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Assessment of pulmonary function test among employees of petrol filling stations

Indumathy V[1*], Dr. Gandhimathi M[2] and Dr. Kishore J[3]

[1]Ph.D Scholar, Rani Meyyammai College of Nursing, Annamalai University, Chidambaram, Tamil Nadu, India
[2]Professor & Guide, Rani Meyyammai College of Nursing, Annamalai University, Chidambaram, Tamil Nadu, India
[3]Professor cum Director & Co-guide, Head of the Department, Community Medicine, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi, India

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Abstract
In the current scenario, the health-related issues at the workplace are steadily increasing. Amongst various factors, one of the reasons for the atmospheric pollution to be raised, is an increase in the number of vehicles, as there is a marked trend towards urbanization. Health effects of occupational exposure to gasoline and air pollution from vehicular sources are relatively unexplored among petrol filling station workers. The objectives of the present study were to (1) assess the vital parameters among employees of petrol filling stations. (2) assess the pulmonary function test among employees of petrol filling stations. A total of 40 employees from selected petrol filling stations at New Delhi have participated in the study. 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 of employees (88%) worked for more than 5 days in a week. Similarly, highest percentage employees (80%) worked 8hours in a day and 48 hours per week. The results revealed normal vital organ function and longer the occupational exposure, the higher the incidence of respiratory morbidity among the employees. The reasons behind this increase are not using personal protective equipment and occupational exposure.

Keywords: Pulmonary function test, Petrol filling station employees, pulmonary function, occupational exposure

Introduction

Occupational health is an area of work in public health to promote and maintain highest degree of physical, mental and social well-being of workers in all occupations. Occupational health is a field of healthcare that is concerned with the relation between work and health. It aims to protect and improve the health and welfare of employees in their respective workplaces.

Occupational health seeks to promote and maintain the health and wellbeing of employees, with the aim of ensuring a positive relationship between an employee's work and health. Having access to specialist occupational health practitioners is key to unlocking the benefits for employees and organisations.

If global health entails a wider approach of public health at the international level, occupational global health focuses on prevention of illnesses and injuries in the workplace under a worldwide perspective. The global implications of occupational health and safety (OHS) are directly related to the internationalized dynamics of the global economy. Given the tight connection of global occupational health with global economics, multidisciplinary expertise is needed to understand the links between economic development and the potential effects on the health and safety of workers.

Current challenges in global occupational health

Occupational health and safety should have higher priority on the international agenda, but improvement of OHS infrastructures and systematic preventive approaches in industrializing countries are extremely slow. Although many countries have developed laws and enforcement activities, working conditions for the majority of the world's workers do not meet the minimum standards and guidelines set by the World Health Organization (WHO) and the International Labour Organization (ILO). Occupational health and safety regulations cover only about 10% of the population in developing countries. (WHO 2022) [8]

Only 5% to 10% of workers in developing countries and 20% to 50% of those in industrialized countries have access to adequate occupational health services. (J. LaDou 2013) [4].

The World Health Assembly urges countries to

- develop national policies and action plans and to build institutional capacities on occupational health,
- scale up the coverage with essential interventions for prevention and control of occupational and work-related diseases and injuries and occupational health services

- ensure in collaboration with other relevant national health programmes such as those dealing with communicable and non-communicable diseases, prevention of injuries, health promotion, mental health, environmental health, and health systems development.

According to WHO Overview on Occupational Health (2020)

The comprehensive global assessment provides insights on the health impacts that could be avoided through healthier and safer workplaces. It is estimated that 2.1% of all deaths and 2.7% of the disease burden worldwide can be attributed to quantified occupational risks. These and the effects from many more unquantified risks are outlined.

Noncommunicable diseases contribute 70% to the total disease burden from occupational risks, with chronic pulmonary disease and cancers causing the highest work-related death toll and disease burden. Workers in low- and middle-income countries bear the largest share of deaths and disability from workplace exposures.

The report also clearly identifies that prevention strategies are available to avoid a significant percentage of work-related deaths and of the disease burden. Implementing such strategies is important in an effort to attain the Sustainable Development Goals. Targeted action towards healthier and safer workplaces will contribute to sustainably improving and protecting the lives of millions around the world.

Spirometry in Occupational Health

The history of spirometry starts almost 200 years ago with James Hutchinson, who developed the spirometer "with a view of establishing a precise and easy method of detecting disease" (J. Hutchinson 1846) [3].

Spirometry, the most common type of pulmonary function test (PFT), is used to evaluate worker respiratory health in medical surveillance programs and to screen workers for their ability to perform certain tasks. Spirometry, the most frequently performed pulmonary function test (PFT), is the cornerstone of occupational respiratory evaluation programs. In the occupational health setting, spirometry plays a critical role in the primary, secondary, and tertiary prevention of workplace-related lung disease. (Townsend, Mary C. DrPH, 2020) [7].

In occupational health field, spirometry is still widely used to screen workers for their ability to perform certain tasks or efforts, and to evaluate workers' respiratory health in medical surveillance programs. Therefore, spirometry results can play a central role after hiring, in decisions about worker job assignments, in use, choice and efficacy assessment of personal protective equipment (PPE), and also in the assessment of exposure-related health effects. (Townsend, Mary C. DrPH, 2020) [7].

What is more, a recent milestone article reported that occupational exposure is a potential cause of almost all respiratory diseases. In fact, workplace exposures contribute substantially to the burden of multiple chronic respiratory diseases, including asthma (16%), chronic obstructive pulmonary disease (14%), chronic bronchitis (13%), idiopathic pulmonary fibrosis (26%), hypersensitivity pneumonitis (19%), other granulomatous diseases, including sarcoidosis (30%), pulmonary alveolar proteinosis (29%), tuberculosis (2.3% in silica-exposed workers and 1% in healthcare workers), and community-acquired pneumonia in working-age adults (10%) (Blanc PD, Annesi-maesano I, Balmes JR, *et al*. 2019) [1].

Occupational health spirometry testing is an exceptional, non-invasive, and highly effective method of monitoring the lung capacity and wellness of employees. (NDD Medical Technologies 2022). Hence the early recognition of respiratory health by modern devices (Spirometry) is an important task and to follow preventive measures of susceptible workers with respiratory morbidity need to adapt health promoting behavior in the work place before the chronic impairment develops will prove to be beneficial.

Aims and Objectives

The current study was aimed to find the pulmonary functional status of employees working in petrol filling stations. The objectives of the present study were to (1) assess the vital parameters among employees of petrol filling stations (2) assess the pulmonary function test among employees of petrol filling stations at New Delhi.

Material and Methods

A total of 40 petrol filling station employees were selected from petrol filling stations at New Delhi. Institutional Ethical Committee obtained from Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. Purposive sampling technique was used to select the subjects. The study was conducted during November 2020 after obtaining the informed consent from the participant and competent authority approval taken from Director of Hindustan Petroleum Ltd, Bharat Petroleum Ltd and Indian Oil Corporation Ltd. In this study vital parameters were assessed by using pre calibrated Infra-Red Thermometer for temperature, Digital Sphygmomanometer for Blood Pressure, Pulse-oxy meter for oxygen saturation and pulse rate, Spirometry for respiration rate. The lung function parameters were assessed by using pre calibrated Spirometer (SPW10 Portable) to find out the pulmonary function test among petrol filling station employees. The researcher used questionnaire to collect basic socio demographic data and occupational data from the petrol filling station employees. The reliability of the tool was 0.90.

Discussion and Result

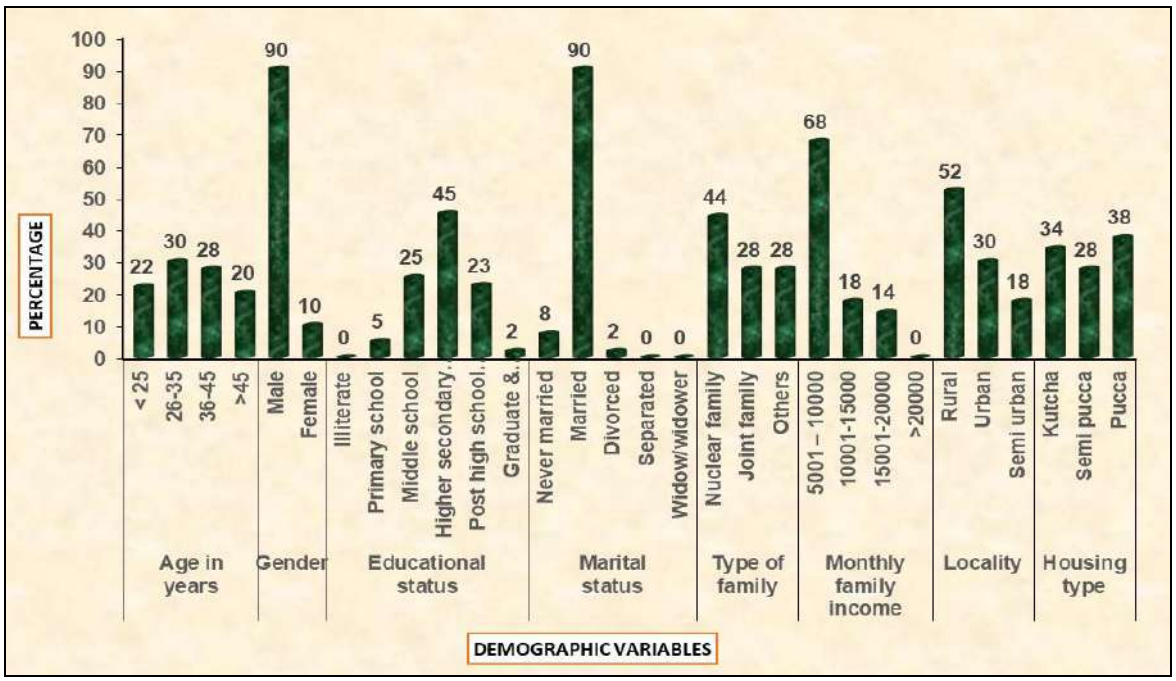

Fig 1: Demographic variables of employees of petrol filling stations

The demographic data shows that highest (30%) of employee belonged to the age group of 26 to 35 years, 28% belonged to 36-45 years of age group and least (20%) belonged to >45 years of age group. Majority (90%) were males and 45% had higher secondary education. Majority 90% were married and 44% were from nuclear family. Regarding monthly income, the majority 68% of employees earned Rs. 5001-10000 and 52% of employees were from rural area, and more than half, 58% of the employees lived in pucca house.

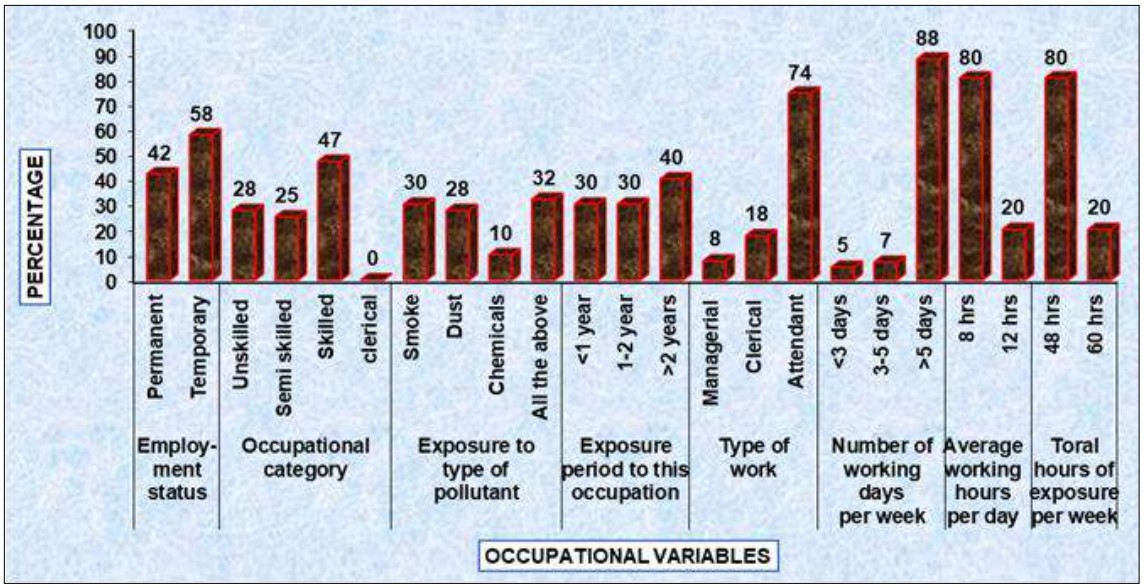

Fig 2: Occupational variables of employees of petrol filling stations

Occupational variables illustrate that, 58% of them were temporary employees and 47% were skilled workers. Regarding the type of pollutant exposure, 32% had exposure to smoke, dust and chemicals whereas, 30% had exposure to only smoke, 28% had dust exposure, and 10% had chemical exposure. About 40% of employees had more than 2 years of exposure. Regarding type of work, majority (74%) were service station attendant and least 8% were managers. Highest (88%) of employees work for more than 5 days in a week. Similarly, majority (80%) of employees work 8 hours in a day and 48 hours per week (Figure:1).

Table 1: Mean vital parameters among employees of petrol filling stations N=40

Assessment	Vital Parameters		
	Mean	SD	Reference Values
Pulse rate	83.15	9.571	60 – 100 beats per minute
Respiratory rate	16.25	2.404	12 – 16 breaths per minute
Systolic BP	128.47	14.107	90mmHg to 120mmHg
Diastolic BP	84.52	9.860	60mmHg to 80mmHg
SPO_2	96.32	2.673	95% - 100%

Table 1. Shows the mean value of vital parameters with the reference range values. The mean value of vital parameters among employees of petrol filling station showed an increased values when compared to normal reference level. The comparison concludes that majority of the employees had an abnormal level of vital parameters. Hence there is an urgent need for health interventions among petrol filling station employees, to bring their vital parameters to normal functional levels.

Table 2: Mean pulmonary function parameters among employees of petrol filling stations N=40

Pulmonary Function Parameters	Comparison of mean value with Reference Values			
	Mean	SD	Reference Values	
FVC (L)	1.565	0.765	Male	4.75 to 5.5 litres
	1.245		Female	3.25 to 3.75 litres
FEV1 (L)	2.344	0.853	Male	3.5 to 4.5 litres
	1.894		Female	2.5 to 3.25 litres
FEV1/ FVC (%)	50%	0.215	$\leq$70%	
PEFR (L/S)	500L	92.474	Male	450 to 550 L
	296L		Female	320 to 470 L

Table 2 shows the pulmonary function parameters of petrol filling station employees. In comparison of mean spirometry value with reference Spirometry value, indicates that all pulmonary function parameters were abnormal. The average mean value of pulmonary function parameter was in low range compared to the normal reference range. The table indicates that majority of the employees had abnormal pulmonary function parameters, hence they need some kind of health care intervention.

Conclusion

Most of the petrol filling station employees had exposure to dust, fumes and chemicals. Hence early recognition of respiratory morbidity is important to take necessary steps to prevent respiratory morbidity in vulnerable groups, who are exposed to the risk-full environment. Long term exposure to the fumes causes severe respiratory morbidity. The findings revealed that Spirometry can be widely used to find out the pulmonary functional status of the employees working in petrol filling stations. Spirometry is a boon in occupational health in terms of cost effectiveness and easy to use and feasible means to identify respiratory morbidity in large scale studies.

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