Chapter 5
MATERIALS & METHOD

The present study was carried out in the Department of Environmental Sciences in collaboration with the Department of Physics, Mohanlal Sukhadia University, Udaipur.

5.1 STUDY DESIGN AND DURATION

A descriptive cross sectional study was conducted in and around the Udaipur city, (Rajasthan, India) within the radius 150Km for evaluating the oral health status and treatment needs of marble mining employees. The study was conducted within the span of 2 years starting from 2012-2015.

5.2 ETHICAL CLEARANCE

The ethical clearance for the study was obtained from the Post Graduate Research Board (PGRB) committee of the Mohanlal Sukhadia University held on 19.12 2012.

Informed consent

The purpose of the study was explained to all the individuals who were examined and the oral consent was obtained for their willing participation in the study.

Inclusion criteria

- Marble mining employees who were available at the time of the study

- Employees those who agreed to participate in the study.

- Only males among general population were included as comparative group as only males were employed in the Marble Mining.

Exclusion criteria

- Participants who had not given consent.

5.3 SELECTION OF MINING EMPLOYEES:

The list of all the mining factories situated in and around Udaipur city, Rajasthan, India was obtained from the internet. The permission to carry out the study was obtained from the Managing Directors (MD) of the factories. The labourers will be divided into groups based on the type of the work they were assigned (Figure 2, Figure 3, Figure 4 and Figure 5). There were five divisions of employees in the marble mining based on the type of work assigned to them namely;

1. Administrative unit.

2. Maintenance unit.

3. Transportation unit.

4. Cutting unit

5. Polishing unit.

A detailed schedule for the examination was prepared in consultation with the mining supervisors (MS) of all the factories. All the employees were informed in prior about the study as well as the date, time and the place of examination.

Based on the exclusion and inclusion criteria the survey was conducted on mining employees that yielded final sample size of 500 mining employees who belonged to 15-54 years of age. The survey on marble mining employees was conducted in the month of December 2012 to January 2015.

5.4 SELECTION OF GENERAL POPULATION: (COMPARATIVE/ CONTROL GROUP)

The comparative group comprised of individuals attending different dental hospital camps for the routine checkup around the Udaipur city proper. The Survey followed the simple random method for selecting the individuals. Only the

male population was included to make the comparison easy with the mining employee group, where none of the group had female employees.

5.5 PILOT SURVEY

One marble mining was selected for pilot survey. Both questionnaire and indices interpretation from Modified WHO oral health assessment form (1997) was done on 15 mining employees. Necessary modifications were done to design the final questionnaire and proforma.

5.6 QUESTIONNAIRE DESIGN

The study involved completion of an open and closed ended pre-designed questionnaire that collected details of the demographic data, deleterious habits, diet, sweet consumption, oral hygiene practices, medical / dental insurance policies, visit to the dentist, working environment, and Personal Protective Measures (PPM) used while working. (Annexure I)

5.7 TRAINING AND CALIBRATION

The investigator was trained about the diagnosis of oral diseases and the interpretation of indices on 10 subjects under the supervision of the expert in the Department of Public Health Dentistry, Darshan Dental College and Hospital, Udaipur.

The data on the oral health status was recorded using Mouth mirror and CPI probe (Figure 6 and Figure 7) and entered on a modified WHO oral health assessment form 1997 (Annexure II). Calibration was done by examining 20 subjects twice on two successive days and compared to know the diagnostic variability. Agreement for assessment was 90 percent.

5.8 LIST OF MATERIALS NEEDED FOR THE STUDY ARE

- Plane mouth mirrors
- Periodontal probes confirming WHO criteria
- Several pairs of Tweezers

- Kidney trays

- Hand sanitizer

- Sterilization solution

- Cloth or paper hand towel

- Gauze

- Patient drape

- Gloves and mouth mirrors

- Cotton rolls

5.9   STERILIZATION

The instruments were sterilized using cold sterilization method at the site of examination using Korsolex solution. (Active ingredients in 100 g: (Ethylenedioxydimethanol 15.3 g, Glutaraldehyde 7.5 g, benzyl- C12-18 alkyl dimethyl ammonium chlorides 1.0 g, didecyl dimethyl ammonium chlorides 1.0 g. Other ingredients: Surfactants, solvents, corrosion inhibitors, foam inhibitors, colorants, fragrances).

5.10   EXAMINATION AND COLLECTION OF DATA

ADA type III examination was done solely by the investigator. The patients was either seated on a chair or laid on the table or bench depending upon the availability of the furniture at the examination area (Figure 7). To do the intraoral examination (Figure 8 to Figure 19) the natural light if feasible was used or else a battery operated light was used. To enter the examined data, a standard form for oral health assessment of WHO was used (Annexure II).

In the proforma tooth surface loss (Figure 10) of the study population was registered and graded according to Eccles and Jenkins criteria (Eccles and Jenkins, 1974).

The grading used for the severity of tooth surface loss was as follows:

Grade 1   :   Loss of surface features, the dentin is not involved

Grade 2   :   Involvement of the dentin for less than one third of the area of the tooth surface.

Grade 3   :   Involvement of the dentin for more than one third of the area of the tooth surface.

Score of the highest affected teeth in the upper and lower anterior sextants were considered as the score for the sextant.

Oral examination was done and questionnaire was completed by the investigator herself for each study subject by asking the questions in the questionnaire to the subject to ensure uniformity in the data collection and to avoid misinterpretation of the questions by the study subjects.

Socio economic status was recorded according to Modified Kuppuswamy's Socio economic status scale (Ravi Kumar *et al*., 2013) This scale takes account of education, occupation and income of the family to classify study groups in to upper, upper middle, middle, upper lower and lower class. It is widely used in community based research and hence was used in this study.

The clinical examination of the samples was done using a plane mouth mirror and CPI probe where necessary according to WHO caries diagnostic criteria (World Health Organization, 1997). Examinations was performed to record the caries experience, decayed, missing, filled (DMF) teeth (Figure 8 and Figure 9). Periodontal index was used to check the gingival and periodontal status (Figure 12 and Figure 13); apart from that the oral cavity will be thoroughly examined for the cancerous and precancerous lesions (Figure 16 to Figure 19) according to WHO criteria.

Collection of particulate matter

The samples of particulate matter was obtained from the department of physics, Mohanlal Sukhadia University. Sample collection was done for 24 hours once in a week using High Volume Sampler with SPM Filter Manifold and Fine Particulate Sampler/Dust Track Sampler.

5.11 STATISTICAL ANALYSIS

Data was entered in Microsoft excel 2010 for Windows. Frequencies, percentages, mean, standard deviation (SD) of variables were calculated. Categorical variables (frequencies, percentages) were analysed using Pearson's chi-square test and Cramer's V test. Shapiro-Wilk test showed that quantitative data (mean and SD) did not follow normal distribution curve. Hence, non-parametric tests such as Kruskal-Wallis test and Mann Whitney U tests were used for further data analysis. P values <0.05 were accepted as statistically significant. All analyses were performed using version 21.0 of the Statistical Package for Social Sciences (IBM Corporation, Armonk, New York, USA).

Statistical formula used in the analysis

$$\text{Mean } (\bar{x})\text{:-} \quad \bar{x} = \frac{\sum x_i}{n}$$

Where,

x_i = value of each observation in sample

n = sample size

Standard Deviation (SD/σ):-

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Where,

x_i = value of each observation in sample

$(\bar{x})$ = Mean

n = sample size

Chi Square test:

The Chi Square ($\chi2$) test is the most important and most used member of the nonparametric family of statistical tests. Nonparametric statistical procedures test hypotheses that do not require normal distribution or variance assumptions about the populations from which the samples were drawn and are designed for categorical (ordinal or nominal) data.

The properties Chi-square test was first investigated by Karl Pearson in 1900. This test is used to determine any significant association between categorical data from two or more groups. It is a method of testing the significant difference between two or more proportions.

$$\text{Chi} - \text{Square Test} (\chi2) = \sum \frac{(\text{Observed value} - \text{Expected value})^2}{\text{Expected value}}$$

Observed value= Obtained from the study (data collection)

Expected value = (Row Total x Column Total) / Grand Total

Degree of freedom for Chi-Square Test:

df = (r-1) x (c-1)

Where,

r= number of rows

c= number of columns

Cramer's V:

Cramer's V is a measure of association between two nominal variables, giving a value between 0 (corresponding to no association between the variables) and 1 (perfect relationship). It is based on Pearson's chi-squared statistic and was published by Harald Cramér in 1946.

$$\text{Cramer's V} = \sqrt{\frac{\text{Chi} - \text{square test value}}{nt}}$$

n is the sample size,

t is the smaller of the number of rows minus one or the number of columns minus one. If r is the number of rows, and c is the number of columns, then

$$t = \text{Minimum } (r - 1, c - 1)$$

Kruskal-Wallis Test:

The Kruskal Wallis test (named after William Kruskal and W. Allen Wallis) is a non-parametric method for comparing differences between two or more than two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. Since it is a non-parametric method, the Kruskal–Wallis test does not assume a normal distribution unlike the analogous one-way analysis of variance (ANOVA).

$$H = \frac{12}{n(n + 1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(n + 1)$$

H = Kruskal-Wallis Test statistic

n = total number of observations in all samples

n_i(i = 1, 2, ..., k) = Sample sizes for each of the k groups in the data.

Ri = the sum of the ranks.

Mann-Whitney U test:

The Mann-Whitney U test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed (contrary to Student's t-test which has to be applied only on normal distribution). The logic behind the Mann-Whitney test is to rank the data for each condition, and then see how different the two rank totals are.

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

U is the Mann-Whitney statistic, n_1 and n_2 are the number of cases in samples 1 and 2, respectively, and R_1 is the sum of the ranks for the first sample.