Short Communication

The Pattern of Morbidity and Use of Social Security Schemes among the Steel Plant Workers in an Industrial District of Odisha

Pragyasini Dehury, Dinesh Prasad Sahu[1], Prajna Paramita Giri[1], Vikas Bhatia[2]

MBBS Student, All India Institute of Medical Sciences, [1]Community Medicine and Family Medicine, All India Institute of Medical Sciences, Bhubaneswar, Odisha, [2]Director, All India Institute of Medical Sciences, Bibinagar, Telangana, India

Abstract

Background: An occupational hazard is a growing concern for developing countries. The study aims to assess the pattern and the factors associated with morbidity of the steel plant workers and the usage of social security schemes among them. **Materials and Methods:** The cross-sectional study was conducted in two steel plants of the Angul district of central Odisha from May to August 2019. The steel plant workers were assessed for occupational hazard using a structured questionnaire and a physical examination was conducted. Chi-square test and binary logistic regression were used to find out the association. **Results:** Dust was the most common exposure followed by noise and heat. Myopia (26.7%), generalized weakness (19.0%), hearing impairment (19.0%), respiratory illness (15.9%), hypertension (11.0%), myalgia (10.2%), and peripheral neuropathy (9.1%) were the common morbidities among the steel plant workers. Exposure to dust, noise, vibration, chemicals, and year of exposure is the common determinants of morbidities. Only 63.5% of the study participants availed of different social-security schemes. **Conclusions:** Pre-placement examination, regular medical check-ups, and the use of proper safety measures during work can reduce the chance of morbidities. Authorities need to sensitize the workers to safety equipment and hazard-prone conditions and also regarding social-security schemes.

Keywords: Hazard, morbidity, Odisha, steel plant workers

Introduction

With the increasing demand for steel products to build infrastructure, the steel industry is growing rapidly. In our country, the steel industry has entered into a new development stage with India becoming the 2nd largest producer of steel during 2018.[1] Odisha being rich in mineral and coal mines has few of the largest steel plants in the country. Many public and private sector steel plants are growing in Odisha. Around 0.95 million workers are working in the steel industry in India.[2] The World Health Organization estimated that 160 million new cases of work-related illness occur every year and work-related hazards claim 1.7 million lives every year accounting for 3% of all deaths.[3] Many occupational exposures resulted in several morbid conditions, including chronic obstructive lung diseases, back pain, hearing impairment, injuries, skin diseases, cancer, and many more.[4] Adverse occupational hazards cost around 2%–14% of the gross national products.[5] In India, the incidence of occupational-related morbidity and mortality is very high.[5] It is estimated that 17 million nonfatal and 0.045 million fatal injuries occur each year in India.[6]

The steel industries consist of ovens and furnaces, thus creating an environmental exposure of heat, noise, chemicals, vibration, and dust. This leads to an increase in occupational health hazards and more sickness absenteeism.[7] The increased rate of morbidity has an impact on productivity and increases the use of medical and welfare services.[8] To improve the quality of life of the steel plant workers, the burden of morbidities needs to be estimated. Hence, the study was carried out to assess the morbidity pattern of the steel plant workers and the association

Address for correspondence: Dr. Prajna Paramita Giri, Third Floor, Academic Block, All India Institute of Medical Sciences, Bhubaneswar, Odisha, India.
E-mail: cmfm_prajna@aiimsbhubaneswar.edu.in

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.IJCM_159_21

How to cite this article: Dehury P, Sahu DP, Giri PP, Bhatia V. The pattern of morbidity and use of social security schemes among the steel plant workers in an industrial district of Odisha. Indian J Community Med 2021;46:739-43.

Received: 08-03-21, **Accepted:** 25-10-21, **Published:** 08-12-21

of the morbidities with a different type of exposure. Along with these, the researchers also studied the social security scheme usage among these workers.

Materials and Methods

A cross-sectional study was conducted in Angul district which is an industrially developed district situated at the heart of the state of Odisha. There are two steel plants in this district. This study was conducted in these two steel plants from May to August 2019. All the workers working in steel plants for >1 year were included in the study. Those who did not give consent for medical examination were excluded from the study. Assuming 60% morbidity among the steel plant workers,[9] with 95% confidence level, 5% precision, and 80% power, the sample size was calculated to be 369. Universal sampling was adopted, and all the 452 workers of both the steel plants were included in the study. All the workers present during the visit were assessed. The study was commenced after receiving ethical approval from the Institute Ethics Committee of All India Institute of Medical Sciences, Bhubaneswar (Ethical approval number: IEC/AIIMS BBSR/STS/2019-20/09). Informed written consent was taken from the participants prior to the study.

Data collection

Data collection was done from the two steel plants after obtaining permission from the security department, safety department, human resource management, medical department of the respective plants. Data collection was done under the guidance of the safety departments along with appropriate safety measures. The data collection was done in three steps, i.e., interview using a predesigned and pretested pro forma, physical examination including anthropometry, and record review. The physical examination was conducted. Blood pressure measurement, cardiovascular system, respiratory system, sensory and motor system examination, vision and hearing assessment were conducted. For vision Snellen's chart, Jaeger's chart, Ishihara chart were used. Watch test, Rinne's test, and the Weber test was used for hearing assessment by the investigator. The findings of the watch, Rinne, Weber test were confirmed with audiometry findings of the audiologist. The records of the preplacement examination and periodical examination about the participants were reviewed for past morbidity.

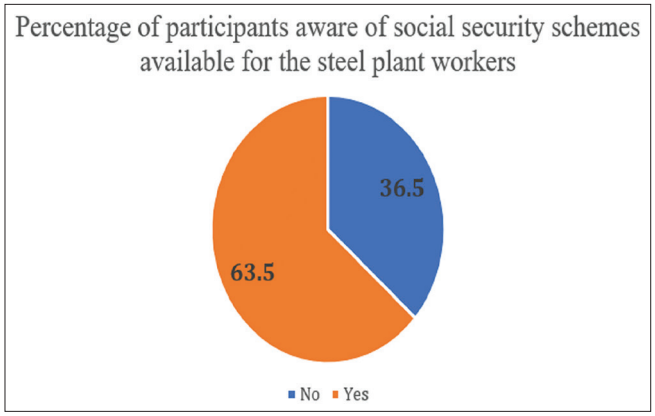

Figure 1: Awareness regarding social security schemes available for the steel plant workers

Statistical analysis

The data were entered simultaneously during data collection into Microsoft excel 2013. Statistical analysis was done using Statistical Package for Social Sciences version 22 (SPSS, IBM Inc., Chicago, IL, USA). Categorical data were presented as proportions and continuous data as mean and standard deviation. The Chi-square test and binary logistic regression were performed to find out the association between the exposure status and morbidity patterns. A two-tailed $P < 0.05$ was considered as the cut-off level of significance.

Results

A total of 452 workers among the 704 available workers in the two steel plants participated in the study. The mean age of the participants was 40.36 ± 6.83 years. More than two-third of the participants (71.2%) were of the age group of 31–40 years. Only 9 (2%) of the workers were females and the rest were male. The majority of the workers belonged to Hindu (92.75%) and from general and other backward castes. Two-fifth of the workers (80.7%) were working for 8-hours, and the rest were working 10–12 h. Around 60.0% of the workers had an experience of 11–20 years in the steel plant [Table 1].

Table 1: Demographic characteristics and exposure status of the steel plant workers (*n*=452)

Group variables	Frequency (%)
Exposure status*	
Dust exposure	324 (71.7)
Noise	263 (58.2)
Heat	222 (49.1)
Vibration	114 (25.2)
Chemical	69 (15.3)
Radiation	32 (7.1)
Working hour (h/day)	
8	365 (80.7)
10	76 (16.9)
12	11 (2.4)
Years of experience	
0-10	108 (23.9)
11-20	217 (60.0)
>20	73 (16.1)
Substance use*	
Tobacco	74 (16.4)
Alcohol	29 (6.4)
Body built	
Thin built	48 (10.6)
Average built	296 (65.5)
Over-weight	108 (23.9)

*Multiple responses

The most common morbidity observed among the steel plant workers was myopia (26.7%) followed by generalized weakness (19.03%) and hearing impairment (19.03%). Other morbidities observed were respiratory illness (15.93%), hypertension (11.06%), myalgia (10.18%), peripheral neuropathy (9.07%), diabetes mellitus (7.74%), diseases of the buccal cavity (7.08%), varicose vein (4.65%), and skin diseases (4.20%).

Most of the workers (71.7%) were exposed to dust, while 58.2% were exposed to noise and 49.1% were exposed to heat. Vibration, chemical, and radiation exposure were seen in 25.2%, 15.3%, and 7.1% of the participants, respectively. While asked about the use of tobacco and alcohol, only 16.4% and 6.4% of the workers self-reported the use of tobacco and alcohol, respectively.

The association of different exposures with morbidities was assessed [Table 2]. Dust exposed workers were around 8 times more likely to have respiratory illness and those who were working for >8 years have 2.6 times more risk of having respiratory illnesses. Similarly, dust and chemical exposure were associated with skin diseases by 3.4 and 1.4 times, respectively and the associations were found to be statistically significant. Peripheral neuropathy was found to be higher among vibration and noise exposure by 40 and 2.7 times, respectively. Similarly, ear disease was 89 times more likely in workers exposed to noise. Generalized weakness was 69 times more likely in the workers exposed to heat but, no significant association was observed.

Only 65% of the workers were aware of any pollution control devices installed in the steel plant. The majority of the workers (98%) were aware of the health hazards of working in a steel plant. Among the steel plant workers, 42% mentioned the working environment as satisfactory, 40% as good, and 6% as excellent. However, 12% of the workers mentioned the working environment as poor or unsatisfactory. Out of the total participants, 63.5% of the steel plant workers were aware of the social security schemes available for them. Among them 33% knew only one scheme, 24% knew two schemes, and only 6.5% of the participants knew three or more social security schemes [Figure 1].

Discussion

This cross-sectional study was conducted among 452 workers of two steel plants. In the current study, the prevalence of morbidity was 81.2%. A similar finding was shown by Manjunatha e*t al*. in their study in Karnatak.[7] This finding was higher than that of the study conducted in central India.[9] The different results could be due to the different working environments. The commonest morbidity in this study was the vision problem followed by generalized weakness. However, the musculoskeletal problem was the major morbidity in other studies.[7,9-11] The prevalence of myalgia in the current study was 10.18%, which is lower than all other studies.[7,9,10] Myalgia was found to be 58 times more among the heat-exposed workers. The sources of heat were the smelting workshop, blast furnace, machinery, and coal gasification plant. Similarly, generalized weakness was reported in 19.03% of the steel plant workers in our study. The higher prevalence of musculoskeletal morbidities in other studies as compared to ours,[7,10-12] could be explained by the rigorous manual work by the workers of those steel plants. Myalgia and generalized weakness will also reduce the work efficiency of the workers and productivity, and consequently increase the chances of other morbidities.

In our study, 11.06% of the participants were found to be hypertensive which is nearly similar to the findings of a study in Coimbatore.[12] Diabetes was reported in 7.74% of the participants in our study. The prevalence of these chronic disorders was similar to that of the national estimate.[13] This reflects that the steel plant workers are carrying the double burden of occupational health hazards and the burden of chronic diseases as well. Myopia (26.8%) was the most common ocular manifestation, followed by presbyopia (9.3%). Presbyopia was reported in 9.7% of the participants in a study by Omoti *et al*.[14]

Respiratory illness was reported in 15.93% of the study participants in our study. However, it was reported in 36.25% of the study participants by Chohan *et al*., 26.0% by Biswas *et al*., and 18.1% participants by Manjunatha *et al*.[7,9,15] The higher proportion of chronic respiratory illness in the steel factory workers could be attributed to the working environment. Respiratory illnesses were associated with dust exposure and also the duration of exposure. There is a requirement for containment measures to reduce dust exposure.

One-third of the participants were not aware of any pollution control devices installed in the steel plant. This shows, probably they were not aware of the health hazards of not using personal protective equipment regularly. Safety drills should be conducted on regular basis to sensitize the workers and make them aware of the health hazards.

This was the first study of its kind in the eastern India. To the best of our knowledge, this was the first study that assessed social security schemes for steel plant workers. One of the strengths of the study was the assessment of a wide range of morbidities and exposures and clinical examination of the participants by the investigator in the presence of the medical team of the steel plants which reflects more accuracy in the assessment of the morbidity. The study was conducted in an adequate sample size to draw inference from the results. However, this study has some limitations. First, the white-collar and blue-collar workers were not stratified in our study, which could have given a better interpretation. Second, there is always a chance of interviewer bias.

Conclusions

There is a need for a thorough preplacement and mandatory periodic medical examination of all the workers and ergonomic guidelines should be followed with strict law enforcement. Effective strategies to reduce the morbidities such as the use

Table 2: Association between exposures and morbidity pattern (*n*=452)

	Respiratory illness		*P*	OR (95% CI)
	Yes, *n* (%)	No, *n* (%)		
Dust exposure				
Present	66 (20.4)	258 (79.6)	<0.001	8.492 (3.381-21.328)
Absent	6 (4.7)	122 (95.3)		1
Years of exposure (years)				
>8	37 (25.5)	108 (74.5)	<0.001	2.662 (1.594-4.447)
≤8	35 (11.4)	272 (88.6)		1
	Skin disease		***P***	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
Dust exposure				
Present	17 (5.2)	307 (94.8)	0.059	3.466 (0.789-15.229)
Absent	2 (1.6)	126 (98.4)		1
Chemical exposure				
Present	4 (5.8)	65 (94.2)	0.327	1.478 (0.473-4.617)
Absent	15 (3.9)	368 (96.1)		1
	Peripheral neuropathy		***P***	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
Vibration				
Present	37 (32.5)	77 (67.5)	<0.001	40.123 (1.888-115.919)
Absent	4 (1.2)	334 (98.8)		1
Noise				
Present	32 (12.2)	231 (87.8)	0.007	2.771 (1.290-5.952)
Absent	9 (4.8)	180 (95.2)		1
Noise	**Any ear disease**		***P***	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
Present	85 (32.3)	178 (67.7)	<0.001	89.775 (12.369-651.577)
Absent	1 (0.5)	188 (99.5)		1
Years of exposure	**Varicose vein**		***P***	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
≤8	12 (8.3)	133 (91.7)	0.012	2.987 (1.229-7.261)
>8	9 (2.9)	298 (97.1)		1
Heat exposure	**Myalgia**		**P**	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
Present	45 (20.3)	177 (79.7)	<0.001	58.220 (7.984-426.470)
Absent	1 (0.4)	229 (99.6)		1
Heat exposure	**Generalized weakness**		***P***	**OR (95% CI)**
	Yes, *n* (%)	**No, *n* (%)**		
Present	84 (37.8)	138 (62.2)	<0.001	69.391 (16.804-286.549)
Absent	2 (0.9)	228 (99.1)		1

Dust exposure also show association with few other diseases like allergy, myalgia, generalized weakness, hepatomegaly, but not very significant. OR: Odds ratio, CI: Confidence interval

of personal protective devices, engineering control measures, administrative measures, job rotation, and proper training have to be implemented. Health education need be imparted periodically to sensitize the workers about different hazards associated with different occupational exposure and for using safety equipment for the same. Authority has to ensure the availability of safety equipment and safety educational posters at all hazard-prone sites. The authorities of the steel plant must arrange awareness sessions for all the workers about all available social security schemes for the workers and advocacy should be done to avail those schemes by the workers.

Acknowledgment

We sincerely thank the steel plant authorities for their co-operation. We also thank the Indian Council.

Financial support and sponsorship

This was ICMR-STS project and we have received grant from ICMR.

Conflicts of interest

There are no conflicts of interest.

References

1. International Labour Organization Regional Office for Asia and the Pacific. Skills trends for green jobs in the steel industry in India [Internet]. Bangkok; 2014. Available from: http://hdl.voced.edu.au/10707/306006. [Last accessed on 2021 Feb 12].
2. Skills trends for green jobs in the steel industry in India. Bangkok: ILO, 2014. Online. Internet. 15 Oct 2021. Available: https://www.skillsforemployment.org/KSP/en/Details/?dn=wcmstest4_112451. [Last assessed on 2021 Jan 12].
3. World Health Organization and International Labour organization. Number of Work-related Accidents and Illnesses Continues to Increase ILO and WHO Join in Call for Prevention Strategies [Internet]. Geneva: World Health Organization; 2005. Available from: https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_005161/lang--en/index.htm [Last assessed on 2021 Jan 12].
4. Ezzati M, Lopez A, Rodgers A, Murray C. Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors. Ch. 21. Geneva: World Health Organization; 2004.
5. Burden of Occupational Disease in Injuries. National Programme for Control and Treatmant of Occupational Diseases; 2014. Available from: http://www.nihfw.org/NationalHealthProgramme/NATIONALPROGRAMMEFORCONTROL.html. [Last accessed on 2020 Feb 14].
6. Wanger NL, Wagner PJ, Jayachandra P. Learning courses in occupation medicine and good practice. Indian J Occup Environ Med 2005;9:57-61.
7. Manjunatha R, Kiran D, Thankappan KR. Sickness absenteeism, morbidity and workplace injuries among iron and steel workers – A cross sectional study from Karnataka, Southern India. Australas Med J 2011;4:144-7.
8. Mikheev M. New Epidemics in Occupational Health. New epidemics: The Challenge for International Health Work. Helsinki: Finnish Institute of Occupational Health; 1994.
9. Biswas MJ, Koparkar AR, Joshi MP, Hajare ST, Kasturwar NB. A study of morbidity pattern among iron and steel workers from an industry in central India. Indian J Occup Environ Med 2014;18:122-8.
10. Aghilinejad M, Choobineh AR, Sadeghi Z, Nouri MK, Bahrami Ahmadi A. Prevalence of musculoskeletal disorders among Iranian steel workers. Iran Red Crescent Med J 2012;14:198-203.
11. Barbieri PG, Somigliana A, Festa R, Bercich L. Pulmonary concentration of asbestos fibers in steel workers with pleural mesothelioma. G Ital Med Lav Ergon 2010;32:149-53.
12. Deepalakshmi K, Johnson P, Pathmavati R, Thangavel G, Jayachandra P, Ayyapan R. Noise induced hearing loss and hypertension in industrial workers – A cross sectional study. Natl J Physiol 2013;1:6-102.
13. World Health Organization-Diabetes Contry Profiles, 2016. India. World Health Organization; 2016. Available from: https://www.who.int/diabetes/country-profiles/ind_en.pdf?ua=1. [Last accessed on 2020 Mar 12].
14. Omoti AE, Edema OT, Akinsola FB, Aigbotsua P. Non-traumatic ocular findings in industrial technical workers in Delta State, Nigeria. Middle East Afr J Ophthalmol 2009;16:25-8.
15. Chohan JS, Bilga PS. Occupational health hazards in small scale steel manufacturing industries: A case study. Int J Manuf Technol Manag 2011;24:182-92.