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A Study on Morbidity Profile of Sewage Workers in Mumbai City

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Abstract

Background: Below each large city, there lies a network of many hundreds of kilometer of sewers, ranging from small pipes to large intercepting sewers. The job of being a sewermen entails several occupational hazards which pose a great danger to the health and wellbeing and life of the worker. Sewage workers are exposed to accidental hazards and suffer from occupational lung diseases and upper respiratory tract infections, eye problems, gastrointestinal problems and musculoskeletal problems.

Objectives: The present study was conducted to assess the morbidity profile and their prevalence among sewage workers in Mumbai city.

Material and Methods: A Cross-sectional study was conducted from May 2005 to October 2005. A total of 150 sewage workers were interviewed and examined. A pre-tested interview tool was used to collect necessary information such as clinical history, socio-demographic profile, clinical examination findings and investigations performed. Results were analysed using Statistical Package of Social Sciences (SPSS) 13.0.

Results: Eye problems were most predominant, seen in 70.6% workers followed by musculoskeletal problems (68.0%), while 58.0% workers presented with gastrointestinal and 52.6% with respiratory ailment, with obstructive pattern observed in 38 (48.1%) subjects being the major finding. Fifty two percent workers had skin problems and injuries were observed in 39 (26.0%) workers including minor injuries such as cuts, abrasions and lacerations.

Conclusion: In this study, large proportion of workers suffered from work related symptomatic morbidities mainly of eye, respiratory, musculoskeletal system, gastrointestinal and skin.

Keywords: Sewage workers, morbidity profile, occupational hazards

Introduction

Sewers were first established by Henry VIII in 1532 in England, but were grossly inefficient. It was Sir Edwin Chadwick's report in 1842 on the sanitary condition of the Labouring population of Great Britain which led to the world movement for provision of sewerage system (Hunter Donald 1978). [1]

The job of being a sewermen entails several occupational hazards with great danger to the health and life of the worker. Sewer workers are exposed to accidental hazards like gassing, injuries and immersion (flooding). They also suffer from occupational lung diseases and upper respiratory tract infections, allergic problems especially of the skin like contact dermatitis, neurological problems like headache, dizziness and numbness, eye problems like burning, watering and redness, gastrointestinal problems like diarrhoea and parasitic infections and musculoskeletal problems like fatigue/weakness and backache (Encyclopedia of Occupational Health and Safety, 1991; Scarlett- Kranz et al, 1987; Sigsgaard T. et al, 1994; Nethercott J. R. et al, 1998; Lundholm M. et al,1983).[2-6]

Nethercott J.R. and Holness D.L. (1988)[5] assessed the health status of a group of sewage workers in Toronto, Canada. Investigation of 50 randomly selected workers revealed that many workers reported influenza- like symptoms, cough, sputum production, wheezing, sore throat and skin complaints. Workers tended to have reduced lung function (Rynander R, 1983). Watt et al (1997) [7-8] investigated 26 sewermen involved in an episode of toxic gas exposure by clinical follow-up, lung function test and measurement of pituitary function. 14 out of the 26 workers developed sub acute symptoms including sore throat, cough, chest tightness, breathlessness, thirst, sweating and irritability. Richardson D.B. et al (1995) [9] carried out a cross sectional study to investigate whether exposure of sewage workers to hydrogen sulfide was associated with reduced lung function. 68 sewage workers and 60 water treatment workers were studied for pulmonary function tests. There was a statistically significant difference in mean FEV1/FVC values between the two groups of workers of similar age, height, race and smoking habits (- 3.1, s.e 1.4). Zuskin E. Mustajbegovic J. and Schachter E .N. (1993) [10] studied respiratory symptoms and ventilatory capacity in a group of 74 sewage workers in Croatia. The workers were studied by their work stations; closed channels (n=26) drainage (n=31) and other sewage workers (n=17).The prevalence of chronic respiratory symptoms was higher in closed channel workers than controls, particularly for chronic cough (41.9% vs. 14.3%), Chronic phlegm (38.7% vs. 14.3%), Chronic bronchitis (32.3% vs. 8.6%), and chest tightness (29.0% vs. 0%). In the group of sewage workers, there was a high prevalence of acute symptoms which developing during the work shift, being particularly pronounced for eye irritation(16.1- 26.9%), dyspnea (16.1-23.1%), dizziness(6.5-23.1%), throat burning(9.7-19.2%) and skin irritation (22.6-26.9%). Zuskin et al (1990) [11] assessed respiratory symptoms and ventilatory capacity in a group of 70 subjects employed as sewage worker. It was found that exposed workers had an increase in the prevalence of chronic respiratory symptoms, when compared with controls, although the difference was statistically significant only for chest tightness ($p<0.01$).

Mumbai is one of the largest city of the world and a nerve centre of trade, commerce and industry in the country. The sewerage system in Mumbai dates back to the 1800. The Municipal Corporation of Mumbai is the civic body which looks after the entire sewerage system in Mumbai. The Brihan Mumbai Corporation (BMC) (1994) [12] undertook a Health Survey of Main Sewer Staff, where 678 workers were examined. It revealed that only 5% of workers had eye complaints, 0.9% had respiratory complaints, while 1.2% suffered from anemia, 2% of workers had cardiovascular diseases, while 0.4% had ENT complaints. A survey was done by the Occupational Health and Safety Centre (1988) [13] in Mumbai to study the occupational health hazards and working conditions of 200 workers from the Main Sewer Department of the BMC. It revealed that 60% of the workers had complaints of shortness of breath and persistent cough. 30% of the workers complained of itching all over the body, especially hands and feet. 53% of the workers had burning, redness of eyes and photophobia. 44% of the workers complained of diminished vision. Hence the present study was conducted to assess the morbidity profile and their prevalence among sewage workers in Mumbai city.

Material & Methods

1. **Study design:** A cross-sectional epidemiological study.

2. **Study Period:** The study was carried out during May 2005 to October 2005.

3. **Study area:** For planning of sewage operations and for implementing measures, the work area of Greater Mumbai limits was grouped under three divisions. i.e. 1) City Division 2) Eastern Suburb Division 3) Western Suburb Division. For the present study, out of 3 divisions, one division i.e. city division was selected randomly. The study area was visited 3-4 times prior to the study so as to get acquainted with particular area, environment and nature of work and to build the rapport with the sewage workers in the main sewer department of sewerage operation of city division, Mumbai.

4. **Study population:** As per attendance muster of employees in city division, which has 370 employees, 160 employees were the actual sewage workers working in deep sewer and manhole. Out of these 160 workers, 10 workers had been chronically absent and were not willing to be part of the study. Hence 150 Municipal sewage workers from main sewer department of sewerage operation of city division, Mumbai were interviewed and examined.

5. **Inclusion criteria:**

   - Those who are willing to be part of the present study.

- Those who enter the manhole and deep sewers as a part of their duty.

6. **Exclusion criteria:**

   - Those who are not willing to be part of the study.
   - Those who remain chronically absent (more than 6 months).
   - Those workers not exposed to manhole atmosphere.

7. **Study tool:** A semi-structured interview schedule was prepared comprising of socio-demographic profile, clinical examination and health appraisal including routine and some specific investigations like pulmonary function test. The ethics committee of the institute approved the study. Informed consent of each worker was taken. Socio-economic status was determined using B.G. Prasad's Classification (Rao TB, 2002) [14]. Data collection was done at the site of work at night between of 10.30 pm to 3.30 am during the duty hours. They were called for the health check-up and investigations at tertiary care teaching hospital. Each worker was directed to attend the Medicine, Ophthalmology, Skin and Psychiatry OPD and told to follow up with the researcher after consultation for collecting reports of all the investigations. The pulmonary function tests were carried out using a computerized spirometer (Vitalograph Compact-II). The spirometer uses Kamath S R et al (1982) [15] equations for expected values.

8. **Data entry and analysis:** Data was entered in MS Excel and analysed using Statistical Package of Social Sciences (SPSS) 13.0. Statistical significance was set at $P \leq 0.05$.

Results

As observed from Table 1, Out of the total 150 workers, 30 (20.0%) workers were in the age group of 35-45 yrs while more than 71% workers were aged between 45 to 55 years. The mean age was 42.97±7.16 years. All the 150 sewage workers studied were males. According to B.G. Prasad's Classification, majority of workers i.e. 86 (57.3%) belonged to upper class followed by 62 (41.3%) belonged to upper middle class, while 2 (1.4%) were from the lower middle class. Majority of the workers 116 (77.3%) had length of service more than 11 years. Majority i.e. 74.7% had studied upto secondary level schooling and only 1 worker had studied upto higher secondary. None of the sewage workers was a graduate.

On clinical examination, these sewage workers were found to be suffering from various morbidities (Table 2). Morbidity pattern in sewage workers could be because of occupational exposure to noxious gases or unhygienic working conditions or

personal habits like smoking, drinking etc. The eye problems were most predominant and seen in 70.6% workers (redness, irritation, and watering of eye) followed by musculoskeletal problems like fatigue/weakness and low backache among 68.0% workers. While 58.0% workers presented with gastrointestinal problems like diarrhea, indigestion, flatulence and worm infestation, 52.6% presented with respiratory problems. Fifty two percent workers had skin disorders like pyoderma, pigmentation / rash and itching. Injuries due to work were present in 39 (26.0%) workers including minor injuries such as cuts, abrasions and lacerations.

As observed from Table 3, ocular disorders were high (70.6%). Among these, irritation, redness and watering of eyes were complaints of 63.2%, 52.8% and 33.0% workers respectively. In gastrointestinal disorders, worm infestation was most common (74.7%) followed by indigestion (71.2%), Flatulence (57.4%) and diarrhoea (48.2%). Respiratory morbidities included chest symptomatic like cough (44.3%), breathlessness (39.2%), bronchitis (34.1%) and tightness (32.9%). Skin morbidities included itching (57.6%), tineasis (34.6%), followed by rash / pigmentation (25.6%) and dermatitis (19.2%).

Table 4 shows relation between eye symptoms and duration of the service among the sewage workers. Twenty (58.8%) and 66 (84.6%) workers with duration of service between 1 to 20 yrs and ≥ 21 yrs respectively had eye symptoms. Thus, as the duration of service increases, ocular morbidity also increased ($p < 0.001$).

Pulmonary function test were done for 79 workers complaining of respiratory tract illness (Table 5). Out of them, 54 (68.3%) were found to have abnormal lung functions, while 28 (35.44%) workers had moderate obstruction and 18 (22.7%) severe obstruction in airways. Obstructive 38 (48.1%) pattern were predominantly seen than the restrictive 16 (20.2%). It was seen that as deterioration in lung function was found to be associated with increased duration of services ($p < 0.05$).

Age also showed a linear trend with complaints of fatigue and weakness (Table 6). Five (20.8%) workers aged less than 35 years complained of fatigue/weakness. This proportion increased steadily with each age group (23.3% in 35 to 39 yrs, to 39.1% in 40 to 45 yrs) increasing to 60.0% in 45 to 49 yrs to reach a maximum 65.2% in 50 to 54 yrs aged workers ($p > 0.05$).

In this study, almost all sewage workers 146 (97.3%) were addicted to one or the other addiction like tobacco, alcohol and smoking. The high prevalence of alcohol and smoking may be attributed to peer pressure, low educational level or mere way to keep awake and attentive during the night shifts. None of the workers had awareness regarding diseases caused due to sewage like lung diseases, worm infestation, leptospirosis and other major sewage related diseases.

Discussion

In the present study, ocular morbidity was most common (70.6%) with irritation,

redness and watering of eyes being complaints of 63.2%, 52.8% and 33.0% workers respectively. In a study on sewage workers by Zuskin E. et al (1993) [10] and as mentioned in Occupational Health of Sewermen (1993) [16] eye irritation was found in 16.1 - 26.9% workers while a study by Rylander et al (1976) [7] revealed that 15% workers suffered from eye problems. Unnati (1997) [17] had reported 10% of sewage workers suffering from eye irritation and redness. In a study by the Occupational Health and Safety Centre (1988) [13] in Mumbai revealed that 53% of the workers had irritation, redness of eyes. Scarlett-Kranz J.M. et al (1987) [3] revealed that sewage workers had a higher frequency of eye irritation.

Fifty-eight percent workers presented with gastrointestinal disorders like worm infestation (74.2%), diarrhoea (48.2%), indigestion (71.2%), and flatulence (57.4%). Similar study on sewage workers by Central Public Health Engineering Research Institute Nagpur (1971) [18] reported that 45.6% workers suffered from gastrointestinal disorders. In a study by Doby et al (1980) [19] it was observed that 16.5% of sewage workers suffering from giardiasis. Srivastava V.K. and Pandey G. K. (1986) [20] had reported that parasitic infestation was much more common, upto 74% in sewage workers. Lundholm M. and Rylander R. (1983) [6] had reported that significantly higher proportion of sewage workers were suffering from gastrointestinal symptoms. Cairncross S. and Feachem R. (1983) [21] stated that sewage workers have an increased on contracting diarrhoeal diseases and worm infestation. Hammouda N.A. et al (1992) [22] had reported that sewage workers were at higher risk of developing intestinal parasitic infestation.

Clinical examination revealed that 79 (52.6%) workers had respiratory symptoms like chronic cough (44.3%), chronic breathlessness (39.2%), chronic bronchitis (34.1%) and chest tightness (32.9%). These finding are comparable to studies by Zuskin E et al (1990, 1993)[10-11] who reported similar findings viz. - 41.9%, 38.0%, 32.0% and 29.0% of chronic cough, chronic breathlessness, chronic bronchitis and chest tightness respectively and also reported that obstructive pattern was predominately seen. Unnati (1997) [17] had reported that 42% sewage workers were suffering from respiratory morbidities in a study conducted on sewage workers from Ahmadabad. A study by the Occupational Health and Safety Centre (1988)[13] in Mumbai revealed that 60.0% of sewage workers had respiratory morbidities.

Pulmonary function test were done for 79 workers complaining about respiratory problems. Out of them, 54 (68.3%) were found to have reduced lung functions. Obstructive 38 (48.1%) pattern were predominantly seen. These finding are comparable to studies by Nethercott J.R. and Holness D.L. (1988)[5] and Richardson D.B. et al (1995)[9] who reported that sewage workers tend to have reduced lung function. Watt et al (1997)[8] had reported that sewage workers developed subacute symptoms including cough, chest tightness, breathlessness and irritability and reduced lung functions.

Skin morbidities includes itching (57.6%), tineasis (34.6%), followed by rash (25.6%) and dermatitis (19.2%). These finding are comparable to studies by Zuskin E et al (1990, 1993)[10-11] had reported skin itching (22.6 - 26.9%) among sewage workers. A

study by the Occupational Health and Safety Centre (1988)[13] in Mumbai reported that skin itching in (30%) of the workers. A study on sewage workers by Central Public Health Engineering Research Institute Nagpur (1971)[18] revealed that 22.3% of sewage workers suffered from skin rash/pigmentation. Scarlett-Kranz J.M. et al (1987)[3] revealed that sewage workers had a higher frequency of skin irritation.

In present study, injuries were observed in 39 (26.0%) workers including minor injuries such as cuts, abrasions and lacerations. A study on sewage workers by James C.P. and Eden G.E. (1992)[23] described that sewermen frequently led to abrasions and cuts of the skin of hands and arms. Eighteen (12.0%) workers had elevation of blood pressure i.e. hypertension. These finding are comparable to studies by Mattsby I and Rylander R. (1978)[24] who stated that there was elevation of blood pressure in sewermen. In another study by Sparacino J. et al (1982)[25] revealed that hypertension was found to be very high in sewermen. Hence there is a need of periodic medical examination and regular training for awareness regarding personal hygiene, addiction, first-aid, safety measures, and occupational hazards due to the sewage and use of protective equipments such as goggles, gloves, mask and gumboot. Further studies with large sample size should be undertaken to identify the factors responsible for increased prevalence of morbidity among sewage workers.

Conclusion

In present study, high proportion of workers suffered from work related symptoms and diseases, mainly of eye, respiratory, skin and musculoskeletal systems. Most of the workers had abnormal lung function in which obstructive pattern was predominant. As the duration of service increased overall morbidity also increased.

Conflict of Interest

The authors state there are no conflicts of interest related to the research reported in the manuscript**.**

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Table 1: Distribution of study population according to socio-demographic Characteristics

Socio-demographic factors	No. of sewage workers	Percentage
1. Age		
35 - 45 yrs	30	20.0
45 - 55 yrs	108	72.0
55 yrs & above	12	8.0
2. Sex		
Male	150	100
3. Religion		
Hindu	103	68.6
Muslim	39	26.0
Christian	08	5.4
4. Socio- economic status		
Upper Class (I)	86	57.3
Upper Middle Class (II)	62	41.3
Lower Middle Class (III)	02	1.4
Upper Lower Class (IV)	00	0.0
Lower Class (V)	00	0.0
5. Marital status		
Married	148	98.6
Unmarried	02	1.4
6. Education		
Illiterate	08	5.4
Primary school	29	19.4
Middle school	112	74.6
High school	01	0.6
7. Length of service		
0 -10 yrs	34	22.6
11 – 20 yrs	38	25.3
21 yrs and above	78	52.0

Table 2: Morbidity profile amongst the sewage workers (n = 150) *

Morbidities	No. of sewage workers	Percentage
Eye Problems	106	70.7
Musculoskeletal Problems	102	68.0
Gastrointestinal Problems	87	58.0
Respiratory Diseases	79	52.7
Skin Problems	78	52.0
Neurological Problems	65	43.3
Fever	50	33.3
Injuries	39	26.0
Hypertension	18	12.0
ENT Problems	12	8.0
Ischemic Heart Disease	10	6.7
Psychiatric disorder	07	4.7
Diabetes Mellitus	05	3.3

(*Multiple responses)

Table 3: Distribution of prevalence of morbidity profile among sewage workers

Prevalence of morbidity profile	No. of sewage workers	Percentage
1. Ocular morbidity	**(n = 106)***	
Irritation	67	63.2
Redness	56	52.8
Watering	35	33.0
2. Gastrointestinal morbidity	**(n = 87)***	
Worm infestation	65	74.7
Indigestion	62	71.2
flatulence	50	57.4
Diarrhoea	42	48.2
Constipation	15	17.2
3. Respiratory morbidity	**(n = 79)***	
Chronic cough	35	44.3
Chronic breathlessness	31	39.2
Chronic bronchitis	27	34.1
Chest tightness	26	32.9
4. Skin morbidity	**(n = 78)***	
Itching	45	57.6
Tineasis	27	34.6
Rash / pigmentation	20	25.6
Dermatitis	15	19.2
Pyoderma	08	10.2

(*Multiple responses)

Table 4: Association between eye symptoms (redness, watering, irritation) and duration of the service of the sewage workers (n = 150)

Duration of the service (years)		Eye symptoms (redness, watering, irritation)		Total
		Yes	No	
1 to 10	No.	20	14	34
	%	58.8%	41.2%	100.0%
11 to 20	No.	20	18	38
	%	52.6%	47.4%	100.0%
21 & above	No.	66	12	78
	%	84.6%	15.4%	100.0%
Total	No.	106	44	150
	%	70.7%	29.3%	100.0%

Pearson Chi-square = 15.585 d.f. = 2 $p < 0.001$ (highly significant)

Table 5: Association between the duration of the service and pulmonary function tests (n = 79)

Duration of the service (years)		Pulmonary Function Test (PFT)				Total
		Mild obstruction in airways #	Moderate obstruction in airways #	Severe obstruction in airways #	Normal	
1 to 10 yrs	No.	4	4	1	11	20
	%	20.0%	20.0%	5.0%	55.0%	100.0%
11 to 20 yrs	No.	2	8	8	8	26
	%	7.6%	30.7%	30.7%	30.7%	100.0%
≥ 21 yrs	No.	2	16	9	6	33
	%	6.0%	48.4%	27.2%	18.1%	100.0%
Total	No.	08	28	18	25	79
	%	10.1%	35.4%	22.7%	31.6%	100.0%

Pearson Chi-square = 7.818 d.f. = 2 $p < 0.05$ (Significant)
Column data pooled to reapply Chi-square test

Table 6: Association between fatigue/weakness and age of the sewage workers (n = 150)

Age in years		**Fatigue / Weakness**		**Total**
		Yes	**No**	
< 35	No.	5	19	24
	%	20.8s%	79.2%	100.0%
35 to 39	No.	7	23	30
	%	23.3%	76.7%	100.0%
40 to 44	No.	9	14	23
	%	39.1%	60.9%	100.0%
45 to 49	No.	27	18	45
	%	60.0%	40.0%	100.0%
50 to 54 #	No.	15	8	23
	%	65.2%	34.8%	100.0%
≥55 #	No.	2	3	5
	%	40.0%	60.0%	100.0%
Total	No.	65	85	150
	%	43.3%	56.7%	100.0%

Pearson Chi-square = 3.165 d.f. = 2 p > 0.05 (Not significant)
Row data pooled to reapply Chi-square test