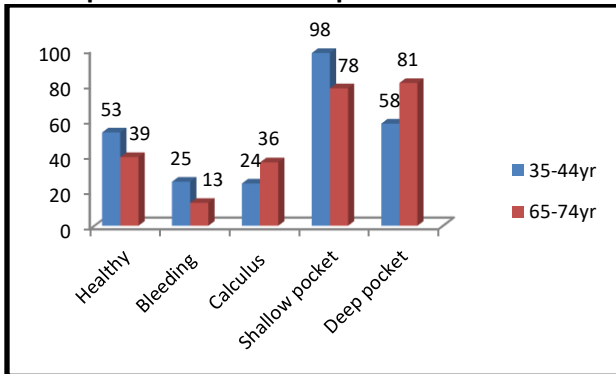


Table 3- Distribution of Mean number of Sextants affected by periodontal diseases according to gender and age groups.

Gender/ Age groups (Years)		Healthy mean±SD	Bleeding mean± SD	Calculus mean± SD	Shallow pocket mean± SD	Deep pocket mean± SD	NR	Statistical inference
5 Years	M	4.048 ±1.641	1.073 ±3.230	0.78 ±2.724	-	-	-	F=28.512 df=5 P=0.000
	F	3.921 ±1.632	1.223 ±3.101	0.855 ±2.614	-	-	-	
12 Years	M	2.893 ±2.561	1.884 ±2.481	1.121 ±1.559	-	-	-	F=14.464 df=5 P=0.000
	F	2.619 ±2.432	2.197 ±2.537	1.18 ±1.613	-	-	-	
35-44 Years	M	1.033 ±1.016	0.727 ±1.312	0.892 ±1.993	2.363 ±1.114	1.818 ±0.953	0.413 ±0.913	F=34.045 df=9 p=0.000
	F	1.386 ±1.981	0.445 ±1.185	0.299 ±1.901	2.277 ±1.243	1.591 ±0.813	0.521 ±0.832	
65-74 Years	M	0.6715 ±1.574	0.343 ±1.486	0.789 ±1.259	1.953 ±1.896	2.195 ±1.081	0.563 ±0.954	F=26.733 df=9 P=0.000
	F	1.226 ±1.612	0.3277 ±1.345	0.932 ±1.314	1.789 ±1.754	1.726 ±1.235	0.418 ±0.513	

Table .4 Distribution of number and percentage of sextants with loss of attachment according to gender and age groups.

Gender/ Age groups (Years)		Loss and attachment 4-5 mm N (%)	Loss and attachment 6-8mm N (%)	Loss and attachment 9-11 mm N (%)	Loss and attachment >12mm N (%)	Total (N)	Excluded sextant N (%)	Not recorded N (%)	Statistical inference
35-44 Years	M	21(17.35%)	8(6.61%)	8(6.61%)	6(4.95%)	121	2(1.65%)	2(1.65%)	X ² =1.72 df=3 P=0.633
	F	29(21.16%)	18(13.13%)	8(5.83%)	10(7.29%)	137	3(2.18%)	3(2.18%)	
65-74 Years	M	33(25.78%)	24(18.75%)	13(10.15%)	6(4.68%)	128	2(1.56%)	4(3.12%)	X ² =6.11 df=3 P=0.106
	F	18(15.12%)	12(10.8%)	16(13.44%)	9(7.67%)	119	3(2.52%)	5(4.20%)	
Total		101(20%)	62(12.2%)	45(8.9%)	31(6.1%)	505	NA	NA	

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Graph -5. Distribution of number of sextants with loss of attachment according to age groups.

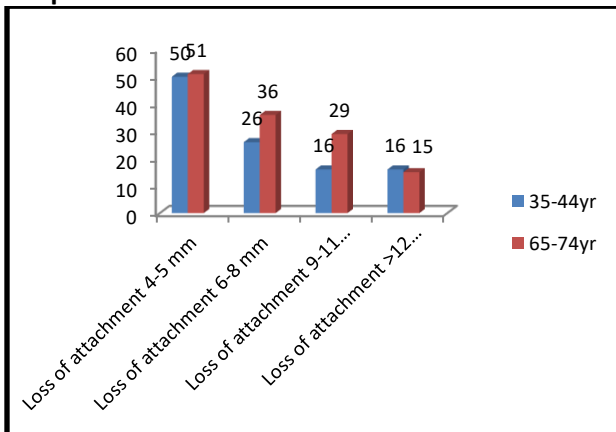


Table- 5 Mean number of sextants with Loss of attachment among study subjects.

Age/sex		4-5mm LOA	6-8 LOA	9-11 LOA	>12 LOA	Excluded Sextant	NR	Total	Statistical inference
35-44	M	0.173 ±1.123	0.066 ±1.312	0.066 ±0.9891	0.0495 ±0.761	0.016 ±0.812	0.016 ±0.932	121	F= 0.506 df=7 P=0.831
	F	0.2116 ±0.932	0.1313 ±0.918	0.0583 ±0.929	0.072 ±0.813	0.021 ±0.915	0.021 ±0.923	137	
65-74	M	0.2578 ±0.857	0.1875 ±0.868	0.1015 ±0.893	0.0468 ±0.732	0.015 ±0.615	0.0312 ±0.613	128	F=0.535 df=7 P=0.808
	F	0.990 ±0.910	0.1008 ±1.9813	0.008 ±1.1832	0.07 ±1.763	0.025 ±1.831	0.042 ±0.09832	119	

Table 6. Correlation between migration status , residence status, oral hygiene and dietary practices, periodontal disease and mucosal condition.

Status	Periodontal disease (correlation co-efficient)	Significance	Mucosal condition	Significance (P value)
Toothbrush	0.76	0.020	0.007	0.837
Toothpaste	0.211	0.000	-0.056	0.089
Rinsing after meal	-0.236	0.000	0.004	0.895
Datoon	-0.017	0.598	-0.018	0.588
Fingers	0.049	0.137	-0.055	0.091
Charcoal	-0.096	0.003	0.026	0.428
Neem stick	-0.211	0.000	0.054	0.100
Diet	-0.133	0.000	0.050	0.126
Sweet consumption	-0.035	0.285	-0.021	0.515
Shelter	-0.029	0.369	-0.008	0.808
Rented /own	-0.91	0.005	-0.010	0.770

DISCUSSION:**Demographic finding-**

The present cross sectional, study was conducted with the aim of assessing oral health status and treatments needs of slum dweller's residing in Bhopal city, Madhya Pradesh, India.

In this study 11 major slum localities of Bhopal city were included i.e, Bajpai Nagar, Shakti Nagar, Rajeev Nagar, 40 Quarters, 50 Quarters, 60 Quarters, 100 Quarters, Gautam Nagar, Bag Sevaniya, Bag Mugaliya, Pipliya Pende Khan and Anna Nagar.

The oral examination was conducted by using WHO oral health assessment proforma 1997, along with a questionnaire to assess to oral health behaviour and their demographic status. Slum dwellers resided in kuccha (temporary dwellings)/ pucca houses (concrete building). Most of them migrated from nearby villages and resided in the slum more than a period of 5 years.

Four index age groups were included in the study i.e 5 years, 12, years, 35-44, 65-74 years.

The present study employed stratified cluster sampling technique. A total of 937 slum dwellers comprised of 463 male and 474 females who belonged to different age groups.

Review of literature has revealed very scare data on slum population. For comparison general population like school children, adults, rural/ urban population were used in the present study. An attempt has been done to validate the present study findings by comparing with similar age groups from general population. Since the literature related oral health among slum dwellers was very limited.

Oral health practices among slum dwellers

In the present study, prior to the commencement of oral examination an interviewer based close ended questionnaire was used to assess the



behaviour related to oral hygiene habits and their residence status, migration status and type of dwelling.

The present study revealed that 61% of the study subjects among all the age groups used tooth paste and 48.6% used tooth brushes. In contrast Zhu et al 2005⁷ found 85% of the population brushed their teeth with tooth brush and tooth paste and Doshi et al 2007⁸ found 96.7% used tooth brush and 100 % of them used tooth paste. Inamdar.I.F et al 2013⁹ found 24% of subjects used tooth brush and Bhowate R.R et al ¹⁰ found 26.31% of subjects used tooth brush, in contrast Padma et al 2010 found that only 0.03 % used tooth paste with brush.

These differences may be attributed to wide variation in population selected for the study.

Oral hygiene practices in India are deeply rooted in tradition and culture with use of indigenous substance being widely prevalent.

In the present study 22.23% subjects used fingers as cleansing aid, in contrast Inamdar I F et al 2013 found 46% of adolescents used finger as a cleansing aid.⁹

In our study we found 13.5% participants used datoon while Inamdar et al found 29.5% used datoon. This difference may again be attributed to population characteristics and their oral health related knowledge.

In our study 6.9% of children used neem stick, similar results was found by Jagat et al 2013 in which 4.3% of children uses neem stick for cleansing their teeth. Neem stick is found to be common practice among rural folks of India.¹¹

An optimum level of oral hygiene practices in our study would have been observed if oral health education, promotion and preventive program had seen carried out in communities that lack access to care.

In our study we found more than 45% of 12 years old children used toothbrush and

paste. Similar results were seen by Chung Hong Chun et al¹² where 43.7% of 12 years used tooth brush and paste. In contrast the percentage of children using toothbrush was less when compared to the study done by WHO in rural population in Uttaranchal states, India where 83% of children used brushes.¹²

This can be attributed to the fact that children of the present study belonged to below poverty line category and affordability plays an important role. In our study total 21.4% of the total population used charcoal, 18.5% neem stick, 13.5% datoon and 22.3% used finger and among children 15.2% used charcoal to clean their teeth. In contrast to our results VC Punitha ¹³ found that 55.5% of children used tooth paste 62.9% cleaned their teeth with tooth brush and 37% used finger as a cleansing aid.

Study conducted by Padma Bhatt 2010 found that 79.8% used chew stick, where as 14.9% used finger with charcoal/salt /rangoli powder.¹⁴

People make chew stick by chewing one end of the twig of neem tree, or variety of local tree (guava, mango) after chewing the frayed and are used to clean their teeth and tongue. After used chew stick is ether replace by new one or the frayed end is cut off to expose a fresh end, where new bristles are prepared by further chewing. This practice is comparable to other population and cultures around the world with various local names. In our studies among indigenous methods of cleansing, charcoal (21.45%) was more widely used, followed by neem stick (18.5%) and datoon (13.5%).

Charcoal though might help in removable of plaque mechanically, studies have revealed that it can cause severe abrasion and can damage gums.

Periodontal disease

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Periodontal disease is characterized by destruction of tissues surrounding the teeth.

On examination of slum dwellers present result revealed 33.6% prevalence of periodontal disease around 17.6% subject have bleeding gum 14.3% had calculus deposit, 18.78% shallow and 14.85% deep pockets these findings may be attributed to oral hygiene habits and other deleterious habits among study subjects,

Classical studies by Greene JC (1960)¹⁵ Ramfjord et al have reported higher prevalence of periodontal disease that is 90-100% among rural population. Other studies contraindicating the present result by Peterson PE 1996 (91% prevalence) dhar V et al 2007 (81% prevalence) and Nilaljana Ghosh 2014.^{16,17}

This differences observed in prevalence rate may be attributed to geographical variation, difference acknowledge and attitude among study subjects among social economic levels.

In the age group study it was seen that bleeding gums and calculus deposit were wide spread among all the ages. Similar finding was recorded by Chinmaya BR et al¹⁸ and Kumar S et al.

Prevalence of gingivitis categorized by bleeding gums most formed among 33.3% males and 36.6% females in the present study contradictory result were revealed by study conducted by Chauhan D et al¹⁹ (22.9%) Jose A²⁰(15%). These differences may be attributed brushing and cleansing habits of the population.

Prevalence's of periodontal disease among slum subject of Bhopal city was found to be 33.6% similar result were found by Nilan Jana Gosh et al 2014 among urban population of kishan Ganj district, Bihar, India.¹⁷

Severity of periodontal diseases increases with age our result are in accordance with report of India national oral health survey and fluoride mapping (2002-2003) and

studies by das UM 2009 and Goel P 2000.^{21,22}

Loss of attachment indicates the severity of periodontal disease. The prevalence of periodontal disease in the present study, Shallow pocket was observed (18.78%) and deep pocket (14.85%). No significant difference in LOA among gender was observed in present study. In contrast Rahul Srivastava²³ et al 2013 found Shallow pockets (4 to 5 mm) were present in 40.5% and deep pockets (≥ 6 mm) were present in 48.6%. The prevalence of loss of attachment (LoA) was 80.3%. Similar result was reported by Bhat et al, Bali, et al.^{14,24}

Rahul Shrivastava²³ et al, 2013 found the prevalence of bleeding gums, 96.6%, periodontal pocket 89% and LOA 80.3% among elderly subjects in Delhi city in contrast to our results.

Day to day oral hygiene practises and use of tooth brush and paste, education level and income may play a role in the occurrence in progression in periodontal disease

SUMMARY AND CONCLUSIONS

The present cross sectional study was conducted to assess the oral health status and treatment needs among slum dwellers residing in Bhopal city, Madhya Pradesh, India.

The detailed proposed study protocol was submitted and approved by the ethical committee of Peoples University, Bhopal. Before the commencement of the study, the examiner was priory calibrated and trained in the Department of Public Health Dentistry, People's Dental Academy.

Bhopal Municipal Corporation is divided into 66 wards with 209 locations notified as slums along with 171 irregular colonies or un-notified slums, amounting to total of 380 poverty pockets, out of which 11 slums were selected randomly.

A total of 937 subjects were distributed into 4 groups out of which 49.1 % were males and 50.58% were females. 17 % children were of 5 year of age in which 8.75 % were



male, 8.11% were female. 29% children were of 12 years of age out of which 14.08% were males ,15.15% were females, 28% belonged to 35-44 of age out of which 12.91% were male and 14.62% were female and rest of the 26% belonged to 65-74 of age in which 13.66%(n=128) were males,12.70% were females.

A questionnaire was used to collect the information on oral health practices along with age, sex, type of housing of study subjects, and years of residence. Subjects' oral health was assessed by using WHO oral health assessment proforma 1997. Examination was carried out according to type III examination procedure. A single examiner conducted all the examinations and intra reliability of the examiner was assessed by using the weighted Kappa statistics.

Statistical Package for social sciences (SPSS 20, IBM,USA) was used for statistical analysis of data. The chi-square test, ANOVA, linear logistic regression were applied wherever required.

From the current study, following conclusions can be drawn:

1. A strong significant difference was observed between gender and use of charcoal as a cleansing aid.
2. There was a strong association between different age groups and dietary habit and frequency of sweet consumption among slum dwellers.
3. A positive correlation was seen between the use of toothbrush, toothpaste and periodontal disease.
4. A positive correlation was seen between the use of finger and periodontal disease.
5. A positive correlation was seen between use of toothbrush, charcoal, neem stick, rinsing after meal, type of diet and oral mucosal condition.
6. There was a positive correlation between the use of toothbrush, toothpaste and dental caries.

7. 17.6 % of the slum population had a gingivitis characterized by bleeding gums and 33.61% had periodontitis.

8. There is a distinct need for strengthening organised preventive and curative programs for slum dwellers. There is an urgent need to plan properly to meet the unmet needs of slum population as it was observed that virtually no care has been provided for this socially deprived community pertaining to oral health.

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