

Prevalence and Associated Factors of Chronic Respiratory Symptoms among Street Sweepers in Bangkok, Thailand: A Cross-sectional Study

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Abstract

Background: Chronic respiratory diseases are becoming a more prominent cause of morbidity and mortality worldwide. Street sweepers are commonly found in low- and middle-income countries. This job involves outdoor work that exposes workers to various health hazards and air pollution, particularly affecting respiratory health. There is still limited research focusing specifically on street sweepers. The study aims to examine the prevalence of chronic respiratory symptoms and the associated factors in street sweepers in Bangkok, Thailand. **Materials and Methods:** We undertook a cross-sectional survey between February and April 2023. A multi-stage sampling technique was employed, stratifying the sample according to district locations within Bangkok, Thailand. Data were collected through a questionnaire assessing demographic characteristics, occupational and environmental factors, and respiratory symptoms using a modified version of the Medical Research Council questionnaire. Data analysis included bivariate analysis and multiple logistic regression. **Results:** The response rate was 98.0% (n = 341). The prevalence of chronic respiratory symptoms among street sweepers in Bangkok, Thailand, with at least one respiratory symptom was reported by 33.7% of the participants, specifically cough (22%), phlegm (20.2%), dyspnea (17.6%), and wheeze (7.0%). The average age of the sample group was 43.2 years, with a majority being female (85.9%). Among the participants, 88.3% were non-smokers, while 37.2% reported exposure to secondhand smoke. All participants reported the use of respiratory protective equipment, with face masks used at 78.9%. 7.3% of the participants lived near sources of pollution, and 12.0% were involved in household pollution activities. An average annual air quality index in the workplace area was categorized as 'good' at 57.8%. Multiple logistic regression analysis revealed significant associations of chronic respiratory symptoms with the following factors: exposure to secondhand smoke [odds ratio (OR) = 2.3, 95% confidence interval (CI) 1.3–4.2] and household activities (OR = 3.0, 95% CI 1.3–6.6). **Conclusion:** Exposure to secondhand smoke and indoor air pollutants in household environments are significant factors associated with the symptoms. Raising awareness about secondhand smoke hazards in household and environmental settings and promoting self-care practices related to various activities with potential exposure to indoor air pollution is crucial.

Keywords: Chronic respiratory symptoms, low- and middle-income countries, street sweeper

INTRODUCTION

Chronic respiratory diseases are becoming a more prominent cause of morbidity and mortality worldwide. Age-standardized death rates from chronic obstructive pulmonary disease (COPD) are highest in low- and middle-income regions of the world, particularly in Asia and Africa.^[1] Irreversible airflow obstruction is often accompanied by dyspnea, persistent cough, and phlegm, which are characteristic of COPD.^[2] COPD is mainly associated with smoking and other possible factors including indoor air pollution, outdoor air pollution, and occupational exposure.^[3]

Street sweepers continue to exist in low- and middle-income countries (LMICs) as a vital profession to support the labor market and maintain cleanliness in public areas. This job

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involves outdoor work and frequent exposure to various health hazards in the work environment, particularly among street sweepers working in major cities such as Bangkok, Thailand. The city has experienced rapid industrial expansion, construction activities, heavy traffic congestion, and an increasing level of air pollution. Consequently, street sweepers have a higher likelihood of encountering airborne particulate matter and pollutants that enter their bodies through inhalation. Currently, air pollution is a significant environmental concern worldwide, affecting the health of populations globally and becoming a prominent issue in large urban areas. It is a leading cause of pre-mature deaths, affecting approximately 7 million people annually.^[4] Air pollution has been associated with respiratory diseases and abnormalities, both acute and chronic.^[5,6] In Bangkok, reports from surveillance hospitals during the period of air pollution and high levels of particulate matter 2.5 (PM_{2.5}) revealed that the two most commonly treated conditions were asthma (58.9%) and chronic obstructive pulmonary disease (COPD) (38.1%).^[7]

There has been a multi-national study that encompassed working populations in LMICs across 27 sites, covering all continents. The study found significant associations between various occupational exposures to dusty environments and chronic respiratory symptoms, including cough, phlegm, dyspnea, and wheeze.^[2] However, it is worth noting that there is still limited research focusing specifically on street sweepers, particularly in investigating the various factors associated with respiratory symptoms in this particular group. To the best of our knowledge, based on the literature review, there is currently no existing study that specifically addresses respiratory system abnormalities in street sweepers in Bangkok, Thailand.

The study aims to examine the prevalence of chronic respiratory symptoms and the associated factors in street sweepers in Bangkok, Thailand.

MATERIAL AND METHODS

Study design

This study employed a cross-sectional survey to investigate the prevalence of chronic respiratory symptoms and associated factors among street sweepers in Bangkok. Data collection took place between February and April 2023.

Study setting and population

The study, based on the Bangkok Metropolitan Administration (BMA) report, was conducted on 9840 individuals working as street sweepers in Bangkok.

Operational definitions

- Street sweeper – an employee who has been hired as a permanent or temporary worker by the BMA in the position of ‘street sweeper’ responsible for cleaning public streets and alleys.
- Chronic respiratory symptoms – assessed by using a modified version of the Medical Research Council questionnaire (MRCQ) on respiratory symptoms^[8] to

evaluate the presence of respiratory symptoms over the past 6 months including cough, phlegm, dyspnea, and wheeze.

- Air quality index (AQI) in the working area – using the AQI for the year 2022 from pollution monitoring stations in the 12 districts of Bangkok. The data were sourced from the Department of Pollution Control, Ministry of Natural Resources and Environment, Thailand. The average annual AQI for each respective district where participants worked was calculated. Data analysis and categorization were performed according to the air quality index criteria established by the Department of Pollution Control.^[9]

Sample size and sampling technique

The sample size was determined using the formula for sample size estimation in finite populations.^[10] The population size of street sweepers in Bangkok, as reported by the BMA, was 9840 individuals (N = 9,840). With a confidence interval of 95% (Z = 1.96), a prevalence value (p) of 0.76 was used based on a previous study by Pintakham *et al.*, which investigated respiratory abnormalities in a similar reference population,^[11] and d was set at 0.05, resulting in a minimum sample size of 273 participants.

In this study, a multi-stage sampling technique was employed, involving the sub-division of the population into six group districts: North Thonburi, Central Bangkok, South Thonburi, East Bangkok, South Bangkok, and North Bangkok. Two districts were randomly selected from each group district, resulting in a total of 12 districts. From each selected district, a sample of 29 street sweepers was randomly chosen from the list of employees, resulting in a total sample size of 348 individuals.^[12]

Inclusion and exclusion criteria

The study included street sweepers who worked for the BMA with a minimum work tenure of 6 months. Participants unable to read Thai were excluded.

Data collection

This study utilized a questionnaire as the primary data collection instrument, which was divided into three sections.

Section 1 focused on demographic characteristics including age, gender, body mass index (BMI, Asian),^[13] marital status, education, socio-economic status (total monthly income), the presence of non-communicable diseases (NCDs including diabetes, hypertension, dyslipidemia, and coronary artery disease) diagnosed by a physician, history of COVID-19 infection, smoking status, and secondhand smoke exposure.

Section 2 (occupational and environmental factors) comprised workplace locations within specific districts in Bangkok, work tenure, working shift, the utilization of respiratory protective equipment (RPE) during work, and residential proximity to factories or pollution sources (including industrial factories, waste disposal sites, and crematoriums). It also covered exposure to household activities (such as kitchen work involving biomass fuels, dusty housekeeping, or secondary

income-generating activities associated with vapors, gases, dust and fumes (VGDF)). To evaluate environmental factors in the workplace, air quality data were obtained using the AQI for the year 2022 from pollution monitoring stations in the 12 districts of Bangkok. The data were sourced from the Department of Pollution Control, Ministry of Natural Resources and Environment, Thailand. The average annual AQI for each respective district where participants worked was calculated. Data analysis and categorization were performed according to the AQI criteria established by the Department of Pollution Control.^[9]

Section 3, the assessment of chronic respiratory symptoms, was conducted using a modified version of the Medical Research Council questionnaire (MRCQ) on respiratory symptoms^[8] that was translated into Thai by Prasongwattana *et al.*^[14] This questionnaire aimed to evaluate the presence of respiratory symptoms over the past 6 months, including cough, phlegm, dyspnea, and wheeze. The questionnaire consisted of 14 items, each with two response options: “no” (0 point) and “yes” (1 point).

The content validity of this questionnaire was evaluated by three experts including a respiratory physician, an occupational physician, and an epidemiologist. In addition, a pilot test using the questionnaire was conducted among 20 street sweepers who were not part of the study samples. The reliability of the questionnaire was assessed, yielding a Cronbach’s alpha coefficient of 0.74, indicating an acceptable level of reliability.

Data analysis

The qualitative data were analyzed using frequency distributions and percentages. Quantitative data are presented using the mean and the standard deviation (SD). When a variable did not follow a normal distribution, the values were divided based on the median. Bivariate analyses were conducted to examine the relationships between different variables. In terms of chronic respiratory symptoms, with at least one abnormal symptom, they were analyzed using the Chi-square test. Furthermore, variables with a *P* value less than 0.25^[15] were included in the multiple logistic regression analysis to identify factors associated with chronic respiratory symptoms. This study set has the statistical significance level at a *P*-value <0.05. All data analyses were conducted using STATA version 16.0 (StataCorp LT, TX, USA).

RESULTS

The questionnaire received a total of 341 responses (98.0%) [Table 1]. Participants were predominantly female (85.9%) with an average age of 43.2 years. Regarding marital status, the majority were married (52.2%), and the majority had completed primary education (43.7%). As for BMI, a majority were classified as obese (49.8%).^[16] The monthly income was non-normally distributed, with a median value of 12,000 Thai Baht, approximately 341.7 USD (IQR 7600 THB, 215.91 USD) [Table 1].

Among the street sweepers, 37.5% reported having NCDs, and 45.2% had a history of COVID-19 infection. Most of the street sweepers did not smoke cigarettes (88.3%), but 37.2% had a history of exposure to secondhand smoke [Table 2].^[16]

Regarding occupational factors, it was found that street sweepers had an average work tenure of 12.5 years. The majority worked morning shifts (63.9%), and all participants used respiratory protective equipment, with face masks being the most used respiratory protection (78.9%). Non-occupational factors revealed that 7.3% of the employees lived near sources of pollution, and 12.0% had household activities involving biomass fuels, dusty housekeeping, or activities associated with VGDF. In terms of environmental conditions in the workplace, street sweepers worked in areas with an average annual AQI categorized as “good” in 57.8% of cases and “moderate” in 42.2% of cases [Table 3].^[9]

Street sweepers in Bangkok experienced a prevalence of chronic respiratory symptoms, with at least one symptom reported by 33.7% of the participants. The most prevalent symptom was coughing, reported by 22.0% of the participants [Table 4].

Bivariate analysis was conducted to explore the relationship between two variables and the occurrence of chronic respiratory symptoms. The analysis revealed that variables with a *P*-value less than 0.25 included age (*P*-value = 0.06), BMI (*P*-value = 0.23), marital status (*P*-value <0.05), income (*P*-value = 0.2), educational level (*P*-value = 0.06), history of NCDs (*P*-value = 0.13), history of COVID-19 infection (*P*-value <0.05), smoking status (*P*-value = 0.07), exposure to secondhand smoke (*P*-value <0.001), workplace location (*P*-value = 0.001), residential proximity to pollution sources (*P*-value = 0.004), household activities (*P*-value = 0.001), and AQI in the working area (*P*-value = 0.08). Furthermore, a multiple logistic regression analysis was conducted to examine the predictive factors associated with the presence of at least one chronic respiratory symptom [Table 5].

Table 5 presents the results of the multiple logistic regression analysis. It was found that the following factors were not significantly associated with chronic respiratory symptoms in street sweepers: age (*P*-value = 0.32), BMI (*P*-value = 0.65), marital status (*P*-value = 0.77), income (*P*-value = 0.41), education (*P*-value = 0.74), history of NCDs (*P*-value = 0.13), history of COVID-19 infection (*P*-value = 0.08), smoking status (*P*-value = 0.68), workplace location (*P*-value = 0.30), work tenure (*P*-value = 0.71), residential proximity to pollution sources (*P*-value = 0.14), and AQI in the working area (*P*-value = 0.20).

These results indicate that two significant factors were associated with the occurrence of chronic respiratory symptoms. These factors included exposure to secondhand smoke (OR = 2.3, 95% CI 1.3–4.2) and household activities (OR = 3.0, 95% CI 1.3–6.6).

DISCUSSION

Our study reveals the prevalence of chronic respiratory symptoms among street sweepers in Bangkok, Thailand, with at least one respiratory symptom reported by 33.7% of the participants. Among these symptoms, cough was reported by 22.0% and dyspnea by 17.6%. When compared to a similar study conducted by Losakul *et al.* in 2006 among street sweepers in Songkhla province, Thailand, specifically within a densely populated and highly trafficked municipality in the southern region of the country, notable differences in demographic characteristics and symptom prevalence were observed. In the study, most of the sample consisted of females (95.0%), with an average age of approximately 43.2 years. The average work tenure was 10.6 years (SD = 7.1), and a large proportion of participants were non-smokers (93.4%). The prevalence of respiratory symptoms closely resembled those of our study, with cough reported by 28.7% and dyspnea by 12.7%.^[14] However, a study conducted among street sweepers in Dessie and Kombolcha City, Ethiopia, revealed that most of the sample group consisted of females (91.3%) and non-smokers (97.0%). The median age was in the 35–39-year-old group, and the majority had been working for at least 5 years. The study found a prevalence of chronic respiratory symptoms in the population, reaching 45.4%, surpassing the findings of this present study. It is possible that factors such as ethnicity and variations in the nature of street sweeping work in different contexts could contribute to the differences in the prevalence of respiratory symptoms among individuals. These factors may serve as explanatory factors for the varying occurrence of respiratory symptoms in the respiratory system.^[17]

We examined various factors associated with chronic respiratory symptoms, including personal factors such as secondhand smoke exposure and non-occupational factors, namely, household activities. However, statistically significant associations between chronic respiratory symptoms and occupational factors including work tenures and working shifts were not found in this study. It was noted that all participants in the sample used RPEs while working, although some reported using cloth masks or hooded caps, which were considered below the standards for dust and air pollution protection. Furthermore, no statistically significant association was found between environmental factors in the workplace, such as the average annual AQI in the workplace area, and the occurrence of respiratory symptoms. It was found that in all surveyed areas, the average annual AQI levels were categorized as “good” or “moderate,” which is still not considered within the range of “unhealthy” levels. Therefore, it is recommended that the general public, who are not part of the sensitive group, can continue to engage in outdoor activities as usual.^[9]

The association between secondhand smoke exposure and chronic respiratory symptoms, with at least one symptom in street sweepers, is consistent with the study conducted by Ho

Table 1: Response rates

Group districts	Number of questionnaires returned (<i>n</i>)	Response Rate (%)
North Thonburi	58	100.0
Central Bangkok	57	98.3
South Thonburi	56	96.6
East Bangkok	57	98.3
South Bangkok	57	98.3
North Bangkok	56	96.6
Total	341	98.0

Table 2: Demographic characteristics of the study participants (*n*=341)

Variables	<i>n</i>	Percentage
Ages (years)		
21-45	170	49.9
46-60	171	50.1
Sex		
Male	48	14.1
Female	293	85.9
BMI (Asian, kg/m ²)		
Normal (18.5–22.9)	90	26.4
Underweight (<18.5)	11	3.2
Overweight (23.0–24.9)	70	20.6
Obese (≥25.0)	170	49.8
Marital status		
Single	109	32.0
Married	178	52.2
Divorced/widowed/separated	54	15.8
Income in THB (USD)		
<12,000 (341.7)	91	26.7
≥12,000 (341.7)	250	73.3
Education		
Primary school	149	43.7
Secondary school	102	29.9
High school/college/university	90	26.4
History of NCDs		
No	232	68.0
Yes	109	32.0
History of COVID-19 infection		
No	187	54.8
Yes	154	45.2
Smoking status		
Never	301	88.3
Ever	12	3.5
Current	28	8.2
Secondhand smoke exposure		
No	214	62.8
Yes	127	37.2

*BMI: Body Mass Index (Asian)^[16], NCDs: Non-Communicable Diseases and COVID-19: Coronavirus Disease 2019

et al. in Hong Kong. Their research focused on workplace secondhand smoke exposure among workers in various occupations and found a statistically significant relationship between secondhand smoke exposure and chronic respiratory

Table 3: Occupational and environmental factors of the study participants (n=341)

Variables	n	Percentage
Workplace location		
North Thonburi	58	17.1
Central Bangkok	57	16.7
South Thonburi	56	16.4
East Bangkok	57	16.7
South Bangkok	57	16.7
North Bangkok	56	16.4
Work tenure (years)		
≤10	175	51.3
>10	166	48.7
Working shift		
Morning	218	63.9
Afternoon	123	36.1
Types of RPE		
Cloth masks/hooded caps	50	14.7
Face masks	269	78.8
N95 masks	22	6.5
Residential proximity to pollution sources		
No	316	92.7
Yes	25	7.3
Household activities		
No	300	88.0
Yes	41	12.0
AQI in the working area		
Good (26-50)	197	57.8
Moderate (51-100)	144	42.2

*AQI: Air Quality Index^[9] and RPE: Respiratory Protective Equipment. 1 USD=35.14 THB (2023)

Table 4: Chronic respiratory symptoms of the study participants (n=341)

Respiratory symptoms	n	Percentage
Any respiratory symptoms	115	33.7
Cough	75	22.0
Phlegm	69	20.2
Dyspnea	60	17.6
Wheeze	24	7.0

symptoms, even among never-smokers.^[18] Explaining the mechanism of disease occurrence, it was found that secondhand smoke contains thousands of chemical components in the form of aerosols (a mixture of solid and liquid particles) and hazardous gases. These components can irritate the respiratory mucosa, leading to damage in both the upper and lower respiratory tracts and consequently resulting in chronic respiratory symptoms and the development of asthma.^[19]

Interestingly, our study did not find a relationship between current smoking status and chronic respiratory symptoms. When considering the study sample group, it was found that most street sweepers were non-smoking females. Among the sample group, there were 28 current smokers, with 13 being males (27.1% of the female sample group) and 15

being females (5.1% of the female sample group). Analyzing the relationship between gender and smoking, a statistically significant difference in the number of smokers was found between genders (P -value <0.001). Hence, gender differences may be one of the explanatory factors for the lack of association between smoking and chronic respiratory symptoms. In this study, the majority of participants were females, and within the social context of Thai society, there is a prevailing negative attitude toward female smoking. This contributes to a lower prevalence of smoking among females compared to males. In this regard, the female participants in the sample group were those who were often exposed to smoking primarily in household settings or environmental contexts, such as the workplace. This is congruent with the findings of Larsson *et al.*, who conducted a population-based study in Finland, Estonia, and Sweden investigating respiratory diseases and symptoms using the MRCQ questionnaire. Similarly, their study revealed a higher incidence of secondhand smoke exposure reported by females in residential areas compared to males, and females showed a tendency toward developing chronic respiratory symptoms due to greater exposure to secondhand smoke.^[20] In addition, a study in Helsinki, Finland, by Hisinger-Mölkänen *et al.* reported that smoking, secondhand smoking, and occupational irritants were significantly related to nasal symptoms with an additive pattern.^[21]

Regarding household exposure to activities involving biomass fuels, dusty housekeeping, or VGDF, this study identified the association with the occurrence of chronic respiratory symptoms is nearly three times higher in the group exposed to indoor air pollution compared to the group not engaged in such activities. Generally, activities that contribute to the generation of smoke and particulate matter often occur in kitchen settings. Traditionally, biomass fuels are commonly used, which can produce significant amounts of smoke. However, in more recent times, the use of gas stoves has become more prevalent, resulting in lower levels of air pollution compared to various biomass fuels. However, in Thai kitchens, smoke is primarily generated from the use of cooking oil and poor ventilation. In this regard, there is a previous large-scale study conducted in Phitsanulok, Thailand, which focused on respiratory health and utilized the MRCQ questionnaire to examine respiratory symptoms. It revealed that smoke exposure from household cooking quantitatively increases the risk of chronic respiratory symptoms.^[22] It has been found that household behaviors play a major role in indoor air pollution, including indoor smoking as mentioned earlier. Solid fuel combustion, particularly in cooking and heating practices, is a significant contributor to indoor air pollution. In LMICs, over 3 billion people continue to rely on biomass fuels for various household activities. Additionally, due to economic conditions, domestic ventilation systems are often inadequate. The issue of indoor air pollution in LMICs is a significant public health concern, particularly regarding respiratory health.^[23]

Strengths and limitations

This study has a plurality of strengths. First, it achieved

Table 5: Chronic respiratory symptoms and associated factors (n=341)

Variables	n (%)	Crude OR	95% CI	Adjusted OR [†]	95% CI
Ages (years)					
21-45	170 (49.9)	reference	–	reference	–
46-60	171 (50.1)	1.6	0.9–2.4	1.4	0.6–2.9
BMI (kg/m ²)					
Normal (18.5-22.9)	90 (26.4)	reference	–	reference	–
Underweight (<18.5)	11 (3.2)	2.3	0.6–8.1	1.1	0.2–5.0
Overweight (23.0-24.9)	70 (20.6)	0.7	0.3–1.3	0.5	0.2–1.1
Obese (≥25.0)	170 (49.8)	1.0	0.6–1.8	0.9	0.5–1.7
Marital status					
Single	109 (31.9)	reference	–	reference	–
Married	178 (52.3)	1.7*	1.0–2.9	1.8	0.9–3.3
Divorced/widowed/separated	54 (15.8)	0.9	0.4–1.9	1.1	0.4–2.5
Income in THB (USD)					
<12,000 (341.7)	91 (26.7)	reference	–	reference	–
≥12,000 (341.7)	250 (73.3)	1.4	0.8–2.3	1.5	0.8–2.9
Education					
Primary	149 (43.7)	reference	–	reference	–
Secondary	102 (29.9)	0.5*	0.3–0.9	0.5	0.3–1.1
High school/college/university	90 (26.4)	0.9	0.5–1.5	1.0	0.5–2.0
History of NCDs					
No	213 (62.5)	reference	–	reference	–
Yes	128 (37.5)	1.4	0.9–2.3	1.0	0.6–1.9
History of COVID-19 infection					
No	187 (54.8)	reference	–	reference	–
Yes	154 (45.2)	1.6*	1.0–2.5	1.6	0.9–2.7
Smoking status					
Never	301 (88.3)	reference	–	reference	–
Ever	12 (3.5)	2.2	0.7–6.7	1.3	0.3–5.1
Current	28 (8.2)	2.2	1.0–4.7	1.1	0.4–3.0
Secondhand smoke exposure					
No	214 (62.8)	reference	–	reference	–
Yes	127 (37.2)	2.6*	1.6–4.1	2.3*	1.3–4.2
Workplace location					
North Thonburi	58 (17.1)	reference	–	reference	–
Central Bangkok	57 (16.7)	0.9	0.4–1.9	1.0	0.4–2.5
South Thonburi	56 (16.4)	1.7	0.8–3.7	1.6	0.7–3.7
East Bangkok	57 (16.7)	1.3	0.6–2.9	1.7	0.7–3.9
South Bangkok	57 (16.7)	0.5	0.2–1.2	0.5	0.2–1.5
North Bangkok	56 (16.4)	2.8*	1.3–6.0	2.3	0.9–5.7
Work tenure (years)					
≤10	175 (51.3)	reference	–	reference	–
>10	166 (48.7)	1.4	0.9–2.2	0.9	0.4–1.9
Residential proximity pollution sources					
No	316 (92.7)	reference	–	reference	–
Yes	25 (7.3)	3.2*	1.4–7.5	1.7	0.6–4.7
Household activities					
No	300 (88.0)	reference	–	Reference	–
Yes	41 (12.0)	2.9*	1.5–5.6	3.0*	1.3–6.6
AQI in the working area					
Good (26-50)	197 (57.8)	reference	–	reference	–
Moderate (51-100)	144 (42.2)	0.7	0.4–1.1	1.0	0.5–2.1

*Statistically significant ($P<0.05$). †Adjusted for all other variables including age, BMI, marital status, income, education, history of NCDs, history of COVID-19 infection, smoking status, secondhand smoke exposure, workplace location, work tenure, residential proximity pollution sources, household activities, and AQI in the working area. BMI: Body Mass Index (Asian), NCDs: Non-Communicable Diseases, COVID-19: Coronavirus Disease 2019 and AQI: Air Quality Index. 1 USD=35.14 THB (2023)

a high response rate of 98.0%, which demonstrates the importance of engaging and educating street sweepers

about respiratory health through collaboration with relevant affiliated organizations. Second, the use of a self-administered

questionnaire, specifically tailored in Thai language for ease of understanding by respondents, ensured good cooperation and avoided missing data. Third, this research represents one of the initial epidemiological surveys conducted on respiratory symptoms during the post-COVID-19 pandemic period, emphasizing its novelty and relevance.

There are limitations to consider in this study. Relying on self-reported questionnaires to gather information, particularly respiratory symptoms within the past 6 months, may introduce recall bias. In addition, self-reported respiratory symptoms may not be as accurate as diagnoses made by professionals or objective measurements such as lung function tests. Last, the assessment of air quality, which is indicative of exposure to air pollutants, was based on data from monitoring stations, providing convenient and easily accessible information but not directly measuring the air quality at the specific work locations of the street sweepers. Personal air sampling, which would capture accurate individual exposure, was not employed. Consequently, the data obtained may not fully reflect the actual exposure experienced by each exposed individual and may not accurately reflect their AQI values.

Suggestion

Our study sheds light on the factors, particularly indoor air pollution influencing chronic respiratory symptoms in this profession. This information is particularly relevant for street sweepers in LMICs and emphasizes the importance of studying and implementing appropriate preventive measures.

The relevant organizations responsible for the care of street sweepers, considering the high prevalence of chronic respiratory symptoms found in this study, should establish respiratory surveillance programs to promote health and safety in the workplace. Measures such as raising awareness about the dangers of secondhand smoke and providing training on self-protection should be implemented. Additionally, campaigns and initiatives focusing on self-care related to various household activities involving exposure to indoor air pollutants should be encouraged.

At the policy level, there should be measures in place to address long-term air pollution issues. Efforts should be made to reduce smoking, not only for smokers themselves but also to minimize secondhand smoke exposure, thereby reducing the impact on public health.

In terms of research, future studies could consider designing a longitudinal cohort study to establish directional relationships and causal relationships. Furthermore, there is increasing interest in the effects of air pollution on various bodily systems. Thus, studies with improved accuracy, such as personal air sampling, or research exploring the relationship between symptoms and diseases in other systems beyond the respiratory should be considered.

CONCLUSION

In this study, it was found that one-third of street sweepers

exhibited chronic respiratory symptoms. Secondhand smoke exposure and household activities exposed to indoor air pollution were identified as related factors. Therefore, it is crucial for stakeholders, including management and policymakers, to prioritize the care of this group. This can be achieved through respiratory surveillance as well as awareness campaigns and education regarding the identified factors, such as highlighting the importance of the hazards of secondhand smoke, and self-care related to various activities in households with potential exposure to indoor air pollution is crucial.

Author contributions

PC, PS and JR were engaged in the design of the study. PC was responsible for data collection. PC and JR analyzed all data and drafted the initial manuscript. All authors contributed to its development and approved the final version.

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Conflicts of interest

There are no conflicts of interest.

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