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Prevalence of Respiratory Symptoms and Risk Factors Among Street Sweepers in Gondar City Northwest, Ethiopia, 2021: A Cross-Sectional Study

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Prevalence of Respiratory Symptoms and Risk Factors Among Street Sweepers in Gondar City Northwest, Ethiopia, 2021: A Cross-Sectional Study

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ABSTRACT

BACKGROUND: Street sweepers are exposed to a variety of risk factors such as dust, bioaerosols, and volatile organic matter, which are responsible for the development of various respiratory symptoms and lung function impairments. However, there is a limited data on the prevalence of respiratory symptoms and associated factors among street sweepers in Ethiopia, especially in the study area.

OBJECTIVE: This study aimed to assess the prevalence of respiratory symptoms and associated factors among street sweepers in Gondar town, northwest Ethiopia, in 2021.

METHODS: Using simple random sampling technique, a total of 391 workers were selected between August 10 and September 15, 2021. The data was entered and analyzed using the Epi Info Version 7 and Statistical Package for Social Science (SPSS) 22 software, respectively. Descriptive statistics, bivariable, and multivariable logistic regression model were used. $P \leq .05$ and adjusted odds ratios (AOR) with 95% confidence interval (CI) were used to declare the statistical significance.

RESULT: A total of 391 respondents, with a response rate of 99.2% participated. The prevalence of respiratory symptoms among street sweepers was 35.3% (95% CI: 30.2, 40.5). History of respiratory illness (AOR = 7.75, (95% CI: 3.45, 17.45), washing personal protective equipments (PPE) after use (AOR = 4.77; 95% CI: 2.02, 11.28), previous work in cement (AOR = 3.10, 95% CI: 1.32, 7.34), and flour factories (AOR = 2.13, 95% CI: 2.02, 4.43), and alcohol drinking (AOR = 3.77, 95% CI: 1.94, 7.29) were associated with respiratory symptom among street sweepers.

CONCLUSION: The overall prevalence of respiratory symptoms among street sweepers was 35.3%. Previous respiratory illness, washing personal protective equipment after use, previous work in a cement and flour factory, and drinking alcohol were independently associated with respiratory symptoms. To reduce the respiratory symptoms among street sweeper, it is advisable implementing safe work practice measures and behavioral changes among workers.

KEYWORDS: Respiratory symptom, dust exposure, risk factor, alcohol drinking, respiratory illness

Introduction

Human activities are generate wastes, and how that waste is handled and disposed of can endanger the environment and public health.[1] Street sweepers are exposed to a variety of pathogens, toxic substances, chemicals, and vehicle exhaust fumes, and as a result of their exposure to multiple risk factors, street sweepers have a high rate of occupational health problems such as respiratory symptoms.[2,3] Street sweepers play an important role in community health and hygiene, but little attention is paid to their health.[1] Chronic respiratory symptoms are defined as the development of 1 or more of the symptom(s) of chronic cough, chronic phlegm, chronic wheezing, chronic shortness of breath, and chronic chest tightness which lasts at least 3 months in 1 year.[4] Occupational respiratory diseases are the most serious public health problem, accounting for 30% of all registered work-related diseases and 10% to 20% of all deaths worldwide,

and as a result of poor working conditions it is a significant burden in low and middle-income countries.[5]

Respiratory symptom among street sweepers were reported in different regions of the world including Tanzania,[3] Iran,[6] India,[7] Nigeria, 47.3% of participants,[8] and in different parts of Ethiopia, such as Dessie and Kombolcha, 45.4%, with the prevalence of cough, 16.54%, phlegm, 15.4%, wheezing, 32.3%, breathlessness, 21.3%, and chest pain, 14.3%,[9] and Addis Ababa, in 2017, 68.9%,[10] and 2018, 70.3%.[11]

There are a number of factors that affect respiratory symptoms and reported in different studies and such factors including socio-demographic characteristics like age,[11] BMI, sleeping hours,[12] educational level, housing condition factors like direct contact with pets, artificial or natural ventilation,[13] use of coal/wood for cooking,[14] behavioral related factors like smoking,[15] personal protective equipments (PPE) utilization,[14] work

experience or duration of exposure, working hours per day,[11] and past respiratory illness.[13]

Industrialized countries' norms and regulations for municipal solid waste management have significantly reduced occupational health impacts. However, in underdeveloped countries, the health-related aspects of solid waste management remain to be addressed as workers manually collect wastes. Street sweeping and waste collecting are labor-intensive jobs that are typically performed by people with poor incomes, limited occupational skills, and workers found in less advantaged educational and socioeconomic categories. Occupational health concern of workers in developing country still neglected and needs more investigation, and this study can be important to know the level of respiratory symptom among street sweepers. As a result, this study was aimed to determine the prevalence of respiratory symptoms and associated factors among street sweepers in Gondar city, northwest Ethiopia.

Materials and Methods

Study design, setting, and period

Community-based cross-sectional study was conduct from August, 10 to September 20/2021 among street sweepers in Gondar city. Gondar city is one of the historical town in Ethiopia, and is located 180 km from North East of Bahir Dar, the capital city of Amhara administrative regional state, and 747 km North West of Addis Ababa, the capital of Ethiopia. In Gondar city, there are 6 sub-cities with a total of 836 street sweeper workers.

Source and study populations

All street sweepers in Gondar city were the source population. Street sweepers who were selected during data collection period were the study population.

Inclusion and exclusion criteria

Street sweepers who have worked for 1 year and above as street sweepers were included in the study, and study participants who were severely ill, and that had known heart problem, thorax, abdomen surgery, were excluded from the study.[4]

Sample size determination and sampling procedure

The sample size was done for both the first and second objectives using single proportional formula and Open EPI info version7 software. Assumptions for the first objective were 95% confidence interval (CI), 36.9%, prevalence of respiratory symptoms among street sweepers[14] and 5% margin of error.

$$n = (Z\alpha/2)2p(1-p)/d^2$$

$$n = (1.96)^2 0.369(1-0.369)/(0.05)^2 = 358$$

For the second objective 95% CI, and power 80% and factors that have strong significant relation with the respiratory symptom such as use of mask and use of fuel at household for cooking[14] were used for sample size calculation for second objective. After adding 10% non-response rate, the final sample size for the first and second objective was 394 and 138, respectively. The final sample size for this study was 394, which is calculated for the first objective. The sampling procedure was proportional allocation to the size of workers in each sub-city and simple random sampling technique such as lottery method was used to select the study participants from each sub-city.

Study variables

The dependent variable of this study was the presence or absence of chronic respiratory symptoms whereas the independent variables included socio-demographic factors, behavioral related factors, housing condition related factors, occupational and environmental factors, institutional factors, and history of past respiratory illness.

Data collection tool and procedure

An interviewer-led standardized structured questionnaire was used, which was adopted and modified from the American Thoracic Society (ATS) to assess respiratory symptoms among the adult populations, and the questioners included the following components such as socio-demographic factors, behavioral-related factors, working condition factors, housing condition factors, past respiratory illness, and questions related to respiratory symptom.

Data quality control

To ensure the quality of the data, the questionnaire was carefully designed, translated, and retranslated, and pre-tests were also done on 5% of the sample population. Data collectors were received 2 days of training. The data was properly classified and coded during data analysis.

Operational definition

In this study, a respiratory symptom was defined as the presence of 1 or more of the following symptoms such as chronic cough, chronic phlegm, chronic wheezing, and chronic chest tightness that lasted at least 3 months in a year.[16]

Cough. Cough has been defined as a cough that occurs 4 to 6 times per day on most days of the week (≥4 days) for at least 3 months per year.[16]

Phlegm. Participants were considered to have chronic phlegm if they answered yes/ to at least 1 of the 4 questions below; Phlegm first thing in the morning, phlegm during the day or

night, phlegm as much as 4 to 6 times a day in a week or phlegm for most days, as much as 3 consecutive months during the year.[17]

Chest pain. Chest discomfort that has held of phlegm workers' jobs in the past 1 year or above.[18]

Wheeze. Whistling breathing during the respiratory cycle perceived by the respondents at least 3 months in a year.[19]

Past respiratory illness. Respiratory disease such as TB, chronic bronchitis, lung cancer, and heart disease that could be developed before and identified by physicians.[16]

Current smokers. Workers who smoked at the time of the study or someone who smokes cigarettes every day or every few days).[20]

Ever smoker. A person who smoked at least 100 cigarettes in his entire life.[4]

Use of PPE. Any item of clothing made up of textile/leather can be worn by the workers to cover their nose/mouth to protect the entry of dust particles.[21]

Data management and analysis

The data was entered into the EPI Info version 7 software and exported to Statistical Package for Social Science (SPSS) version 22 software for further analysis. The mean and standard deviation (SD), were computed as descriptive statistics. To control potential confounder variables, independent variables with *P*-values less than .2 in the bivariable analysis were included in a multivariable regression analysis model. To declare the presence and strength of an association, *P*-values less than .05 and adjusted prevalence ratios with 95% CI were used.

Results

Socio–demographic characteristics of study participants

A total 391 respondents, with a response rate of 99.2%, were participated. All of the study participants were females. More than half (54.7%) of the participants were unable to read and write. The majority (84.4%) of street sweepers were orthodox Christian followers. The mean age of the study participants was (35.6 ± 7.8 (SD) years (Table 1).

Prevalence of respiratory symptoms

In this study, the prevalence of respiratory symptoms among street sweepers was 35.3% (95% CI: 30.2, 40.5), with the prevalence of cough (30.2%), phlegm (22.3%), whistling (15.9%), and chest tightness 71 (18.2%; Figure 1).

Table 1. Socio-demographic characteristic of the study participants, 2021 (n = 391).

VARIABLE		FREQUENCY	PERCENT
Sex	Female	391	100
Age	≤35	195	49.9
	>35	196	50.1
Religion	Orthodox Christian	330	84.4
	Muslim	50	12.8
	Protestant	9	2.3
	Catholic	2	0.5
Marital status	Married	212	54.2
	Single	83	21.2
	Divorced	58	14.8
	Widowed	38	9.8
Educational level	Unable to read and write	214	54.7
	Read and write	70	17.9
	Primary school	65	16.6
	secondary cool and above	42	10.7
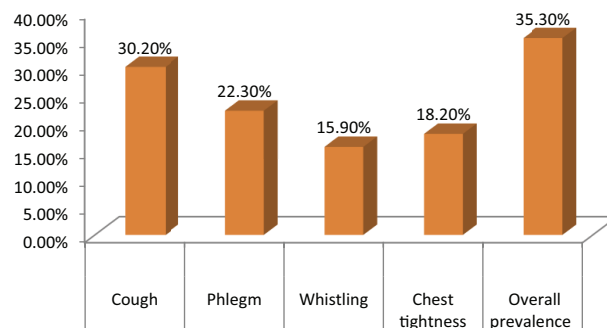
Figure 1. Prevalence of different respiratory symptom among street sweepers in Gondar town, Ethiopia.

Behavioral related factors

More than three fourth (79.3%) of study participants used personal protective equipment, but nearly one-fourth (20.5%) of participants were reported as uncomfortable as the main reason for non-utilization of personal protective equipments, and one fourth 98 (25.1%) of participants were drank alcohol.

Factors associated with respiratory symptom

In bivariable regression analysis, 10 independent variables were candidates (*P* < .2) for multivariable logistic regression. But in a multivariable regression analysis, previous respiratory illness,

washing PPE after use, types of industry, and drinking alcohol were significantly associated with respiratory symptoms among street sweepers.

Street sweepers with underlying respiratory illness had 7.75 times higher odds of having respiratory symptoms, when compared to their counterparts (adjusted odds ratio [AOR] = 7.75 (95% CI: 3.45, 17.45). The likelihood of developing respiratory symptoms was 4.77 times higher among street sweepers who did not wash their PPE after use when compared to their counterparts (AOR = 4.77; 95% CI: (2.02, 11.28). The odds of having respiratory symptoms were 5.9 times higher among street sweepers who drink alcohol when compared to their counterparts (AOR = 3.77, 95% CI: (1.94, 7.29). The odds of respiratory symptoms were 3.10 and 2.13 times higher among street sweepers who previously worked in cement (AOR = 3.10, 95% CI: 1.32, 7.34) and flour (AOR = 2.13, 95% CI: (2.02, 4.43) factory when compared to other industry respectively (Table 2).

Discussion

Street sweeping dust is the determinant of the occurrence of respiratory symptoms among street sweepers in poor working condition and this study aimed to determine the prevalence of respiratory symptoms and associated factors among street sweepers in Gondar city.

Based on this finding, 35.3% (95% CI: 30.2, 40.5) of participants had reported respiratory symptoms, with the prevalence of cough (30.2%), phlegm (22.3%), whistling (15.9%), and chest tightness (18.2%). This study was found cough as the most prevalent respiratory symptom among street sweepers and which is in line with a comparative study conducted in Tanzania that reported a higher prevalence of cough compared to other respiratory symptoms such as cough (54.9% vs 12.9%), phlegm (39.2% vs 7.1%), wheezing (32.4% vs 14.1%(3), in Zahedan Iran coughing was the most common complaint reported among street sweepers (81% vs 16.3%.[6] But in other parts of Ethiopia among street sweepers wheezing (32.3%) was higher reported than cough (16.54%).[9]

In this study, the prevalence of respiratory symptoms were higher than studies conducted in India (11.5%),[7] and Egypt, 18.1%[1] among street sweepers, and Philippines, 19%,[22] among waste collectors. This disparity could be attributed to differences in exposure status to road dust and other contaminants, as well as differences in duration of exposure (work experience) and use of respiratory protection. On the other hand, this study finding were lower than those of a previous study conducted among street sweepers in Addis Ababa, 2016 (68.9%),[26] and 2017/2018 (70.3%),[12] Dessie city (36.9%),[14] Kombolcha City (45.4%),[9] and Nigeria (47.3%).[8] This difference could be due to difference in utilization of personal protective equipments like respiratory mask and differences in the use of operational

definition of respiratory symptoms.[23] Example, a study conducted in Addis Ababa, in addition 4 chronic respiratory symptoms measurement variables, sneezing or nose irritation was used as operational definition and give higher prevalence of respiratory symptom.[11]

According to this study, factors such as previous respiratory illness, washing PPE after use, previous work in a cement and flour factory, and drinking alcohol were independently associated with respiratory symptoms among street sweepers. Street sweepers with a history of respiratory illness are more likely to have respiratory symptoms when compared to those workers without a history of respiratory illness. This finding is consistent with studies conducted in Ethiopia, Addis Ababa,[24] Komblcha,[9] and Malaysia.[13] In this study, another important factor was washing PPE after use, and respiratory symptoms were higher among workers who did not wash their PPE after use when compared to workers who did wash their PPE after use. This finding is consistent with another finding in Dessie City, Ethiopia, which stated that acute respiratory infection was seen in workers who did not clean/wash their PPE after use,[14] and this could be due to exposure to dust that accumulated day after day in protective equipment and can increase the exposure status of workers.

Respiratory symptoms were more common among street sweepers who had previously worked in cement and flour factory before being hired in the current job, and this finding is consistent with findings in Ethiopia, which stated that workers who had previously worked in a dusty industry before being hired for the current job were approximately twice as likely to develop respiratory symptoms.[25] In this study, respiratory symptoms were higher among street sweepers, who drank alcohol compared to those of non-drinkers, which is consistent with findings in Boston, US,[26] Sweden,[27] and Yugoslavia[28] that respiratory symptoms were significantly associated with alcohol consumption.

Limitation

The respiratory symptoms were assessed based on the medical histories of the study participants, which could lead to recall bias.

Conclusion

The overall prevalence of respiratory symptoms among street sweepers was 35.3%. Previous respiratory illness, washing PPE after use, previous work in a cement and flour factory, and drinking alcohol were independently associated with respiratory symptoms among street sweepers. To reduce the development of respiratory symptoms in workers, it is advisable implementing safety practice measures and behavioral changes among workers.

Table 2. Multivariable analysis and factors associated with respiratory symptoms among street sweepers in Gondar town, northwest, Ethiopia, 2021, (n=391).

VARIABLES	RESPIRATORY SYMPTOMS		CRUDE ODDS RATIO	AOR [95% CI]	*P* VALUE
	YES	NO			
Age					
>35	78	118	1.48 [0.98, 2.26]	1.53 [0.91, 2.54]	.11
≤35	60	135	1	1	
Income					
<2000	60	75	1.71 [1.08, 2.70]	1.52 [0.86, 2.64]	.14
2000-2400	19	52	0.78 [0.42, 1.44]	1.08 [0.53, 2.26]	.822
>2400	59	126	1	1	
Use mask					
No	57	28	5.65 [3.36, 9.49]	1.54 [0.73, 3.22]	
Yes	81	225	1	1	
Previous respiratory illness					
Yes	34	12	6.56 [3.27, 13.18]	**7.75 [3.45, 17.45]**	**.001**
No	104	241	1	1	
Piece of cloth					
No	102	162	1.59 [1.01, 2.52]	1.35 [0.74, 2.45]	.33
Yes	36	91	1	1	
Wash PPE after use					
No	43	18	5.91 [3.24, 10.76]	**4.77 [2.02, 11.28]**	
Yes	95	235	1		
Drink alcohol					
Yes	52	45	2.79 [1.74, 4.47]	**3.77 [1.94, 7.29]**	**.001**
No	86	208	1	1	
Previously work in dusty industry					
Textile	6	27	0.54 [0.21, 1.35]	0.37 [0.12, 1.19]	.09
Cement	18	15	2.91 [1.39, 6.08]	**3.10 [1.32, 7.34]**	**.01**
Flour	39	29	3.26 [1.88, 5.66]	**2.13 [2.02, 4.43]**	**.04**
Others*	75	182	1	1	
Open the window					
No	75	101	1.79 [1.18, 2.72]	1.6 [0.93, 2.76]	.091
Yes	63	152	1	1	
Pet in the house					
Yes	67	95	1.56 [1.03,2.38]	0.92 [0.53, 1.60]	.77
No	71	158	1	1	

Model fitness=0.275 1; Reference, Others*; previously worked in gas station, farm.

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Author Contributions

E.A. conceived the research idea and contributed to the data collection, data analysis and interpretations of the results. H.B. contributed in data collection and analysis and result interpretation. H.F. and G.T. had contributed in manuscript write up. All authors have commented, edited, and approved the final version of the manuscript.

Availability of Data and Materials

This article includes all of the data generated for this study. The data are also available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

The Ethical Review Committee of the Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, evaluated the ethical issue of this research proposal and approved it as ethically sound research. Participants were informed about the purpose of the study, the importance of their participation, and their right to withdraw at any time, and written consent was obtained from each participant during data collection.

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