Introduction

Many factors can affect people’s health negatively, one of them is occupational environment. It is a well-known fact that polluted air puts the humans’ life in danger and may lead to respiratory and non-respiratory diseases (Batta & Dhir, 2015). Air pollution is an increasing hazard due to the rapidly increasing number of motor vehicles. Working in gas stations increases the exposure to the organic and non-organic compounds that are found in the gasoline (Dube et al., 2013). Petroleum is a combination of hydrocarbons and benzene and toluene which are the major monocyclic hydrocarbons in petrol. They are highly volatile and the only route for exposure is inhalation of vapors (Barman et al., 2016). A worldwide concern is caused by occupational and environmental exposure to gasoline products and poses a real threat to human health. To detect the diseases that affect the respiratory system and respiratory functions in subjects working in gas stations Spirometry and Fractional Exhaled Nitric Oxide (FeNO) are important and have not been collectively and extensively studied. The aim of the study is to determine lung functions and Fractional Exhaled Nitric Oxide (FeNO) among gas station workers.

The study was conducted in the Respiratory Therapy Department at Inaya Medical College, Riyadh, Saudi Arabia. The IRB of the Scientific Research Unit (SRU) of the college granted ethical approval for the study. All participants signed a written informed consent. Study participants consisted of 100 adult males in the age group of 20-55 years-old (50 gas station workers and 50 control subjects). Gas station workers were working at different petrol pumps as petrol filling employees for more than a year with at least 10 hours of work daily to be considered in the study group. The mean duration of exposure in the gas station workers was 5.3 years. Each subject from both groups was interviewed with a detailed questionnaire regarding their occupation and personal habits. A comprehensive history and clinical exam was also conducted for all study participants.

Subjects were adjusted for age, weight, height, ethnicity and status without history of any respiratory illness. Selection of control group was done in a similar way. They consisted of workers in supermarkets, colleges and hotels.

Exclusion criteria

Anemia, blood diseases, diabetes mellitus, chronic obstructive pulmonary diseases, bronchial asthma, malignancy and drug addiction cases were excluded from the study. Smoking or shisha was a condition for exclusion from the study. Each of the subjects’ clinical history and investigation was reviewed to decide whether to include or exclude from the research study.

Spirometry:

The Pulmonary function tests included: Forced Vital Capacity (FVC), Forced Expiratory Volume in the first second (FEV1), FEV1/FVC (%), Forced Expiratory Flow in 25- 75% (FEF 25-75%) and Forced Expiratory Flow Maximum (FEF Max). Test parameters were collected using an electronic spirometer (Breeze, MedGraphics, USA). The machine was calibrated according to manufacturers’ specification prior to use.

The tests were performed using the standard guidelines outlined by the American Thoracic Society and European Thoracic Society with subjects in sitting position and a nose clip applied to them during the maneuver. Each subject was asked to take full inspiration followed by as much rapid and forceful expiration as possible in the mouthpiece of the Spirometer. Three consecutive readings were taken and the best reading was considered for statistical analysis.

Fractional exhaled Nitric Oxide (FeNO):

The Fractional Exhaled Nitric Oxide [FeNO] was determined using NObreath® (BedFont, UK). The FeNO device was pre-calibrated as per manufacturer’s standards prior to every use. The established procedures in performing FeNO test was based on the American Thoracic Society/ERS Standardization procedure for FENO and the accuracy of the device is 45ppb of measured value ≤50ppb and/or ±10% of measured value <50ppb.

Statistical analysis:

The data were computed into the computer, analyzed using Microsoft excel. The mean of pulmonary function tests are presented as mean±SEM for each of the parameters. Unpaired students t-test (parametric test) was used to test differences in means between variables. The level of significance was considered at p<0.05.

In conclusion, gas station workers have shown significant reduction in their lung volumes and a significant increase in FeNO compared to controls, presumably due to the prolonged exposure to the gasoline fumes. The reduction in lung functions and the increase in inflammatory biomarker detected in these workers provides an early evidence that working in petrol gas stations may result in a negative impact on lung function.