



## International Journal of Applied Dental Sciences

ISSN Print: 2394-7489  
ISSN Online: 2394-7497  
IJADS 2022; 8(4): 173-177  
© 2022 IJADS  
[www.oraljournal.com](http://www.oraljournal.com)  
Received: 14-11-2022  
Accepted: 28-11-2022

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### Assessment of oral health status among underground coal mine workers of Bokaro city, Jharkhand, India: A cross sectional study

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DOI: <https://doi.org/10.22271/oral.2022.v8.i4c.1642>

#### Abstract

**Aim:** The aim of this study was to assess the oral health status of underground coal mine workers with the objectives of assessing their tobacco and alcohol habits, oral hygiene behaviours, dental caries and periodontal disease status as well as dental traumatic injuries.

**Methods:** The Cross-Sectional Descriptive Study was conducted in Bokaro city, Jharkhand, India for the duration of 2 months. 400 subjects were included in the present study. Official permission was taken from the HRD department, Central Coal fields Limited (CCL), Ranchi headquarter. All the subjects who agreed to participate in the study were requested to give written informed consent prior to the beginning of the study.

**Results:** Majority of them belongs to 51-60 years of age group (32.8%) followed by 41-50 years (29.3%), 31-40 years (24.5%) and <30 years (13.5%). The result depicted that most of the workers had their education between primary and secondary level (60.3%) and above secondary level of education was observed in (18.3%). The result demonstrates caries status; 6% subjects had no caries. Caries was found prevalent in 51.5% followed by caries with restoration in 25.8%, filled 11.8% and missing teeth was observed in 5% of the study population. The result demonstrates prevalence of gingival bleeding; 16.5% subjects had no gingival bleeding manifestation and rest 83.5% of the workers presented with bleeding gums.

**Conclusion:** In conclusion, the underground coalmines workers are characterized by a lack of previous dental care, poor oral hygiene, high prevalence of dental caries and periodontal diseases and high treatment needs.

**Keywords:** Dental caries, periodontal disease, traumatic injuries

#### Introduction

It is a fact of life that what man is and to what disease he may fall victim to, depends on a combination of two sets of factors-his genetic factors and the environmental factors to which he is exposed. Increased industrial activity worldwide has improved the standard of living of the people but at the same time made people prone to various occupational health hazards<sup>[1]</sup>. This deteriorates the general and oral health of people due to their exposure to hazardous occupational environment<sup>[2]</sup>. The effects of various aetiologic agents responsible for occupational disease depends on their specific chemical, physical and bacterial nature, their physical state, and their mode of entry.

Oral health is essential and integral to overall health and well-being. The oral cavity serves as a connection between external environment and internal body environment and is especially prone to occupational diseases due to its direct exposure to various occupational pollutants. Oral diseases like dental caries, periodontitis, malocclusion, oral cancer and dental traumatic injuries have considerable impact on overall well-being of an individual. Work in mines, metal work, and work in the chemical industry may affect the disease in the periodontium and the oral mucosa<sup>[2]</sup>.

Coal mining is one of the major age old industries throughout the world and in India. A large number of laborers work in the coal mining industry in India.

As per the annual report published by Ministry of Mines, Government of India, 89 minerals are being produced in India by operating 569 coal mines, 67 oil and gas mines and 1770 non-coal mines and many more small mines<sup>[3]</sup>. It is an ancient occupation, which is recognized to be associated with injury and disease<sup>[2]</sup>. Worker's exposure to coal dust and a number of other particulate matter make them more prone for respiratory system diseases<sup>[4-6]</sup>.

Coal mining industry works throughout the week for the production where the workers are engaged in the tedious work round the clock where they work in rotating shifts. They work in three shifts of eight hours each. The physically tedious work drives people to consume alcohol and tobacco<sup>[7]</sup>. These may lead to deterioration of their oral health in terms of periodontal disease and oral mucosal diseases<sup>[8-11]</sup>. Shift work, because of disruption of regular body circadian rhythm activity may lead to a number of dangerous health conditions, like cardiovascular disease, diabetes, gastrointestinal disease, nervous system disease, and obesity, increased risk of accidents or injury<sup>[12-15]</sup>. Mining has independently been associated with a number of adverse health effects such as cardiovascular, pulmonary, neurological, renal, haematological and musculoskeletal disorders<sup>[2, 4-6, 16-18]</sup>.

The aim of this study was to assess the oral health status of underground coal mine workers with the objectives of assessing their tobacco and alcohol habits, oral hygiene behaviours, dental caries and periodontal disease status as well as dental traumatic injuries.

### Materials and Methods

The Cross-Sectional Descriptive Study was conducted in Bokaro city, Jharkhand, India for the duration of 2 months. 400 subjects were included in the present study.

### Methodology

The study protocol was reviewed by the ethical committee of pacific dental college and hospital and was granted ethical clearance. Official permission was taken from the HRD department, Central Coalfields Limited (CCL), Ranchi headquarter. All the subjects who agreed to participate in the study were requested to give written informed consent prior to the beginning of the study. Before the commencement of the study, the training and calibration of the examiner and the recording assistant (internee) were carried out under the guidance of experts in the Department of Public Health Dentistry by practicing the examination on a group of 30 subjects with a wide range levels of disease conditions to ensure uniform interpretations, understanding and application of the codes and criteria for the various diseases and conditions to be observed and recorded.

### Inclusion Criteria

- A. Workers present on the day of examination.
- B. Those who are willing to participate.
- C. Rotating shift Workers.
- D. Underground coalmine workers.

### Exclusion Criteria

- A. Those who are not willing to participate.
- B. Officers and other office personnel.
- C. Workers with history of any systemic diseases.

### Proforma Details

Clinical oral health examination was done using WHO 2013 oral health assessment form. A questionnaire consisting of questions regarding general information, oral hygiene practices and adverse habits were made. Oral hygiene practices registered included type of cleaning materials used and frequency of cleaning teeth. Adverse habits included smoking habits, chewing habits, pan chewing and alcohol consumptions habits. The questionnaire was constructed in English and translated into Hindi language.

### Schedule of the Survey

A survey was systematically scheduled as per the convenience of the office staff. A detailed monthly schedule was prepared well in advance in harmony with the office authorities. The examination was conducted during September 2021 to October 2021 on an average 15 to 20 subjects were examined each day. Although a detailed schedule plan was prepared meticulously, few adjustments and changes were called for working it out practically.

### Method of Examination

Clinical oral examination of the subjects was carried out by the investigator himself. The oral health examination of subjects was made as described by the WHO Oral Health Survey Basic method 2013 by using a WHO Probe and plane mouth mirror. Type III clinical examination was carried out as per American Dental Association (ADA) specification under adequate natural illumination. Subjects were made to sit on a chair or a raised platform. The examiner stood next to the subjects and all examinations were carried out by a single examiner. The examiner was assisted by a trained recording clerk who was sitting close enough to the examiner so that instructions and codes could be easily heard and the examiner was able to see the data being entered correctly. A total of 15-20 subjects were examined daily. Demographic data included the age, location, and number of years of education, oral hygiene practices included type of oral hygiene aid, material and frequency, tobacco and alcohol habits were the additional data recorded.

### Statistical Analysis

The data obtained were compiled systematically, transformed from a precoded proforma and was entered in Microsoft Excel and analyzed using Statistical package for Social Science version 20 (SPSS Inc, Chicago, Illinois, USA). The statistical tests applied for the analysis were Chi-Square test and t test. Descriptive statistics included computation of frequency and percentages.

**Results**

**Table 1:** Demographic data, oral hygiene practices, tobacco and alcohol habits

Variable	Levels	N%
Age in years	<30	54 (13.5%)
	31-40	98 (24.5%)
	41-50	117 (29.3%)
	51-60	131 (32.8%)
Education	0	42 (10.5%)
	1-5	44 (11.0%)
	6-10	241 (60.3%)
	>10	73 (18.3%)
Oral Hygiene Aids	Finger	6 (1.5%)
	Neem Stick	99 (24.8%)
	Tooth Brush	262 (65.5%)
	Neem Stick + Tooth Brush	33 (8.3%)
Materials	None	107 (26.8%)
	Tooth Paste	288 (72.0%)
	Tooth Powder	5 (1.3%)
Frequency	Once Daily	400 (100.0%)
	Twice daily	0
Habits	Chewing	190 (47.5%)
	Smoking	32 (8.0%)
	Alcohol+Chewing	98 (24.5%)
	Alcohol+Smoking	17 (4.3%)
	Smoking+Chewing	47 (11.8%)
	No habit	16 (4.0%)

Of the total 400 subjects who participated in the survey; 100% were males. Majority of them belongs to 51-60 years of age group (32.8%) followed by 41-50 years (29.3%), 31-40 years (24.5%) and <30 years (13.5%). The result depicted that most of the workers had their education between primary and secondary level (60.3%) and above secondary level of education was observed in (18.3%). The table revealed that more than half of the population (65.5%) was using tooth brush to clean their teeth. Considerable number of subjects (24.8%) was using neem stick as cleaning aids. The result shows the Distribution of study population according to different brushing material. Majority of population was found using toothpaste (72.0%) followed by tooth powder (1.3%). The table depicted that 100% of the study population found using any oral hygiene aid once daily only. Prevalence of chewing tobacco was seen among 47.5% of the population

followed by alcohol along with chewing tobacco was observed in 24.5% of the population.

**Table 2:** Distribution of subjects in relation to dental caries status

Variable	Levels	N%
Dentition status	Sound	24 (6.0%)
	Caries	206 (51.5%)
	Filled w/caries	103 (25.8%)
	Filled	47 (11.8%)
	Missing	20 (5.0%)

The result demonstrates caries status; 6% subjects had no caries. Caries was found prevalent in 51.5% followed by caries with restoration in 25.8%, filled 11.8% and missing teeth was observed in 5% of the study population.

**Table 3:** Distribution of subjects in relation to periodontal status

Variable	Levels	N%
Gingival bleeding	Absent	66 (16.5%)
	Present	334 (83.5%)
Periodontal pockets	Absent	24 (6.0%)
	4-5 mm	109 (27.3%)
	≥6 mm	267 (66.8%)
Loss of Attachment	0-3 mm	22 (5.5%)
	4-5 mm	36 (9.0%)
	6-8 mm	117 (29.3%)
	9-11 mm	187 (46.8%)
	≥12 mm	38 (9.5%)

The result demonstrates prevalence of gingival bleeding; 16.5% subjects had no gingival bleeding manifestation and rest 83.5% of the workers presented with bleeding gums. The above table demonstrates prevalence of periodontal pocket; 6% subjects had no pocket. ≥6 mm of periodontal pocket formation was most prevalent (66.8%) followed by 4-5 mm

pocket depth in (27.3%) of the study population. The table demonstrates loss of attachment status; revealed that majority of the study population showed attachment loss of 9-11 mm (46.8%) followed by 6-8 mm loss (29.3%), ≥12 mm loss was observed in (9.5%) and 0-3 mm was found only in (5.5%) of the workers.

**Table 4:** Distribution of subjects in relation to traumatic injuries of teeth

Variable	Levels	N%
Traumatic injury of teeth	Treated Injury	103 (25.8%)
	Enamel fracture only	70 (17.5%)
	Enamel & Dentine fracture	24 (6.0%)
	Pulp involved	11 (2.8%)
	Missing tooth due to trauma	192 (48.0%)

Out of total 400 subjects, 25.8% subjects had their traumatic injury treated. The missing tooth due to trauma was highest 48.0% followed by enamel fracture 17.5%, enamel & dentine fracture 6.0% and pulp involved was observed in 2.8%.

### Discussion

Standard of living of the people has been improved by expanding industrial activity, but at the other end it has created many occupations related hazards. Development in various fields such as technology, industrial, political, scientific and social fields has led to various occupational and environmental diseases. Improvement in technology has made jobs very easy in several aspects, but, at the same time, has created new occupational hazards that have drawn public attention.<sup>1</sup> Coal mining is one of the major age-old industries throughout the world<sup>[3]</sup>. Very less has been known regarding oral health status of workers in this occupation. WHO defines oral health as a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal(gum) disease, tooth decay, tooth loss and other diseases and disorders that limit an individual 's capacity in biting, chewing, smiling, speaking and psychological well-being<sup>[19]</sup>.

All the participants in the survey were male population<sup>[20]</sup>. The study population was in the age range of 30-60 years. Majority of the subjects were in the age range of 51-60 years 131(32.8%) with only a small proportion belonging to the age group of < 30 years 54(13.5%). In the present study, the mean age of the total population was 43.193 +10.17 years. This finding was higher than the study conducted by Rao BV *et al.* (2017) among Gunj marketing yard labourers of Raichur City wherein the mean age of the workers was 35.1 years<sup>[21]</sup>. The mean age of the workers in the present study groups was lower when compared to the study by Abbas *et al.*<sup>[22]</sup> Furthermore, demographics of the study population showed that major portion of the study participants had educational status not above middle school level. This finding is in contrast to Iram Abbas *et al.* (2016) where majority (49.7%) of the coalminers were uneducated<sup>[22]</sup>.

Oral hygiene of the workers was found very poor though all of them cleaned their teeth once daily. This is in accordance with the findings of Iram abbas *et al.* (2016)<sup>[22]</sup>, Murrat Innc *et al.* (2018)<sup>[23]</sup> who also reported a poor oral hygiene among underground coal mine workers of Telangana and Turkey. In present study the most prevalent oral hygiene practices among the study population were tooth brush 262(65.5%) with tooth paste 288(72.0%) followed by the neem sticks 99(24.8%) and 33(8.3%) were used neem stick +tooth brush to clean their teeth. This finding is in concordance with the findings of green marble workers at Kesariyaji, Rajasthan, India (2008)<sup>[24]</sup> but analogous to the result reported by the Iram Abbas *et al.* (2016)<sup>[22]</sup> at Telangana, India where 225(63.2%) use tooth brush and toothpaste to clean their teeth. Study conducted by Banashree Baishya *et al.* (2013) 11 on brick klin workers of Odisha more than half of the study participants brushing their teeth once daily 75.2%.

Only Chewing Tobacco 190(47.5%) and combined usage of Alcohol and tobacco 98(24.5%) habits were very much prevalent among the underground Coalmine workers of

Bokaro city, Jharkhand. Only 16(4%) are free from alcohol and tobacco habits. This finding is similar to that of Iram Abbas *et al.* (2016)<sup>[22]</sup> where usage of tobacco (87.6%) and Alcohol (43.3%), Murrat Inanc Cengiz *et al.* (2018)<sup>[23]</sup> shows in his study workers exposure to coal dust and physically tedious work drives workers to consume alcohol and tobacco. In our study we found that the study population had the habit of using smokeless tobacco rather than smoking cigarettes and bidis. This-finding is similar to study done by Banashree Baishya *et al.* (2013)<sup>[25]</sup> on study population of brick klin workers of odisha; most of the workers were found to be consuming paan or gutkha as compared to cigarette or beedis. In the present study the prevalence of dental caries in the present study was 51.5% which was similar to the study done by Iram abbas *et al.* (2016)<sup>[22]</sup> in her study they reported prevalence of dental caries was 55.6%. Contradictory to these findings, lower caries prevalence was observed in studies carried out by Amit and Ankita bansal (2018)<sup>[26]</sup> on brass factory workers in the Mathura city were Prevalence of dental caries in the workers was found to 35.8%.

In our study out of 400 subjects' periodontal pockets of 4-5mm and >6mm were found prevalent in 376 subjects. Our study also accessed the prevalence of loss of attachment among the study subjects and it was revealed that 46.8% of the study subjects substantiated loss of attachment of 9-11mm. six to eight mm and more than twelve loss of attachment was evidenced by 29.3% and 9.5% of the study population. Loss of attachment of more than 6mm was significantly higher among age groups of 51-60 years followed by 41-50 years. However contradictory results were obtained in the study conducted by Iram abbas *et al.* (2016)<sup>[22]</sup> on coal workers and Sudhanshu Sanadhya *et al.* (2013)<sup>[27]</sup> on salt workers. Age, Smoking and tobacco habits, unawareness about dental care utilization as well as lower education attainment are associated with higher periodontal disease among the study population.

In the present study missing tooth due to trauma 48% was most prevalent conditions followed by enamel fracture 17.5% and enamel and dentin fracture is only 6% seen among the study participants. Slippery surface of the underground mine tunnels, sloping of the tunnels, minimum lighting in the mines where workers carry only battery driven headlights to their worksites would have influence on traumatic injuries. Workers under such conditions are more prone for falls or may accidentally hit by rock side, which results in injuries oral as well as general parts of body. However, study conducted by Iram Abbas *et al.* (2016)<sup>[22]</sup> reported on her study on underground coal mine workers of Telangana only 14% subjects had fractured tooth and no traumatic injury seen on the study population.

The workplace environment of individual has an influence on their oral health status through their behaviour and habits exerted by their personal and work characteristics. The Oral health status of underground coalmine workers of Bokaro city was quite poor. The study population was characterized by high prevalence of periodontal disease, dental caries and high treatment needs. The Results from this study could be used as baseline information for health authorities and dental professionals for planning strategies for oral health

promotion, prevention and treatment among coal mine workers. Improving the oral health status of these mines workers will require treatment of current disease and initiation of an effective oral health programme to prevent oral diseases.

### Acknowledgement

Not available

### Author's Contribution

Not available

### Conclusion

In conclusion, the underground coalmines workers are characterized by a lack of previous dental care, poor oral hygiene, high prevalence of dental caries and periodontal diseases and high treatment needs. Therefore, to improve the overall oral health of the underground coalmines workers, a two pronged approach is required-

1. Promoting oral health awareness and disease prevention.
2. Improving the oral health care delivery.

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#### How to Cite This Article

Namrata, Asawa K, Tak M, Rawal A, Rathod D. Assessment of oral health status among underground coal mine workers of Bokaro city, Jharkhand, India: A cross sectional study. *International Journal of Applied Dental Sciences*. 2022;8(4):173-177.

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