

**AN ASSESSMENT OF ORAL HEALTH STATUS
AND TREATMENT NEEDS OF SALT PAN
WORKERS IN MARAKKANAM, VILLUPURAM
DISTRICT, TAMIL NADU.**

Dissertation Submitted to
THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY
In Partial Fulfillment for the Degree of
MASTER OF DENTAL SURGERY

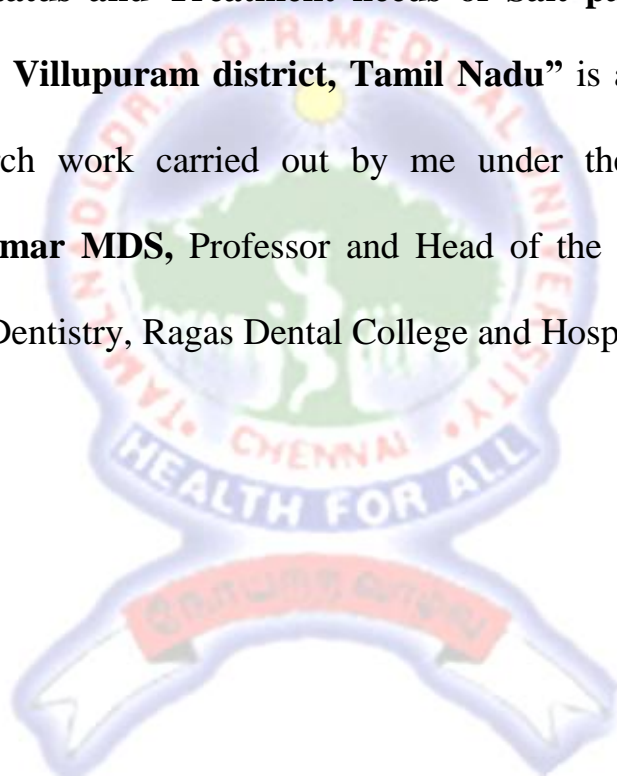


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I hereby declare that this dissertation titled “**An assessment of Oral health status and Treatment needs of Salt pan workers in Marakkanam, Villupuram district, Tamil Nadu**” is a bonafide and genuine research work carried out by me under the guidance of **Dr.M.Shivakumar MDS**, Professor and Head of the Department of Public Health Dentistry, Ragas Dental College and Hospital, Chennai.



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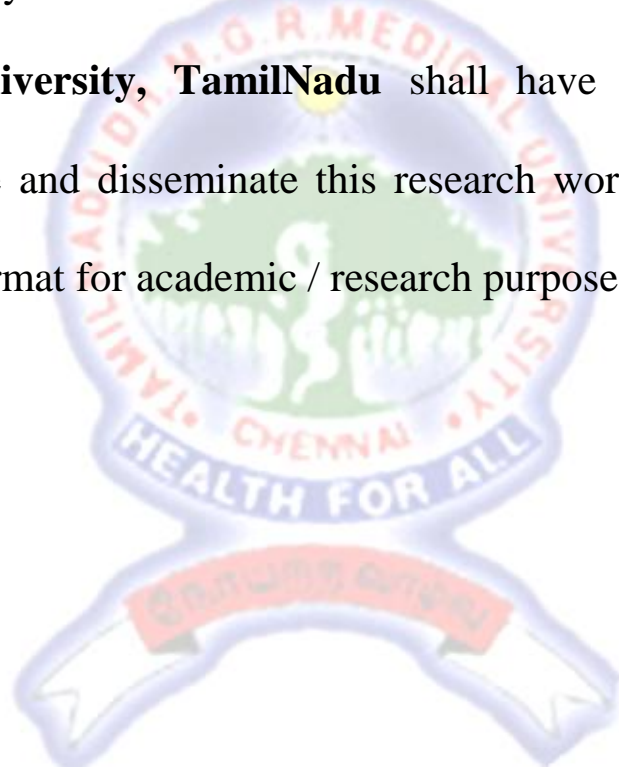
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CONTENTS

S No	INDEX	PAGE NO
1.	INTRODUCTION	1
2.	SALT PRODUCTION – AN OVERVIEW	4
3.	AIM AND OBJECTIVES	9
4.	REVIEW OF LITERATURE	10
4.	MATERIALS AND METHODS	18
5.	PHOTOS	24
6.	RESULTS	25
7.	DISCUSSION	79
8.	SUMMARY	88
9.	CONCLUSION	90
10.	RECOMMENDATION	91
11.	BIBLIOGRAPHY	92
13.	ANNEXURE	96

LIST OF TABLES

TABLE NO	TITLES	PAGE NO
1	Distribution of study population based on Sex.	25
2	Distribution of study population based on Mean Age	26
3	Distribution of study population based on education	27
4	Distribution of study population based on years of working experience	29
5	Distribution of study population based on smoking/smokeless tobacco usage	31
6	Distribution of study population based on alcohol consumption	32
7	Distribution of study population based on combination of smoking / smokeless tobacco usage and alcohol consumption	34
8(A)	Distribution of study population based on Type of tooth cleaning	37
8(B)	Distribution of study population based on Method of Tooth Brushing	38
8(C)	Distribution of the study population based on frequency of Tooth Brushing	39
8(D)	Distribution of study population based on duration of tooth brushing.	41

8 (E)	Distribution of study population based on frequency of changing Tooth Brush	43
9	Distribution of study population based on past dental visits	45
10	Distribution of study population based on reason for last dental visits	46
11	Distribution of study population based on reason for not visiting the dentist earlier	48
12	Distribution of study population based on work related problems	50
13	Distribution of study population based on TMJ symptoms, clicking, tenderness, reduced jaw mobility	52
14	Distribution of study population based on oral mucosa condition	54
15	Distribution of study population based on Enamel Opacities	56
16	Distribution of study population based on Dental Fluorosis	57
17	Distribution of study population based on Community Periodontal Index	59
18	Distribution of study population based on Loss of Attachment	60

19	Distribution of study population based on Crown Status	62
20	Distribution of study population based on Root status	63
21	Distribution of study population based on Treatment needs	64
22	Distribution of study population based on Mean DMFT	65
23	Distribution of study population based on prosthetic status	67
24	Distribution of study population based on prosthetic needs	68
25	Distribution of study population based on years of working experience and work related health problems	71
26	Distribution of study population based on work related health problems and Community Periodontal Index	74
27	Distribution of study population based on work related health problems and Loss of Attachment	77

LIST OF GRAPHS

GRAPH NO	TITLES	PAGE NO
1	Distribution of study population based on Sex.	25
2	Distribution of study population based on Mean Age	26
3	Distribution of study population based on education	28
4	Distribution of study population based on years of working experience	29
5	Distribution of study population based on smoking/smokeless tobacco usage	32
6	Distribution of study population based on alcohol consumption	33
7	Distribution of study population based on combination of smoking / smokeless tobacco usage and alcohol consumption	35
8(A)	Distribution of study population based on Type of tooth cleaning	37
8(B)	Distribution of study population based on Method of Tooth Brushing	38
8(C)	Distribution of the study population based on frequency of Tooth Brushing	40
8(D)	Distribution of study population based on duration of tooth brushing.	42

8 (E)	Distribution of study population based on frequency of changing Tooth Brush	44
9	Distribution of study population based on past dental visits	46
10	Distribution of study population based on reason for last dental visits	47
11	Distribution of study population based on reason for not visiting the dentist earlier	49
12	Distribution of study population based on work related problems	51
13	Distribution of study population based on TMJ symptoms, clicking, tenderness, reduced jaw mobility	53
14	Distribution of study population based on oral mucosa condition	54
15	Distribution of study population based on Enamel Opacities	56
16	Distribution of study population based on Dental Fluorosis	57
17	Distribution of study population based on Community Periodontal Index	59
18	Distribution of study population based on Loss of Attachment	60

19	Distribution of study population based on Mean DMFT	65
20	Distribution of study population based on prosthetic status	67
21	Distribution of study population based on prosthetic needs	69
22	Distribution of study population based on years of working experience and work related health problems	72
23	Distribution of study population based on work related health problems and Community Periodontal Index	75
24	Distribution of study population based on work related health problems and Loss of Attachment	78

Health is defined as a state of complete physical, mental and social well being and not merely an absence of disease or infirmity¹. The key to man's health lies largely in his environment. According to Davis (1989)², the environment includes the surroundings, conditions or influences that affect an organism. Last (2001)² defined the environment as: "All that which is external to the human host. It can be divided into physical, biological, social, cultural, etc., any or all of which can influence health status of populations ". Therefore there should be continuous adjustment not only within the body but also with the environment to ensure optimal function of our body. The multifactorial factors which influence health, are both within the individual and externally in the society and environment in which he or she lives.

Environmental health is defined by the World Health Organization as:

“Those aspects of the human health and disease that are determined by factors in the environment”. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health. A clean environment is essential for human health and well-being³.

Environmental factors include air, water and land in which the individual lives and works. The occupational environment implies the sum of external conditions and influences prevailing at the place of work, which has a bearing on the health of workers in their workplace. The health of workers at large will be influenced by conditions prevailing in their work place. One such workplace which influences health is Salt Pan. Salt Pan is a small, undrained, shallow depression in which water accumulates, evaporates, and deposits salt⁴.

In the World about 120 countries produce salt. Total salt production is about 210 million tonnes per year. The USA is the top producer; China ranks second; India, with 17 million tonnes, is third (2006)⁵. In India salt pans lie in coastal and desert areas of Rajasthan, Gujarat, Tamil Nadu and about 150 000 salt workers live here and are employed for eight months a year in this environment⁶. They do the toughest of manual jobs and are at a risk of being visually affected, prone to hypertension, skin lesions, knee injury, back pain and exhaustion.

In India the salt industry is governed by the Salt Cess Act of 1953, which is implemented through the Salt Commissioner's Office, headquartered in Jaipur. Gujarat accounts for about 70 percent of India's salt production, followed by Tamil Nadu with 14 percent and Rajasthan with 11 percent⁵.

In Tamil Nadu, salt is produced primarily in Nagapattinam District, Tuticorin District and Marakkanam in Villupuram district⁵. The salt pan workers work under extremely hazardous conditions and have employment only for about eight months in a year.

Marakkanam is a panchayat town in Viluppuram district of Tamil Nadu state in South India. Its major resource is salt production. It is estimated that about 1,500 workers live in Marakkanam area. Their major mode of income is by working in the salt pan. They spend most of their time in the pan.

Due to their long working hours and stress associated, they become susceptible to a variety of health problems. The lack of education and decreased health awareness level prevent these people to avail proper medical care. Hence

they hardly have access to any quality medical care. Haldiya K.R etal (2005)⁶ reported brine workers had a fair knowledge of their occupational health problems, protective measures as compared to non brine workers. Haldiya.K.R etal (2010)⁷ reported high prevalence of ophthalmic symptoms among salt workers of Rajasthan. Very few studies have been done to assess the oral health of salt pan workers. Hence this study has been undertaken to assess the oral health status and treatment needs of salt pan workers at Marakkanam.

SALT PRODUCTION PROCESS – AN OVERVIEW⁸:

Salt is an inseparable ingredient, which sustains life on earth. In ancient time when seawater evaporated in pits, white layer was formed and found it was found to be tasty. Human beings who consumed it, experienced some strength after eating this white layer⁸. The white layer was nothing but “Solar Salt”. The Solar Salt production process is used worldwide for producing maximum quantity of salt for industry.

Solar Salt process can be divided in to four parts-

- 1) Brine Management
- 2) Crystallization
- 3) Harvesting salt
- 4) Up-grading.

1) BRINE MANAGEMENT

Depending on location, the initial specific gravity of the brine i.e., (Water saturated with or containing large amounts of a salt, especially sodium chloride) varies; normally it is 1.02 to 1.025 i.e. around 3.0* Be (Deg. Baume). At initial stage the size of ponds are big and known as reservoir. Lots of shrimps come along with seawater. In few locations the silt also comes. The silt settles in ponds and there after clean brine flows further. The shrimps attract the birds and the discharge of birds is a fertilizer for the growth of the algae, which give colour to brine, and finally it helps to increase the evaporation. This leads to more salt

production. The process of seawater concentration can be divided in seven stages.

Each stage represents a distinct change in the resulting liquid:-

- 1) Between 3 deg to 10 deg Be
- 2) Between 10 deg to 17 deg Be
- 3) Between 17 deg to 25 deg Be
- 4) Between 25 deg to 29 deg Be
- 5) Between 29 deg to 35 deg Be
- 6) Between 35 deg to 37 deg Be
- 7) Between 37 deg to 39 deg Be

FIRST STAGE

By gradual evaporation the seawater volume reduced to 37% when density reaches to 10 deg Be.



Fig 1: Brine Management showing the reservoir of water

SECOND STAGE

The original volume of the seawater reduces to 20%. The liquid remain unsaturated till 17 deg Be. Sometimes it is noticed that a portion of Gypsum, Calcium and Magnesium Carbonate separates out at 12 deg Be.

THIRD STAGE

When concentration reaches to 17 deg Be the calcium sulphate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) begins to separate out in form of thin layer. Though it floats initially it later settles down at bottom. The major portion of CaSO_4 separate out at 17 deg to 25 deg Be.

FOURTH STAGE

At this stage rate of evaporation reduces less than 50% of Sea water. As the evaporation proceeds for every 100 grams of water evaporated from saturated solution, 36.5 grams of sodium chloride precipitate. The solubility of sodium chloride being 36.5 grams at 30 deg C in 100 grams of water, the percentage of salt present in saturated solution would be: $36.5 / (100+36.5) = 26.74 \%$ by weight. Thus for every 100 grams of saturated solution we have 73.26 grams water and 26.74 grams salt. The fifth, sixth and seventh stages are for bittern (waste products) for the recovery of by products of Salt.

2) CRYSTALLIZERS

This is a part of fourth stage only. The crystallizers are the heart of the salt works. Hence its best utilization is of utmost importance in salt production⁵. The crystallizers should give maximum yield, best quality salt with minimum brine consumption. It is necessary that for proper control of quality, in addition of checking of sp. gravity / density of Ca & Mg should also be determined, before charging the brine to crystallizers. After charging of brine to crystallizers, it is necessary to continue to monitor the density and as well as Ca & Mg in Brine and the amount of salt being precipitate. Normally specific gravity of 1.21 to 1.25 (density 25.17 to 29 deg Be) is maintained in crystallizers. It is also very important to maintain about 20 Cms depth in brine. In deep charging crystallizers, the formation of crystal is cubical where as in shallow charging crystallization, crystals formation is hollow type. Removal of impurities in cubical crystal is easy in washing plant.



Fig 2: The salt crystals were collected and kept ready for upgrading

CRYSTAL

The shape of the crystal is very important in quality of salt. In deep charging crystallizers, the crystals are solid, heavier and do not retain mother liquor after harvesting as impurities are drained out very fast. Whereas in shallow charging crystallization, crystal is of hollow type, which retains mother liquor after harvesting, and it dries up inside the crystal. The first salt crust of about 30cms thickness is used as permanent bed and subsequent salt crust of the thickness 10cms to 30cms are harvested and sent to washing plant.

4. UP GRADING:

Freshly harvested salt has impurities derived from seawater. By washing with brine these impurities are removed partly by about 70%. Hydrosal salt upgrading process with Hydro extraction of impurities from salt selectively cracks the crystals to free the enclosed impurities. The process achieves very high purity of NaCl⁹.



Fig 3: The solar salt is being packed and transported

ABSTRACT

BACKGROUND:

The present study was conducted to assess the oral health status and treatment needs of salt pan workers in Marakkanam, Villupuram District, Tamil Nadu, South India.

Objectives:

1. To assess the oral health status and treatment needs of salt pan workers using WHO oral health assessment proforma 1997.

Methodology:

A cross-sectional descriptive study was conducted to assess the oral health status and treatment needs of 674 salt pan workers in Marakkanam, Villupuram District, Tamil Nadu. Data was collected using a survey proforma which comprised of a questionnaire and WHO Oral Health Surveys – Basic Methods Proforma(1997). The collected data was subjected to statistical analysis.

Results:

Results showed that majority of the salt pan workers examined were males 460 (68.2%). 373 (55.4%) workers used tobacco products and 195 (28.9%) workers consumed alcohol. 599 (88.9%) workers used tooth paste and tooth brush to clean their teeth. A large percentage of the workers, 513 (76.1%) had not visited dentist before. Of those who have visited the dentist, 73 (10.8%) workers had visited dentist for extraction. 295 (43.8%) workers reported work related health problems. 50 (7.4%) workers had leukoplakia and 31 (4.6%) had sub mucous fibrosis. A very high prevalence of periodontal disease was found, with only 0.3% having healthy periodontium. The prevalence of dental caries among the study population was 61.1%. and the mean DMFT was 3.35 in both males and females. 79 (11.8%) workers were partially edentulous in the upper arch and 102 (15.1%) were partially edentulous in the lower arch.

Conclusion:

The oral health status of salt pan workers was poor with high prevalence of periodontal disease and dental caries. Regular oral examinations by dental professionals, dental health education to motivate subjects to receive regular dental check-up and to maintain oral hygiene, adoption by nearby Dental colleges if any and involvement of NGO'S like Rotary Club, Lions Club, IDA will be needed to improve the oral health status of these workers.

Key words:

Salt Pan Workers, oral health status, WHO oral health proforma, treatment needs.

AIM:

To assess the oral health status and treatment needs of salt pan workers in Marakkanam, Villupuram District, Tamil Nadu State, South India.

OBJECTIVES:

1. To assess the duration of work, need for dental treatment, utilization of dental services and oral hygiene practices among salt pan workers using a closed ended pre-tested questionnaire.
2. To assess the oral health status and treatment needs of salt pan workers using WHO oral health assessment proforma 1997.
3. To compare the oral health status among these workers based on sex.
4. To provide baseline data on oral health status of these workers for planning and implementing dental public health programme.

REVIEW OF LITERATURE

Srikandi TW, Carey SE and Clarke NG (1983)¹⁰ conducted a study in Adelaide, South Australia to establish the pattern of dental service utilization, the perception of periodontal disease and the oral hygiene practice within a group of adult workers with respect to age, sex, socioeconomic level and to relate the pattern to tooth loss and periodontal status. The study population included were 680 workers. Data on latest dental visit, usual pattern and frequency of dental visits, reasons for non utilization, types of dental treatment perceived to be needed and oral hygiene practices were obtained using questionnaire. Results showed 50.5% of the study population had made a dental visit previous year, 40.1% had seen their dentist 1-5 years previously while 8.9% has not consulted a dentist for more than 5 years. 4 males(0.6%) had not consulted a dentist in their lives. Females tend to visit more frequently than males. Regular visits were supported by 42.5% subjects. The principle reasons for not utilization, as given by the subjects were 60.2% subjects felt that there was 'nothing wrong', 16.4% said they were 'too busy or could not be bothered'. 'fear of dentist' and 'cost' associated for 8%. About 80.5% had never been advised that they had periodontal disease and only 11% stated that they had received periodontal treatment. Subjects in higher socioeconomic group appeared to be more aware of the existence of periodontal disease than those in the lower level groups. 91.4% brushed their tooth atleast once daily and only 10% practice interproximal cleaning clearly.

Peterson PE (1983)¹¹ investigated the utilization of dental services, the distribution of dental diseases and treatment needs in a Danish industrial

population. The study covered the male population at Danish shipyard and a sample of 988 workers and clerical and management staff were drawn by stratified random sampling. 841 persons were interviewed regarding dental visit and attitude towards the dental health services and the data on dental health and treatment needs were collected using WHO basic oral health survey 1977. 61% of the participants aged 15-64 years made regular dental visits atleast once a year. The percentage of regular visitors varied according to age and occupation from 68 to 82% among clerical staff to 34 to 51% among workers. The mean DMFT increased from 16.6 in the age group of 15-24 years to 27 among 55-64 years age group. Untreated dental treatment was prominent among workers and persons never seeing a dentist, where as there were more filled teeth and fewer missing teeth among staff and regular visitors. The periodontal status was less satisfactory in the older age groups and among workers. Most denture wearers were found in the age group of 35-64 years and among workers.

Petersen PE, Gormsen C (1988)¹² conducted a study to evaluate the oral conditions among German battery factory workers. The study group consists of 61 dentate workers. At the time of investigation the concentration of airborne acids varied from 0.4 to 4.1 mg/cm³. Information about the dental health status was based on clinical observations. Dental caries was recorded as described by W.H.O. Periodontal registration included measurements of pocket depth in mm. dental erosion was measured using the criteria recommended by Ten Bruggen HJ. Dental attrition was assessed using the criteria recommended by W.H.O. Results showed that the mean DMFT was 25.5. Mean number of scored teeth with gingival pockets deeper than 5mm was 2.1. 40% of workers had crown or bridge

restorations; mean number of teeth with crown restoration was 5.3. 31% of workers were affected by dental erosion and 92% by attrition.

Petersen PE, Henmar P (1988)¹³ conducted a study to evaluate the oral conditions among workers in the Danish Granite Industry in particular to describe the prevalence and severity of dental abrasion. The study population consists of 39 males. The study was preceded by dust measurements performed by the labour inspection service. At the time of the investigation the concentration of quartz at the crushing mill varied from 2.24 to 2.38 mg/m³. Questionnaire was used to collect data on residence, education, work conditions, dental health behavior, self assessment of dental health status and symptoms from temporomandibular joint and muscles. Information about the oral health status was based on clinical observations. Dental caries and removable dentures were recorded as described by W.H.O. The assessment of periodontal status was based on the Periodontal Treatment System. Dental abrasion of each tooth was recorded according to W.H.O criteria. Results showed that 10 % of respondents had been treated by school dental service and 51% visited the dentist regularly. The mean DMFS was 87.2. The mean percentage of teeth with healthy periodontium was 6.8, the percentage of teeth with gingivitis without calculus was 48.3, percentage of teeth with gingivitis and calculus was 31.5, percentage of teeth with pockets deeper than 5mm or looseness of the third degree was 13.4. The prevalence of dental abrasion was 100% and was frequent on the front teeth (incisors and cuspids).

Maselin K, Murtomaa H et al (1990)¹⁴ conducted a study among the workers in the modern Finnish confectionery industry to find out the significance of airborne sugar and flour dust as an occupational hazard. The study was carried

out by comparing the oral health status of workers exposed to such dust on production lines on which sweets, biscuits and other sugar containing products were made with the oral health status of workers in the same company not exposed to such dust. The study population was 700 workers in biscuit, sweet and bakery production lines in a modern Finnish confectionery factory. An internal control group was chosen from workers not employed in production or not active in units directly associated with sugary environments. A total of 298 employees were studied. Clinical assessment was carried out using WHO criteria 1977. Dental caries were recorded using DMFS and periodontal status using CPITN. All subjects were given a questionnaire before clinical investigation for recording medical and dental examination. Highest DMFS means 73 were found in employees working in biscuit and confectionery production than controls with DMFS 60.4. Maximum CPITN sextant scores of 3 and 4 were most frequent in biscuit group. (45% had score 3 and 18% had score 4).

Ahlberg J, Tuominen R, Murtomaa H (1996)¹⁵ conducted a study to assess the knowledge and attitudes concerning oral health care among male industrial workers in Finland with or without access to an employer provided dental benefit scheme and whether these factors were associated with utilization of dental services. The study population consists of 325 subsidized workers and 174 controls. Data was collected using a pre tested postal questionnaire survey and clinical examination using mouth mirror and WHO periodontal probe and explorer in good light. Results showed that 60% of the subjects in both the groups had visited a dentist within past 12 months. Subjects in both the study groups who had not visited a dentist within past 2 years were most likely to claim a lack of

symptom as the reason. Probability of a dental visit within past 2 years was positively associated with access to an employer provided dental benefit scheme, tooth brushing to maintain dental health and negatively associated with the number of carious teeth.

Bachanck T, Pawlowicz A et al (2001)¹⁶ studied the incidence of dental caries among the workers of flour mills. The study covered 48 workers employed in three flour mills in Lublin city, Poland. Examination was carried out in artificial light, using a mirror and dental explorer. The average DMFT index was 17.4 in males and 19.62 in females and 17.77 in whole examined group.

Amin NM and Al-Omouh SA (2001)¹⁷ conducted a study to assess the oral health of workers exposed to acid fumes in phosphate and battery industries in Jordan. Study population includes 68 subjects (37 acid workers and 31 controls who were drawn from acid free department) in the phosphate industry and in the battery factory 39 subjects (24 acid workers and 15 controls). Structured questionnaires were used to collect data on medical and dental histories, dietary habits, parafunctional habits, oral hygiene practices and dental symptoms. Oral hygiene was examined using Oral Hygiene Index – Simplified and gingival status examined using Gingival Index. Results showed that the oral hygiene practice was poor. Only 14% of acid workers and 25% of controls brushed their tooth daily. 12% had visited a dental clinic during the past year mainly for extraction. More than half (58%) were smokers. Two thirds (66.6%) had poorer oral hygiene score, one third had fair score and none had good OHI-S score than controls.79.3% of acid workers in battery factory had scores 2 and 3.

Tomita NE, Chinellato LEM et al (2005)¹⁸ conducted a study to assess the oral health status of building construction workers in Sao Paula, Brazil. 219 subjects were examined using WHO oral health assessment criteria 1997. The study showed a mean DMFT of 16.9. The DMFT was found to increase with increase in age. There was a positive relation between socioeconomic status and dental disease. Around 2.7% of the study population presented with oral disease.

Haldiya KR, Sachdev R, Mathur ML et al (2005)⁶ conducted a cross sectional study to assess the knowledge, attitude and practices related to occupational health problems among salt workers working in the desert of Rajasthan. The study population consists of 205 workers (78 brine and 127 non brine workers) from Sambhar, Nawa, Rajas salt manufacturing units. Data was collected using a questionnaire using face to face interview method. Results showed that among the brine salt workers 98.7% had knowledge of occupational health problems, 100% had knowledge of protective measures, 100% knew the benefits of using shoes while working in brine water, 98.7% knew the benefits of using goggles during working hours. Among the non brine salt workers 89% and 85.8% had knowledge of health problems and interventional measures to prevent the entry of salt dust on different parts of the body. 78.7% and 66.9% knew the benefits of using a mask and spectacles during working hours. Brine workers (29.5%) and non brine workers (31.5%) used unconventional measures to prevent contact with salty water, salt dust, raw dust and glare.

Gurav RB, Karthikeyan S, Wayal R et al (2005)¹⁹ conducted a study to assess the health profile of daily wage labourers. The study population consists of

172 males and 116 females of Shivaji Chawk Naka Village in Thane District, Maharashtra. Data was collected using interviews and clinical examinations. A pretested proforma was used to record information which includes age, sex, education, marital status, religion, place of residence, tobacco usage, alcohol consumption, blood pressure. Diagnosis of hypertension was made as per the recommendations made by W.H.O. The results showed that about 12.5% of the respondents had no addictions to tobacco products or alcohol. Alcohol consumption was seen in 42.71% and usage of tobacco only in 24.65%, paan and tobacco in 65.97%, smoking in 45.49%. About 60.76% of workers had musculoskeletal problems, 3.12% of workers had eye problems, 11.46% of workers had skin problems.

Dagli RJ, Kumar S, Dhanni C, Duraiswamy P and Kulkarni S (2008)²⁰ conducted a study to assess the dental health among green marble mine workers in India. The study population was 513 workers. Examination was carried out using WHO oral health proforma 1997. Datas were collected with respect to age, oral hygiene practices, tobacco habits, alcohol habits and stress. Results showed majority of the workers, 33.3% were in the age group of 18-24 years. 21.1% labours were not cleaning their teeth daily. About 65% of workers were experiencing stressful life as mine labourers. Prevalence of fracture tooth was 10.5%. Tobacco and alcohol habits were among 40.3% and 15.8% labourers respectively. The mean DMFT and DMFS scores were 2.79 ± 2.44 and 5.47 ± 5.4 . The caries prevalence was 71.1% of all age group with maximum in 25-34 year group. None of the participant had filled teeth. Periodontal status among study population shows high prevalence of periodontal disease. DMFT was increasing

with age, malnutrition, poor oral hygiene practices, stress and habits of tobacco and alcohol.

Roy S, Dasgupta A (2008)²¹ conducted a study to find out the health status of women engaged in a home based “papad making” industry in a slum area of Kolkatta, and the occupational factors influencing their health status and their felt health needs. The study subjects consists of 80 women between age 14 – 60yrs. Data was collected using predesigned and pretested schedule with questions regarding their socio economic condition, their occupational history and their health problems and by clinical examination and observation. Results showed that Neck (33.5%) was the most commonly affected part. A significant relationship was found to exist between duration of occupation and musculoskeletal problem ($p<0.001$). On examination Pallor (75%), angular stomatitis (25%), pedal odema (17.5%), poor oral health (15%), hypertension (12.5%), epigastric tenderness (10%), scabies (7.5%) were found.

Sachdev R, Mathur ML, Haldiya KR etal (2010)⁷ did a study to identify the work related health problems in salt workers of Rajasthan, India. A total of 865 workers were studied. Data was collected in health camps held at Sambhar, Nawa and Phalodi salt manufacturing units. Data was collected regarding age, gender, detailed occupational history and nature of job and duration of working in a pre designed schedule. JNC VI criteria was used for making the diagnosis of hypertension. Results showed that prevalence of work related symptoms was 85.9% among the salt workers. Prevalence of ophthalmic symptoms was 60.7%, dermatological symptoms was 43.8%, symptoms like head ache, giddiness, breathlessness, muscular and joint pain was present on 52.1 % of salt workers.

I thank Dr.M.Shivakumar MDS, Professor and Head of the Department of Public Health Dentistry, Ragas Dental College and Hospital, Chennai, who has been instrumental in shaping my views throughout the completion of my dissertation in all aspects. His enthusiasm and unlimited zeal proved to be a major driving force throughout the dissertation completion. Sir, I solemnly express my deep felt gratitude for your valuable and great guidance and suggestions.

I express my deep sense of gratitude to Dr.P.D.Madan Kumar MDS, Reader, who was there at each step guiding me to prepare this dissertation. I am deeply grateful for his detailed and constructive comments, and for his important support throughout this work.

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I take this opportunity to thank Dr. S. Ramachandran MDS, Principal, Ragas Dental College & Hospital and to Dr. N.S. Azhagarasan, MDS and Dr.N.R.Krishnaswamy, MDS, Vice-principals, Ragas Dental College for their generous support rendered throughout my course.

I would also like to thank Mr.Elango, the Deputy Commissioner of Salt, Marakkanam for giving me permission to carry out this dissertation. A special

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I also thank my batchmates Dr. S.Aparna and Dr.Delfin Lovelina for encouraging me and helping me in completing this dissertation. I extend my gratitude to my seniors Dr. Vishnu Prasad, Dr.Nijesh.JE, Dr.Anu.V and Juniors Dr.Rajmohan and Dr.Rajeswary for their friendly help, support and cooperation throughout my postgraduate life.

I express my love and thanks to my loving Dad and Mom and all at home who made my dreams come true.

Truly,

Dr.I.Nanda Balan

I. BACKGROUND OF STUDY

The present study was done to assess the Oral Health Status and Treatment needs of Salt pan workers in Marakkanam, Villupuram District, Tamil Nadu State, South India

II. BACKGROUND OF THE STUDY AREA

The study was conducted in Marakkanam during October 2010 to March 2011, among Salt Pan workers to assess their oral health status and treatment needs.

Marakkanam is a panchayat town in Viluppuram district of Tamil Nadu state in South India. Its major resource is salt production. It is estimated that about 3,500 acres of Salt Pan area exist in Marakkanam area where more than 1500 workers are employed. Their major mode of income is by working in the salt pan.

III. STUDY POPULATION

The Marakkanam Salt Pan is one of the pioneer salt producing unit in Tamil Nadu which has around 1,500 workers working under similar environmental condition. Most of them were paid on a daily basis.

IV. OBTAINING THE APPROVAL FROM AUTHORITIES

Ethical clearance to conduct the study was obtained from the Institution Review Board of Ragas Dental College and Hospital (**Annexure I**). Further, permission was also obtained from the Deputy salt commissioner, Chennai (**Annexure II**).

V. INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

1. Salt Pan Workers aged 18 years and above who were present on the day of examination and who were willing to participate in the study were included
2. Salt Pan Workers who have worked in the salt pan for a minimum of one year.

EXCLUSION CRITERIA

1. Workers who had history of any systemic illness like diabetes mellitus, hypertension etc. which might affect the outcome of the study

VI. SAMPLE SIZE DETERMINATION.

i) PILOT STUDY:

A pilot study was undertaken during October 2010 in a Community Hall in Marakkanam to determine the feasibility of the study and also to determine the sample size. The study population included were 50 salt pan workers. Questionnaire was used to assess the years of working experience, tobacco usage and alcohol consumption, oral hygiene practices, utilization of dental services and work related problems. WHO oral health assessment proforma 1997 was used to assess the oral health status and treatment needs. It took an average of 15-20 minutes to complete the proforma and questionnaire

As per the pilot study, the prevalence of dental fluorosis and leukoplakia was found to be 4.8 % and it was taken for sample size calculation.

ii) SAMPLE SIZE DERIVATION:

Sample size calculation was done using the formula given below.

$$\begin{aligned}n &= \frac{z^2 pq}{d^2} \\ &= \frac{(2.5)^2 \times 4.8 \times 95.92}{2^2} \\ &= 610 + 10\% \\ &= 674 \text{ (approximately)}\end{aligned}$$

Z (Confidence Interval 99 %) = 2.5

p = prevalence = 4.8 %

q = 1-p = 95.92%

d = allowable error = 2%

iii) STUDY SAMPLE AND SAMPLING PROCEDURE

The study sample for the present study was selected using simple random sampling method.

VII. IMPLEMENTING THE STUDY

a. PROFORMA and DATA COLLECTION

Data was collected from a cross-sectional survey, using a Survey Proforma which comprised of a Questionnaire, and Clinical examination.

(i) QUESTIONNAIRE AND DEMOGRAPHIC DATA

A pre-tested questionnaire which included Demographic data, years of working experience, tobacco habits, and oral hygiene practices, questions to assess utilization of dental care services, was collected from the individuals prior to the clinical examination (**Annexure III**)

(ii) CLINICAL EXAMINATION

An intra-oral examination was carried out by a single examiner to assess the Oral Health Status and treatment needs using WHO Oral Health Surveys – Basic Methods Proforma (1997)

(**Annexure IV**).

b. EXAMINATION AREA

Type III Examination was conducted under bright natural light, by positioning the subject as to receive sufficient daylight.

c. EXAMINATION POSITION

The subjects were made to sit on a chair with comfortable arm rest facing the light in an upright position with sufficient head rest. Type-III clinical examination as recommended by American Dental Association (ADA) specification was followed. The examiner examined by standing to the right of the subject. The trained data recorder was seated on the left side of the patient, so that data recorder was able to hear the examiner's instructions and codes and also the examiner was able to see the data being entered (**Photograph 1**).

d. INSTRUMENTS AND MATERIALS USED

Examination was carried out with the help of the following (**Photograph 2**):

- ◆ Mouth mirrors
- ◆ CPI probe
- ◆ Cotton rolls
- ◆ Kidney trays
- ◆ Sterilizing solution
- ◆ Chip blower
- ◆ Cotton holder
- ◆ Disposable gloves and masks

During data collection, chemical method of disinfection and sterilization using Korsolex (Glutaraldehyde- 7gms; Polymethyl urea derivatives- 11.6 gms; 1,6 dihydroxy 2,5 droxyhexane - 8.2gm) diluted by adding water was used. Used instruments were washed and placed in the disinfectant solution (for 30 minutes), then re-washed and drained well. After each day of examination, the entire set of instruments was autoclaved.

VIII. EXAMINATION, ORAL HEALTH EDUCATION AND TREATMENT REFERRAL

Each worker was examined for 15 minutes after the questionnaire was completed. Around 25 workers approximately were examined per day. After the oral examination, a brief oral health education session was conducted in the local language Tamil to all the workers.

The findings of the survey were reported at the venue of the examination to the workers and those requiring treatment were provided free treatment by arranging Dental Camp which was organized by Ragas Dental College and Hospital in co-operation with Government of India, Ministry of Commerce & Industry, Salt Commissionerate Mrakkanam Salt Factory (**Annexure V**). Dentists from Ragas Dental College and Hospital participated in the dental camp. Along with the dental camp a medical camp was also conducted for the workers with the help of local medical practitioners from Government Hospital Marakkanam and Aravind Eye Hospital, Pondicherry. Workers who required further dental treatment were referred to nearby dental clinics and Ragas Dental College & Hospital for dental treatment.

IX. STATISTICAL ANALYSIS:

The data recorded were transferred and tabulated to the computer - Windows Microsoft Excel (2007) - for the purpose of the data analysis. SPSS 15 was used for statistical analysis. The alpha error (Type I error) was assumed to be 0.01. 99% confidence limit was set for the above analysis. Chi-square test was used for comparison between male and female workers.

PHOTOGRAPHS

Photograph 1: Oral Examination.



Photograph 2: Armamentarium



RESULTS

The present study was done to assess the oral health status and treatment needs of Salt Pan Workers in Marakkanam, Villupuram District, Tamil Nadu.

Table 1 and graph 1 shows that the majority of the study population, i.e., 460 (68.2%) of the total study population were males and 214 (31.8%) were females.

Table 1: Distribution of study population based on Sex

Male	Female	Total
460 (68.2%)	214 (31.8%)	674 (100%)

Graph 1: Distribution of study population based on Sex

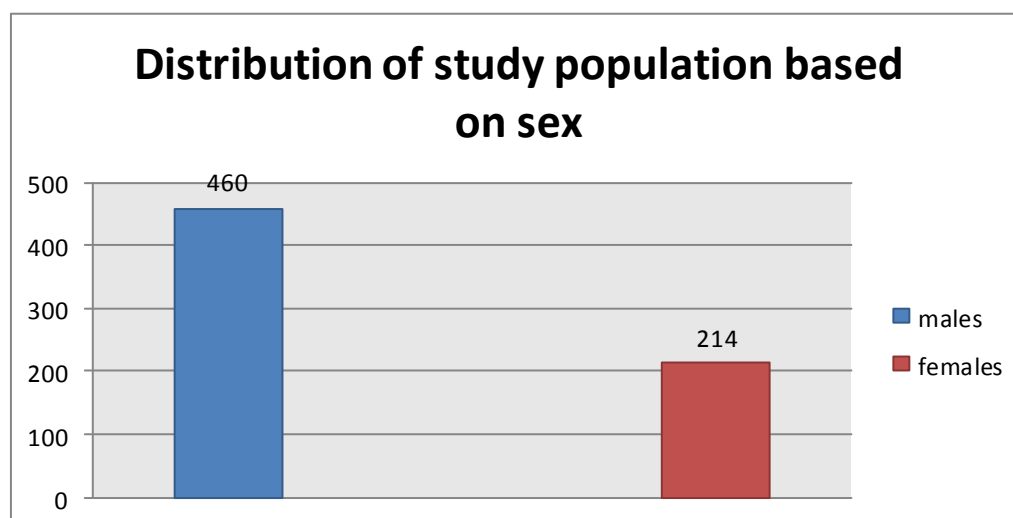


Table 2, Graph 2 shows that the mean age of males was 36.07 years and females was 32.98 years.

Table 2: Distribution of study population based on Mean Age

	Male	Female
	N = 460	N = 214
Mean	36.07	32.98
Standard deviation	8.796	8.917

Graph 2: Distribution of study population based on Mean Age

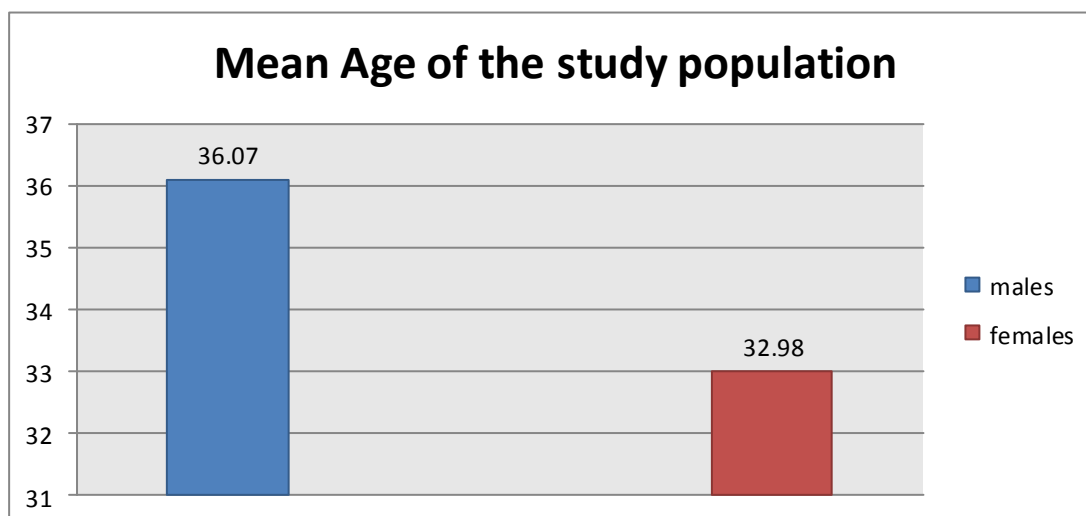


Table 3, Graph 3 shows that the majority of males i.e., 229 (49.8%) had secondary education, 113 (24.6%) had primary education, 81 (17.6%) had PUC, 37 (8%) had no formal education. Majority of the females i.e., 108 (50.5%) had primary education, 81 (37.5%) had secondary education, 16 (7.5%) no formal education, 9 (4.1%) had PUC.

Statistical test showed a significant difference between education and sex ($\chi^2 = 54.114$; $P = 0.000$)

Table 3: Distribution of study population based on education

Education	Male	Female	Total
No formal education	37 (8.0%)	16 (7.5%)	53 (7.7%)
Primary	113 (24.6%)	108 (50.5%)	221 (37.6%)
Secondary	229 (49.8%)	81 (37.9%)	310 (43.9%)
PUC	81 (17.6%)	9 (4.1%)	90 (13.3%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 54.114 P = 0.000 (significant)

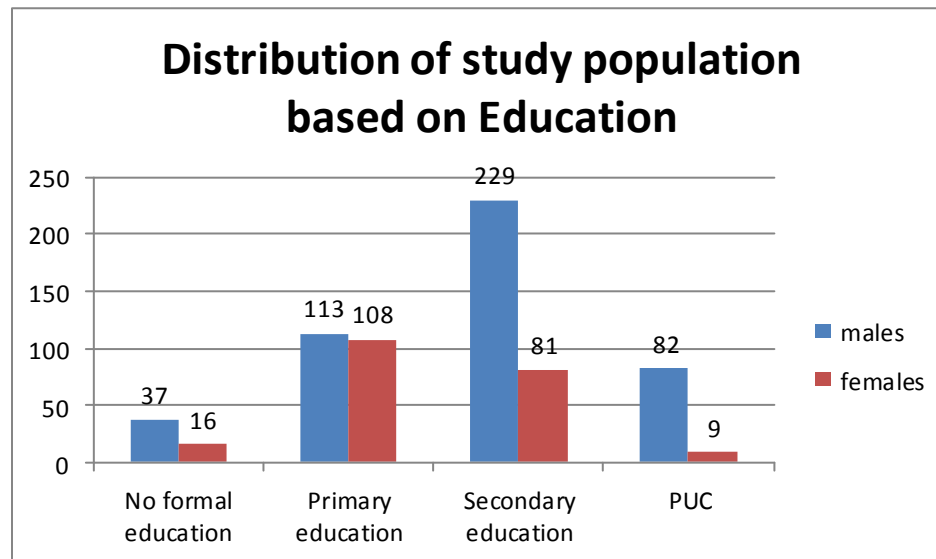
Graph 3: Distribution of study population based on education

Table 4, Graph 4 shows that majority of the study population ie.286 (42.6%) had a working experience of 5 – 10 years of which 198 (43 %) were males and 88 (41.1%) were females. About 213 (31.6%) workers had a working experience of greater than 10 years of which 160 (34.8%) were males and 53 (24.8%) were females. About 175 (26%) workers had a working experience of less than 5 years of which 102 (22.2%) were males and 73 (34.1%) were females.

Statistical test showed a significant difference between years of working experience and sex ($\chi^2 = 28.782$; $P= 0.000$).

Table 4: Distribution of study population based on years of working experience

Years of working experience	Males	Females	Total
< 5 years	102 (22.2%)	73 (34.1%)	175 (26%)
5 – 10 years	198 (43.0%)	88 (41.1%)	286 (42.4%)
> 10 years	160 (34.8%)	53 (24.8%)	213 (31.6%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 78.782 P = 0.000 (significant)

Graph 4: Distribution of study population based on years of working experience

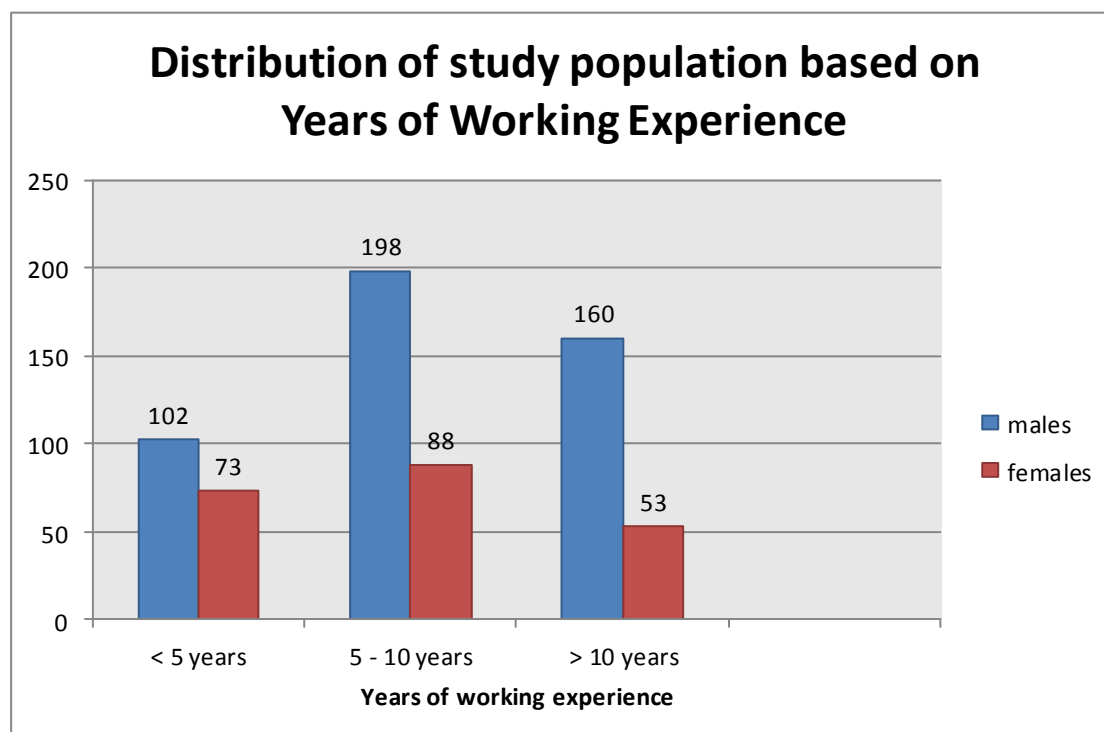


Table 5, Graph 5 shows distribution of study population based upon whether they have any habit of tobacco usage. Among the total study population i.e., 301 (44.6%) had no smokeless / smoking tobacco habit of which 154 (33.5%) were males and 147 (68.7%) were females. 120 (17.8%) male workers had cigarette smoking habit. 82 (17.8%) male workers had beedi smoking habit. 2 (0.4%) and 20 (4.3%) male workers had Hans and gutkha chewing habit. 67 (9.9%) female workers had the habit of chewing beetel leaves along with tobacco. 82 (12.2%) male workers had the habit of using both smoking and smokeless tobacco.

Statistical test showed a significant difference between smoking / smokeless tobacco usage and sex ($\chi^2 = 291.049$; $P= 0.000$).

Table 6, Graph 6 shows distribution of study population based on alcohol consumption. Among the total study population ie.,195 (28.9%) consumed alcohol of which all the workers were male. 479 (71.1%) had no habit of alcohol consumption of which 265 (57.6%) were males and 214 (100%) were females.

Statistical test showed a significant difference between alcohol consumption and sex ($\chi^2 = 127.65$; $P= 0.000$).

Table 5: Distribution of study population based on smoking/smokeless tobacco usage

Smoking/smokeless tobacco habit	Male	Female	Total
No Smoking / smokeless tobacco habit	154 (33.5%)	147 (68.7%)	301 (44.6%)
Cigarette	120 (26.1%)	0 (0%)	120 (17.8%)
Beedi	82 (17.8%)	0 (0%)	82 (12.2%)
Hans	2 (0.4%)	0 (0%)	2 (0.3%)
Gutkha	20 (4.3%)	0 (0%)	20 (2.9%)
Beetel	0 (0%)	67 (31.3%)	67 (9.9%)
Combination of smokeless and smoking tobacco	82 (17.8%)	0 (0%)	82 (12.2%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 291.049 P = 0.000 (significant)

Graph 5: Distribution of study population based on smoking/smokeless tobacco usage

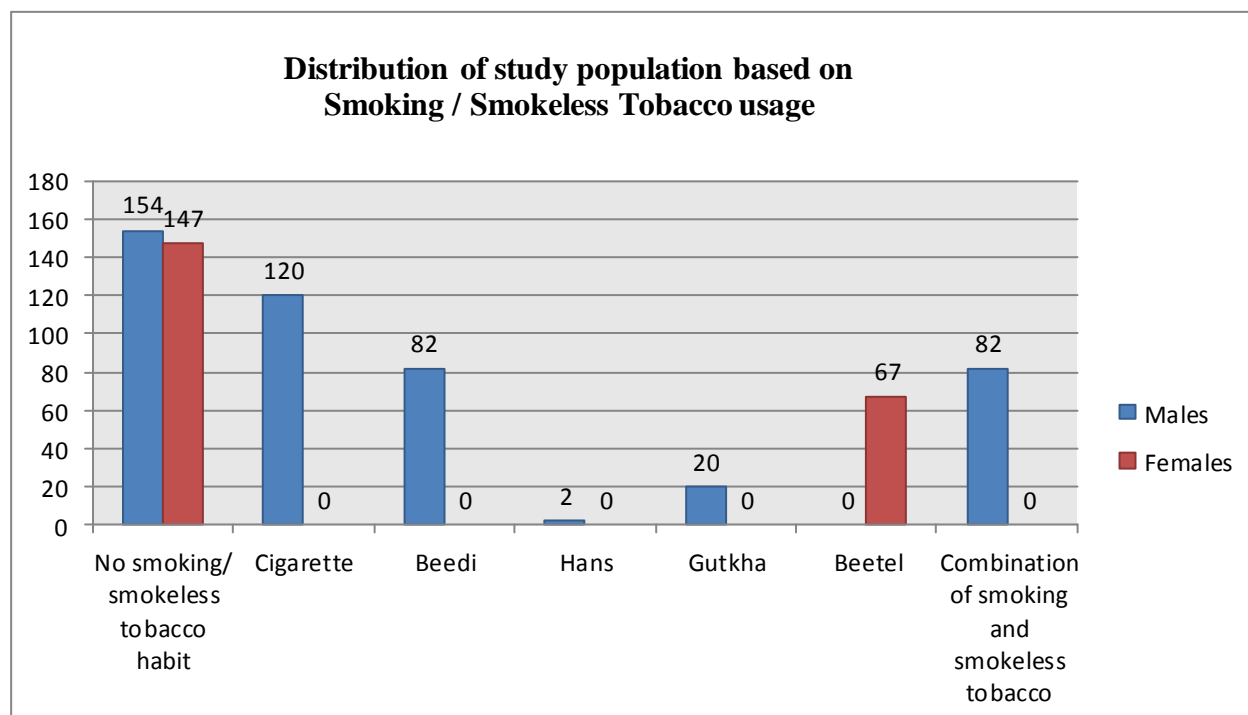


Table 6: Distribution of study population based on alcohol consumption:

Alcohol consumption	Male	Female	Total
Yes	195 (42.4%)	0 (0%)	195 (28.9%)
No	265 (57.6%)	214 (100%)	479 (71.1%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 127.65 P = 0.000 (significant)

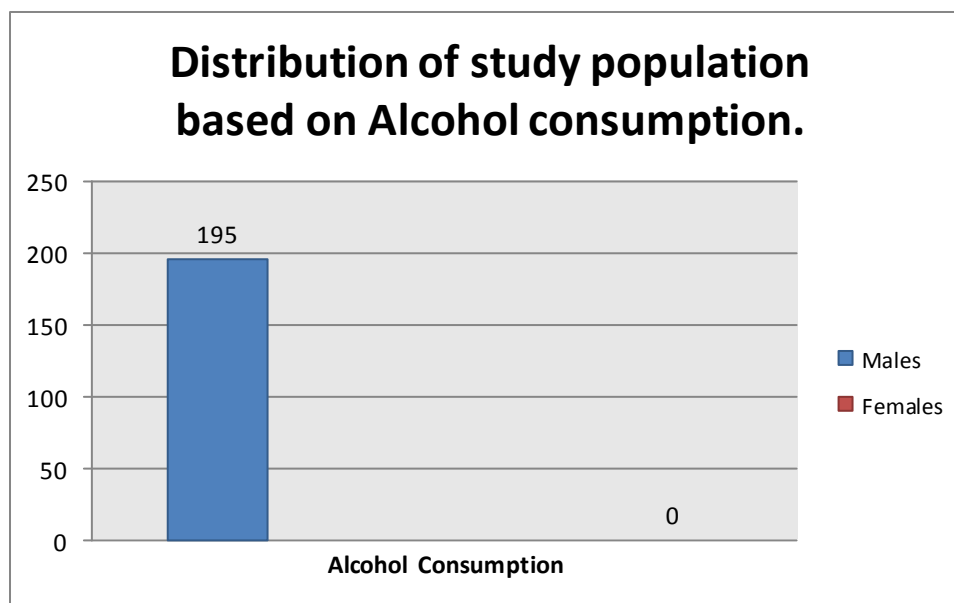
Graph 6: Distribution of study population based on alcohol consumption:

Table 7, Graph 7 shows the distribution of study population based on combination of smoking / smokeless tobacco usage and alcohol consumption. Among the total study population i.e., 414 (61.4%) had no habit tobacco usage and alcohol consumption of which 200 (43.5%) were males and 214 (100%) were females. 82 (17.8%) male workers had habit of smoking and smokeless tobacco usage forms. 119 (25.9%) male workers had habit of smoking tobacco and alcohol consumption. 8 (1.7%) male workers had the habit of smokes tobacco usage and alcohol consumption. 51 (11.1%) male workers had the habit of smoking, smokeless tobacco usage and alcohol consumption.

Statistical test showed a significant difference between combination of smoking, smokeless tobacco usage and alcohol consumption and sex

($\chi^2 = 137.056$; $P = 0.000$).

Table 7: Distribution of study population based on combination of smoking / smokeless tobacco usage and alcohol consumption.

Combination	Male	Female	Total
No habit of tobacco usage and alcohol consumption	200 (43.4%)	214 (100%)	414 (61.4%)
Smoking + smokeless form	82 (17.8%)	0 (0%)	27 (12.1%)
Smoking + alcohol	119 (25.9%)	0	0 (17.7%)
Smokeless form + alcohol	8 (1.7%)	0	8 (1.2%)
Smoking + smokeless form + alcohol consumption	51 (11.1%)	0	51 (7.6%)
Total	460 (100%)	214 (100%)	474 (100%)

Chi Square Value = 137.056 P = 0.000 (significant)

Graph 7: Distribution of study population based on combination of smoking / smokeless tobacco usage and alcohol consumption.

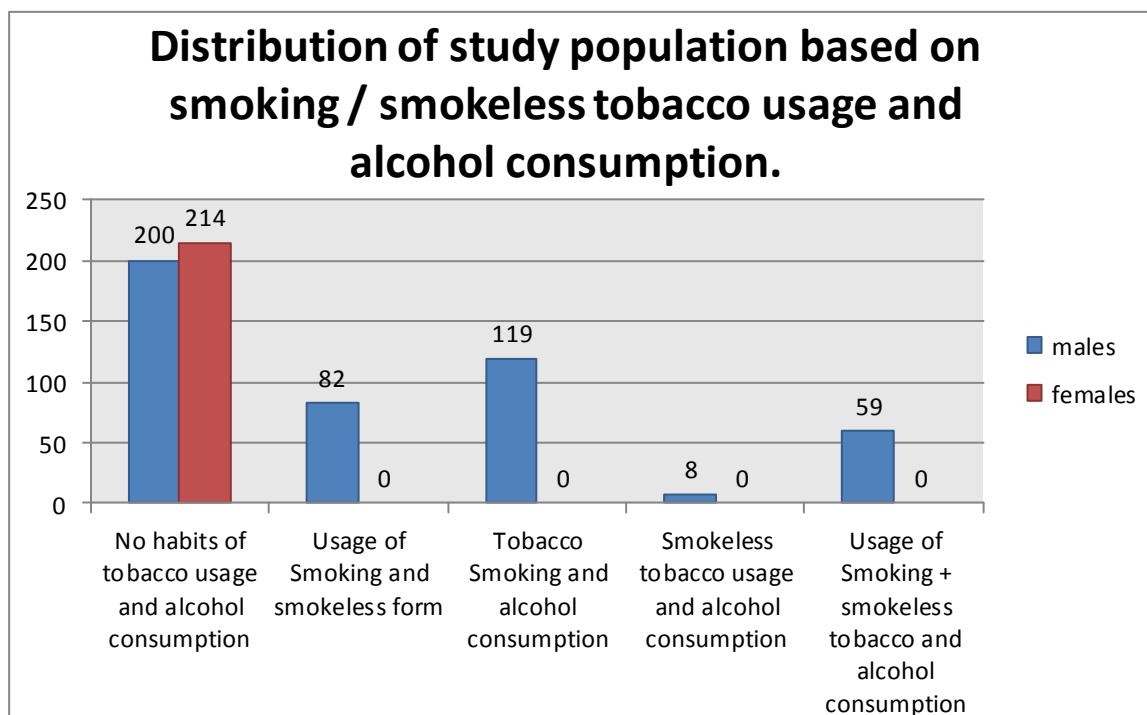


Table 8 (A) Graph 8 (A), shows distribution of study population based on the materials they use for brushing their teeth. Majority of the total study population i.e., 599 (88.9%) used tooth brush and paste for brushing their teeth of which 410 (89.1%) were males and 189 (88.3%) were females. 17 (2.5%) workers used toothbrush and powder of which 15 (3.3%) were males and 2 (0.9%) were females. 11 (1.6%) workers used finger and paste to clean their teeth of which 7 (1.5%) were males and 4 (1.9%) were females. 34 (5%) workers used finger and powder to clean their teeth of which 15 (2.8%) were males and 19 (8.9%) were females. 13 (2.8%) male workers used salt to clean their teeth.

Statistical test showed a significant difference between type of tooth cleaning and sex ($\chi^2= 18.43$; $P= 0.001$).

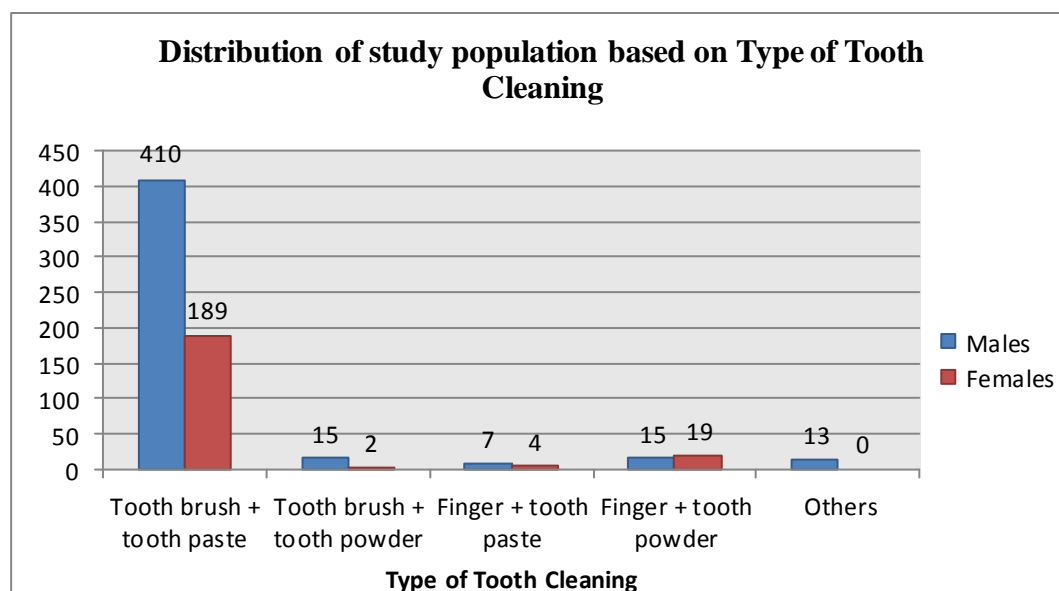
Table 8 (B), Graph 8 (B) shows distribution of study population based on the method of tooth brushing. Among the total study population i.e., 412 (61.1%) used horizontal strokes to clean their teeth of which 265 (57.6%) were males and 147 (68.7%) were females. 6 (0.9%) workers used vertical strokes of which 4 (0.9%) were males and 2 (0.9%) were females. 254 workers used both horizontal and vertical strokes to clean their teeth of which 191 (41.5%) were males and 63 (29.4%) were females. 2 (0.9%) female workers used circular strokes.

Statistical test showed a significant association between method of brushing and sex ($\chi^2 = 12.899$; $P= 0.005$).

Table 8 (A): Distribution of study population based on Oral Hygiene Practices:**A. Type of tooth cleaning:**

Type of tooth cleaning	Male	Female	Total
Tooth brush + Tooth paste	410 (89.1%)	189 (88.3%)	599 (88.9%)
Tooth brush + Tooth powder	15 (3.3%)	2 (0.9%)	17 (2.5%)
Finger + Tooth paste	7 (1.5%)	4 (1.9%)	11 (1.6%)
Finger + Tooth powder	15 (3.3%)	19 (8.9%)	34 (5%)
Others	13 (2.8%)	0 (0%)	13 (1.9%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 18.43 P = 0.001 (significant)

Graph 8 (A): Distribution of study population based on Oral Hygiene**Practices:**

B. Distribution of study population based on Method of Tooth Brushing:

Table 8 (B):

Method of tooth brushing	Male	Female	Total
Horizontal strokes	265 (57.6%)	147 (68.7%)	412 (61.1%)
Vertical strokes	4 (0.9%)	2 (0.9%)	6 (0.9%)
Horizontal + vertical strokes	191 (41.5%)	63 (29.4%)	254 (37.7%)
Circular strokes	0 (0%)	2(0.9%)	2 (0.3%)
Total	460 (100%)	214 (100%)	464 (100%)

Chi Square Value = 12.899 p = 0.005 (significant)

C. Graph 8 (B): Distribution of study population based on Method of Tooth Brushing:

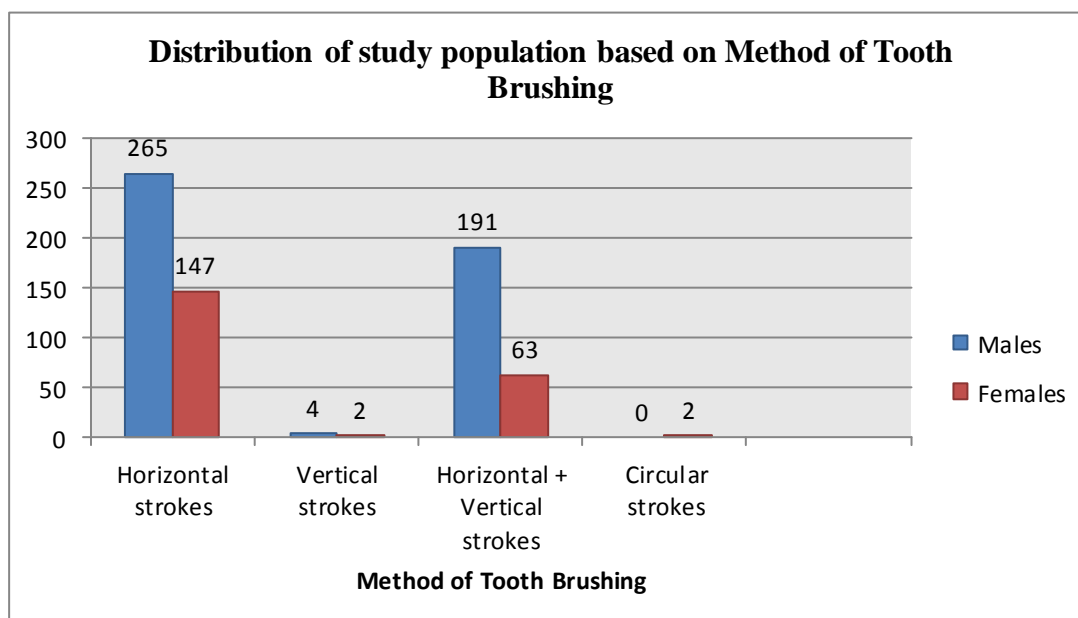


Table 8 (C), Graph 8 (C) shows the distribution of study population based on the number of times they clean their teeth per day. Among the total study population i.e., 422 (62.6%) brushes their teeth once daily of which 282 (61.3%) were males and 140 (65.4%) were females. 238 (35.3%) workers brushes their teeth twice daily of which 168 (36.5%) were males and 70 (32.7%) were females. 14 (2.1%) workers brushes their teeth thrice or more than three times per day of which 10 (2.2%) were males and 4 (1.9%) were females.

Statistical test showed no significant difference between frequency of tooth brushing and sex ($\chi^2 = 1.061$; $P = 0.588$).

C. Table 8 (C): Distribution of the study population based on frequency of

Tooth Brushing

Frequency of tooth brushing	Male	Female	Total
Once daily	282 (61.3%)	140 (65.4%)	422 (62.6%)
Twice daily	168 (36.5%)	70 (32.7%)	238 (35.3%)
Thrice or more daily	10 (2.2%)	4 (1.9%)	14 (2.1%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 1.061 P = 0.588 (non significant)

**D. Graph 8 (C): Distribution of the study population based on frequency of
Tooth Brushing**

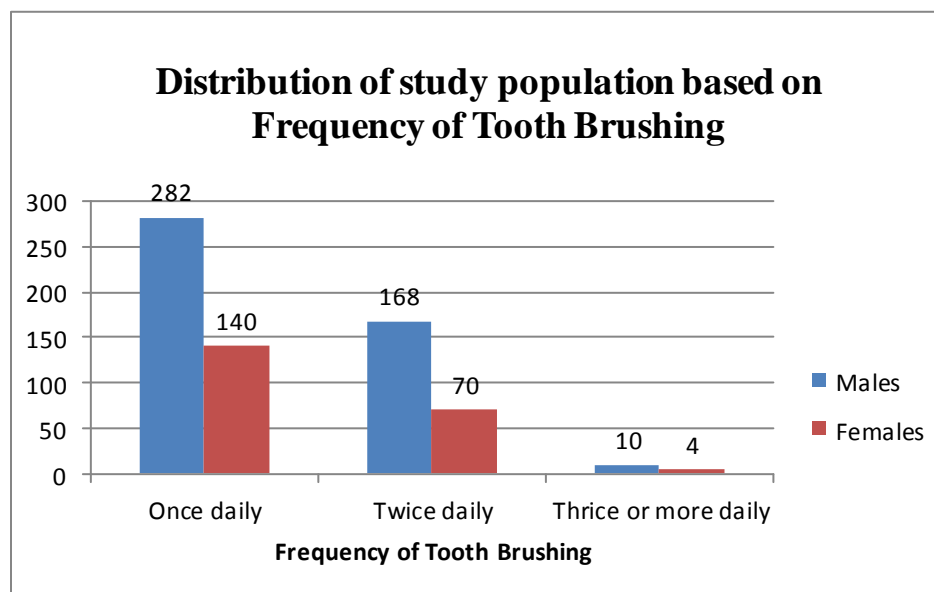


Table 8 (D), Graph 8 (D) shows the distribution of study population based on how long the workers brush their teeth. Majority of the study population i.e., 319 (47.3%) workers brushed their teeth for 3 – 5 minutes of which 216 (47%) were males and 103 (48.1%) were females. 301 (44.7%) workers brushed their teeth for more than 5 minutes of which 204 (44.3%) were males and 97 (45.3%) were females. 49 (7.3%) workers brushed their teeth for 1 – 2 minutes of which 35 (7.6%) were males and 14 (6.5%) were female. 5 (1.1%) male workers had not noticed their duration of tooth brushing.

Statistical test showed a significant difference between duration of tooth brushing and sex ($\chi^2 = 2.629$; $P = 0.453$).

E. Table 8 (D): Distribution of study population based on duration of tooth brushing

Duration of tooth brushing	Male	Female	Total
1 – 2 min	35 (7.6%)	14 (6.5%)	49 (7.3%)
3 – 5 min	216 (47.0%)	103 (48.1%)	319 (47.3%)
➤ 5 min	204 (44.3%)	97 (45.3%)	301 (44.7%)
Not noticed	5 (1.1%)	0 (0%)	5 (0.7%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 2.629 P = 0.453 (non significant)

Graph 8 (D): Distribution of study population based on duration of tooth brushing

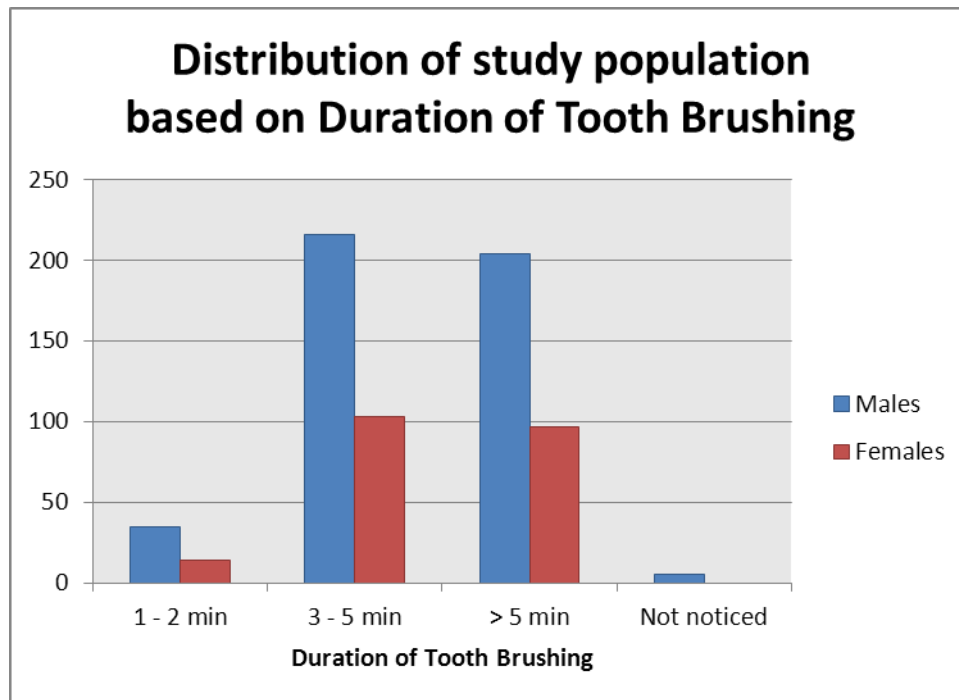


Table 8 (E), Graph 8 (E) shows the distribution of study population based on how frequent the workers change their tooth brush. Majority of the study population i.e., 314 (46.6%) changed their tooth brush between 4 – 6 months of which 227 (49.3%) were males and 87 (40.7%) were females. 188 (27.9%) workers changed their tooth brush once in 3 months of which 112 (24.4%) were males and 76 (35.5%) were females. 81 (12%) workers changed their tooth brush between 7 – 12 months of which 57 (12.4%) were males and 24 (11.2%) were females. 60 (8.9%) workers changed their tooth brush between 1 – 2 months of which 41 (8.9%) were males and 19 (8.8%) were females. 15 (2.2%) workers changed their tooth brush once flared of which 11 (2.3%) were males and 4 (1.9%) were females.

16 (2.4%) workers had not noticed how frequent they changed their tooth brush of which 12 (2.6%) were males and 4 (1.9%) were females.

Statistical test showed a significant difference between frequency of tooth brushing and sex ($\chi^2 = 12.667$; $P = 0.049$).

F. Table 8 (E): Distribution of study population based on frequency of changing Tooth Brush

Frequency of changing tooth brush	Male	Female	Total
1 – 2 months	41 (8.9%)	19 (8.8%)	60 (8.9%)
3 months	112 (24.4%)	76 (35.5%)	188 (27.9%)
4 – 6 months	227 (49.3%)	87 (40.7%)	314 (46.6%)
7 – 12 months	57 (12.4%)	24 (11.2%)	81 (12.0%)
Once flared	11 (2.3%)	4 (1.9%)	15 (2.2%)
Not noticed	12 (2.6%)	4 (1.9%)	16 (2.4%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 12.667 P = 0.049 (significant)

G. Graph 8 (E): Distribution of study population based on frequency of changing Tooth Brush

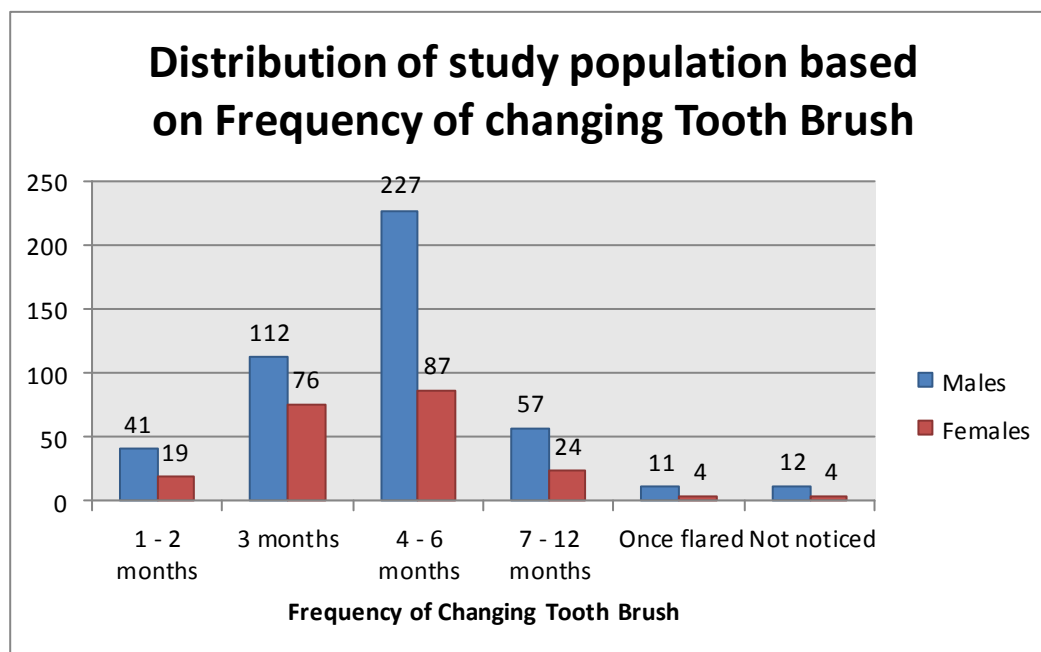


Table 9, Graph 9 shows that majority of study population i.e., 513 (76.1%) workers had no previous dental visits of which 329 (71.6%) were males and 184 (86%) were females. 161 workers had visited a dentist earlier of which 131 (28.4%) were males and 30 (14%) were females.

Statistical test showed a significant difference between past dental visits and sex ($\chi^2 = 19.433$; $P = 0.000$).

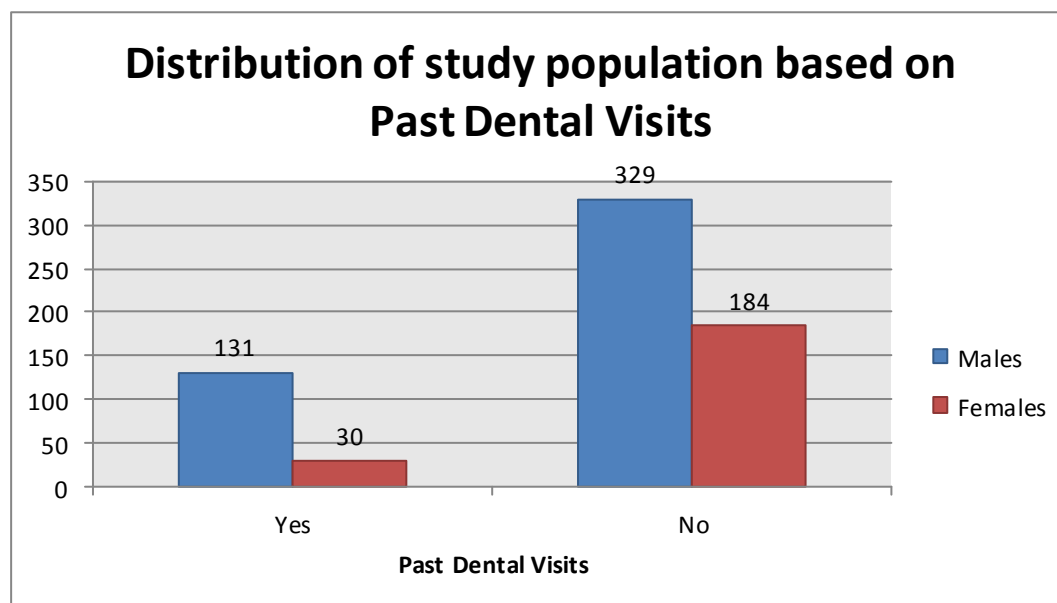
Table 10, Graph 10 shows the distribution of workers based on their reason for last dental visits. Majority of study population i.e., 513 (76.1%) workers had no previous dental visits of which 329 (71.6%) were males and 184 (86%) were females. 30 (4.4%) workers had visited a dentist due to tooth ache of which 20 (4.3%) were males and 10 (4.6%) were females. 73 (10.8%) workers had visited a dentist due for extraction of which 58 (12.6%) were males and 15 (7%) were females. 22 (4.4%) male workers had visited a dentist due for filling. 9 (1.3%) workers had visited a dentist due to tooth for cleaning their teeth of which 4 (0.9%) were males and 5 (2.5%) were females. 27 (5.9%) male workers had visited a dentist for replacement of their teeth.

Statistical test showed a significant difference between reason for last dental visits and sex ($\chi^2 = 34.522$; $P = 0.000$).

Table 9: Distribution of study population based on past dental visits:

Past dental visits	Male	Female	Total
Yes	131 (28.4%)	30 (14%)	161 (23.9%)
No	329 (71.6%)	184 (86%)	513 (76.1%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 19.433 P = 0.000 (significant)

Graph 9: Distribution of study population based on past dental visits:**Table 10: Distribution of study population based on reason for last dental visits**

Reason for last dental visit	Male	Female	Total
No dental visits	329 (71.5%)	184 (85.9%)	513 (76.1%)
Tooth ache	20 (4.3%)	10 (4.6%)	30 (4.4%)
Extraction	58 (12.6%)	15 (7%)	73 (10.8%)
Filling	22 (4.8%)	0 (0%)	22 (3.3%)
Cleaning	4 (0.9%)	5 (2.5%)	9 (1.3%)
Replacement of teeth	27 (5.9%)	0 (0%)	27 (4%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 34.522 P = 0.000 (significant)

Graph 10: Distribution of study population based on reason for last dental visits

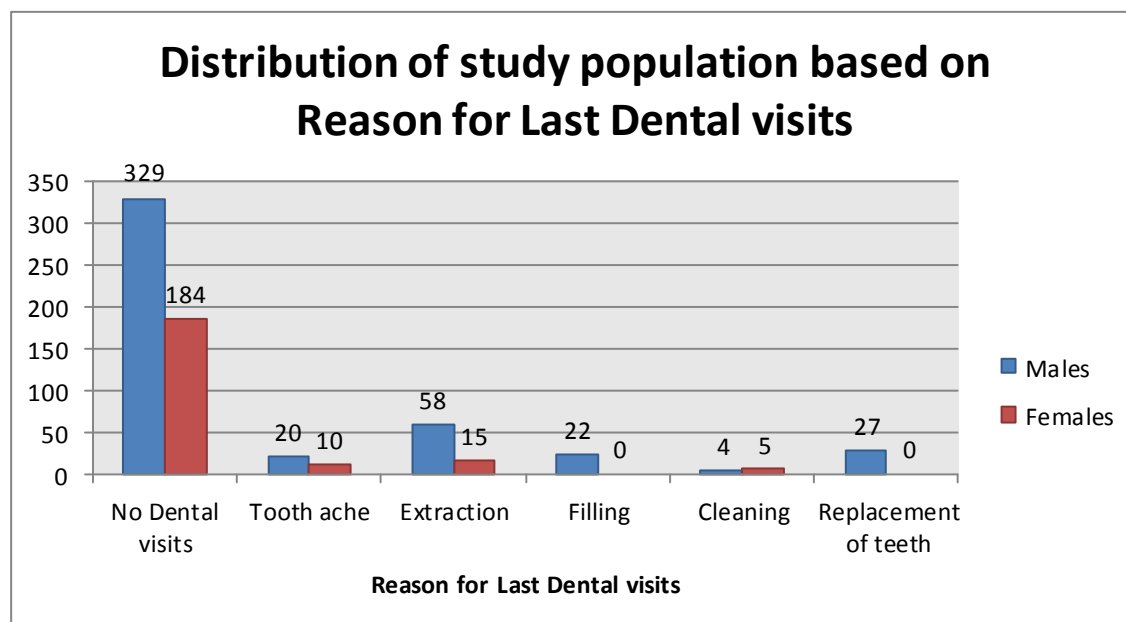


Table 11, Graph 11, shows the distribution of study population as why the workers had not visited a dentist earlier. Majority of the study population i.e., 236 (35.1%) felt that there was no need for them to visit a dentist of which 168 (36.5%) were males and 68 (31.9%) were females. 169 (25.1%) workers had not visited a dentist because they felt that dental treatments are of high cost of which 100 (21.6%) were males and 69 (32.2%) were females. 100 workers (55 (12%) males and 45 (21%) females) said that they were not interested in a dental visit. 3 (0.7%) male workers felt that they had no time to visit a dentist. 5 (0.7%) workers (3 (0.7%) males and 2 (0.9%) females) felt they had no dentist in the nearby surrounding to visit.

Statistical test showed a significant difference between reason for not visiting the dentist earlier and sex ($\chi^2 = 31.598$; $P = 0.000$).

Table 11: Distribution of study population based on reason for not visiting the dentist earlier:

Reason for not visiting the dentist earlier	Male	Female	Total
Visited dentist earlier	131 (28.4%)	30 (14%)	161 (23.9%)
Lack of time	3 (0.7%)	0 (0%)	3 (0.4%)
Dentist not nearby	3 (0.7%)	2 (0.9%)	5 (0.7%)
High cost of treatment	100 (21.6%)	69 (32.2%)	169 (25.1%)
Not interested	55 (12%)	45 (21%)	100 (14.8%)
Others (not needed)	168 (36.5%)	68 (31.9%)	236 (35.1%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 31.598

P = 0.000 (significant)

Graph 11: Distribution of study population based on reason for not visiting the dentist earlier

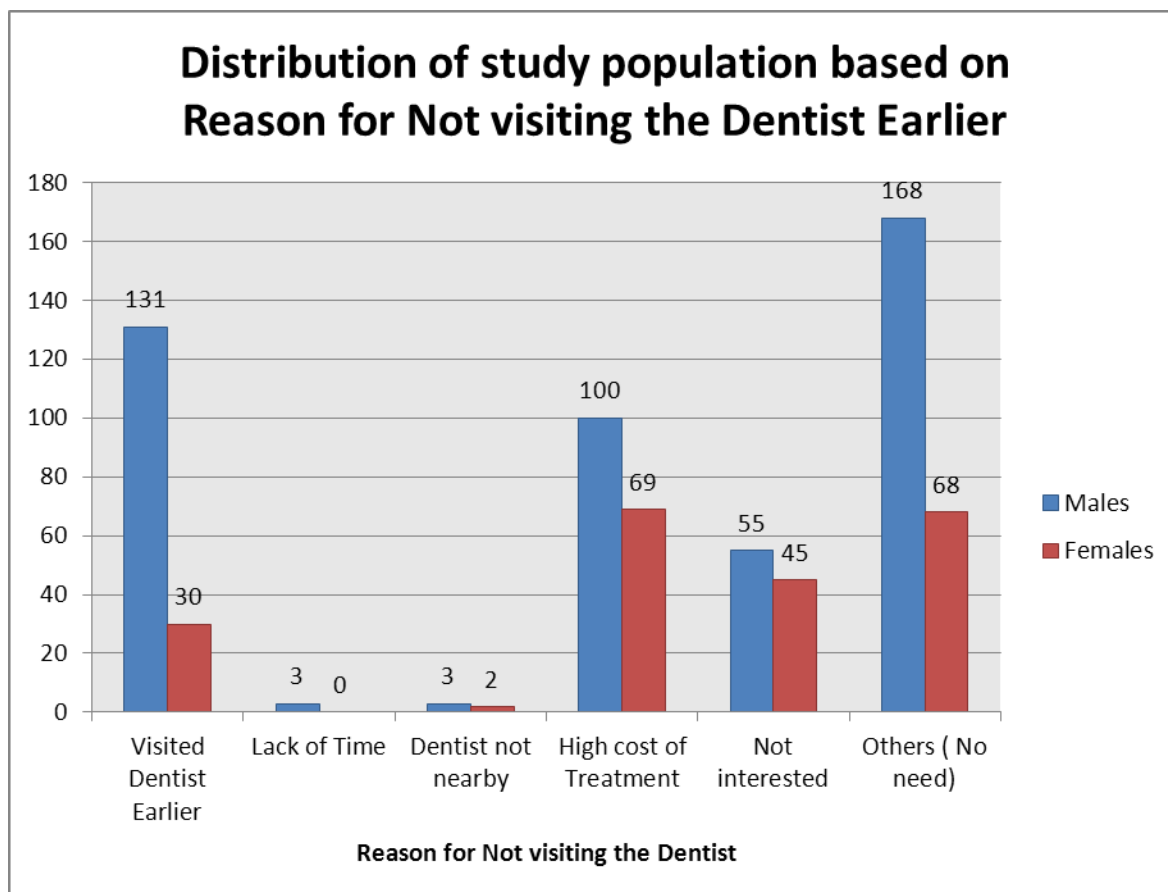


Table 12, Graph 12 shows the work related health problems faced by the workers. 379 workers had no work related health problems of which 266 (57.8%) were males and 113 (52.8%) were females. 39 workers (28 (6.1%) males and 11 (5.1%) females) had skin problems. 22 workers (14 (3%) males and 8 (3.7%) females) had eye problems. 125 workers (76 (16.5%) males and 49 (22.9%) females) had back pain. 13 workers (11 (2.4%) males and 2 (0.9%) females) had

both skin and eye problems. 29 workers (24 (5.2%) males and 5 (2.3%) females) had both skin and back pain. 58 workers (34 (7.4%) males and 24 (11.2%) females) had both eye problems and back pain. 9 workers (7 (1.5%) males 2 (0.9%) females) had skin rashes, eye problems and back pain.

Statistical test showed no significant difference between work related health problems and sex ($\chi^2 = 11.581$; $P = 0.115$).

Table 12: Distribution of study population based on work related problems

Work related problems	Male	Female	Total
No work related problems	266 (57.8%)	113 (52.8%)	379 (56.2%)
Skin rashes	28 (6.1%)	11 (5.1%)	39 (5.8%)
Eye problems	14 (3%)	8 (3.7%)	22 (3.3%)
Back pain	76 (16.5%)	49(22.9%)	125 (18.5%)
Skin + eye problems	11 (2.4%)	2 (0.9%)	13 (1.9%)
Skin + back pain	24 (5.2%)	5 (2.3%)	29 (4.3%)
Eye problems + back pain	34 (7.4%)	24 (11.2%)	58 (8.6%)
Skin + eye problems + back pain	7 (1.5%)	2 (0.9%)	9 (1.3%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 11.581 P = 0.115 (non significant)

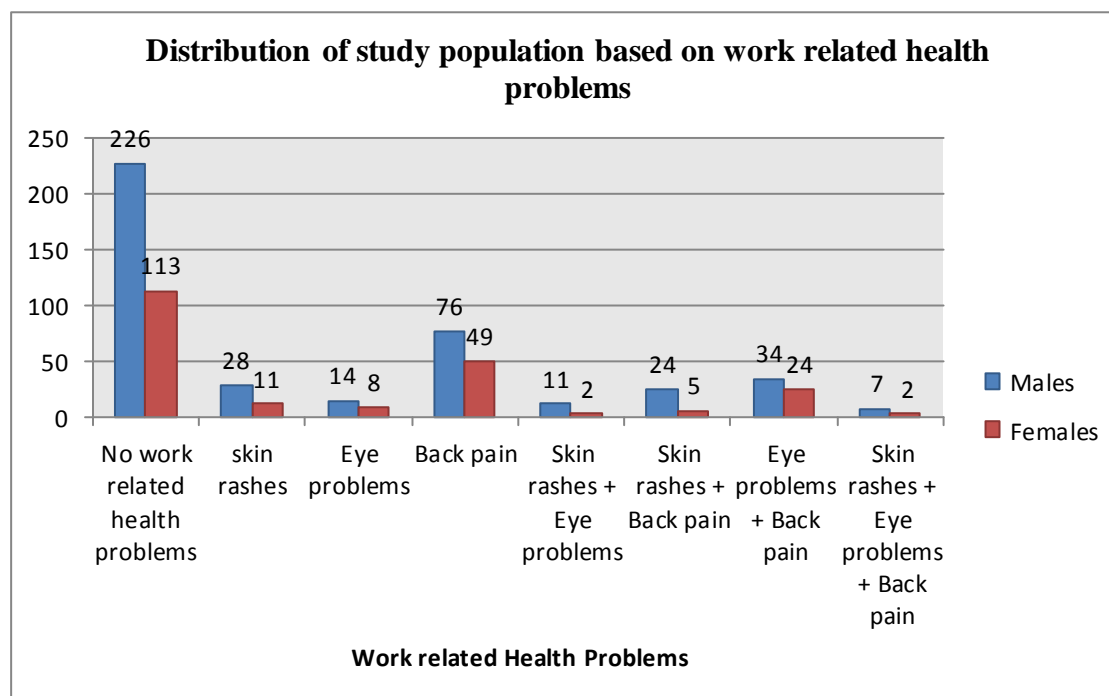
Graph 12: Distribution of study population based on work related problems

Table 13, Graph 13 shows the distribution of study population based on TMJ symptoms, clicking, tenderness, and reduced jaw mobility. Among the total study population 17 (3.7%) male and 2 (0.9%) female workers reported of TMJ symptoms, 21 (4.6%) male and 2 (0.9%) female workers had clicking, 2 (0.4%) male workers had tenderness on palpation, 31 (6.7%) male workers had reduced jaw mobility. Statistical test showed significant difference between TMJ symptoms and sex ($\chi^2 = 4.064$; $P = 0.044$), clicking and sex ($\chi^2 = 5.841$; $P = 0.016$), reduced jaw mobility ($\chi^2 = 15.117$; $P = 0.000$).

Statistical test showed no significant difference between tenderness and sex ($\chi^2 = 0.933$; $P = 0.334$).

Table 13: Distribution of study population based on TMJ symptoms, clicking, tenderness, and reduced jaw mobility

TMJ symptoms	Male	Female	Total
Yes	17 (3.7%)	2 (0.9%)	19 (2.8%)
No	443 (96.3%)	212 (99.1%)	655 (97.2%)
Total	460 (100%)	214 (100%)	674 (100%)
Clicking			
Yes	21 (4.6%)	2 (0.9%)	23 (3.4%)
No	439 (95.4%)	212 (99.1%)	651 (96.6%)
Total	460 (100%)	214 (100%)	674 (100%)
Tenderness			
Yes	2 (0.4%)	0 (0%)	2 (0.3%)
No	458 (99.6%)	214 (100%)	672 (99.7%)
Total	460 (100%)	214 (100%)	674 (100%)
Reduced jaw mobility			
Yes	31 (6.7%)	0 (0%)	31 (4.6%)
No	429 (93.3%)	214 (100%)	643 (95.4%)
Total	460 (100%)	214 (100%)	674 (100%)

TMJ symptoms : Chi Square Value = 4.064 P = 0.044 (significant)

Clicking : Chi Square Value = 5.841 P = 0.016 (significant)

Tenderness : Chi Square Value = 0.933 P = 0.334 (non significant)

Reduced Jaw

Mobility : Chi Square Value = 15.117 P = 0.000 (significant)

Graph 13: Distribution of study population based on TMJ symptoms, clicking, tenderness, reduced jaw mobility:

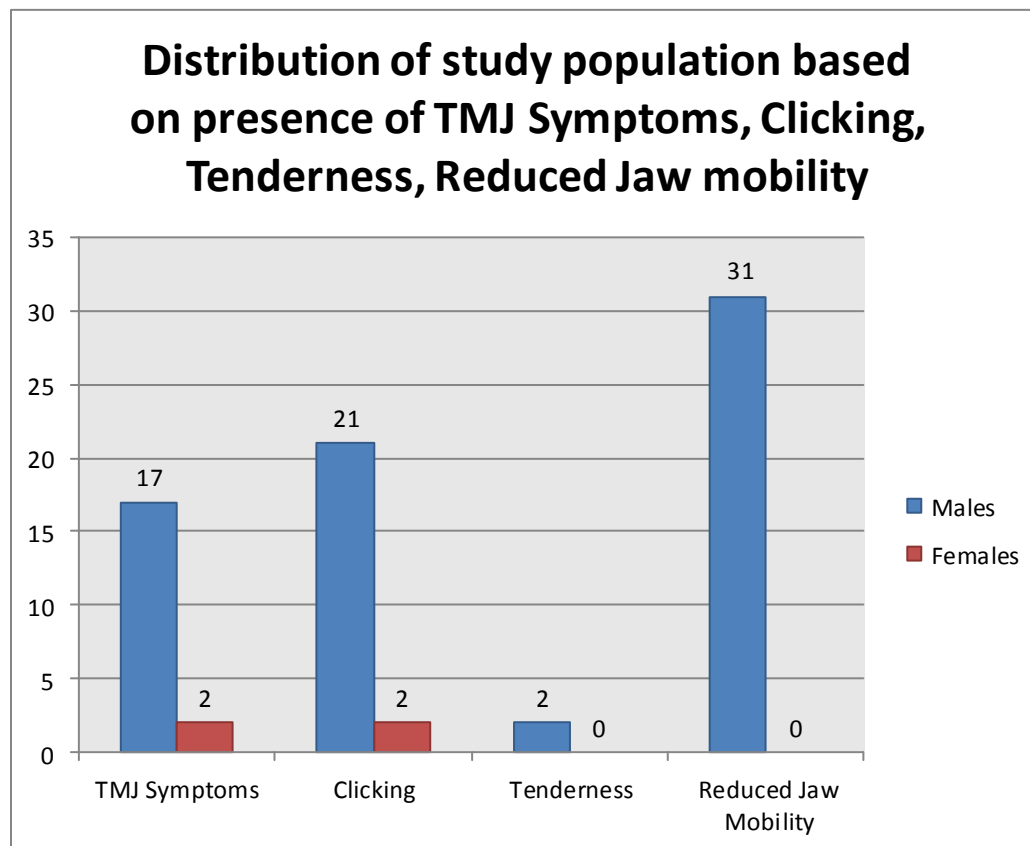


Table 14, Graph 14, shows that 50 (7.4%) workers had leukoplakia of which 27 (5.9%) were males and 23 (10.7%) were females. 31 (6.7%) male workers had oral sub mucous fibrosis.

Statistical test showed a significant difference between oral mucosal condition and sex ($\chi^2 = 19.164$; $P = 0.000$)

Table 14: Distribution of study population based on oral mucosa condition

Oral mucosa condition	Male	Female	Total
No abnormal condition	402 (87.4%)	191 (89.3%)	593 (88%)
Leukoplakia	27 (5.9%)	23 (10.7%)	50 (7.4%)
Others	31 (6.7%)	0 (0%)	31 (4.6%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 19.164 P = 0.000 (significant)

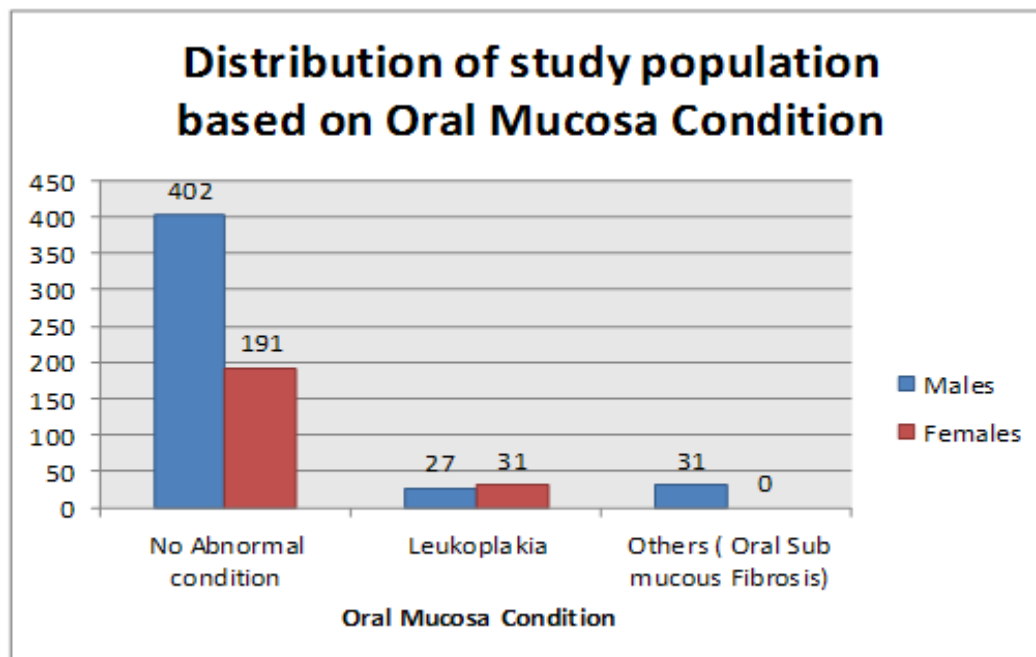
Graph 14: Distribution of study population based on oral mucosa condition

Table 15, Graph 15, shows the distribution of study population based on Enamel Opacities. Among the study population 450 (97.8%) males and 212 (99.1%) females had no enamel opacities. About 10 (2.2%) males and 2 (0.9%) females had demarcated enamel opacities.

Statistical test showed no significant difference between enamel opacities and sex ($\chi^2 = 1.283$; $P = 0.257$)

Table 16, Graph 16, shows the distribution of study population based on Dental Fluorosis. Among the study population 4 (0.9%) males had questionable fluorosis and 4 (0.9%) males had mild fluorosis.

Statistical test shows no significant difference between Dental fluorosis and sex. ($\chi^2 = 3.766$; $P = 0.152$).

Table 15: Distribution of study population based on Enamel Opacities

Enamel opacity			Total
	Males	Females	
No enamel opacity	450 (97.8%)	212 (99.1%)	662 (98.2%)
Demarcated opacity	10 (2.2%)	2 (0.9%)	12 (1.8%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 1.283

P = 0.257 (non significant)

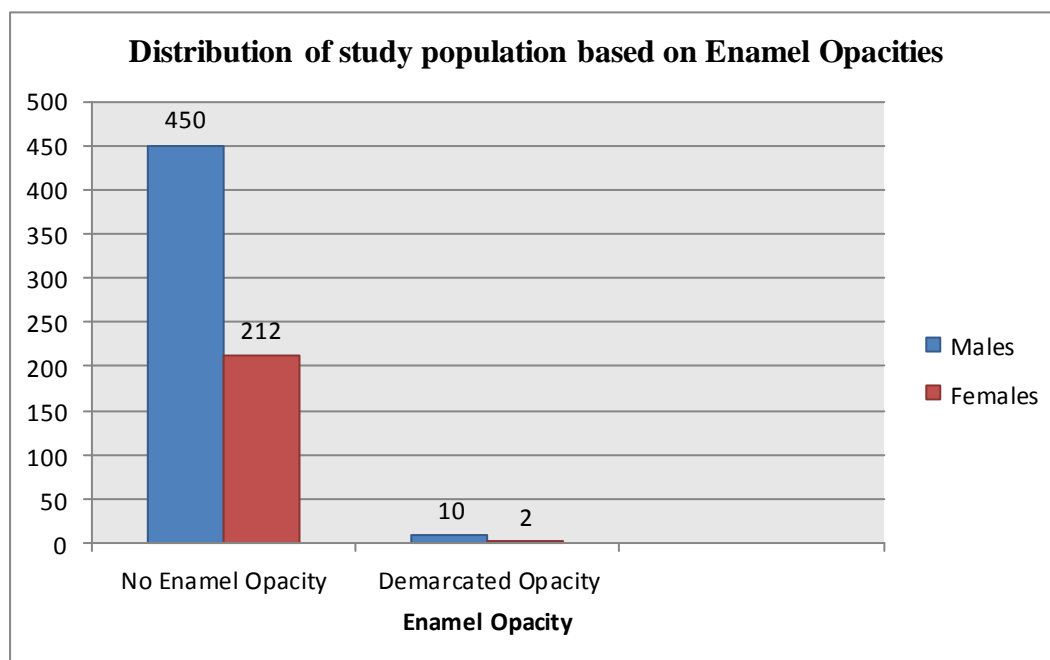
Graph 15: Distribution of study population based on Enamel Opacities

Table 16: Distribution of study population based on Dental Fluorosis

Dental fluorosis			Total
	Males	Females	
No Dental fluorosis	452 (98.2%)	214 (100%)	666 (98.8%)
Questionable Fluorosis	4 (0.9%)	0	4 (0.6%)
Mild Fluorosis	4 (0.9%)	0	4 (0.6%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 3.766 P = 0.152

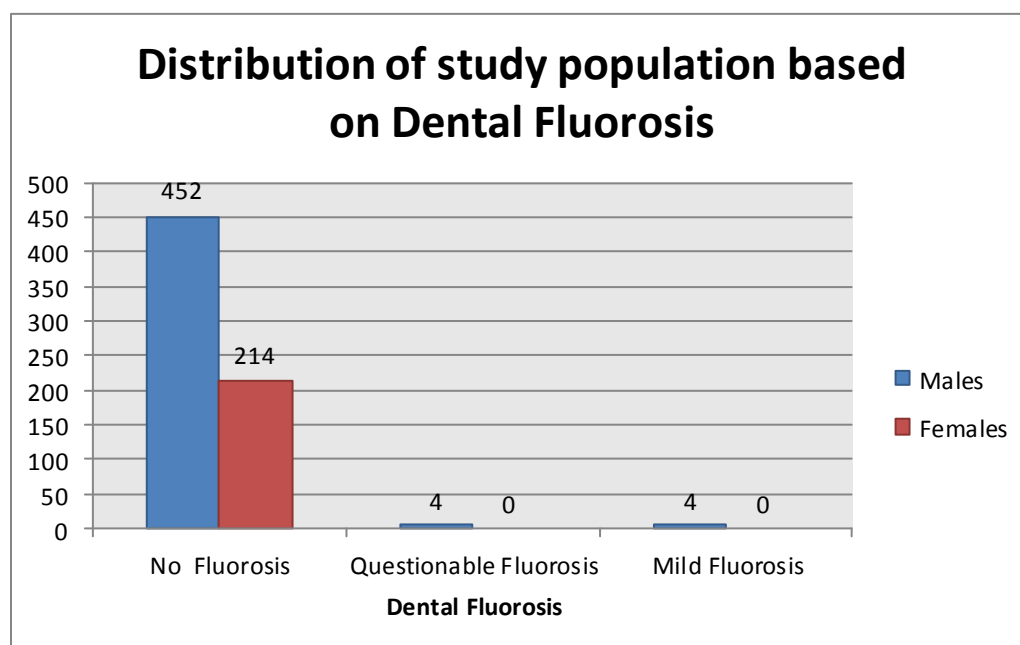
Graph 16: Distribution of study population based on Dental Fluorosis

Table 17, Graph 17, shows distribution of study population based on CPI index. Among the total study population majority i.e., 469 (69.6%) workers (318 (69.1%) males and 151 (70.5%) females) had calculus, 202 (29.9%) workers (142 (30.7%) males and 61 (28.6%) females) had pocket 4-5mm, 2(0.3%) female workers were normal, 1 (0.1%) male worker had pocket 6mm or more.

Statistical tests showed a significant difference between CPI index and sex ($\chi^2 = 60.658$; $p=0.00$)

Table 18, Graph 18, shows the distribution of study population based on Loss of attachment. Among the study population 480 (71.2%) workers (317 (68.9%) males and 163 (76.1%) females) had 0 – 3mm attachment loss, 132 workers (101 (21.9%) males and 31 (14.5%) females) had 4 – 5mm attachment loss, 61 workers (41 (8.9%) males and 20 (9.4%) females) had 6 – 8mm attachment loss, 1 (0.3%) male worker had 9 – 11mm attachment loss.

Statistical tests showed no significant difference between Loss of attachment and sex ($\chi^2 = 5.737$; $P = 0.125$)

Table 17: Distribution of study population based on Community Periodontal Index:

Code	Male	Female	Total
0 = healthy	0 (0%)	2 (0.9%)	2 (0.3%)
1 = bleeding	0 (0%)	0 (0%)	0 (0%)
2 = calculus	318 (69.1%)	151 (70.5%)	469 (69.6%)
3 = pocket 4-5 mm	141 (30.7%)	61 (28.6%)	202(29.9%)
4 = pocket 6 mm or more	1 (0.2%)	0 (%)	1 (0.1%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 5.032 P = 0.169 (non significant)

Graph 17: Distribution of study population based on Community Periodontal Index:

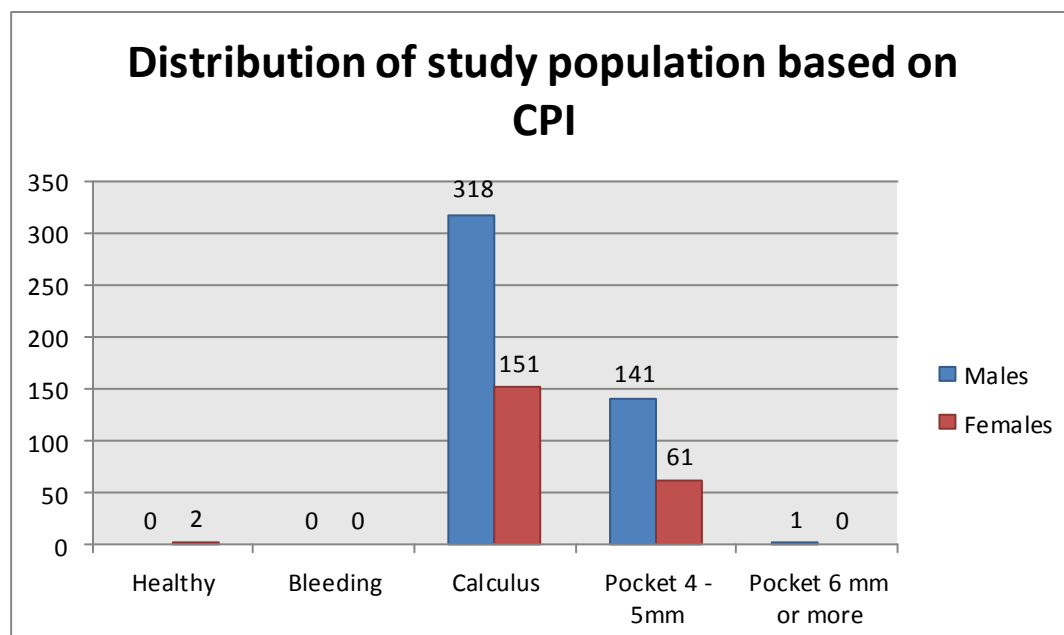


Table 18: Distribution of study population based on Loss of Attachment:

Code	Male	Female	Total
0 = 0 – 3 mm	317 (68.9%)	163 (76.1%)	480 (71.2%)
1 = 4 – 5 mm	101 (21.9%)	31 (14.5%)	132 (19.6%)
2 = 6 – 8 mm	41 (8.9%)	20 (9.4%)	61 (9.0%)
3 = 9 – 11 mm	1 (0.3%)	0 (0%)	1 (0.2%)
Total	460 (100%)	214 (100%)	674 (100%)

Chi Square Value = 5.737 P = 0.125 (non significant)

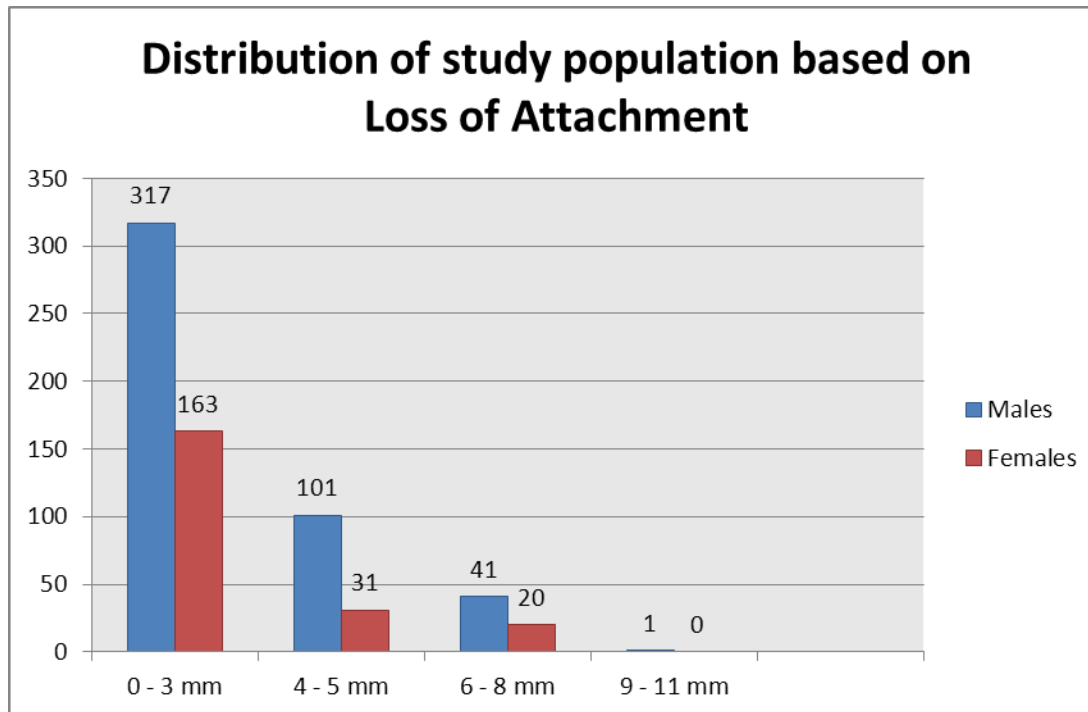
Graph18: Distribution of study population based on Loss of Attachment

Table 19, shows the distribution of study population based on crown status. 412 workers (283 (61.5%) males and 129 (60.2%) females) had decayed teeth. 6 (1.3%) male workers had filled teeth with decay. 16 (3.5%) male workers had filled teeth. 97 (14.4%) workers (76 (16.5%) males and 21 (9.9%) females) had teeth missing due to caries. 113 (16.9%) workers (78 (16.3%) males and 35 (16.8%) females) had teeth missing due to reason other than dental caries. 16 (2.4%) workers (12 (2.6%) males and 4 (1.9%) females) had fractured teeth.

Table 19: Distribution of study population based on Crown Status

	Male	Female	Total
Decayed			
Yes	283 (61.5%)	129 (60.2%)	412 (61.1%)
No	177 (38.5%)	85 (39.8%)	262 (38.9%)
Filled with decay			
Yes	6 (1.3%)	0 (0%)	6 (0.9%)
No	454 (98.7%)	214 (100%)	668 (99.1%)
Filled without decay			
Yes	16 (3.5%)	0 (0%)	16 (2.4%)
No	444 (96.5%)	214 (0%)	658 (97.6%)
Missing due to caries			
Yes	76 (16.5%)	21 (9.9%)	97 (14.4%)
No	384 (83.5%)	193 (90.1%)	577 (85.6%)
Missing other reason			
Yes	128 (27.8%)	55 (25.7%)	183 (27.2%)
No	332 (72.2%)	159 (74.3%)	491 (72.8%)
Trauma			
Yes	12 (2.6%)	4 (1.9%)	16 (2.4%)
No	448 (97.4%)	210 (98.1%)	658 (97.6%)

Table 20, shows the distribution of study population based on root status of the workers. 197 (29.2%) workers (146(31.7%) males and 51 (23.9%) females) had no sound root. 76 (11.3%) workers (41 (8.9%) males and 35 (16.4%) females) had decayed root. 480 (71.2%) workers (317 (68.9%) males and 163 (78.2%) females) had unexposed root. Root was not recorded in 225 (33.4%) workers (147 (31.9%) males and 78 (36.4%) females).

Table 20: Distribution of study population based on Root status

	Male	Female	Total
Root sound			
Yes	314 (68.3%)	163 (76.1%)	477 (70.8%)
No	146 (31.7%)	51 (23.9%)	197 (29.2%)
Root decayed			
Yes	41 (8.9%)	35 (16.4%)	76 (11.3%)
No	419 (91.1%)	179 (83.6%)	598 (88.7%)
Root unexposed			
Yes	317 (68.9%)	163 (76.2%)	480 (71.2%)
No	143 (31.1%)	51 (23.8%)	194 (28.8%)
Root not recorded			
Yes	147 (31.9%)	78 (36.4%)	225 (33.4%)
No	313 (68.1%)	136 (63.6%)	449 (66.6%)

Table 21, shows the distribution of the workers based on their treatment needs. Majority of the study population i.e., 340 (50.4%) workers (229 (49.8%) males and 111 (51.1%) females) needed one surface restoration and two surface restoration was needed by 235 (51.1%) males and 92 (42.9%) females. Pulp care treatment was needed by 37 (8.1%) male workers and 28 (13.1%) female workers. Extraction was needed by 59 (12.9%) male workers and 56 (26.2%) female workers.

Table 21: Distribution of study population based on Treatment needs

	Male	Female	Total
One surface restoration			
Yes	229 (49.8%)	111 (51.9%)	340 (50.4%)
No	231 (50.2%)	103 (48.1%)	334 (49.6%)
Two surface restoration			
Yes	235 (51.1%)	92 (42.9%)	327 (48.6%)
No	225 (48.9%)	122 (57.1%)	347 (51.4%)
Pulp care			
Yes	37 (8.1%)	28 (13.1%)	65 (9.6%)
No	423 (91.9%)	186 (40.4%)	609 (90.4%)
Extraction			
Yes	59 (12.9%)	56 (26.2%)	115 (17.1%)
No	401 (81.1%)	158 (73.8%)	559 (82.9%)

Table 22, Graph 19 shows the mean DMFT of the study population. Males and Females had a mean DMFT Value of 3.35.

Statistical test showed no significant difference between Mean DMFT and Sex.

(Mann Whitney U Value = 48460.000 ; P = 0.743)

Table 22: Distribution of study population based on Mean DMFT

DMFT	Males	Females
Mean	3.35	3.35
Standard Deviation	2.916	3.057

Mann Whitney U Value = 48460.000 P = 0.743 (non significant)

Graph 19: Distribution of study population based on Mean DMFT

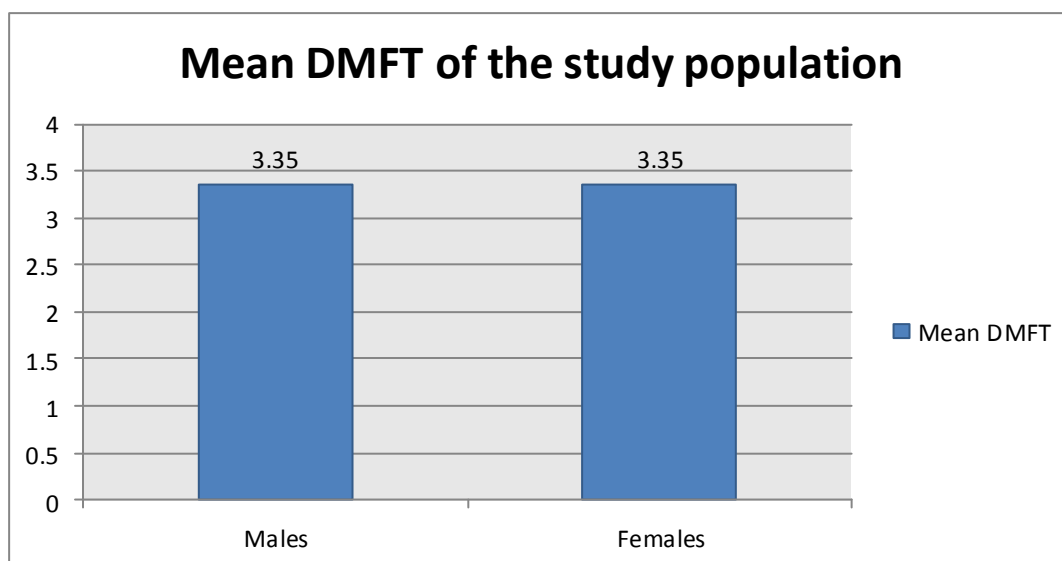


Table 23, Graph 20 shows the distribution of the workers based on their prosthetic status. Among the total study population 25 (5.4%) male workers wore an upper partial denture and 2 (0.4%) male workers wore a lower partial denture.

Statistical test showed a significant difference between upper prosthetic status and sex ($\chi^2 = 12.078$, $P = 0.001$) and no significant difference between lower prosthetic status and sex. ($\chi^2 = 0.933$, $P = 0.334$).

Table 24, Graph 21 shows the distribution of study population based on their prosthetic needs. Among the study population 19 (4.1%) male workers and 6 (2.8%) female workers needed upper one unit prosthesis. 23 (5%) male workers and 14 (6.5%) female workers needed upper multiunit prosthesis. 6 (1.3%) male workers and 11 (5.2%) female workers needed both upper one unit and multiunit prosthesis. 22 (4.8%) male workers and 4 (1.9%) female workers needed lower one unit prosthesis. 38 (8.3%) male workers and 28 (13.1%) female workers needed lower multiunit prosthesis. 6 (1.3%) and 4(1.9%) needed both lower one unit and multiunit prosthesis.

Statistical test showed a significant difference between upper prosthetic needs and sex ($\chi^2 = 14.497$; $P = 0.006$)

Statistical test showed no significant difference between lower prosthetic needs and sex ($\chi^2 = 7.103$; $P = 0.069$)

Table 23: Distribution of study population based on prosthetic status

Prosthetic status	Male	Female	Total
Upper			
No prosthesis	435 (94.6%)	214 (100%)	649 (96.3%)
Partial denture	25 (5.4%)	0 (100%)	25 (3.7%)
Chi Square Value = 12.078 P = 0.001 (significant)			
Lower			
No prosthesis	458 (99.6%)	214 (100%)	672 (99.7%)
Partial denture	2 (0.4%)	0 (0%)	2 (0.3%)
Chi Square Value = 0.933 P = 0.334 (non significant)			

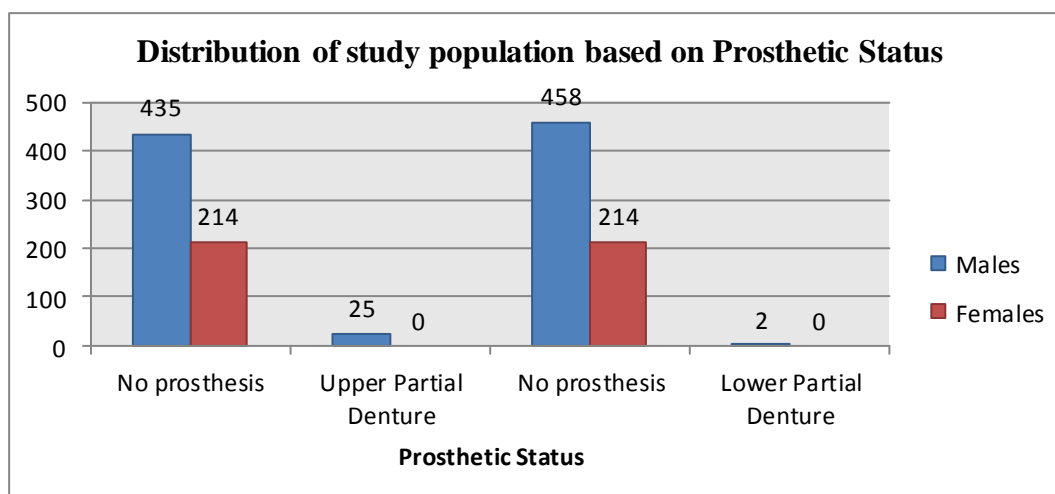
Graph 20: Distribution of study population based on prosthetic status

Table 24: Distribution of study population based on prosthetic needs

Prosthetic needs	Male	Female	Total
Upper			
No prosthesis needed	412 (89.6%)	183 (85.5%)	595 (88.3%)
One unit prosthesis	19 (4.1%)	6 (2.8%)	25 (3.7%)
Multiunit prosthesis	23 (5.0%)	14 (6.5%)	37 (5.5%)
One unit prosthesis + Multiunit prosthesis	6 (1.3%)	11 (5.2%)	17 (2.5%)
Total	460 (100%)	214 (100%)	674 (100%)
Chi Square Value = 14.497 P = 0.006 (significant)			
Lower			
No prosthesis needed	394 (85.7%)	178 (83.2%)	572 (84.9%)
One unit prosthesis	22 (4.8%)	4 (1.9%)	26 (3.9%)
Multiunit prosthesis	38 (8.3%)	28 (13.1%)	66 (9.8%)
One unit prosthesis + Multiunit prosthesis	6 (1.3%)	4 (1.9%)	10 (1.5%)
Total	460 (100%)	214 (100%)	674 (100%)
Chi Square Value = 7.103 P = 0.069 (non significant)			

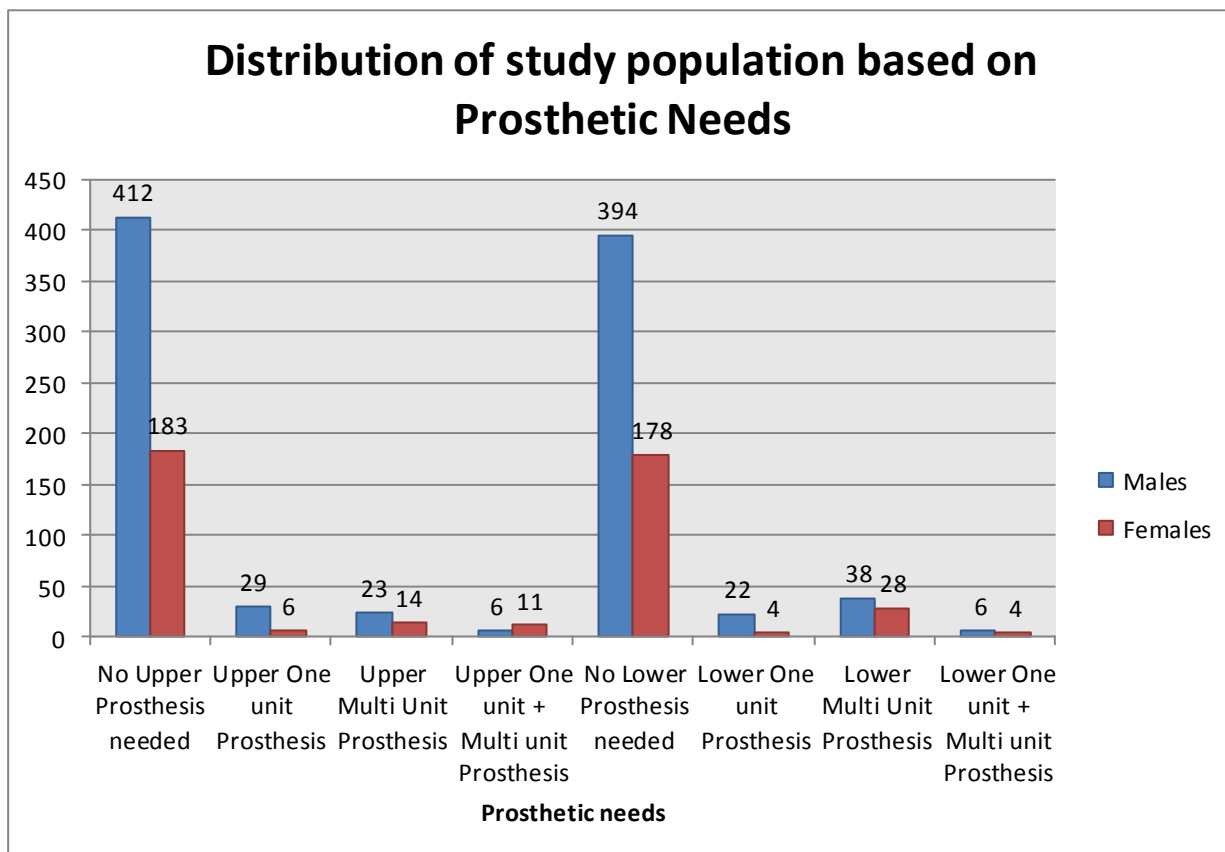
Graph 21: Distribution of study population based on prosthetic needs

Table 25, Graph 22 shows the distribution of study population based on years of working experience and work related health problems. Among the total study population 102 (15.1%) males and 73 (10.8%) females had less than 5 years of working experience. 198 (29.4%) males and 88 (13%) females had 5 – 10 years of working experience. 160 (23.8%) males and 53 (7.9%) females had more than 10 years of working experience. Of the workers with less than 5 years of working experience 1 (0.9%) male and 1 (1.4%) female worker had skin rashes, 1 (1.4%)

female worker had eye problems, 7 (6.9%) male and 10 (13.7%) female workers had back pain, 1 (0.9%) male worker had eye problems and back pain. Of the workers with 5 – 10 years of working experience 13 (6.6%) male and 4 (4.5%) female workers had skin rashes, 1 (1.4%) male and 4 (2%) female workers had eye problems, 10 (13.7%) male and 38 (19.2%) female workers had back pain, 1 (0.5%) female worker had both skin and eye problem, 5 (2.5%) female workers had skin rashes and back pain, 5 (2.5%) female workers had eye problems and back pain. Of the workers with more than 10 years of working experience 14 (8.7%) male and 6 (11.3%) female workers had skin rashes, 10 (6.2%) males and 4 (7.5%) female workers had eye problems, 31 (19.3%) male and 13 (24.6%) female workers had back pain, 10 (6.3%) male and 2 (3.8%) female workers had skin and eye problems, 19 (11.9%) male and 4 (7.5%) female workers had skin rashes and back pain 28 (17.6%) male and 15 (28.3%) female workers had eye problems and back pain, 7 (4.4%) male and 2 (3.8%) female workers had skin rashes, eye problems and back pain.

Statistical test showed a significant association between years of working experience and work related health problems ($\chi^2 = 318.400$; $P = 0.000$)

Table 25: Distribution of study population based on years of working experience and work related health problems

Work related problems	Years of working experience					
	< 5 years		5 – 10 years		> 10 years	
	Male N=102 (15.1%)	Female N=73 (10.8%)	Male N=198 (29.4%)	Female N=88 (13%)	Male N=160 (23.8%)	Female N=53 (7.9%)
No work related problems	93 (91.3%)	61 (83.5%)	132 (66.7%)	45 (51.1%)	41 (25.6%)	7 (13.2%)
Skin rashes	1 (0.9%)	1 (1.4%)	13 (6.6%)	4 (4.5%)	14 (8.7%)	6 (11.3%)
Eye problems	0 (0%)	1 (1.4%)	4 (2%)	3 (3.5%)	10 (6.2%)	4 (7.5%)
Back pain	7 (6.9%)	10 (13.7%)	38 (19.2%)	26 (29.6%)	31 (19.3%)	13 (24.6%)
Skin rashes + eye problems	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	10 (6.3%)	2 (3.8%)
Skin rashes + back pain	0 (0%)	0 (0%)	5 (2.5%)	1 (1.1%)	19 (11.9%)	4 (7.5%)
Eye problems + back pain	1 (0.9%)	0 (0%)	5 (2.5%)	9 (10.2%)	28 (17.6%)	15 (28.3%)
Skin rashes + eye problems + back pain	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (4.4%)	2 (3.8%)
Total	102 (100%)	73 (100%)	198 (100%)	88 (100%)	160 (100%)	53 (100%)

Chi Square Value = 318.400 ; P = 0.000

Graph 22: Distribution of study population based on years of working experience and work related health problems

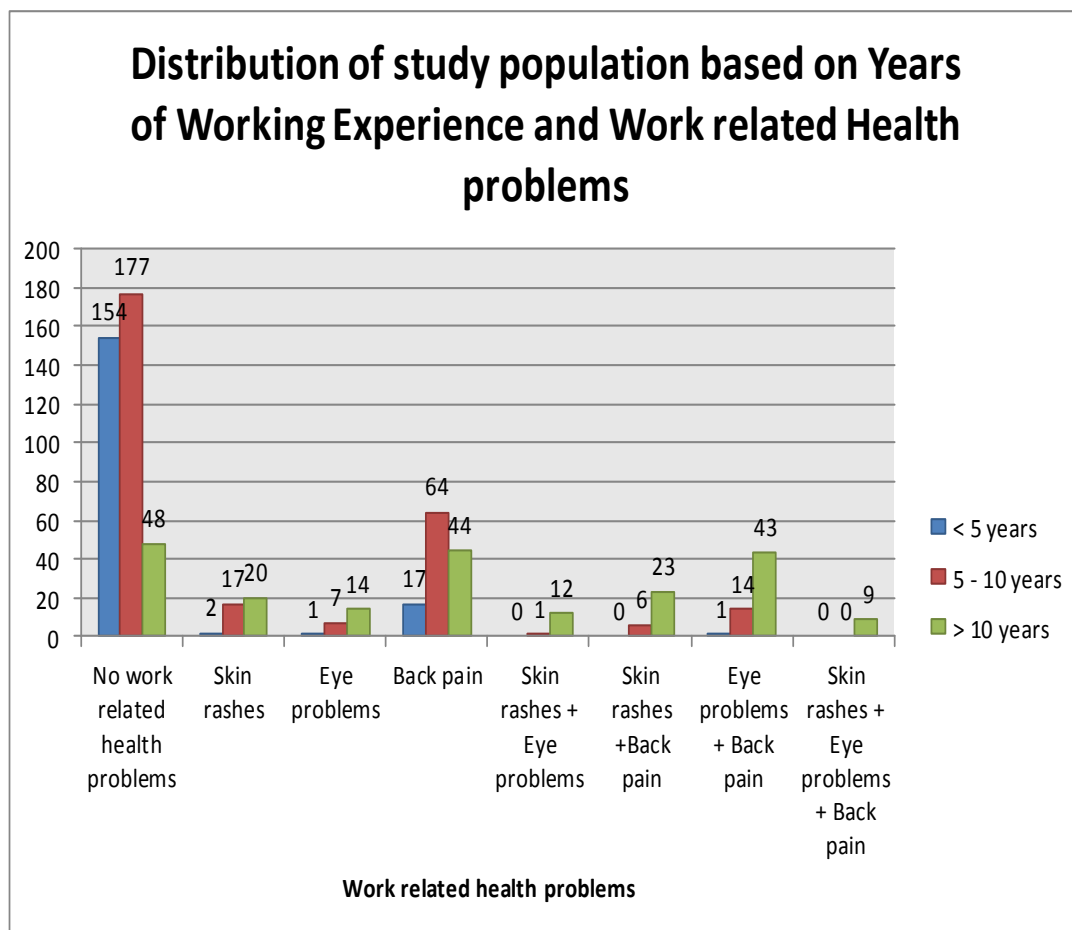


Table 26, Graph 23 shows the distribution of study population based on Work Related Health Problems and Community Periodontal Index. Among the study population who had No work related health problems 2 (0.3%) were normal, 336 (49.9%) workers had calculus, 41 (6.1%) workers had 4 – 5 mm pocket. Among the workers who had Skin rashes 31 (4.6%) workers had calculus, 8 (1.2%) workers had 4 – 5 mm pocket. Among the workers who had Eye problems 7 (1%) workers had calculus, 15 (2.2%) workers had 4 – 5 mm pocket. Among the workers who had Back pain 66 (9.8%) workers had calculus, 58 (8.8%) workers had 4 – 5 mm pocket and 1 (0.1%) worker had pocket 6 mm or more. Among the workers who had Skin rashes and Eye problems 4 (0.6%) workers had calculus, 9 (1.4%) workers had 4 – 5 mm pocket. Among the workers who had Skin rashes and Back pain 9 (1.4%) workers had calculus, 20 (3%) workers had 4 – 5 mm pocket. Among the workers who had Eye problems and Back pain 14 (2%) workers had calculus, 44 (6.5%) had 4 – 5 mm pocket. Among the workers who had Skin rashes, Eye problems and Back pain 2 (0.3%) had calculus and 7 (1%) had 4 – 5 mm pocket.

Statistical test showed a significant association between work related Health Problems and Community Periodontal Index. ($\chi^2 = 203.548$; $P = 0.000$)

Table 26: Distribution of study population based on work related health problems and Community Periodontal Index

Work related health problems	Community Periodontal Index Code				Total
	0	2	3	4	
No work related health problems	2 (0.3%)	336 (49.9%)	41 (6.1%)	0	379 (56.3%)
Skin rashes	0	31 (4.6%)	8 (1.2%)	0	39 (5.8%)
Eye problems	0	7(1%)	15 (2.2%)	0	22 (3.2%)
Back pain	0	66 (9.8%)	58 (8.8%)	1 (0.1%)	125 (18.7%)
Skin + eye problems	0	4 (0.6%)	9 (1.4%)	0	13 (2%)
Skin rashes + back pain	0	9 (1.4%)	20 (3%)	0	29 (4.3%)
Eye problems + back pain	0	14 (2.0%)	44 (6.5%)	0	58 (8.5%)
Skin rashes + eye problems + back pain	0	2 (0.3%)	7 (1%)	0	9 (1.2%)
Total	2 (0.3%)	469 (69.6%)	202 (30%)	1 (0.1%)	674 (100%)

Chi Square Value = 203.548 P = 0.000 (significant)

Graph 23: Distribution of study population based on work related health problems and Community Periodontal Index

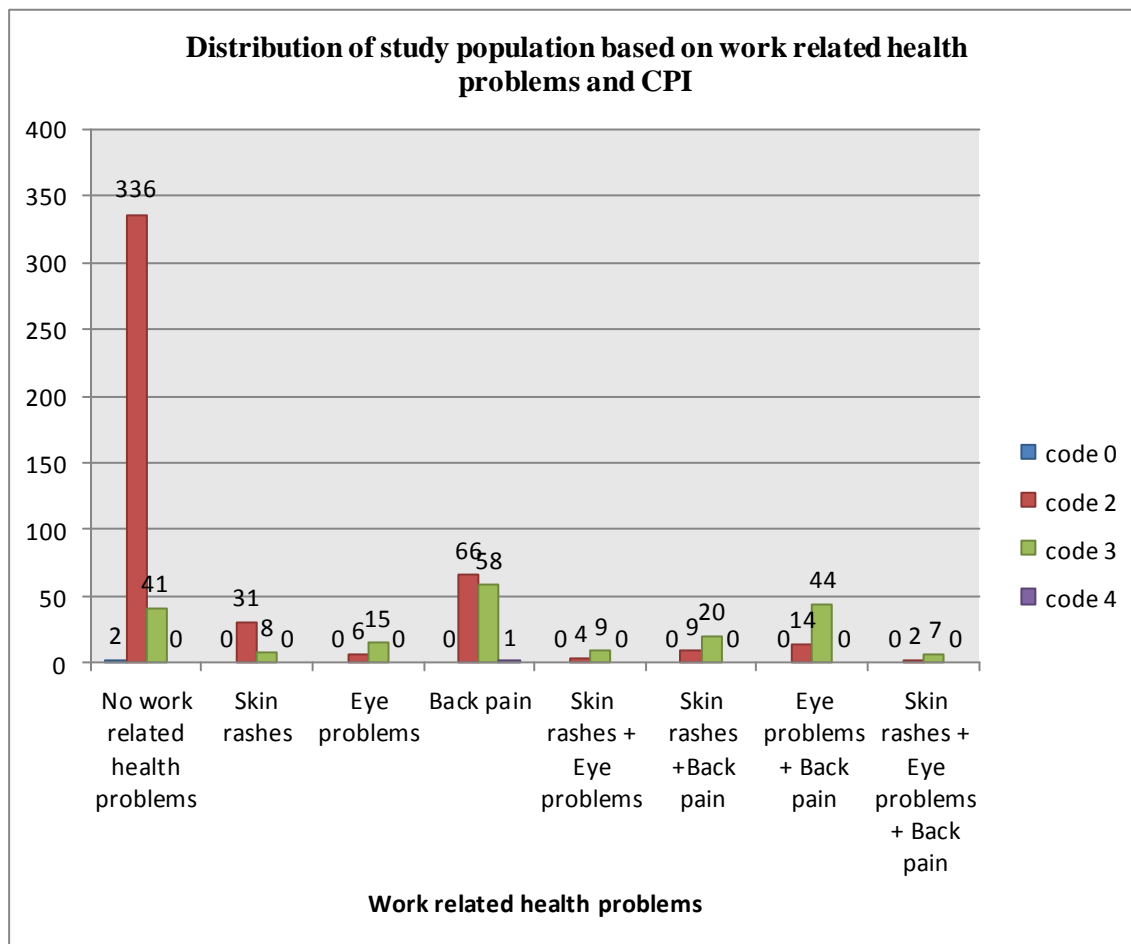


Table 27, Graph 24 shows the distribution of study population based on work related health problems and Loss of attachment. Among the study population who had no work related health problems 336 (49.9%) workers had 0 – 3 mm attachment loss, 36 (5.3%) workers had 4 – 5 mm attachment loss, 7 (1%) had 6 – 8 mm attachment loss. Among the workers who had skin rashes 31 (4.6%) had 0 – 3 mm attachment loss, 8 (1.2%) workers had 4 – 5 mm attachment loss. Among the workers who had Eye problems 7 (1%) workers had 0 – 3 mm attachment loss, 7 (1%) workers had 4 - 5 mm attachment loss, 8 (1.2%) workers had 6 – 8 mm attachment loss. Among the workers who had Back pain 77 (11.4%) workers had 0 – 3 mm attachment loss, 37 (5.6%) workers had 4 - 5 mm attachment loss, 10 (1.2%) workers had 6 – 8 mm attachment loss, 1 (0.1%) worker had 9 -11 mm attachment loss. Among the workers who had Skin rashes and Eye problems 4 (0.6%) workers had 0 – 3 mm attachment loss, 9 (1.3%) workers had 4 - 5 mm attachment loss. Among the workers who had Skin rashes and Back pain 9 (1.3%) workers had 0 – 3 mm attachment loss, 8 (51.2%) workers had 4 - 5 mm attachment loss, 12 (1.8%) workers had 6 – 8 mm attachment loss. Among the workers who had Eye problems and Back pain 14 (2%) workers had 0 – 3 mm attachment loss, 22 (3.3%) workers had 4 - 5 mm attachment loss, 22 (3.3%) workers had 6 – 8 mm attachment loss. Among the workers who had Skin rashes, Eye problems and Back pain 2 (0.3%) workers had 0 – 3 mm attachment loss, 5 (0.7%) workers had 4 - 5 mm attachment loss, 2 (0.3%) workers had 6 – 8 mm attachment loss.

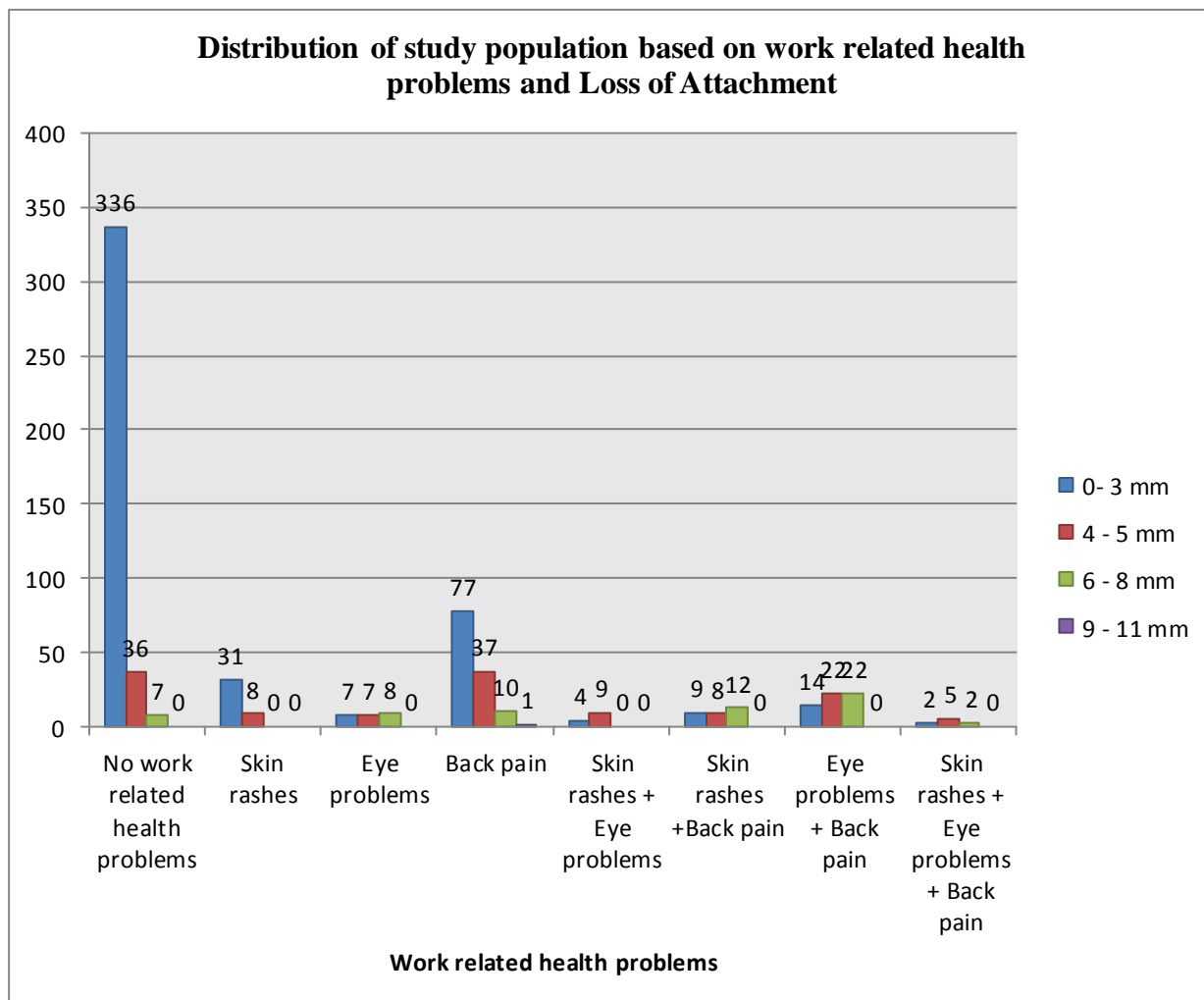
Statistical test showed a significant association between work related health problems and Loss of attachment ($\chi^2= 252.412$; $P = 0.000$)

Table 27: Distribution of study population based on work related health problems and Loss of Attachment

Work related health problems	Loss of attachment				Total
	0	1	2	3	
No work related health problems	336 (49.9%)	36(5.3%)	7 (1%)	0	379 (56.2%)
Skin rashes	31(4.6%)	8 (1.2%)	0	0	39 (5.8%)
Eye problems	7 (1%)	7 (1%)	8(1.2%)	0	22 (3.3%)
Back pain	77(11.4%)	37(5.6%)	10(1.5%)	1(0.1%)	125(18.6%)
Skin+ eye problems	4 (0.6%)	9 (1.3%)	0	0	13 (1.9%)
Skin rashes + back pain	9 (1.3%)	8 (1.2%)	12(1.8%)	0	29 (4.3%)
Eye problems + back pain	14 (2%)	22(3.3%)	22(3.3%)	0	58 (8.6%)
Skin rashes + eye problems + back pain	2 (0.3%)	5 (0.7%)	2 (0.3%)	0	9 (1.3%)
Total	480 (71.2%)	132 (19.6%)	61 (9.1%)	1 (0.1%)	674 (100%)

Chi Square Value = 252.412 P = 0.000 (significant)

Graph 24: Distribution of study population based on work related health problems and Loss of Attachment



DISCUSSION

The production of solar salt involves various stages like Brine management, Crystallization, Harvesting salt and Upgrading. The whole salt production process is labour oriented. These workers are exposed to direct sun light and sub soil Brine water leading to various work related health problems. The work related health problems due to working in the salt pan were related to musculoskeletal, ophthalmological, dermatological and respiratory systems as reported by Haldiya. K.R, etal (2005)⁶. Till date (2011) literature related to the oral health and treatment needs of Salt Pan workers is sparse. Hence this study has been undertaken to assess the oral health status and treatment needs of salt pan workers at Marakkanam.

This study was conducted among 674 (460 Males and 214 females) Salt Pan Workers in Marakkanam, Villupuram District. In this study the WHO Oral Health Assessment Proforma (basic oral health survey 1997)²² was used to assess the oral health status and treatment needs of the study population. A pretested closed ended structured questionnaire was used to find out the oral health associated habits between males and females

In this study majority of the Male workers 229 (49.8%) had Secondary education and 108 (50.5%) Female workers had Primary education.

A study done by Ansari.Z.A etal (2011)²³ among Power Loom workers in Mau Aima District of Allahabad showed that 2.9% workers had been educated up to 12th standard, 40.1% had primary education, 12.3% workers were illiterate,

15.8% workers had secondary education. Another study conducted by Tomita N.E etal (2005)¹⁸ among building construction workers in Sao Paulo, Brazil showed that the prevalence of dental caries reduced as the schooling level increases.

TOBACCO HABITS:

The present study showed that 373 (53.9%) workers had the habit of using Tobacco products. Among all Tobacco users 202 (30%) workers used only smoking form, 87 (13.2%) used only smokeless form, 82 (12.2%) workers used both smokeless and smoking form. The salt pan workers on an average spend nearly 6 hours working under the Sun. The high prevalence of tobacco usage among the salt pan workers might be due to stressful working condition & long working hours. In order to relieve themselves from these stressful condition & boredome they adopt the habit of using tobacco products.

A study conducted by Ansari.Z.A, etal (2011)²³ among Power Loom workers in Mau Aima Town, Allahabad showed that the overall prevalence of Tobacco use was 85.9%. Among the study population 89 (23.12%) workers were only smokers, 106 (27.53%) workers used only Chewing Tobacco, 190 (49.35%) workers used both forms. This showed that Tobacco consumption was high among the Power Loom workers when compared to the present study population.

ORAL HYGIENE PRACTICES:

It was observed in the present study that 674 (100%) workers brushed their teeth and majority 599 (88.9%) workers used Tooth brush and Tooth paste to clean their teeth and 13 (1.9%) workers used Salt for brushing their teeth.

A study conducted by Daglei .RJ etal (2008)²⁰ among Green Marble mine Laborers in Rajasthan showed that 405 (78.9%) workers cleaned their teeth daily and 108 (21.1%) workers did not clean their teeth daily.

DENTAL VISITS AMONG STUDY POPULATION

In the total study population 513 (76.1%) workers had not visited any dentist before. Of those visited majority 65 (9.6%) workers visited for extraction. This might be due to lack of oral health awareness, lack of visit to dentist, the cost of treatment was too high which was reported by 169 (25.1%) workers and people visited dentists only at the severe stage. This was similar to the study conducted by Amin NM and Al-Omouh SA (2001)¹⁷ on workers exposed to acid fumes in phosphate and battery industries in Jordan where 12% visited dentist mainly for tooth extraction due to lack of education and lack of time.

In the present study majority of the study population 236 (35.01%) workers felt there was 'no need' or 'no problem' to visit a dentist. This was similar to the study done by Srikandi TW etal (1982)¹⁰ in Adelaide, Australia where 60.2% subjects felt that there was 'nothing wrong', 16.4% said they were 'too busy or could not be bothered'. 'fear of dentist' and 'cost' associated for 8% workers. In the present study 3 (0.4%) workers had not visited a dentist due to

lack of time which was very low when compared to another study done by Kawamura M et al (1999)²⁴ among Japanese employees were 44% of the study population did not visit the dentist due to lack of time. This may be due to flexible working time schedule in the salt pan. Though majority of the salt pan workers had the time to visit a dentist only 161 (23.9%) workers had visited a dentist. Among the rest of the study population majority of the salt pan workers 236 (35.01%) felt that there was 'no pain' or 'no problem' to visit a dentist, lack of interest as reported by 100 (14.8%) of the workers.

WORK RELATED HEALTH PROBLEMS:

The present study showed 295 (43.8%) workers had work related health problems. This might be due to the fact they were working directly under the sun. This finding was similar to the study done by Dagli RJ et al (2008)²⁰ among green marble mine workers at Rajasthan, India where 65% workers experienced stress at work due to increased physical load, poor economic status and noisy working environment.

In the present study the most common work related health problems encountered was back pain. 125 (18.5%) workers had back pain, 58 (8.6%) workers had Eye problems and back pain, 39 (5.8%) workers had skin problems. 22 (3.3%) workers had eye problems. 13 (1.9%) workers had both skin and eye problems. 29 (4.3%) workers had both skin and back pain. 58 (8.6%) workers had both eye problems and back pain. 9 (1.3%) workers had skin rashes, eye problems and back pain. This was similar to the study done by Roy.S, Dsgupta A (2010)⁷

among women engaged in home based Papad making Industry in Kolkatta where 82.5% workers had musculo skeletal problems.

A study done by Haldiya. etal (2005)⁶ showed that 60.7% workers had Ophthalmic symptoms, 43.8% workers had dermatological symptoms, muscular and joint pains were felt by 52.1 % workers, while in the present study musculoskeletal problem was found to be the most common work related health problem. This might due to the fact that in the present study the workers were made to attend general health camp conducted by the Government of India twice yearly and every workers with eye problems were provided with free optical glasses and hence the prevalence of eye problems was found to be less (10.5%).

ORAL MUCOSAL LESIONS:

In the present study the percentage of oral mucosal lesions observed was low. The prevalence of oral mucosal lesion was 12.01% (81 workers). The prevalence of Leukoplakia was 7.4% (50 wrokers) and sub mucous fibrosis was 4.6% (36 workers). Prevalence of leukoplakia and Sub mucous fibrosis in the study population was due to their habits like tobacco usage and alcohol consumption.

A study done by Deshmukh P, Raizade R, Chaturvedi V (1995)²⁵ in rural inhabitants of Maharashtra, India showed that the prevalence of leukoplakia lesions was highest (6.06/1000) among people with tobacco usage and alcohol consumption.

ENAMEL OPACITIES AND DENTAL FLUOROSIS:

In the present study 12 (1.8%) workers had demarcated Enamel Opacities, 4 (0.6%) workers had questionable fluorosis, 4 (0.6%) workers had mild fluorosis.

A study conducted by Kumar.P etal (2005)²⁶ showed that the prevalence of enamel opacities in 5 years and 12 years was 28.3% and 12 years 23.3% and the prevalence of dental fluorosis in 5 and 12 year group was 1% and 2.5% 2.5%.

PERIODONTAL DISEASE:

The present study showed 469 (69.6%) workers had calculus, 202 (29.9%) workers had pocket 4-5mm, 2 (0.3%) workers were normal, 1 (0.1%) worker had pocket 6mm or more. In the present study the increase in prevalence of periodontal disease might be due to lack of proper oral hygiene practices, lack of awareness about oral health and lack of visit to the Dentist.

The results in the present study were similar with the study done by Srikandi TW and Clarke NG (1982)²⁷ among industrial workers in Adelaide, South Australia where reversible gingivitis with no pocket formation was evident in 11.1% of the total subjects and only 4.2% of subjects were free from any signs of periodontal disease.

Corbet.E.F etal (2001)²⁸ showed in their studies done among Old dentate Chinese of Guangdong Province, Southern China reported that the presence of dental calculus was the highest CPI score in 61-68% of the 35- to 44-year-old subjects and in 54-57% of the 65- to 74-year-olds.

A study done by Dagli.R, etal (2008)²⁰ among Green marble mine laborers of Rajasthan showed that the overall prevalence of Periodontal disease was 98.25%.

Another study done by Kumar.A, etal (2010)²⁹ among the rural population of Ambala District, Haryana reported the overall prevalence of periodontal disease was 92.7%.

DENTAL CARIES:

PREVALENCE OF DENTAL CARIES:

The prevalence of dental caries among the study population was 62.01%. The increase in the prevalence of dental caries can be due to, poor oral hygiene practices, lack of awareness regarding oral health, lack of interest in maintaining oral health. In the previous study conducted by Kumar.A, etal (2010)²⁹ among the rural population of Ambala District, Haryana where majority of the people were either farmers or laborers, the prevalence of Dental Caries was found to be 69.5%.

MEAN DECAYED, MISSING AND FILLED TEETH:

The mean DMFT of the study population in the present study was 3.35. The mean Decayed teeth component in the study population was (2.84), the mean of missed teeth component in study population was (0.46) and the mean component of filled teeth was (0.05). The findings in the present study were in agreement with a study conducted by Peterson PE (1983)¹¹ among Danish Industrial population which concluded that untreated dental caries and missing

teeth were predominant among workers than the filled teeth. This is because the workers less frequently visit dentist and decay may be severe requiring extraction of teeth than restoring the teeth.

Another study conducted by Tomita NE et al (2005)¹⁸ among building construction workers in Sao Paula, Brazil showed a mean DMFT of 16.9 and this was attributed due to low level of education and hence they preferred dental extractions as a therapeutic measure owing to dental caries in populations of lower socioeconomic status.

In another study conducted by Kumar.A et al (2010)²⁹ among the rural population of Ambala District, Haryana the mean DMFT was found to be 5.2, Mean number of teeth decayed, missing due to caries & 2.61, 2.46 which is higher than the present study.

TREATMENT NEEDS:

In the present study 340 (50.4%) workers needed one surface restoration, 327 (48.6%) workers needed two surface restoration, 65 (9.6%) needed pulp care and 115 (17.1%) needed extraction of one or several teeth. These figures of treatment needs indicate that workers less frequently visited dentist, the cost of treatment is too high as reported by 169 (25.1%) workers, lack of awareness in maintaining oral hygiene. Many workers felt there was no need or no problem for them to visit a Dentist. A study done by Nawell PL (2002)³⁰ among a rural highland community in New South Wales, Australia, showed 60% of the total

sample needed restoration of teeth and 36% needed extractions of teeth, which is higher than the present study.

Mean number of teeth requiring one surface filling, two or more surface filling, pulp therapy & extraction was 1.27, 0.42, 0.27 & 2.14, respectively in the study done by Kumar.A, etal (2010)²⁹ among the rural population of Ambala District, Haryana.

PROSTHETIC STATUS AND TREATMENT NEEDS:

The present study showed 79 (11.5%) workers needed upper prosthesis but only 25 (3.7%) workers had upper partial denture and 102 (15.1%) workers needed lower partial denture but only 2 (0.3%) workers had lower partial denture. This is due to the lack of visit to dentists, payment on daily wages basis, lack of awareness about the need to replace their lost teeth timely.

A study done by Sakki TK etal (1995)³¹ in Oulu, Finland showed 65% were dentate and 32% were edentulous and concluded that this was associated with low socioeconomic status.

In another study by Kumar A etal (2010)²⁹ it was found that partial dentures in maxillary arch & mandibular arch were 4% & 1.4% respectively. When prosthetic needs of the subjects was estimated it was found that 35.2 % (440) of subjects needed prosthesis in maxillary arch & 45.3% (566) needed prosthesis in mandibular arch which was higher than the present study.

SUMMARY

The present descriptive cross-sectional study was conducted to assess the oral health status and treatment needs of salt pan workers in Marakkanam, Villupuram District, Tamil Nadu. Ethical clearance was obtained from the Institution Review Board of Ragas Dental College & Hospital and Deputy salt commissioner, Chennai to conduct the study and informed consent from workers (**ANNEXURE VI**).

Workers who have worked for more than a year and who were present on the day of examination were examined. Workers with history of any systemic illness were excluded. Data was collected using proforma which consisted of WHO basic oral health assessment form (1997) and a pre-tested, closed ended questionnaire. The collected data was subjected to statistical analysis using SPSS 15 version.

The findings of the current study were as follows:

- Of the 674 salt pan workers examined, majority 460 (68.2%) workers were males.
- Majority of the workers, 373 (55.4%) used tobacco products and 195 (28.9%) consumed alcohol.
- Majority of the workers, 599 (88.9%) used tooth paste and tooth brush to clean their teeth.
- A large percentage of the workers, 513 (76.1%) workers had not visited dentist before. Of those visited, 73 (10.8%) workers had visited dentist for extraction.
- 295 (43.8%) workers reported work related health problems.

- On TMJ examination, 23 (3.4%) workers had clicking, 2(0.3%) workers had tenderness on palpation and 31 (4.6%) had reduced jaw mobility.
- 50 (7.4%) workers had leukoplakia and 31 (4.6%) had sub mucous fibrosis.
- 12 (1.8%) workers had demarcated enamel opacities.
- 4 (0.6%) workers had questionable dental fluorosis, and 4 (0.6%) workers had mild dental fluorosis.
- 469 (69.6%) had dental calculus, 202 (29.9%) had periodontal pocket depth 4 – 5mm.
- 132 (19.6%) workers had 4 – 5mm attachment loss, 61 (9%) had 6 – 8mm attachment loss.
- 412 (61.1%) workers had decayed crown, 97 (14.4%) had teeth missing due to caries, 23(3.8%) had filled crown, 4(0.67%) had abutment, 183 (27.2%) had teeth missing due to other reason.
- 76 (11.3%) workers had decayed root, in 194 (28.8%) workers roots were exposed.
- 340 (50.4%) needed one surface restoration, 327 (48.6%) needed two surface restoration, 65 (9.6%) needed pulp care and 115 (17.1%) needed extraction
- 25 (3.7%) workers wore a upper partial denture and 2 (0.3%) workers wore a lower partial denture.
- 79 (11.8%) workers were partially edentulous in the upper arch and 102 (15.1%) were partially edentulous in the lower arch.

CONCLUSION

People constantly interact with their environment which not only helps to shape their lives but also affects their health. Workers around the world despite vast differences in their physical, social, economic, and political situations face some kind of working place environmental hazards. Therefore environmental factors play a significant role in influencing general health conditions of workers. As oral health is an integral part of general health, the oral health of these people may also get influenced by such environmental factors. Among the oral diseases, Dental caries and periodontal diseases have historically been considered the most important global oral health burdens. Despite various steps taken to improve the oral health of people, oral health problems still remain as a burden in many communities, particularly among underprivileged people.

The present study was conducted to assess the oral health status and treatment needs of Salt Pan Workers in Marakkanam revealed that the oral health status of these workers was poor with high caries prevalence and high periodontal disease. This study also highlighted the contribution of poor working environmental conditions and its adverse effects on general health conditions of these workers as many of them are suffering from back pain, eye problems, skin rashes.

RECOMMENDATIONS

1. Regular oral examinations by dental professionals will help these workers to maintain good oral health and oral health promotion help to control oral disease and promote good health.
2. Nearby Dental colleges and IDA if any may adopt Salt pan workers which may help to reduce the unmet back log of dental treatment needs of these workers who are poor socio economically.
3. Government and Local NGO's like Rotary Club, Lions Club etc can organise free medical and dental camps periodically so that the workers can get free treatment.
4. Immediate tobacco cessation programs are warranted to reduce the burden of tobacco use related morbidity.
5. Set up a group insurance scheme so that the workers can avail dental treatment at a reasonable cost.

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ANNEXURE I



RAGAS DENTAL COLLEGE & HOSPITAL

(Unit of Ragas Educational Society)

Recognized by the Dental Council of India, New Delhi

Affiliated to The Tamilnadu Dr. M.G.R. Medical University, Chennai

2/102, East Coast Road, Uthandi, Chennai - 600 119. INDIA.

Tele : (044) 24530002, 24530003-06. Principal (Dir) 24530001 Fax : (044) 24530009

To:
The Regional Officer
Marakanam Salt Panworkers
Marakanam, Villupuram Dist.

Sir,

This is to certify that Dr. Nanda Balan. I, is a bonafide First year MDS (Public Health Dentistry) student of this college. He is doing the dissertation on "An assessment of Oral Health status and treatment needs of Salt Pan Workers, Marakkanam, Villupuram Dist." Since he need to use the facilities available in your field for his study purpose, I will be thankful if you could allow him to do the study under your guidance.

Thanking you,

Yours sincerely,



Date: 18.02.2010

(Dr. S. RAMACHANDRAN)
PRINCIPAL

PRINCIPAL
RAGAS DENTAL COLLEGE & HOSPITAL
CHENNAI

ANNEXURE II

**GOVERNMENT OF INDIA
OFFICE OF THE DEPUTY SALT COMMISSIONER
POST BOX NO.706, CHENNAI-600006**

C.No.13017(1)W2/03/

Dated: 23 -03-2010

To,

✓ The Factory Officer,
Marakanam.

Sub: Permission to RAGAS DENTAL COLLEGE & HOSPITAL, UTHANDI, CHENNAI for doing on "An assessment of Oral Health status and treatment of Salt Pan Workers, Marakanam" by Dr.I.Nanda Balan -- Requested -- Reg.

Please refer to your letter F.No.13/Misc./2008/449-51, dated 09.03.2010, seeking our permission to do a dissertation study on salt pan workers of Marakanam Factory by Dr.I.Nanda Balan, student of Ragas Dental College & Hospital, Chennai.

The study viz., "An assessment of Oral Health Status and treatment needs of salty pan workers" is to be done among the salt pan workers, who are being employed directly by lessees in manufacturing, iodisation, crushing, loading and unloading of salt. Hence it is felt that you may advise the lessees to assist the student, in conducting the study. You may also guide him in case of need.

The student may be requested to share the outputs of the study, so that we may solicit the services of Dentist in our Health Camps, in case the problems are alarming.

(Dr.Jaipal Singh)
Deputy Salt Commissioner
Chennai.

Copy to:

- 1.The Superintendent of Salt, Cuddalore.
- 2.The Assistant Salt Commissioner, Tuticorin.

Sgk.

ANNEXURE III - QUESTIONNAIRE

DEPARTMENT OF PUBLIC HEALTH DENTISTRY
RAGAS DENTAL COLLEGE AND HOSPITAL
CHENNAI

சமுதாயப் பல் மருத்துவத்துறை
ராகாஸ் பல் மருத்துவலக் கல்லூரி மற்றும் மருத்துவமனை,
சென்னை.

An Assessment of the Oral Health Status and Treatment Needs of Salt Workers
in Marakkanam

மரக்காணம் உப்பளத் தொழிலாளர்களின் வாய்நலம் மற்றும் சிகிச்சை தேவை பற்றிய
ஆய்வு

Serial No :
வரிசை எண்:

Examination Date :
ஆய்வு தேதி:

1. Name :
பெயர் :

2. Age :
வயது

3. Gender (M/F) :
பாலினம் (ஆ/பெ) :

4. Education:

- 1) No formal education 2) Primary education
3) Secondary education 4) P.U.C. 5) Degree

கல்வித் தகுதி

அ) முறையான கல்வி பயிலாதவர்
இ) நடுநிலைக் கல்வி

ஆ) ஆரம்பக் கல்வி
ஈ) பி.யு.சி. உ) பட்டப்படிப்பு

5. Working hours per day :
ஒருநாளைய வேலை நேரம்

6. Monthly income :
மாத வருமானம்

7. Working experience :
வேலை அனுபவ ஆண்டு

8. Diet : 1)Vegetarian 2)Mixed
உணவுப்பழக்கம்: அ) சைவம் ஆ) கலப்பு உணவு

9. Do you eat sweets : Yes / No
If yes, How many times in a day ?
Once a day / Twice a day/ Thrice a day or more
- நீங்கள் இனிப்பு உட்கொள்வீர்களா? ஆம்/ இல்லை
ஆம் எனில் எத்தனை முறை?
ஒரு முறை / இரண்டு முறை/ மூன்று முறை அல்லது அதற்கு மேல்
10. Do you smoke ? Yes / No
புகை பிடிக்கும் பழக்கம் உள்ளதா? ஆம்/ இல்லை
11. If yes, 1) What do you smoke?
2) How many cigarettes /beedis do you smoke in a day?
3) Duration :
- ஆம் என்றால் (அ) எந்த வகை புகை பிடிப்பீர்கள்?
ஆ) ஒரு நாளில் எத்தனை சிகரெட் / பீடி புகைப்பீர்கள்
இ) பழக்கத்தின் கால அளவு
12. Do you have paan / tobacco chewing habit? Yes/No
புகையிலை மெல்லும் பழக்கம் உண்டா? ஆம்/ இல்லை
- If yes, 1) Type :
2) Quantity :
3) Duration :
- ஆம் என்றால்
அ) வகை
ஆ) அளவு
இ) கால அளவு
13. Do you consume alcohol? Yes / No
மது அருந்தும் பழக்கம் உள்ளதா? ஆம்/ இல்லை
- If yes, 1) Quantity :
2) Duration :
- ஆம் என்றால்
அ) அளவு
ஆ) கால அளவு
14. Oral Hygiene practices:
வாய் சுகாதார பழக்கங்கள்
- I. Type of tooth cleaning
1) Tooth brush + paste 2) Tooth brush + powder 3) Finger + paste



- 4) Finger + powder 5) Finger 6) Others, specify

பல் துலக்கும் முறை

அ) பல் துலக்கி + பற்பசை

ஆ) பல் துலக்கி + பற்பொடி

இ) கை விரல் + பற்பசை

ஈ) கை விரல் + பற்பொடி

உ) கை விரல்

ஊ) வேறு ஏதேனும், குறிப்பிடவும்

II. Method of brushing

- 1) Horizontal 2) Vertical 3) Both 4) Circular 5) Don't know

பல் துலக்கும் முறைகள்

அ) கிடை மட்டமாக

ஆ) செங்குத்தாக

இ) இரண்டுமாக

ஈ) வட்டமாக

உ) தெரியாது

III. Frequency of tooth brushing

- 1) Once daily 2) Twice daily 3) Thrice or more

ஒரு நாளில் எத்தனை முறை பல் துலக்குவீர்கள்

அ) ஒரு முறை

ஆ) இரண்டு முறை

இ) முன்று அல்லது அதற்கு மேல்

IV. Duration of tooth brushing

- 1) 1-2 min 2) 3-5 min 3) > 5 min 4) Not noticed

பல்துலக்க எடுத்துக்கொள்ளும் கால அளவு

அ) 1-2 நிமிடங்கள்

ஆ) 3-5 நிமிடங்கள்

இ) 5 நிமிடங்களுக்கு மேல்

ஈ) கவனித்தது இல்லை

V. Frequency of changing the tooth brush

- 1) 1-2 months 2) 3 months 3) 4-6 months 4) 7-12 months
5) Once flared 6) Irregular 7) Not noticed

பல்துலக்கியை எப்போது மாற்றுவீர்கள்

அ) 1-2 மாதத்திற்கு ஒருமுறை

ஆ) 3 மாதத்திற்கு ஒருமுறை

இ) 4 -6 மாதத்திற்கு ஒரு முறை

ஈ) 7-12 மாதத்திற்கு ஒருமுறை

உ) பாழான பிறகு

ஊ) ஒழுங்கற்ற முறை

எ) கவனித்தது இல்லை

VI. Any other dental cleansing aids used, Yes / No

வேறு ஏதேனும் பல் சுத்தப்படுத்தும் கருவி பயன்படுத்துவீர்களா?

ஆம்/இல்லை

15. Have you visited a dentist earlier? Yes / No

இதற்கு முன் பல்மருத்துவரை அணுகியுள்ளீர்களா? ஆம் / இல்லை

16. If yes, what was the reason?

- 1) Tooth ache 2) Extraction 3) Filling 4) Get teeth cleaned
5) Replacement of teeth 6) Others

ஆம் என்றால், என்ன காரணத்திற்காக

- அ) பல் வலிக்காக ஆ) பல் எடுப்பதற்காக இ) பல் அடைப்பதற்காக
ஈ) பல் சுத்தம் செய்ய உ) மாற்றுப்பல் வைக்க ஊ) வேறு ஏதேனும்

17. If Not, what was the reason?

- 1) Lack of time 2) Dentist not available nearby 3) High cost of treatment
4) Not interested 5) Others

இல்லை என்றால் என்ன காரணம்?

- அ) நேரமின்மை ஆ) பல் மருத்துவர் அருகாமையில் இல்லை என்பதனால்
இ) செலவு அதிகமாவதால் ஈ) விருப்பமில்லாததால்
உ) வேறு ஏதேனும்

18. Do you have any dental problems ? Yes / No

உங்களுக்கு வாயில் ஏதேனும் பிரச்சனை உள்ளதா? ஆம்/ இல்லை

19. Do you suffer from any work related problems? Yes/No

If yes,

- 1) Rashes 2) Eye Disease
3) Back Pain 4) Any other

நீங்கள் வேலைப்பளுவினால் ஏதாவது உடல்நலக்குறைவால் பாதிக்கப்படுகிறீர்களா? ஆம்/இல்லை.

ஆம் எனில்

- அ) தோல் அரிப்பு ஆ) கண் பார்வை குறைவு
இ) முதுகுவலி ஈ) மற்றவை

ANNEXURE IV – WHO Proforma 1997

WHO ORAL HEALTH ASSESSMENT FORM (1997)

Country

Leave blank (1) (4) Year (5) (8) Month (9) (10) Day (11) (14) Identification number Examiner (15) Original/duplicate (16)

GENERAL INFORMATION

Name

Date of birth Year (17) (20) Month (21) (22)

Age in years (23)

Sex (M = 1, F = 2) (24)

Ethnic group (25)

Occupation (26)

Geographical location (27)

Location type: 1 = Urban (28) 2 = Periurban (29) 3 = Rural (30)

OTHER DATA (specify and provide codes) (31)

CONTRAINDICATION TO EXAMINATION Reason: (32)

0 = No 1 = Yes

CLINICAL ASSESSMENT

EXTRA-ORAL EXAMINATION

0 = Normal extra-oral appearance
 1 = Ulceration, sores, erosions, fissures (head, neck, limbs)
 2 = Ulceration, sores, erosions, fissures (nose, cheeks, chin)
 3 = Ulceration, sores, erosions, fissures (commissures)
 4 = Ulceration, sores, erosions, fissures (vermillion border)
 5 = Cancrum oris
 6 = Abnormalities of upper and lower lips
 7 = Enlarged lymph nodes (head, neck)
 8 = Other swellings of face and jaws
 9 = Not recorded (33)

TEMPOROMANDIBULAR JOINT ASSESSMENT

SYMPTOMS

0 = No
 1 = Yes
 9 = Not recorded (34)

SIGNS

0 = No
 1 = Yes
 9 = Not recorded

Clicking (35)
 Tenderness (on palpation) (36)
 Reduced jaw mobility (< 30 mm opening) (37)

ORAL MUCOSA

CONDITION

0 = No abnormal condition
 1 = Malignant tumour (oral cancer)
 2 = Leukoplakia
 3 = Lichen planus
 4 = Ulceration (aphthous, herpetic, traumatic)
 5 = Acute necrotizing gingivitis
 6 = Candidiasis
 7 = Abscess
 8 = Other condition (specify if possible)
 9 = Not recorded

(37) (40)
 (38) (41)
 (39) (42)

LOCATION

0 = Vermilion border
 1 = Commissures
 2 = Lips
 3 = Sulci
 4 = Buccal mucosa
 5 = Floor of mouth
 6 = Tongue
 7 = Hard and/or soft palate
 8 = Alveolar ridges/gingiva
 9 = Not recorded

ENAMEL OPACITIES/HYPOPLASIA

Permanent teeth

0 = Normal
 1 = Demarcated opacity
 2 = Diffuse opacity
 3 = Hypoplasia
 4 = Other defects
 5 = Demarcated and diffuse opacities
 6 = Demarcated opacity and hypoplasia
 7 = Diffuse opacity and hypoplasia
 8 = All three conditions
 9 = Not recorded

14 13 12 11 21 22 23 24
 (43) (50)
 (51) (46) (52) (36)

DENTAL FLUOROSIS

0 = Normal
 1 = Questionable
 2 = Very mild
 3 = Mild
 4 = Moderate
 5 = Severe
 8 = Excluded
 9 = Not recorded (53)

COMMUNITY PERIODONTAL INDEX (CPI)

0 = Healthy
 1 = Bleeding
 2 = Calculus
 3 = Pocket 4–5 mm (black band on probe partially visible)
 4 = Pocket 6 mm or more (black band on probe not visible)
 X = Excluded sextant
 9 = Not recorded

1016 11 2627
 (34) (50)
 (57) (59)
 4348 31 3637

LOSS OF ATTACHMENT*

0 = 0–3 mm
 1 = 4–5 mm (cementoenamel junction (CEJ) within black band)
 2 = 6–8 mm (CEJ between upper limit of black band and 8.5-mm ring)
 3 = 9–11 mm (CEJ between 8.5-mm and 11.5-mm rings)
 4 = 12 mm or more (CEJ beyond 11.5-mm ring)
 X = Excluded sextant
 9 = Not recorded

1218 11 2627
 (60) (62)
 (63) (65)
 4348 31 3637

* Not recorded under 15 years of age

DENTITION STATUS AND TREATMENT NEED Identification number

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
Crown (96)																	(81)
Root (82)																	(97)
Treatment (98)																	(113)

	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
Crown (114)																	(129)
Root (130)																	(145)
Treatment (146)																	(161)

Primary teeth	Permanent teeth	STATUS	TREATMENT
Crown	Crown/Root		
A	0 0	Sound	0 = None
B	1 1	Decayed	P = Preventive, caries-arresting care
C	2 2	Filled, with decay	F = Fissure sealant
D	3 3	Filled, no decay	1 = One surface filling
E	4 —	Missing, as a result of caries	2 = Two or more surface fillings
—	5 —	Missing, any other reason	3 = Crown for any reason
F	6 —	Fissure sealant	4 = Veneer or laminate
G	7 7	Bridge abutment, special crown or veneer/implant	5 = Pulp care and restoration
—	8 8	Unrupted tooth, (crown)/unexposed root	6 = Extraction
T	T —	Trauma (fracture)	7 = Need for other care (specify).....
—	9 9	Not recorded	8 = Need for other care (specify).....
			9 = Not recorded

PROSTHETIC STATUS	Upper	Lower	PROSTHETIC NEED	Upper	Lower
	<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>
0 = No prosthesis	(162)	(163)	0 = No prosthesis needed	(164)	(165)
1 = Bridge			1 = Need for one-unit prosthesis		
2 = More than one bridge			2 = Need for multi-unit prosthesis		
3 = Partial denture			3 = Need for a combination of one- and/or multi-unit prostheses		
4 = Both bridge(s) and partial denture(s)			4 = Need for full prosthesis (replacement of all teeth)		
5 = Full removable denture			9 = Not recorded		
9 = Not recorded					

DENTOFACIAL ANOMALIES

DENTITION
 (166) (167) Missing incisor, canine and premolar teeth—maxillary and mandibular—enter number of teeth

SPACE
 (168) Crowding in the incisal segments:
 0 = No crowding
 1 = One segment crowded
 2 = Two segments crowded

(169) Spacing in the incisal segments:
 0 = No spacing
 1 = One segment spaced
 2 = Two segments spaced

(170) Diastema in mm

(171) Largest anterior maxillary irregularity in mm

(172) Largest anterior mandibular irregularity in mm

OCCLUSION
 (173) Anterior maxillary overjet in mm

(174) Anterior mandibular overjet in mm

(175) Vertical anterior openbite in mm

(176) Antero-posterior molar relation:
 0 = Normal
 1 = Half cusp
 2 = Full cusp

NEED FOR IMMEDIATE CARE AND REFERRAL

Life-threatening condition (177) 0 = Absent

Pain or infection (178) 1 = Present

Other condition (specify)..... (179) 9 = Not recorded

Referral (180)
 0 = No
 1 = Yes
 9 = Not recorded

NOTES

ANNEXURE V

**GOVERNMENT OF INDIA
OFFICE OF THE DY.SUPERINTENDENT OF SALT
MARAKANAM SALT FACTORY**

F.No.23/W/Eye Camp/2010/ 126-29 DATE: 27.1.2011.

To
M/s Ragas Dental Collage & Hospital, (By Name) Dr.M.Sivakumar
Uthandi,
Chennai – 600 119.

Sir,

Sub:- Labour Welfare Works –Conducting of one day General Health – cum –
Eye Camp at Marakanam Salt Factory by the Salt Commissionerate,
Govt. of India for the benefit of the Salt workers & their families –
Deputation of team of Doctors – Requested – Reg.

Salt Commissionerate, Govt. of India, Ministry of Commerce & Industry is organizing one day FREE General Health – cum – Eye Camp at Marakanam Salt Factory for the benefit of the Salt workers & their families working in the salt fields. About 750 labourers both male & female are working in the salt fields for the manufacture of salt in the hot Sun. The proposed camp is mainly to check the eyes of the salt workers working in the hot sun during the day times besides general health check up. In this camp, FREE dental check up also may be done with your specialized Doctors.

Date for the above camp has been fixed on 18.2.2011 from 09.00 am to 4.00 pm at Ramakrishna Higher Secondary School, Salt Road, Marakanam.

Hence, I request you to kindly depute the Specialist Doctors along with necessary instruments to the above camp at Marakanam for free dental check up on 18.2.2011 for the successful conduction of FREE one day General Health – cum –Eye check up for the Salt Workers of Marakanam Salt Factory.

Yours faithfully,


27/1/2011

**(R.ELANGO)
DY.SUPERINTENDENT OF SALT
MARAKANAM SALT FACTORY**

Copy submitted to:

1. The Deputy Salt Commissioner, Chennai.
2. The Assistant Salt Commissioner, Tuticorin.
3. The Superintendent of Salt, Cuddalore.

ANNEXURE VI

INFORMED CONSENT FORM

I Mr/Ms aged the undersigned hereby agree to participate in the research project titled, “An Assessment of Oral Health Status and Treatment needs of Salt Pan Workers in Marakkanam, Villupuram District, Tamil Nadu” conducted by Dr.I.Nanda Balan, Postgraduate student, under the guidance of Dr.M.Shiva Kumar MDS, Professor and HOD, Department of Public Health Dentistry, Ragas Dental College and Hospital, Chennai.

I understand that as a part of this study, my oral cavity will be examined by the investigator using examination instruments.

I also understand that this examination will not include any invasive procedures or any action which might cause pain or discomfort to me.

I hereby give my voluntary consent to participate in the study voluntarily, unconditionally and freely without fear or pressure in mentally sound and conscious state.

Witness/ representative

Participant’s Signature

Date

ஒப்புதல் படிவம்

_____ ஆகிய நான் ராகாஸ் பல் மருத்துவக் கல்லூரி முதுகலை பல் மருத்துவ மாணவன் டாக்டர் ஐ. நந்தபாலன், செயலாற்றும் மரக்காணம் உப்பளத் தொழிலாளர்களின் வாய் நலம் சார்ந்த இந்த ஆய்வில் எனக்கு வாய் பரிசோதனை மேற்கொள்ள முழு ஒப்புதல் அளிக்கிறேன்.

இந்த ஆய்வு குறித்து எனக்கு தெரிவிக்கப்பட்ட நடைமுறைகளை புரிந்து கொண்டு எந்த தயக்கமோ யாருடைய வற்புறுத்தலோ இன்றி சுயநினைவுடன் முழு மனதுடன் இந்த ஆய்வில் பங்கேற்க ஒப்புதல் அளிக்கிறேன்.

பங்கு பெறுபவர் கையொப்பம் :

தேதி :