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Assessment of Respiratory Morbidities among Shopkeepers and Vendors in a Semi-Urban Area

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Abstract

Context: Rapid urbanization has increased risk factors for respiratory morbidities, leaving the general population vulnerable. Potentially damaging agents are numerous, which result in damage to defence mechanisms, in turn causing respiratory morbidities. Shopkeepers and vendors in the semi-urban area, who mostly work outdoors at ground level, are continuously exposed to unhealthy environments and practices, and the majority are unaware of the situation. **Aim:** Our study will help identify the prevalence of respiratory morbidities and their association with risk factors. Thus, appropriate measures could be taken to impede respiratory morbidities. **Settings and Design:** Cross-sectional study in a semi-urban area. **Methods:** done among 260 subjects working for more than a year, while ones already on medication for respiratory illnesses were excluded. **Statistical Analysis Used:** Excel was used for data tabulation and Chi-square tests for significance, with the level of significance at $\alpha = 0.05$. **Results:** A high prevalence of respiratory morbidities, with 64.62% of the study population showing one or more respiratory morbidities, was noted. Cough (23.85%), followed by breathlessness (22.31%), and were highly prevalent. The study revealed significant relationships between Peak Expiratory Flow Rate (PEFR) and age, BMI, Total Exposure Period (TEP), respiratory morbidities, and addictions. However, no significant relation was found between PEFR and the type of shop, whereas prevalence was high on the roadside as compared to closed shops. **Conclusions:** The prevalence was high in subjects with shops situated on the roadside as compared to the closed ones. This was due to the high TEP, as the shopkeepers worked for longer durations owing to their socioeconomic demands. Therefore, the Total Exposure Period (TEP) plays a greater role than the type of shop.

Keywords: Respiratory Morbidities, Shopkeepers, Vendors

1. Introduction

Growing populations and rapid urbanization subject one to harmful concentrations and a vast diversity of air pollutants. Air pollution refers to the release of air pollutants into the air that are detrimental to human health. Thus, the negative impacts of air pollution on health are an increasing concern. The following data in Table 1 shows the Air Quality Index (AQI) and its concentrations[1]. Furthermore, Table 2 mentions its associated health impacts[1].

The shopkeepers and vendors across the streets are continuously exposed to dust, vehicle exhaust emissions, cooking fume emissions, and environmental tobacco smoke. This renders them susceptible to a variety of respiratory health problems[2].

The potentially damaging agents are numerous, and thus, to stay healthy, defence mechanisms are an integral component. Any damage to this leads to an alteration in human health. Motor vehicle exhaust effuses diverse pollutants, including Particulate Matter (PM), lead, carbon monoxide, sulfur dioxide, oxides of nitrogen, unburned fuel, partly oxidized hydrocarbons, benzene, and polycyclic aromatic hydrocarbons. These penetrate the lungs and initiate steps towards adverse health effects. These adverse health effects are usually greater than those of industrial pollutants, as the emissions are released near ground level and remain there for longer periods[3].

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Table 1. Air Quality Index and its concentrations

AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5-1.0
Moderately	101-250	61-90	81-180	101-168	2.1-10	81-380	401-800	1.1-2.0
polluted (101200)								
Poor (201300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301400)	351-430	121-250	281-400	209-748	17-34	801-1600	1200-1800	3.1-3.5
Severe (401500)	430+	250+	400+	748+	34+	1600+	1800+	3.5+

Table 2. Health impacts of AQI

AQI Category (Range)	Associated Health Impacts
Good (0-50)	Minimal Impact
Satisfactory (51-100)	May cause minor breathing discomfort to sensitive people
Moderately polluted (101-200)	May cause breathing discomfort to people with lung diseases such as asthma, and discomfort to people with heart disease, children and older adults
Poor (201-300)	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease
Very poor (301-400)	May cause respiratory illness in people on prolonged exposure. Its effects and alterations may be more evident in people with lung and heart diseases.
Severe (401-500)	May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity.

Although vehicular emissions are a known risk, the shopkeepers are situated along the roadside[4]. Most studies on occupational health in India are done in industrial settings, whereas few have looked into occupational groups exposed to air pollution[5-9], and the health hazards get more detrimental with increasing exposure to traffic[10].

The population in this study includes shopkeepers and vendors who mostly work outdoors at ground level and are continuously exposed to unhealthy environments and practices[11]. Most of them are unaware of the damage caused to them or tend to ignore symptoms due to lack of awareness, illiteracy, economic status, and neglect[12]. Several studies show a significant relationship between advancing age and asthma in a first-degree relationship with the increased prevalence of asthma[13,14,18]. Difficulty in breathing, wheeze, cough, tightness in the chest when exposed to dust or contact to any kind of allergen in the nature are considered signs of asthma[15-17]. There are also confounding associations with infections and infestations, air pollution, and tobacco smoke exposure[19,20,21].

Recent studies show current concentrations of particulate air pollution are associated with adverse health outcomes[22,23]. Hence, taking into consideration the current situation, this study was planned to assess the respiratory health problems among shopkeepers and vendors.

2. Methodology

This is a cross-sectional study carried out in a semi-urban area, which is about 3km from the National Highway. A total of 260 participants were included. The

study population was shopkeepers who owned or were employed in the shop for more than 1 year and included those selling goods from pushcarts to those working in concrete shops. All the shops and vendors around the area were covered. Those already on medication for any respiratory problems were excluded. A questionnaire was prepared and later validated by experts. The interview was conducted on a one-on-one basis with the shopkeeper and vendors present on the site by the principal investigator with the help of a structured questionnaire. The purpose and procedures of the study were explained in English as well as in the local language for better understanding, and consent was obtained beforehand. Peak Expiratory Flow Rate (PEFR) was recorded with the help of a Peak Expiratory Flow Meter. It is a portable, handheld device used to measure the ability of one's lungs to push out air. Before each use, the marker on the device was adjusted to zero marks, and a cardboard replaceable mouthpiece was used for sterility purposes. The mouthpiece was put into the mouth, with the lips tightly closed around the mouthpiece and the tongue away from the mouthpiece. A deep breath is taken, and in one breath, air is blown out as a fast and hard blast to empty air from the lungs. Three readings were taken, and the highest was chosen. The instrument used is a Cipla Breathe-O meter. All the gathered data was used to find the prevalence of respiratory morbidities and their associations with their risk factors. Microsoft Office Excel 2007 was used for data tabulation and Chi-square tests for significance, with the level of significance at $\alpha = 0.05$. Our study took place from July 2019 to September 2019.

3. Result

The mean age of the population was 42.61 years. The male population (61.15%) was higher than that of the female population (38.85%), as seen in Table 3.

Table 3. Age and sex distribution

Age(years)	Male	Female	Total
20 – 30	30	07	37
30 – 40	36	29	65
40 – 50	43	29	72
50 – 60	31	18	49
>60	19	18	37
Total	159	101	260

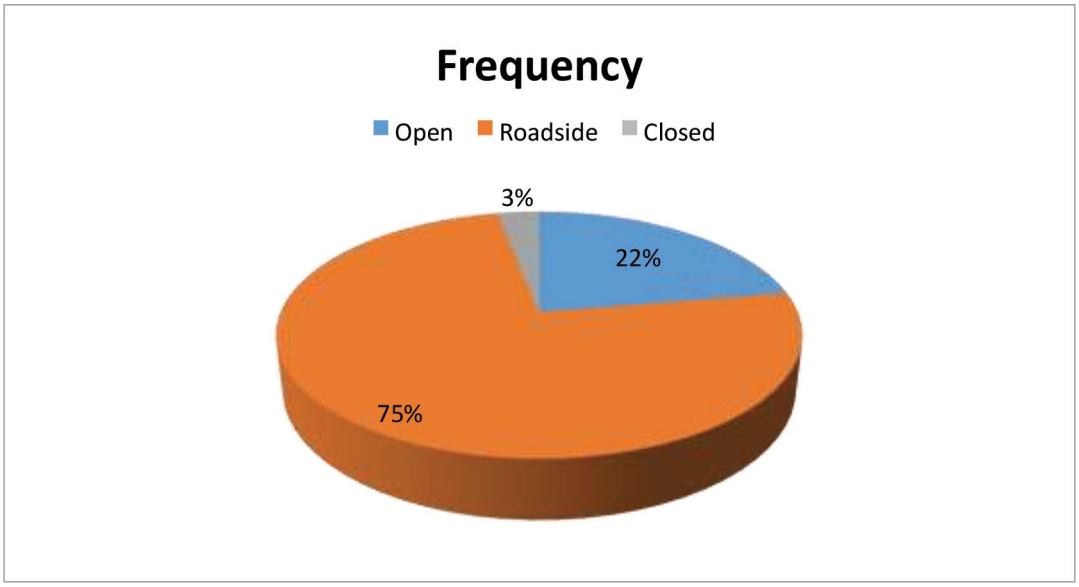

Figure 1. Shows the majority of the shops were either roadside or situated on the ground floor, thus subjected to maximum exposure. Total Exposure Period (TEP) is defined as the product of the total number of working hours per day per shopkeeper and the total number of working years per shopkeeper[1].The mean TEP of the population was 195.33. Out of the 195 (75%) working along the roadside, 181 (92.8%) had a TEP higher than the mean, and 53 (81.5%) of the rest of the 65 (25%) of the population had a TEP equal to or less than the mean TEP.

Many subjects showed more than one symptom, and 36 (13.85%) of the total study population showed no respiratory morbidities. Cough (23.85%) was highly prevalent, followed by breathlessness (22.31%), as shown in Table 4. Out of the 58 (22.31%) subjects with breathlessness, 18 (31.03%) had a family history of asthma, and 2 subjects had a history of asthma but showed no symptoms of breathlessness or asthma. The majority of the subjects showed breathlessness at work, with only 7 (12.06%) showing breathlessness at rest.

Maximum morbidities were observed in shopkeepers selling goods on the roadside, whereas those in closed shops barely showed any respiratory symptoms, as shown in Table 4.

The normal range of PEFR is 500 - 600 L/min for males and 350-450 L/min for females.

Only 10.06% of males and 22.77% of females had normal PEFR. Since >500 L/min and

>350 L/min are termed normal PEFR for males and females, respectively, the majority of the population had PEFR below normal.

The observed range of PEFR was thus divided into two groups. Males and Females with a PEFR equal to or above 450 L/min and 300 L/min, respectively, were considered average or normal, and those below this were considered poor.

From Table 5, the p-value for males (0.1807) and females (0.426) was greater than the significance level (0.05), suggesting no significant relation between PEFR and type of shop.

From Table 6, the p-value for males (0.02175) and females (0.0157) was less than the significance level (0.05), suggesting a significant relationship between PEFR and age.

From Table 7, the p-value for males (0.0261) and females (0.00301) was less than the significance level (0.05), suggesting a significant relationship between PEFR and BMI.

From Table 8, the p-value for males (0.0078) and females (0.0359) was less than the significance level (0.05), suggesting a significant relationship between PEFR and TEP.

Table 4. Prevalence of respiratory morbidities

Respiratory Morbidities	Frequency	Percentage	Open	Closed	Roadside
Cough	62	23.85%	19	3	40
Breathlessness	58	22.31%	15	1	42
Chest tightness	42	16.15%	7	0	35
Fever	16	06.15%	2	0	14
Rhinitis	46	17.69%	12	0	34

Table 5. Comparison of PEFR with types of shops

PEFR (L/min)		Type of Shop		
		Open	Closed	Roadside
Males	>450	22	5	33
	<450	29	2	68
Females	>300	6	1	49
	<300	1	0	44

Table 6. Comparison of PEFR with age

PEFR(L/min)		Age				
		20-30	30-40	40-50	50-60	>60
Males	>450	19	12	14	11	4
	<450	11	24	29	20	15
Females	>300	3	17	21	11	4
	<300	4	12	8	7	14

Table 7. Comparison of PEFR with BMI

PEFR(L/min)		BMI		
		<20	20-30	>30
Males	>450	11	43	6
	<450	5	82	12
Females	>300	2	54	0
	<300	8	33	4

Table 8. Comparison of PEFR with TEP

PEFR(L/min)		Total Exposure Period		
		<200	200-400	>400
Males	>450	38	20	2
	<450	38	52	9
Females	>300	22	29	5
	<300	28	12	5

Table 9. Comparison of PEFR with the Prevalence of Respiratory Morbidities

PEFR(L/min)		Respiratory Morbidities				
		Cough	Breathlessness	Chest Tightness	Fever	Rhinitis
Males	>450	15	11	13	3	18
	<450	28	18	9	5	8
Females	>300	8	22	10	2	14
	<300	11	7	10	6	6

Table 10. Comparison of PEFR with addictions

PEFR(L/min)		Addiction		
		Smoking	Alcohol	Tobacco
Males	>450	6	19	20
	<450	45	29	35

From Table 9, the p-value for males (0.0366) and females (0.0257) was less than the significance level (0.05), suggesting a significant relationship between PEFR and the prevalence of respiratory morbidities.

From Table 10, the p-value (0.0034) is less than the significance level (0.05), suggesting a significant relationship between the PEFR of males and addictions.

4. Discussion

A high prevalence of respiratory morbidities was seen, with 64.62% of the study population showing at least one of the noted respiratory morbidities and many showing more than one. Cough was highly prevalent (23.85%), and one patient showed signs of tuberculosis but had no hemoptysis. The second most prevalent was breathlessness (22.31%), out of which 31.03% had a family history of asthma and could be suspects of asthma. Individuals who experienced breathlessness at work, which relieved gradually or with rest, could either be suspects of asthma or tiredness due to overexertion at work. This prevalence was found to be higher than in the study carried out by Ramesh *et al.,* (40.5%).The prevalence of cough (32.2%) and breathlessness (31.4%) was higher than in our study[2]. Whereas, in a study by Nazurah *et al.*, the prevalence of respiratory morbidities was found to be 47.1%, with cough and breathlessness present in 24.7% and 20.0%, respectively[5].

The study also revealed a significant relation between PEFR and age, that is, PEFR increases with age and then decreases with advancing old age. A significant relationship was also seen with PEFR and BMI in the study population. The study showed a significantly higher BMI for low socioeconomic status in semi-urban areas, probably due to long hours of sitting in one position at shops. The significantly high BMI among the population could also be the reason for the majority of recorded PEFR being average or below normal, as the relation shows that PEFR value declines with the increase in BMI. A similar correlation was found in a study carried out by Kaur *et al.,*and Bharadwaj *et al*[7,23].

TEP and PEFR also showed a significant relationship, showing a decrease in the recorded value of PEFR with an increase in TEP, as shown in Figure 2. The study carried out by Sajal et al. showed that shopkeepers working in heavy traffic areas and exposed to vehicular emissions suffer from respiratory morbidities, and the risk increases with an increase in TEP[3].

Respiratory morbidities showed a significant association with PEFR. The recorded PEFR was significantly lower in subjects with some or other respiratory morbidity. A similar association was found between PEFR and addictions, as the recorded PEFR was lower in subjects consuming one or more of the substances. Similar findings were found in the Naveen *et al.*, study[2].

No significant association was found between the type of shop and PEFR, but a study carried out by Naveen *et al.,* showed a drop in mean PEFR in subjects exposed to their surroundings[2]. Whereas, in a study carried out by Jones *et al.,* there was no significant statistical relationship between PEFR and the type of shop[4]. The drop seen in the study carried out by Dr Naveen was only marginal. No significant relationship suggests that even though the shopkeepers along the roadside or in open shops are more exposed to hazardous surroundings, it has no significant effect on their lung function as compared to those in closed shops.

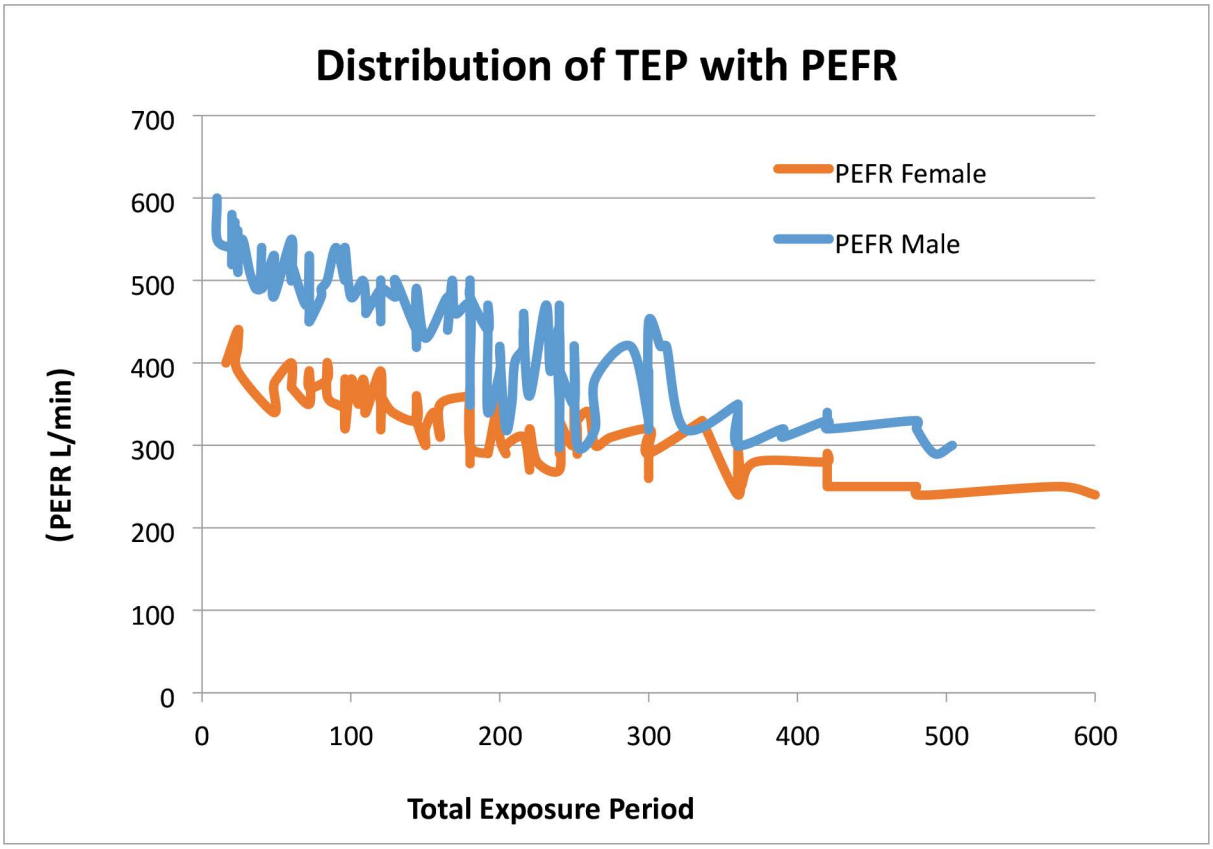

Figure 2. Distribution of TEP with PEFR.

5. Conclusion

Our present study was based on the respiratory function of the shopkeepers and vendors exposed to the surrounding pollution. Various correlations were found, and conclusions were drawn as a result of these findings.

A high prevalence of respiratory morbidities was seen in the study population, with 64.62% of the study population showing at least one of the noted respiratory morbidities and many showing more than one. Cough was highly prevalent, and one patient showed signs of tuberculosis but had no hemoptysis. The second most prevalent was breathlessness, where 31.03% had a family history of asthma and could be suspected of having asthma. The subjects who experienced breathlessness at work and were relieved gradually or with rest could either be suspects of asthma or tiredness due to overexertion at the workplace. The study also revealed a significant association between PEFR and age; that is, PEFR increases with increasing age and then decreases with advancing old age. A significant correlation was also seen between PEFR and the BMI of the study population. A study showed significantly higher BMI for a low socioeconomic status of the population in a semi-urban area. This may have been due to long hours of sitting in one position at the shops. The significantly high BMI among the population could also be the reason for the majority of recorded PEFR being average or below normal, as the correlation shows that PEFR value declines with an increase in BMI. Total Exposure Period and PEFR also showed a significant association, showing a decrease in the recorded value of PEFR as the Total Exposure Period increased. Respiratory morbidities display a significant association with PEFR, such that the recorded PEFR was significantly less in subjects with some or other respiratory morbidity. Similarly, with addictions, a significant association was found between PEFR and addictions; that is, recorded PEFR was less in subjects consuming one or more of the substances, like tobacco, alcohol, or any form of smoking. No significant association was found between the type of shop and the values of PEFR, thus showing that even though the shopkeepers along the roadside or the ones in

open shops are more exposed to hazardous surroundings, this did not affect their lung function as compared to those in the close shops. However, the prevalence of respiratory morbidities was high in the subjects with shops situated on the roadside as compared to the ones in closed ones. This was due to the total working hours and the number of years the subjects had been working for, that is, the total exposure period. Therefore, these shopkeepers and vendors must be made aware of the situation and the effects on their working surroundings. The study area being located near the highway and the usage of auto rickshaws being high in the area, the pollution was detrimental to health. These shopkeepers and vendors must be provided with and encouraged to sell their goods in an area a little far from the highway, not so far as to decline their business and their customers, but at a moderate distance from the highway. Planting trees and plants near the highways and near the working area could work as filters and help decrease the effects of pollution. An increase in the use of protective measures, maintenance of clean surroundings, hygiene, and self-care must be encouraged. The majority of the population did not seek medical help even after showing symptoms. The most common reason for this was low socioeconomic status or busy working schedules. The majority of the population worked for 10 - 12 hours daily with no breaks. Pradhan Mantri Jan Arogya Yojana, ascheme launched on September 23, 2018, by the Hon'ble Prime Minister Shri Narendra Modi in Ranchi, Jharkhand, aims at providing health insurance cover of Rs. 5 lakhs per family per year for secondary and tertiary care hospitalization to over 10.74 crore poor and vulnerable families and provides cashless access to health care services for the beneficiary. Through this scheme and other such schemes, our study population can receive benefits, and if these shopkeepers and vendors receive medical facilities at an affordable rate, they might seek help. Along with this, short breaks during long working hours must be encouraged so they can rest and have proper nutrition. The population under study that presented with morbidities was referred to the respective OPD, and a few exercises were taught for healthy respiratory and musculoskeletal function. Health check-up camps must be set up for this population, and the health of these subjects must be inspected regularly. Awareness must be spread about the harmful effects of the environment, the precautionary measures that could be taken, and visits to the hospital for any sign of illness.

6. References

1. Press Information Bureau Government of India Ministry of Environment, Forest and Climate Change. Available from:www.cpcb.nic.in
2. Ramesh N. Prevalence of respiratory morbidity among shopkeepers in the vicinity of a National Highway, Bangalore. International Journal of Occupational Safety and Health. 2017; 5(1).https://doi.org/10.3126/ijosh.v5i1.12985
3. De S, Kushwah G, Dharwey D, Shanmugasundaram, D. Respiratory morbidity of roadside shopkeepers exposed to traffic-related air pollution in Bhopal, India. Journal of health and Pollution. 2019; 9(21):190305. https://doi.org/10.5696/2156-9614-9.21.190305, PMid:30931165, PMCid:PMC6421956
4. Jones AYM, Lam PKW, Gohel MDI. Respiratory health of road-side vendors in a large industrialized city. Env Sci Pollut Res. 2008; 15(2):150–4. https://doi.org/10.1065/espr2006.12.368. PMid:18380234
5. Nazurah Bt Abdul Wahid NN, Balalla NB, Koh D. Respiratory symptoms of vendors in an open-air hawker center in Bruneidarussalam. Front Public Health. 2014; 2:167. https://doi.org/10.3389/fpubh.2014.00167. PMid:25325051 PMCid:PMC4183101
6. Durairaj P, Raju S, Thirumalaikumarasamy S. Measurement of peak expiratory flow rate values in healthy school going children between 6 and 12 years attending urban schools in Chennai. Int J Contemp Pediatr. 2017; 4:2002-7. https://doi.org/10.18203/23493291.ijcp20174679
7. Kaur H, Singh J, Makkar M, Singh K, Garg R. Variations in the peak expiratory flow rate with various factors in a population of healthy women of the Malwa Region of Punjab, India. J Clin Diagn Res. 2013; 7(6):1000–3. https://doi.org/10.7860/JCDR/2013/5217.3049PMid:23905089 PMCid:PMC3708184
8. Mary E. Assessment of respiratory morbidities among police personnel in Kochi City, Ernakulam [Doctoral dissertation]. SCTIMST.
9. Brauer M, Hoek G, Jongste JC, Gerritsen J, Postma DS, Kerkhof M, Brunekreef B. Air pollution and development of asthma, allergy and infections in a birth cohort. European Respiratory Journal. 2007; 29:879–88. https://doi.org/10.1183/09031936.00083406. PMid:17251230
10. Bandopadhyay A, Bandopadhyay S, Lele P, Patil R. A cross-sectional study to assess respiratory, eye and ear health problems among traffic police personnel in Nashik City. Journal of Clinical and Diagnostic Research. 2018; 12. https://doi.org/10.7860/JCDR/2018/37141.12224
11. Noomnual S, Shendell DG. Young adult street vendors and adverse respiratory health outcomes in Bangkok, Thailand.

Saf Health Work. 2017; 8(4):407-9. https://doi.org/10.1016/j.shaw.2017.02.002. PMid:29276642 PMCid:PMC5715443

12. Afiqah AN, Zainal AE, Rasdi I. Respiratory health symptoms and lung function among road-side hawkers in serdang and its association with traffic-related exposures. Iranian Journal of Public Health. 2016; 45:77-84.
13. Jindal SK, Aggarwal AN, Gupta D, Agarwal R, Kumar R, Kaur T, Chaudhry K, Shah B. Indian study on epidemiology of asthma, respiratory symptoms and chronic bronchitis. In Adults. 2012; 1270–7. https://doi.org/10.5588/ijtld.12.0005. PMid:22871327
14. Delclos GL *et al*. Validation of an asthma questionnaire for use in healthcare workers. Occupational and Environmental Medicine, 2006; 63(3):173–9. https://doi.org/10.1136/oem.2005.021634. PMid:16497858 PMCid:PMC2078145
15. Burney P, Laitinen LA, Perdrizet S, *et al*. Validity and repeatability of the IUATLD (1984) bronchial symptoms questionnaire: An international comparison. Eur Respir J 1989; 2:940–5.https://doi.org/10.1183/09031936.93.02090940
16. Alim MA, Sarker MA, Selim S, Karim MR, Yoshida Y, Hamajima N. Respiratory involvements among women exposed to the smoke of traditional biomass fuel and gas fuel in a District of Bangladesh. Environmental Health and Preventive Medicine. 2014; 19(2):126. https://doi.org/10.1007/s12199-013-0364-4. PMid:24105352. PMCid:PMC3944038
17. Yadav PK, Yadav RL, Islam MN. A study to assess the peak expiratory flow rate in nepalese population involved in tailoring occupation. Journal of Biomedical and Pharmaceutical Research. 2015; 4(5):41–5.
18. Shrestha HS, Nepal, Khanal K, Kapoor BK. A cross-sectional study of lung functions in traffic police personnel at work in Kathmandu Valley, Nepal. Annals of Clinical Chemistry and Laboratory Medicine. 2015; 1(1):42–8. https://doi.org/10.3126/acclm.v1i1.12315
19. Sana A, Somda SM, Meda N, Bouland C. Chronic obstructive pulmonary disease associated with biomass fuel use in women: A systematic review and meta-analysis. BMJ Open Respiratory Research. 2018; 5(1). https://doi.org/10.1136/bmjresp-2017-000246. PMid:29387422 PMCid:PMC5786909
20. Peat JH, Spijker M. Prevalence of asthma in adults in Busselton, Western Australia. BMJ (Clinical Research ed.); 1992. https://doi.org/10.1136/bmj.305.6865.1326. PMid:1483077 PMCid:PMC1883869
21. Agarwal AC, Chhabra K, D'Souza, Gupta, Jindal D, Katiyar S, Bilal V. Prevalence and risk factors for bronchial asthma in indian adults: a multicentre study. The Indian Journal of Chest Diseases and Allied Sciences. 2005; 48:13–22.
22. van der Zee S, Hoek G, Boezen HM, Schouten JP, van Wijnen JH, Brunekreef B. Acute effects of urban air pollution on respiratory health of children with and without chronic respiratory symptoms. Occupational and Environmental Medicine. 1992; 56(12):802–12. https://doi.org/10.1136/oem.56.12.802PMid:10658536 PMCid:PMC1757690
23. Bhardwaj P, Poonam K. Short communication effects of age and body mass index on peak expiratory flow rate in Indian population. Indian J Physiol Pharmacol. 2014; 58(2):166–9.