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Indumathy V

Ph.D. Scholar, Rani
Meyyammai College of
Nursing, Annamalai
University, Chidambaram,
Tamil Nadu, India

Dr. Gandhimathi M

Professor, Guide, Rani
Meyyammai College of
Nursing, Annamalai
University, Chidambaram,
Tamil Nadu, India

Dr. Kishore J

Professor cum Director and
Co-guide, Head of the
Department, Department of
Community Medicine,
Vardhaman Mahavir Medical
College & Safdarjung Hospital,
New Delhi, India

Corresponding Author:

Indumathy V

Ph.D. Scholar, Rani
Meyyammai College of
Nursing, Annamalai
University, Chidambaram,
Tamil Nadu, India

A Study to assess the prevalence of respiratory morbidity among petrol filling station employees in New Delhi, India

Indumathy V, Dr. Gandhimathi M and Dr. Kishore J

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Abstract

Good quality natural environment provides basic needs, in terms of clean air and water, fertile land for food production, and energy and material inputs for production. Human health and well-being are intimately linked to the state of the environment. Though several types of environments exist, it is the physical environment which plays an important bearing on health. Occupational environment plays a major role on the health of those exposed to pollutants. The objectives of the study were to: (1) assess the prevalence of respiratory morbidity among petrol filling station employees (2) determine the association between respiratory morbidity among employees with selected demographic and occupational variables. The study was conducted among 40 petrol filling station employees at New Delhi. The study revealed significant association between phlegm with locality ($p < 0.05$), breathlessness with age in years ($p < 0.001$), chest illness with age in years, employment status, exposure to type of pollutant and number of working days per week ($p < 0.05$). The study found adverse effects of workplace exposures on respiratory health and development of respiratory morbidity symptoms among petrol filling station employees.

Keywords: Respiratory morbidity, prevalence, petrol filling station employee

Introduction

Health is not something that one possesses as a commodity, but connotes rather a way of functioning within one's environment (Work, recreation and living). The work environment constitutes an important part of man's total environment, so health to a large extent is affected by work conditions. Though several types of environments exist, it is the physical environment which plays an important bearing on health.

Environmental pollution is a growing problem to mankind. The problem is pertinent in the urban context as with the present trends half the world's population is living in urban settlements. It is estimated that the problem is most acute in developing countries, where millions suffer and die from respiratory diseases caused by indoor or outdoor pollution. Hence health of urban population deserves urgent attention.

Occupational environment plays a major role on the health of those exposed to pollutants. The health hazards get more severe when the duration of exposure increases. This fact is more important in case of traffic cops or enforcers, petrol filling station workers, taxi drivers etc.

Rapid urbanization, increasing use of automobiles and industrial activities give rise to urban air pollution dominated by oxides of Sulphur (Sox), nitrogen (NOx), carbon (Cox), volatile organic compounds (VOCs) and suspended particulate matter (SPM) in all cities of the world. (Chawla and Lavanya 2008). In urban areas certain occupations like petrol filling station workers, vehicle repairing and servicing are associated with exposure to fumes, vapors, gases, exhausts, dusts and SPM. Vehicular pollution is an important contributor to air pollution in Delhi.

According to the Department of Transport, Government of National Capital Territory of Delhi (2019) [5], total vehicle count estimated at more than 3.4 million, reaching higher at a growth rate of 7% per annum. Air pollution in urban area has health effects on the public as well as on workers specially those working in traffic congested environment, where they are regularly exposed such job-related exposures. Vehicular exhaust is the worst type of exhaust as it is emitted at the ground near the breathing level, and it gives maximum human exposure (Ahmad *et al.*, 2017) [1].

Respiratory health problems like reduction in pulmonary functions due to such working exposures are relatively unexplored area of research (Aprajita and Sharma, 2011)^[2]. Respiratory disorders range from deterioration of pulmonary function, dryness of the throat, coughing, tightness in the chest, wheezing and breathlessness to chronic bronchitis. Workers who are regularly exposed to fuels, gasoline oils, solvents report 30-40% incidence of pulmonary health related problems. (Brosseau *et al.*, 2014)^[4]. Exposure to petroleum products among certain occupations for a long time significantly affects respiratory system and the symptoms such as breathless ness, chronic cough and wheezing can be observed. Moreover, if the exposure concentration is higher there is a chance of marked systemic pulmonary inflammatory occur. (Rosa Faner, Nuria Gonzalez *et al.* 2014)^[8].

The inhaled air contains pollutants that adversely affect the respiratory health of the workers. The fuel exhausts release the particles which are extremely fine having large surface area and can transport high rate of toxic compounds including hydrocarbons on their surface. These fine particles are capable of longer retention and have a probability to deposit in greater number and deep into the lungs. (Rosa Faner, Nuria Gonzalez *et al.* 2014)^[8]. COx (Oxides of carbon) and SOx (oxides of Sulphur) can cause multitude adverse effects on a respiratory system like tissue hypoxia, reversible decrease in functions of lung, constriction of the bronchioles, severe airway obstruction, pulmonary oedema and hypoxemia, while NO₂ (Nitrogen Dioxide) impairs the immune defense mechanism of lungs.

Human lung functionality is evaluated by pulmonary function testing (PFT) and the main type of PFT is spirometry. Spirometry is performed by spirometer; This device employs non-invasive diagnostic techniques for testing and screening of lung functions. These are relatively cheaper and can be performed within minutes. As lung

diseases like bronchitis, emphysema and asthma are prevailing and common, spirometry has become an indispensable technique in epidemiology, clinical and occupational settings as well as in industrial Medicine (Harbison, 2013)^[6].

Hence the early recognition of respiratory illness and preventive measures of susceptible employees with respiratory morbidity need to adapt health promoting behavior in the work place before the chronic impairment develops will prove to be beneficial.

Aim and Objectives

The present study is aimed to assess the occupational exposure and respiratory morbidity among petrol filling station employees in selected Petrol filling stations at New Delhi. The objectives of the study were to: (1) assess the prevalence of respiratory morbidity among petrol filling station employees (2) determine the association between respiratory illness among employees with selected demographic and occupational variables.

Methods and Materials

A total of 40 petrol filling station employees were selected from petrol filling stations at New Delhi. The study was conducted during November 2020. Purposive sampling technique was used to select the subjects. After getting approval from Vardhman Mahavir Medical College Institutional Ethical committee, researcher enrolled the subject after getting their informed consent and data were collected from the samples. Demographic data, Occupational data, Health history and Medical Council Research Questionnaire (MRCQ; developed by Medical Research Council, The United Kingdom, 1986) were administered to assess their respiratory morbidity. The reliability of the tool was assessed by test re-test method and it was found to be feasible (r= 0.90)

Discussion and Results

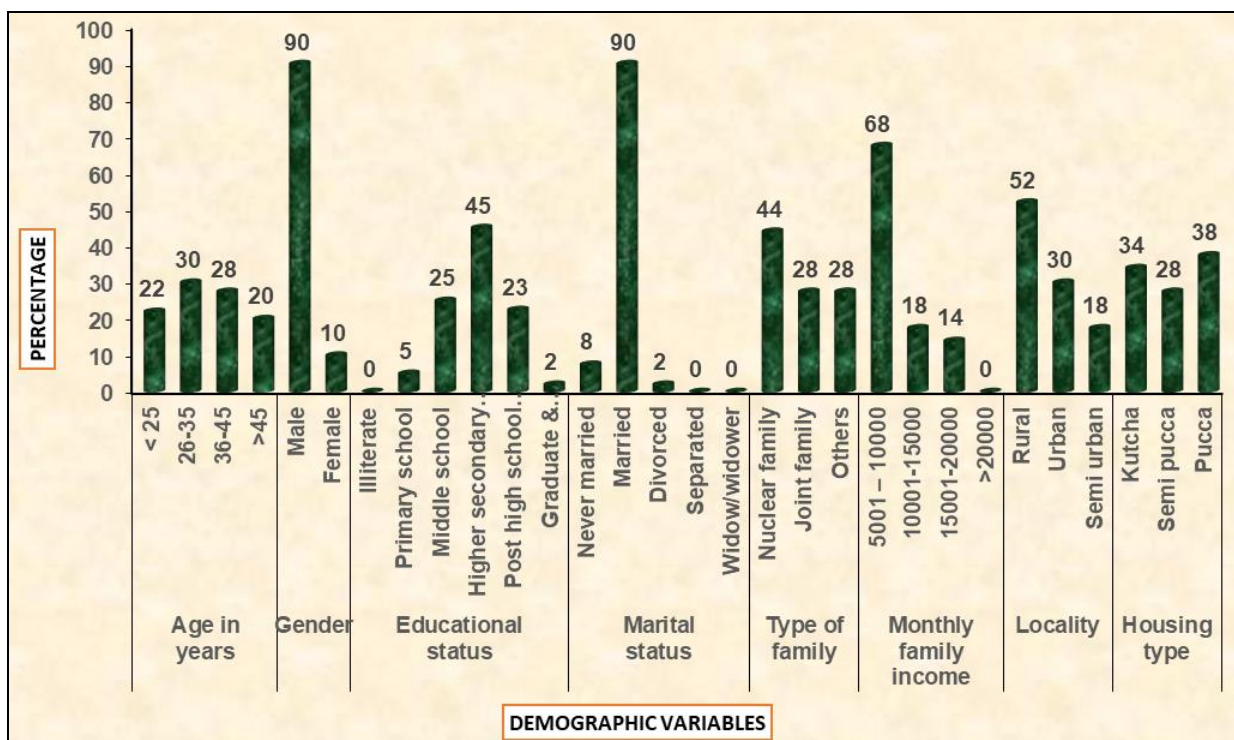


Fig 1: Demographic Variables of employees of petrol filling stations

Figure 1. show the Demographic data of Petrol Filling Station Employees. About 30% of employee belonged to the age group of 26 to 35 years and least, 20% belonged to >45 years of age group. Majority were males (90%) and 45% had higher secondary education. Majority were married

(90%) and 44% were from nuclear family. Regarding monthly income, the majority 68% of employees earned between Rs. 5001-10000, 52% of employees hailed from rural area, and more than half (58%) of the employees lived in pucca house.

Table 1: Frequency and Percentage Distribution of Occupational Variables among Employees of Petrol Filling Stations. N=40

S. No	Variables	Sub variables	Frequency	Percentage
1.	Employment status	Permanent	17	42
		Temporary	23	58
2.	Occupational category	Unskilled	11	28
		Semi-skilled	10	25
		Skilled	19	47
3.	Type of pollutant Exposure	Smoke	12	30
		Dust	11	28
		Chemicals	4	10
		All the above	13	32
4.	Duration of Exposure	<1 year	12	30
		1-2 years	12	30
		>2 years	16	40
5.	Type of work	Managerial	3	8
		Clerical	7	18
		Attendant	30	74
6.	Number of working days per week	<5 days	5	12
		5 -7 days	32	88
7.	Average working hours per day	8 hours	32	80
		12 hours	8	20
8.	Total hours of exposure per week	48 hours	32	80
		60 hours	8	20

Table 1. Shows the Occupational Variables of Petrol Filling Station employees. About 58% of them were temporary employees and highest, 47% were skilled workers. The type of pollutant exposure shows that 32% had exposure to smoke, dust and chemicals whereas, 30% had exposure to only smoke, 28% had dust exposure, and 10% had chemical

exposure. Highest, 40% of employees had more than 2 years of exposure. Regarding type of work majority, 74% were service station attendants and least (8%) were managers. Highest percentage (88%) of employees works more than 5 days per week. Similarly, highest (80%) of employees work 8 hours per day and 48 hours per week.

Table 2: Prevalence of Respiratory Morbidity among Employees of Petrol Filling Stations. N=40

Sl. No	Category	Variables	Yes		No	
			f	%	f	%
1	Cough	Usually coughs, first in the morning (winter)	8	20	32	80
2		Usually coughs during the day or at night (winter)	24	60	16	40
3		If yes to 1 or 2	N=24			
4	Phlegm	Coughs on most days for as much as three months each year	15	62	9	38
5		Usually bring up any phlegm from your chest in the morning (winter)	9	22	31	78
6		Usually bring up phlegm from your chest during the day or at night (winter)	25	63	15	37
7	Periods of cough and phlegm	If yes to 4 or 5	N=25			
7b		Bring up phlegm on most days for as much as three months each year	6	24	19	76
8a		Past three years had a period of increased cough and phlegm lasting for three weeks or more	4	10	36	90
8b	Breathlessness	If yes	N=4			
8c		Had more than one such period	3	75	1	25
9		Troubled by shortness of breath when hurrying on level ground or walking up a slight hill/ stairs	3	8	37	92
10.a	Wheezing	If yes	N=3			
10.b		Shortness of breath walking with other people of your own age on level ground	0	0	3	100
11		If yes	N=0			
12.a	Chest Illness	Have to stop for breath when walking at your own pace on ground level	-	-	-	-
12.b		Had attacks of wheezing or whistling in your chest at any time in the last 12 months	40	100	0	0
12.c		Ever had attacks of shortness of breath with wheezing	2	5	38	95
		If yes	N=40			
		Breathing absolutely normal between attacks	0	0	40	100
		At any time in the last 12 months been woken at night by an attack of shortness of breath	1	2	39	98
		Past three years had any chest illness which has kept you from your usual activities for as much as a week	12	30	28	70
		Bring up more phlegm than usual in any of these illnesses	35	88	5	12
		If yes	N=35			

		Had more than one illness like this in the past three years	0	0	35	100
13.a	Past Illness	Had a chest illness before An injury or operation affecting your chest	0	0	40	100
13.b		Heart trouble	0	0	40	100
13.c		Bronchitis	0	0	40	100
13.d		Pneumonia	7	18	33	82
13.e		Bronchial Asthma	2	5	38	95
13.f		Other chest trouble	0	0	40	100
14	Tobacco Smoking	Smoking habit (YES IF PRESENT)	3	8	37	92
14.a		If No	N=37			
		Ever smoked more than one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as a year	26	70	11	30
15			If YES to both parts of 14	N=29		
		Smoke inhalation	3	10	26	90

Table 2 shows the prevalence of respiratory morbidity among employees of petrol filling stations. Only 20% reported “cough in the morning during winter” and 60% reported “cough during the day or at night in the winter” and among them majority 62% “cough on most days and for as much as three months each year”. Regarding phlegm, 22% of employees “bring up phlegm from chest first thing in morning during winter”, and highest 63% expressed “usually bring up any phlegm from chest during the day or at night in the winter” and only 24% “bring up phlegm like this on most days for as much as three months each year”. However, least number of employees (10%) had a period of increased cough and phlegm lasting for three weeks or more in the past three years. About 8% of employees expressed to be “troubled by shortness of breath when hurrying on level ground or walking up a slight hill” but none among them

had “shortness of breath walking with other people of your own age on level ground”. All of them had reported “attacks of wheezing or whistling in chest at any time in the last 12 months “and a few 5% of employees had “attacks of shortness of breath with wheezing”. Regarding chest illness, 30% of employees had “chest illness which kept them from usual activities for as much as a week during the past three years” and 88% reported “bringing up more phlegm than usual”. Surprisingly, none of them had more than one illness like this in the past three years. Regarding past illness, only 18% had pneumonia and 5% had bronchial asthma. With regard to tobacco smoking, least, i.e., 8% were current smokers and among the non-smokers 70% expressed yes to “ever smoked as much as one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as a year” and 10% of employees reported inhalation of smoke.

Table 3: Association between respiratory morbidity with selected Demographic and Occupational Variables N=40

S. No	Variables	Respiratory Morbidity		Chi-square (x2) value	df	p- value
1	Demographic Variable	Breathlessness		12.973	3	0.005*** S
	Age in years	No	Yes			
	18-25	09	00			
	26-35	12	00			
	36-45	11	00			
	Above 45	05	03			
2	Demographic Variable	Phlegm		6.889	2	0.032* S
	Locality	No	Yes			
	Rural	19	02			
	Urban	09	03			
	Semi Urban	03	04			
3	Occupational Variable	Chest illness		4.097	1	0.043* S
	Employment status	No	Yes			
	Permanent	09	08			
	Temporary	19	04			
4	Occupational Variable	Chest illness		11.459	3	0.009** S
	Exposure to type of pollutant	No	Yes			
	Smoke	05	07			
	Dust	11	00			
	Chemicals	04	00			
	All of the above	08	05			
5	Occupational Variable	Chest illness		5.986	2	0.050* S
	Number of Working Days	No	Yes			
	<5 days	03	02			
	5-7 days	25	10			

S – Significant

*Significant at $p < 0.05$ level

**Significant at $p < 0.01$ level

***Significant at $p < 0.001$ level

Table 3. (Serial No. 1 & 2) revealed that there was a significant association between respiratory morbidity with selected Demographic and Occupational variable. There was

a significant association of breathlessness with age (in years) of the employees at $p < 0.001$ and phlegm with the demographic variable locality (urban locality) at $p < 0.05$

level. There was no significant association with gender, educational status, monthly income, marital status, housing type and type of family with respiratory morbidities such as cough, wheezing and chest illness.

Table 3 (Serial No. 3, 4 & 5) shows that only chest illness had a significant association with occupational variables like employment status at $p < 0.05$ level, exposure to type of pollutant at $p < 0.01$ level, and number of working days per week at the level of $p < 0.05$ level. There was no significant association found between other occupational variable such as occupational category, total hours of exposure, type of work, working hours and source of health information. The study found adverse effects of workplace exposure on respiratory health and development of respiratory morbidity like breathlessness, chest illness and phlegm were predominant among petrol filling station employees.

Conclusion

The research study highlighted adverse effects of workplace exposures on respiratory health and impairment of the pulmonary functions among petrol filling station employees. From the present study, it is concluded that the exposed workers are highly vulnerable for developing respiratory health symptoms and the highest reported symptoms were chest tightness.

The studied petrol filling station employees are found to be vulnerable occupational groups due to deficiency of resources, unsafe working conditions, lack of education on lung health and lack of regular monitoring and inspections, unaware of use of personal protective equipment to safe guard them. Interventional plans like education awareness, use of personal protective equipment need to be advocated for the workers.

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