

# Factors affecting lung function among motorcycle taxi drivers in Thonburi district, Bangkok

Alongkot Prasansri<sup>1\*</sup> and Pornthip Chompook<sup>2</sup>

<sup>1</sup> Faculty of Sciences and Technology, Bansomdejchaopraya Rajabhat University, Bangkok 10600, Thailand

<sup>2</sup> Faculty of Public Health, Thammasat University, Pathumthani 12120, Thailand

## ABSTRACT

**\*Corresponding author:**  
Alongkot Prasansri  
[alongkot.pr@bsru.ac.th](mailto:alongkot.pr@bsru.ac.th)

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Motorcycle taxi drivers are another occupational group whose work inevitably exposes them to air pollution. This exposure places them at a higher risk of respiratory diseases and impaired lung function. This cross-sectional analytical study aimed to determine the prevalence of respiratory diseases and lung function impairments, along with their associated factors. A total of 208 participants were interviewed, and their lung function was tested using spirometry. The lung function parameters evaluated included forced vital capacity (FVC), forced expiratory Volume in the first second (FEV1), and forced vital capacity ratio (FEV1/FVC). The prevalence of abnormal lung function was found to be 53.85%. Moreover, the results also showed the prevalence of respiratory symptoms: coughing, phlegm, difficulty breathing, and wheezing. Factors associated with impaired lung function were identified, including being in the age 40–49-year age group, which significantly increase the risk of impaired lung function. Conversely, being overweight was found to reduce the risk. The study suggests that a surveillance system for monitoring lung function among motorcycle taxi drivers can focus on drivers aged 40 years and above, those who are underweight and at risk of impaired lung function, and individuals with respiratory symptoms, particularly coughing, as it is a key factor associated with lung function impairment.

**Keywords:** motorcycle taxi drivers; impaired lung function; age; BMI

## 1. INTRODUCTION

The evidence linking air pollution to human health problem is extensive, particularly regarding traffic congestion and road constructions. These are major sources of air pollution, contributing to dust, smoke from engine combustion, carbon dioxide, nitrogen dioxide, and other harmful gases, all of which can deteriorate lung function and lead to long-term health problem such as chronic obstructive pulmonary disease (Omland et al,

2014), which can be life-threatening. Motorcycle taxi drivers, who spend most of their time on the road amid heavy traffic and air pollution, are at high risk of impaired lung function and other respiratory diseases. Moreover, other studies found that motorcycle taxi drivers are often smokers, consume alcohol, and engage in limited physical activity, all of which increase the risk of acute or long-term respiratory diseases (Chuenban et al., 2013; Rongthong & Boonkerd, 2021; Suebsuk et al., 2013). Pulmonary function tests are essential examinations to assess health risk

related to respiratory track exposure. They are particularly useful for early detection of respiratory diseases, with spirometry being the most popular method for measuring lung function (Miller et al., 2005; Redlich & Tarlo, 2015). Previous studies in Thailand found varying prevalence of impaired lung function among motorcycle taxi drivers, accounting for 14.3%, 22.4%, and 88.0% in different districts in Bangkok (Suebsuk et al., 2013), Bangkok district in Bangkok (Chuenban et al., 2013), and Nakhon Pathom province (Rongthong & Boonkerd, 2021), respectively. These findings highlight significant health impacts, especially impaired lung function, among this occupational group. Thonburi district, home to landmarks such as Taksin monument and Wongwian Yai, serves as a major transportation hub on the west side of the Chao Phraya river. It hosts numerous government offices, universities, and private enterprises, making it a high populated area with heavy traffic congestion. There are 108 motorcycle taxi stands catering to commuters in this area (Thonburi District Office, Bangkok, 2022). In contrast to Bangkok district and Nakhon Pathom province are less crowded. Notably, Thonburi district was the second most polluted districts in Bangkok in 2022, with PM<sub>2.5</sub> and PM<sub>10</sub> levels reaching 86 µg/m<sup>3</sup>, and 115 µg/m<sup>3</sup>, respectively (Pollution Control Department, 2023). Hence, this study aimed to determine the prevalence of respiratory symptoms and impaired lung function among motorcycle taxi drivers in Thonburi district. Moreover, it seeks to identify factors associated with impaired lung function in this population. The findings will contribute to a deeper understanding of respiratory health issues among motorcycle taxi drivers in this area, paving the way to interventions to control and prevent health risks.

## 2. MATERIALS AND METHODS

This cross-sectional analytical study was conducted between September to October 2023.

### 2.1 Population and sample

The study population comprised motorcycle taxi drivers in Thonburi district of Bangkok. The sample size was calculated using the formula for an estimation of indefinite population (Daniel, 1995). A proportion of impaired lung function of 0.875, based on a previous study (Suebsuk et al., 2013), was used for the calculation, with a margin of error of 0.05 and a 5% significance level. An addition of 10% was added to account for potential non-response, resulting in a total of 208 participants. A stratified random sampling was performed across the 7 sub-districts in Thonburi district. In each sub-district, one motorcycle stand was randomly selected. Approximately 29–30 motorcycle taxi drivers were randomly selected from each stand to participate in interviews and undergo lung function tests. If drivers were unavailable at a selected motorcycle stand, the next stand was randomly selected until the required sample size was achieved.

### 2.2 Inclusion and exclusion criteria

The inclusion criteria were as follows: participants must be a motorcycle taxi driver of Thai nationality, aged at least 20 years (male or female), have worked in Thonburi district for one year or more, and be literate in Thai, including the ability to write and read. The exclusion criteria were: a

motorcycle taxi driver working part-time or those who are not eligible to undergo spirometry for lung function testing.

### 2.3 Research instrument

The standardized questionnaire and lung function test were used in this study. The instruments consisted of 3 components as follows:

#### Session 1: Personal data

This section collected information including age, sex, weight, height, educational level, underlying disease, history of respiratory illnesses, social security scheme for treatment, income and its sufficiency, length of career as a motorcycle taxi driver, working hour per day, smoking, alcohol consumption, and exercise habit. This section was reviewed by three experts, yielding an average index of item-objective congruence (IOC) score of 0.89.

#### Session 2: Symptoms of respiratory diseases

This section was developed by the researcher based on the ATS-DLD-78A questionnaire from the American Thoracic Society Division of Lung Disease (Ferris, 1978). It included symptoms such as coughing, phlegm, having difficulty breathing, and wheezing. This section was also validated by three experts, achieving an average IOC score of 0.89.

#### Session 3: Lung function test (Spirometry)

Lung function test was conducted using spirometry, providing three key parameters: (1) force vital capacity: (FVC), (2) forced expiratory volume in one second (FEV<sub>1</sub>), and (3) FEV<sub>1</sub>/FVC. Spirometers (CONTEC model SP10W) were used for all participants, calibrated according to standard procedure prior to the use (Miller et al., 2005). Participants were fully informed on the procedure, and researchers demonstrated the correct technique for measuring air volume during inhalation and exhalation (flow sensing spirometer). The open circuit technique was employed, where participants were instructed to take a deep inhale, followed by a deep, quick, and strong exhale. This process was repeated three times, and the maximum values of FVC and FEV<sub>1</sub> were recorded as the best results that met acceptability and repeatability criteria (Summacheeva Foundation, 2018; Thoracic Society of Thailand under Royal Patronage, 2019).

### 2.4 Interpretation of lung function

This study used a specified ratio (fixed ratio) to interpret spirometry results by comparing the detected values with the predicted value calculated using the Siriraj Formula (Dejsomritrutai et al., 2000), a standard for lung capacity among Thai individuals stratified by sex, height, and age. The results were then interpreted according to the standard set by the Thoracic Society of Thailand under Royal Patronage (2019), and the American College of Occupational and Environmental Medicine (Townsend & Occupational and Environmental Lung Disorders Committee, 2011).

The abnormal lung function was determined based on the cutoff values for FEV<sub>1</sub> and FVC at 80% of the predicted value or less. For the FEV<sub>1</sub>/FVC ratio, the cutoff for abnormal lung function was 75% or less for participants under 50 years of age, and 70% or less for those aged 50 years or older. This study classified lung function into two levels: normal lung function and abnormal lung function. Abnormal lung function was further categorized into three types: (1) obstructive abnormality, (2) restrictive abnormality, and (3) mixed abnormality, following the

procedure shown in Table 1 (Summacheeva Foundation, 2018):

(1) Obstructive abnormality: If the FEV1/FVC ratio was within the normal range, it indicated no obstructive abnormality. In contrast, if the FEV1/FVC ratio was below the normal range, it indicated the presence of an obstructive abnormality.

(2) Mixed abnormality: If obstructive abnormality was identified, further assessment was conducted to determine if a restrictive abnormality also existed by evaluating FVC. A normal FVC indicated no restrictive abnormality, leading to a final diagnosis of obstructive abnormality only. However, If FVC was below the normal range, the individual was diagnosed with mixed abnormality, which included both restrictive and obstructive abnormality.

(3) Restrictive abnormality: If the FEV1/FVC ratio was normal, it confirmed no obstructive abnormality. However, if further evaluation showed that FVC was below the normal range, the individual was diagnosed with a restrictive abnormality only.

## 2.5 Statistical analysis

Descriptive statistics were used to explain the personal characteristics of participants, the prevalence of respiratory disease symptoms, and lung function. The analysis included frequency, percentage, minimum and

maximum values, and mean with standard deviation. Inferential statistics were performed using Binary Logistic Regression to examine the associations between related factors and lung function.

Step 1: Univariate analysis was performed to calculate crude odds ratios (COR) at a statistical level of 0.05.

Step 2: Multivariate analysis included all relevant variables from univariate analysis with a p-value < 0.10. Interaction term and multicollinearity were tested before proceeding. A backward model selection procedure was performed to identify the best-fitting multivariable mode, and adjusted odds ratios (AOR) were calculated at a statistical level of 0.05.

## 2.6 Ethical consideration

The study received ethical approval from the Human Research Ethics Committee of Bansomdejchaopraya Rajabhat University on 25 July 2023 (COA No. BSRU-REC 660702). Ethical consideration was performed throughout the interview and spirometry procedures. Informed consent was obtained from all participants. who were allowed to decline participation or withdraw from the interview or testing at any time without providing a reason. The result were anonymized to ensure confidentiality, with no identifying information such as names or addresses traceable to participants.

**Table 1.** Interpretation of lung function test

FEV1/FVC (%)		FVC (% predicted)	Level of lung function
< 50 years of age	≥ 50 years of age		
>75	>70	>80	Normal
>75	>70	≤80	Restrictive abnormality
≤75	≤70	>80	Obstructive abnormality
≤75	≤70	≤80	Mixed abnormality

## 3. RESULTS AND DISCUSSION

### 3.1 Characteristics of participants

All 208 motorcycle taxi drivers were included in the analysis. Most of them were male accounting for 99.52%. Most participants were aged 50–59 years (34.62%), with a mean age of 48.13 ± 10.59 years. Nearly half (49.04%) had a secondary school education. Half of participants (50%) had a normal body mass index (BMI), while 28.85% had underlying diseases. A history of respiratory disease was reported by 62.98% of participants. More than half (50.69%) had a history of COVID-19 infections, while 1.92% and 11.54% got tuberculosis and influenza infection, respectively. In term of income, 45.19% earned less than 10,000 Thai Baht (THB) per month, and 53.85% reported that their income is insufficient. Most participants (64.90%) had basic government health insurance, and 70.19% had worked as motorcycle taxi drivers for less than

10 years. The majority (51.44%) worked less than 8 h per day. Regarding lifestyle, 26.92% were non-smokers, 61.06% reported no alcohol consumption, and 68.75% indicated a lack of regular exercises, as described in Table 2.

### 3.2 Prevalence of respiratory symptoms

The most commonly reported respiratory symptom was coughing (20.67%) followed by phlegm (13.46%), difficulty breathing (8.17%), and wheezing (2.88%) as shown in Table 2.

### 3.3 Lung function

The study found 46.15% of motorcycle taxi drivers had normal lung function. Among these with abnormal lung function, 32.69% had obstructive abnormality, 12.98% had restrictive abnormality, and 8.18% had mixed abnormality, as described in Table 2.

**Table 2.** Characteristics of participants (n = 208)

Characteristics	n (%)
<b>Gender</b>	
Male	207 (99.52)
Female	1(0.48)
<b>Age (years)</b>	
Mean $\pm$ SD. = 48.13 $\pm$ 10.59	
Min-Max = 20.00–70.00	
< 30	11 (5.29)
30–39	37 (17.78)
40–49	61(29.33)
50–59	72 (34.62)
$\geq$ 60	27 (12.98)
<b>Educational level</b>	
No schooling	3 (1.44)
Primary school	88 (42.31)
Secondary school	102 (49.04)
More than secondary school	15 (7.21)
<b>Body Mass Index (BMI)</b>	
Under weight (< 18.50 kg/m <sup>2</sup> )	3 (1.44)
Normal (18.50–24.99 kg/m <sup>2</sup> )	104 (50.00)
Overweight (25.00–29.99 kg/m <sup>2</sup> )	71 (34.14)
Obesity ( $\geq$ 30.00 kg/m <sup>2</sup> )	30 (14.42)
<b>Underlying diseases</b>	
No	148 (71.15)
Yes	60 (28.85)
-Hypertension	25 (41.67)
-Diabetes	3 (5.00)
-Hyperlipidemia	3 (5.00)
-Hypertension and diabetes	12 (20.00)
-Diabetes and hyperlipidemia	1 (1.67)
- Hypertension and hyperlipidemia	2 (3.33)
- Hypertension, diabetes and hyperlipidemia	8 (13.33)
-Asthma	2 (3.33)
-Others	4 (6.67)
<b>History of respiratory diseases</b>	
No	77 (37.02)
Yes	131 (62.98)
<b>History of COVID-19 infections</b>	
No	102 (49.04)
Yes	106 (50.69)
<b>Tuberculosis</b>	
No	204 (98.08)
Yes	4 (1.92)
<b>History of influenza infection</b>	
No	184 (88.46)
Yes	24 (11.54)
<b>Health care scheme</b>	
Universal health coverage	136 (64.90)
Social security	61 (29.33)
Government officer	11 (5.77)

**Table 2.** Characteristics of participants (n = 208) (continued)

Characteristics	n (%)
<b>Monthly income (THB)</b>	
Mean $\pm$ SD. = 12,709.13 $\pm$ 5,000.31	
Min-Max = 3,000–35,000	
≤ 10,000	94 (45.19)
10,001–15,000	80 (38.46)
15,001–20,000	25 (12.02)
≥ 20,000	9 (4.33)
<b>Sufficiency of income</b>	
No	112 (53.85)
Yes	96 (46.15)
<b>Length of being a motorcycle taxi driver (years)</b>	
Mean $\pm$ SD = 9.83 $\pm$ 8.51	
Min-Max = 1–40	
≤ 10	146 (70.19)
11–20	41 (19.71)
≥ 20	21 (10.10)
<b>Working hours per day (as a motorcycle taxi driver)</b>	
Mean $\pm$ SD. = 8.61 $\pm$ 2.64	
Min-Max = 3–14	
≤ 8	107 (51.44)
9–12	95 (45.67)
> 12	6 (2.89)
<b>Smoking</b>	
Never	56 (26.92)
Current smoker	112 (53.85)
Ex-smoker	40 (19.23)
<b>Alcohol drinking</b>	
Never	127 (61.06)
1–2 times/ week	41 (19.71)
3–6 times/ week	19 (9.13)
Everyday	21 (10.10)
<b>Exercises</b>	
No	143 (68.75)
Sometimes	49 (23.56)
Regularly	16 (7.69)
<b>Coughing</b>	
No	165 (79.33)
Yes	43 (20.67)
<b>Phlegm</b>	
No	180 (86.54)
Yes	28 (13.46)
<b>Difficulty breathing</b>	
No	191 (91.83)
Yes	17 (8.17)
<b>Wheezing</b>	
No	202 (97.12)
Yes	6 (2.88)
<b>Lung function</b>	
Normal	96 (46.15)
Abnormal	112 (53.85)
- Obstructive abnormality	68 (32.69)
- Restrictive abnormality	27 (12.98)
- Mixed abnormality	17 (8.18)

### 3.4 Factors associated with lung function

Multivariable analysis showed that participants aged 40-49 years had 5.39 times higher risk of abnormal lung function compared to those aged 30 years or younger, with statistical significance. (AOR = 5.39, 95% CI = 1.31 - 22.30, p-value = 0.020). Being overweight was significantly associated with lung function, showing a protective effect (AOR = 0.47, 95% CI = 0.24 - 0.90, p-value = 0.024). In addition, having a cough was significantly associated with lung function (AOR = 0.48, 95% CI = 0.23 - 0.99, p-value = 0.049). However, a history of COVID-19 infection was

associated with an increased risk of abnormal lung function, but the association was not statistically significant (AOR = 1.65, 95% CI = 0.90 - 3.03, p-value = 0.103). Similarly, older age was linked to an increasing risk of abnormal lung function compared to younger participants, though this finding was not significant. Being underweight showed a non-significant increase in risk of abnormal lung function compared to those with normal BMI (AOR = 2.19, 95% CI = 0.16 - 28.95, p-value = 0.553) as described in Table 3.

**Table 3.** Factors affecting lung function using logistic regression at 5% significance

Factors	n	Lung function		Univariate analysis		Multivariate analysis <sup>s</sup>	
		Normal	Abnormal	COR* (95% CI)	p-value	AOR* (95% CI)	p-value
<b>Gender</b>							
Male	207	69(46.38)	111(53.62)	NA		NA	
Female	1	0(0.00)	1(100.00)	NA			
<b>Educational level</b>							
More than secondary school	15	8(53.33)	7(46.67)	ref			0.733
No schooling	3	2(66.67)	1(33.33)	0.57	(0.04-7.74)		
Primary school	88	42(47.73)	46(52.27)	1.25	(0.42-3.75)		
Secondary school	102	44(43.14)	58(56.86)	1.51	(0.51-4.47)		
<b>Underlying diseases</b>							
No	148	69(46.62)	79(53.38)	ref			0.832
Yes	60	27(45.00)	33(55.00)	1.07	(0.58-1.95)		
<b>History of respiratory disease</b>							
No	77	40(51.95)	37(48.05)	ref			0.199
Yes	131	56(42.75)	75(57.25)	1.45	(0.83-2.55)		
<b>Tuberculosis</b>							
No	204	96(47.06)	108(52.94)	NA			NA
Yes	4	0(0.00)	4(100.00)	NA			
<b>History of influenza infection</b>							
No	184	83(45.11)	101(54.89)	ref			0.403
Yes	24	13(54.17)	11(45.83)	0.70	(0.30-1.63)		
<b>Health care scheme</b>							
Government officer	11	6(54.55)	5(45.45)	ref			0.848
Universal health coverage	136	62(45.59)	74(54.41)	1.43	(0.42-4.92)		
Social security	61	28(45.00)	33(54.10)	1.41	(0.39-5.13)		
<b>Monthly income (THB)</b>							
> 10,000	114	54(47.37)	60(52.63)	ref			0.699
≤ 10,000	94	42(44.68)	52(55.32)	1.11	(0.64-1.92)		
<b>Sufficiency of income</b>							
Yes	96	43(44.79)	53(55.21)	ref			0.715
No	112	53(47.32)	59(52.68)	0.90	(0.52-1.56)		
<b>Length of being a motorcycle taxi driver (years)</b>							
≤ 10	146	68(46.58)	78(53.42)	ref			0.852
> 10	62	28(45.16)	34(54.84)	1.06	(0.58-1.92)		
<b>Working hours per day (as a motorcycle taxi driver)</b>							
≤ 8	107	50(46.73)	57(53.27)	ref			0.864
> 8	101	46(45.54)	55(54.46)	1.05	(0.61-1.81)		
<b>Smoking</b>							
Never	96	45(46.88)	51(53.13)	ref			0.849
Smoker	112	51(45.54)	61(54.46)	1.06	(0.61-1.82)		
<b>Alcohol drinking</b>							
Never	127	56(44.09)	71(55.91)	ref			0.456
Drinking	81	40(49.38)	41(50.62)	0.81	(0.46-1.41)		

**Table 3.** Factors affecting lung function using logistic regression at 5% significance (continued)

Factors	n	Lung function		Univariate analysis		Multivariate analysis <sup>s</sup>	
		Normal	Abnormal	COR* (95% CI)	p-value	AOR* (95% CI)	p-value
<b>Exercises</b>						0.456	NA
Regularly	16	9(56.25)	7(43.75)	ref			
Sometimes	49	25(51.02)	24(48.98)	1.23	(0.40-3.84)		
None	143	62(43.36)	81(56.64)	1.68	(0.59-4.76)		
<b>Phlegm</b>						0.975	NA
No	180	83(46.11)	97(53.89)	ref			
Yes	28	13(46.43)	15(53.57)	0.99	(0.44-2.19)		
<b>Difficulty breathing</b>						0.667	NA
No	191	89(46.60)	102(53.40)	ref			
Yes	17	7(41.18)	10(58.82)	1.25	(0.46-3.41)		
<b>Wheezing</b>						0.848	NA
No	202	93(46.04)	109(53.96)	ref			
Yes	6	3(50.00)	3(50.00)	0.85	(0.17-4.33)		
<b>Age (years)</b>						0.005	
< 30	11	1(63.64)	4(36.36)	ref		ref	
30-39	37	14(37.84)	23(62.16)	2.88	(0.71-11.62)	3.43	(0.79-14.93) 0.101
40-49	61	18(29.51)	43(70.49)	4.18	(1.09-16.06)	5.39	(1.31-22.30) 0.020
50-59	72	42(58.33)	30(41.67)	1.25	(0.34-4.65)	1.54	(0.39-6.11) 0.541
≥ 60	27	15(55.56)	12(44.44)	1.40	(0.33-5.93)	2.12	(0.47-9.56) 0.330
<b>Body Mass Index (BMI)</b>						0.054	
Normal	104	45(43.27)	59(56.73)	ref		ref	
Underweight	3	1(33.33)	2(66.67)	1.52	(0.13-17.35)	2.19	(0.16-28.95) 0.553
Overweight	71	41(57.75)	30(42.25)	0.56	(0.30-1.03)	0.47	(0.24-0.90) 0.024
Obesity	30	9(30.00)	21(70.00)	1.78	(0.74-4.26)	1.05	(0.41-2.69) 0.926
<b>History of COVID-19 infections</b>						0.099	
No	102	53(51.96)	49(48.04)	ref		ref	
Yes	106	43(40.57)	63(59.43)	1.58	(0.92-2.74)	1.65	(0.90-3.03) 0.103
<b>Coughing</b>						0.035	
No	165	70(42.42)	95(57.58)	ref		ref	
Yes	43	26(60.47)	17(39.53)	2.08	(1.05-4.12)	0.48	(0.23-0.99) 0.049

\* Crude odds ratio

\* Adjusted odds ratio

\* Adjusted for age, BMI, history of COVID-19 infection, and coughing

### 3.5 Discussion

The results showed that motorcycle taxi drivers experienced respiratory symptoms, including coughing (20.67%), phlegm (13.46%), difficulty breathing (8.17%), and wheezing (2.88%). These symptoms are likely associated with exposure to environmental pollution, particularly air pollution encountered during their work (Arphorn et al., 2018; Lawin et al., 2018). Moreover, personal lifestyle factors, such as smoking, increase the risk of respiratory infections (Oelsner et al., 2020; Suebsuk et al., 2014). These findings align with other studies conducted in various countries, where the prevalence of respiratory infections among motorcycle taxi drivers was higher than in occupational group less exposed to environmental pollution (Lawin et al., 2016; Shabani & Mamuya, 2020). However, the prevalence of respiratory symptom in this study was lower than that reported in other countries. For example, the prevalence of coughing was higher than 50% among motorcycle taxi drivers in Tanzania (Shabani & Mamuya, 2020), more than 40% in Indonesia (Setiawan et al., 2022), and also high in Pakistan, where coughing was the most reported symptom (Mumtaz

Joya et al., 2020). Coughing is an indication of several chronic respiratory conditions, including asthma, COPD, chronic inflammatory lung disease, lung cancer, and tuberculosis (TB) (Chung & Pavord, 2008; Chung & Widdicombe, 2004). In TB patients, lungs damage often results in reduced lung function (Lyon Sarah & Rossman Milton, 2017; Ravimohan et al., 2018). As Thailand remains on the World Health Organization's list of 30 high-burden countries for TB in year 2022 (Bagcchi, 2023), the findings of this study are concerning. Among participants with restrictive (6/27) or mixed abnormalities (3/17), 20% (9/44) who reported coughing may have had TB, which could impair lung function.

The prevalence of lung function abnormalities among motorcycle taxi drivers in this study was 53.85%, higher than the 14-29% reported in previous studies in Bangkok, (Chuenban et al., 2013; Samana & Ketsakorn, 2023; Suebsuk et al., 2013). However, another study in Nakhon Pathom found even higher prevalent of 88% (Rongthong & Boonkerd, 2021). The higher prevalence in this study may reflect severe air pollution in Bangkok and its vicinity, which ranks among the worst globally (The Nation

Thailand, 2023; The United Nations Environment Programme, 2019). Among abnormal lung function cases, 32.69% were obstructive abnormalities, likely caused by long exposure to air pollution (Duan et al., 2020; Górska et al., 2017; Tahery et al., 2021), and smoking (Hikichi et al., 2019; Yoon et al., 2021). Restrictive abnormalities accounted for 12.98%, lower than reported in the other study in Bangkok (Samana & Ketsakorn, 2023). These restrictive abnormalities may be linked to respiratory infections (Boutou et al., 2021; Chen et al., 2017; Dadhwal et al., 2021; Sharma & Ahmed, 2022). The participants in this study had a history of COVID-19 infection (50.69%), influenza (11.54%), and TB (1.92%). Obesity (14.42%) may also contribute to restrictive abnormalities (Tang et al., 2024).

Multivariable analysis identified several factors associated with lung function. Participants aged 40–49 years had 5.39 times higher risk of abnormal lung function than those younger than 30 years old. This finding aligns with evidence that pulmonary function declines with age, starting at 20–25 years (Lee et al., 2016; Sharma & Goodwin, 2006). Age-related reductions in expiratory muscle strength and airway diameter contribute to an annual decline in FEV1 of approximately 20 mL during ages 25–39, with the greater reduction at older ages (Lalley, 2013; S. H. Lee et al., 2016). Interestingly, being overweight appeared to have a protective effect on lung function compared to a normal BMI. While increased BMI can increase lung function in some cases (Engbers et al., 2010), obesity is known to reduce lung function (Al Ghobain, 2012; Forno et al., 2018), and abdominal adiposity may impair lung function in specific age groups, particularly among women (Ochs-Balcom et al., 2006). The study also found a borderline significant association between coughing and reduced risk of abnormal lung function. However, this may be due chance as evidence generally links respiratory symptoms with reduced lung function (Jamali & Nafees, 2017). Coughing remains a marker of lung function abnormality (Chung & Pavord, 2008; Chung & Widdicombe, 2004).

However, there are few limitations in this study. First, air pollution levels in the study area were not directly measured, although the existing evidence of air pollution in Bangkok is substantial and may provide sufficient context. Second, abdominal adiposity, a potential determinant of lung function, was not measured. However, other relevant determinants were included in the analysis. Third, this study may have lacked statistical power to detect a strong association between coughing and lung function abnormality. Despite this, the sample size calculation was vigorously performed.

#### 4. CONCLUSION

This study provides a multivariable analysis of factors associated with lung function among motorcycle taxi drivers in Bangkok, presenting a comprehensive overview of their health status. The findings highlight the importance of implementing targeted health interventions for this occupational group. Key factors for a lung function surveillance system include respiratory symptoms, particularly coughing, age 40 years and above, and BMI, especially underweight status. A well-designed surveillance system can facilitate early detection of impaired lung function, enabling timely medication intervention. Further

research should incorporate air pollution measurement in the study area to establish the association between air quality and lung function. Furthermore, the role of abdominal adiposity in lung function could be explored further if strong associations are identified, providing a basis for more targeted monitoring and intervention strategies.

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