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EFFCT OF AIR POLLUTION ON RESPIRATORY AND PEAK EXPIRATORY FLOW RATE OF SEMI-URBAN, URBAN AND RURAL PEOPLE OF THANJAVURE DISTRICT

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ABSTRACT

Due to human life style modifications and their requirements, the number of industries, power plants, vehicles and burning of fossil fuels and large amount of solid waste materials are increased and introduce various dangerous gaseous and minute particles into the atmosphere. The indication of these dangerous diseases is increased Respiratory Rate (RR) and decreased Peak Expiratory Flow Rate (PEFR) of affected individuals. So, the study was made to examine RR and PEFR of about 200 male and female samples from semi-urban, urban and rural areas of thanjavur District. Among 200 samples semi-urban was 48.5%, urban showed 38.5% and 13% was rural. In the present study normal samples were observed as 92 (46%). The mildly affected samples were denoted as 26(13%).The moderate samples were showed 41(20.5%).The severe and very severe samples are 23(11.5%),18(9%) respectively. The semi-urban area showed 44(47.8%) normal, 9(34.6%) mild, 23(56.1%) moderate, 14 (60.9%) severe and 7(38.9%) very severe studied samples. The urban area were noted as 38(41.3%) normal samples, 14 (53.8%) mild samples, 13(31.7%) moderate samples, 6(26.1%),6(33.3%) severe and very severe samples. The rural area was recorded as 10(10.9%) normal studied samples, 3(11.5%),5(12.2%),3(13%) and 5(27.8%) mild, moderate, severe and very severe samples respectively. This study showed the more number of altered respiratory and peak expiratory flows rate samples were belonged semi-urban and urban places of study area. Hence, the present study suggested that the environment should be conserved by us for lead a healthy or near healthy life.

Keywords: Air pollution, Respiratory Rate, Peak Expiratory Flow Rate, Respiratory function.

INTRODUCTION

Air is a necessary resource for every human being because one cannot live without air even for five minutes, clean air is obligatory to keep a body healthy and happy. Now a day, the atmosphere air surrounding the human habitation is highly polluted due to the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damage the natural environment and the atmosphere. The information on meteorological pollution, caused by CO, NO, NO2, SO2, O3 and particulate matter (PM10) is very important due to their harmful effects on human health [1, 2]. Urbanization with its high levels of vehicle emissions and westernized lifestyles parallels the increase in respiratory allergy in most industrialized countries.The people who live in urban and semi- urban areas tend to be more affected by the respiratory allergic disease than those of rural areas. The World Health Organization (WHO) estimates that inhalation of PM is responsible for 5, 00,000 excess deaths each year worldwide. As, very small particles penetrate further into the lungs than the large particles and they are more strongly associated with adverse health effects. The concentration of gaseous, pollutants, odors, and suspended particulate matter (SPM) such as dust, fumes, mist and smoke near the semi-urban and urban areas causes severe pollution to the surroundings.Diesel engine emissions contributedisproportionately to the very small particle

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fraction of urban air pollution. Outdoor particulate air pollution was estimated to be responsible for about 0.8 million premature deaths [3]. Numerous epidemiological studies have examined the effect of air pollution on mortality hospital admissions, and emergency hospital visits for cardiovascular diseases, respiratory diseases and cardiopulmonary diseases [4-7]. Airborne particulate matter (PM) is an environmental trigger of asthma and has been linked to adverse health impacts including aggravation of respiratory conditions and premature death [8, 9].

An association between increased levels of particulate air pollution and a decreased lung function growth has been reported in cross-sectional studies in the USA and Canada. Although air pollution levels in Thanjavur district have increased significantly in the past few years due to aggressive increase of vehicles, burning of fossil fuels and industry, many people in this area still breathe the worst air in the district. Hence the present study, an attempt has been made to determine their respiratory function by examine the respiratory rate and (RR) peak expiratory flow rate (PEFR) of studied samples of in and around the Thanjavur District.

MATRIALS AND METHODS

Study Area

Thanjavur District is one of the oldest cultural heritage districts in Tamil Nadu. It covers a total area of 3,710 square miles (9,600 Km²). It is called the rice bowl of Tamil Nadu because of the high level of paddy cultivation. Every year, the density of motor vehicles and small scale industries in Thanjavur District increase tremendously. So the atmosphere of study area has worsened by year to year. The male and female about 200 samples were drawn randomly and examine them for over a six month period from various communities in semi-urban, urban and rural areas of Thanjavur district, Tamil Nadu.

Questionnaire Design

The questionnaire included fixed responses as well as free response questions. There were two versions of the questionnaire the first consisted of questions related to their demographic background and the remaining three questions mainly focused on the samples response about their own health status.

DATA COLLECTION METHOD

Respiratory Rate (RR)

Before data collection for the research the researcher approached the samples and explained the aim and purpose of this study to make the samples feel free and relaxed. The intake of oxygen and releasing carbon dioxide is probably the most basic but a pivotal respiratory system function. It is calculated by counting the number of times a person's chest expands and contracts in one minute. This rate can range from a low of 12 breathe per minute in resting adults. If this rate is above 20 in resting period that indicates having defects in his respiratory function. The studied samples RR and PEFR value were predicted with standard value.

Peak Expiratory Flow Rate (PEFR)

The peak expiratory flow meter records peak flow or peak expiratory flow rate (PEFR). The fastest rate at which air can move through the airways during a forced expiratory starting with fully inflated lungs. Measurement of PEFR is typically used for asthma diagnosis by comparing a patients PEFR with his/her normal personal best PEFR or his/her predicted PEFR value. The decreased PEFR than normal may be a warning sign of asthma. The value was recorded nearest to liter/minute.

The variations in health states of the samples in relation to pollution intensities in the surrounding environment and the various pollution sources such as vehicles number, transport, industries and smoke by burning of wood and dusts in the study site were analyzed. Three satisfactory readings were taken and the highest among the three was accepted.

Table 1. **Standard RR value and PEFR value for healthy and lung affected human beings**

Type	RR/min	PEER/min
Normal	12-18	Above 80
Affected	Above 18	Below 80
Mild	-	80-69
Moderate	-	69-50
Severe	-	49-35
Very Severe	-	>35

Table 2. Number and percentage of male and female Study samples from semi-urban, urban and rural studied areas of Thanjavur District

Sampling places	Male% (No)	Female% (No)	Total% (No)
Semi-urban	49.3(74)	46(23)	48.5(97)
Urban	39.3(59)	36(18)	38.5(77)
Rural	11.3(17)	18(09)	13(26)
Total	150	50	200

Table 3. Number and percentage of lungs function status among the Study samples from semi-urban, urban and rural studied areas of Thanjavur District

Disease Severity	Study Area			Total
	Semi-urban % (No)	Urban % (No)	Rural% (No)	
Normal	47.8(44)	41.3(38)	10.9(10)	46(92)
Mild	34.6(9)	53.8(14)	11.5(3)	13(26)
Moderate	56.1(23)	31.7(13)	12.2(5)	20.5(41)
Severe	60.9(14)	26.1(6)	13(3)	11.5(23)
Very Severe	38.9(7)	33.3(6)	27.8(5)	9(81)

Plate 1. Examination of Health status among Road workers

Plate 2. Examination of Peak Expiratory Flow Rate among Road side shop keepers

Plate 3. Examination of Peak Expiratory Flow Rate among the urban women

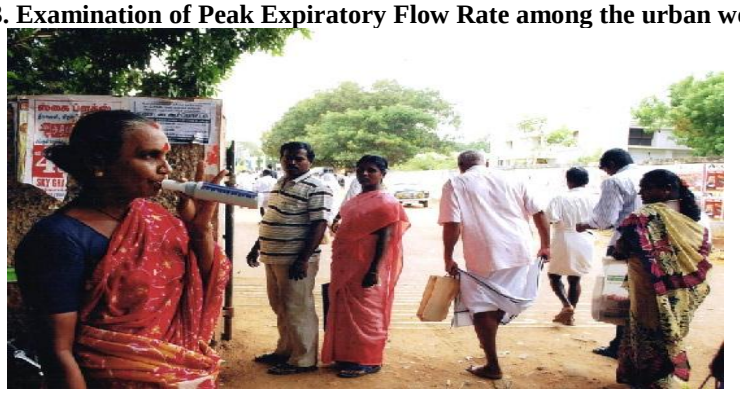


Figure 1. Percentage Studied samples from semi-urban, urban and rural areas of Thanjavur District

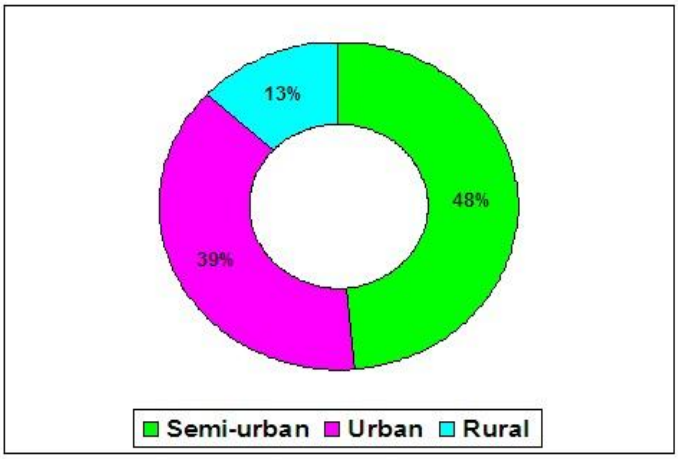
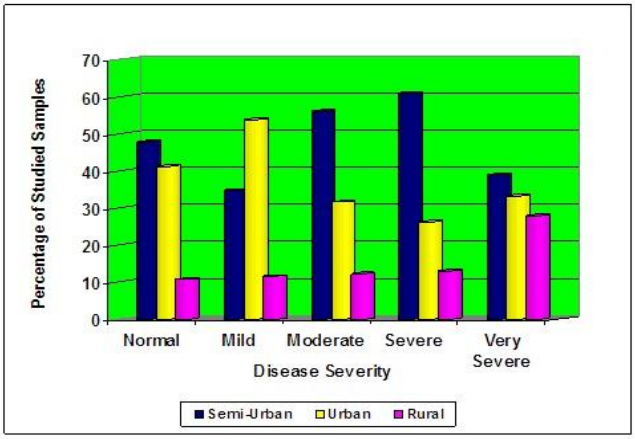


Figure 2. Percentage of normal and severity based altered lungs function samples from semi-urban, urban and rural areas of Thanjavur District.



RESULTS

The number and percentage of studied samples from semi-urban, urban and rural areas of Thanjavur District was given in the Table 2. Among 200 samples semi-urban was 48.5%, urban showed 38.5% and 13% was rural. The RR and PEFR of studied samples were predicted with standard value are given in the Table1 and fig1. On the basis of data observed from studied samples RR and PEFR values, they were classified as normal, mild, moderate, severe and very severe categories and are given in the Table 3 and fig 2. Both semi-urban and urban samples are showed significant difference in their RR and PEFR value than the rural samples. In the present study normal samples were observed as 92(46%). The rest of the studied samples were having altered RR and PEFR values and coming under different disease category, on the basis of the impaired air quality in their residencies and occupational environment. The mildly affected samples were denoted as 26(13%).The moderate samples were showed 41(20.5%). The severe and very severe samples are 23(11.5%),18(9%) respectively.

The semi-urban area showed 44(47.8%) normal, 9(34.6%) mild, 23(56.1%) moderate, 14 (60.9%) severe and 7(38.9%) very severe studied samples. The urban area were noted as 38(41.3%) normal samples, 14 (53.8%) mild samples, 13(31.7%) moderate samples, 6(26.1%), 6(33.3%) severe and very severe samples. The rural area was recorded as 10(10.9%) normal studied samples, 3(11.5%), 5(12.2%), 3(13%) and 5(27.8%) mild, moderate, severe and very severe samples respectively. This study showed the more number of altered respiratory and peak expiratory flow rate samples were belonged semi-urban and urban places of study area.

DISCUSSION

Respiratory health problems and related allergies have increased around the world in recent years. Air pollution is a major blot on our environmental health scorecard in some western countries, it is estimated that car emissions kill twice as many people as car crashes [10]. In both urban Australia and new Zealand the main sources of air pollution are motor vehicle emissions, wood smoke from home heating, and industrial pollution. The environmental air of our studied places also impaired with same emissions. According to Ignatius Ttak Yu et al [11] a researcher entitled “Effect of ambient air pollution on daily mortality rates in Guangzhou, china” to investigate the effects of ambient air pollutants on daily mortality in a relatively stable homogeneous population in Guangzhou, china.

Air pollution effects human health as well as plants and micro-organisms. Higher levels of air pollution in Sao Paulo have been associated with several health outcomes, including low birth weight [12]. Vehicular traffic emissions play an important role in air pollution, they consists of gaseous pollutants like nitric oxides, carbon monoxide, sulphur dioxide, hydrocarbons, fine and coarse particulate matter like diesel soot and airborne particulate bound trace metals and metals [13,14].This finding was highly supported to the present investigation.

Every year, the density of motor vehicles in Thanjavur district increases approximately 12 in number of kilometers. This has lead to traffic congestion and release of many toxic air pollutants into the atmosphere. Particularly, the tremendous increase of two wheelers. The usage of very old and poorly maintained vehicles by people spewing out noxious fumes into the atmosphere and this is the prime factor for increasing the air pollution in the study areas. From the present investigation showed the vehicular emissions is the major cause to increase respiratory impairment among semi- urban and urban area studied samples than rural studied samples.

Dust is a mixture of organic and inorganic particles that, under natural conditions incorporate into the soil, but in the sealed ground surfaces of urban areas, tends to accumulate, creating an extra source of pollution. The dust containing ultra fine particles enter rapidly into the lung tissues and also get entered to other organs of the body via neutral cells from the nose and pharynx to the olfactory bulb of the brain [15, 16].

Yun-chulhong et al [17] conducted a study on “Asian dust Strom and pulmonary function of school children in Seoul” to evaluate how the Asian dust Strom (ADS) affects particulate air pollution and pulmonary function of children. Their PEFR was measured from May 13 to June15 2007. The observed results showed that the ambient concentrations of particulates were significantly associated with decrease of the children PEFR. On the basis of above observation in the present study 108 (54%) of samples have showed decreased PEFR.The adverse effects of ambient particulate pollution on human health have been known since the early 1950s [18].

These findings are having a close associates with data obtained from the sites of semi-urban, urban area of Thanjavur in the present investigation (Table 3). The RR and PEFR of individual have altered who are long time exposures of high level of airborne dust exposure. The traffic police are at a risk, since they are continuously exposed to emissions from vehicles due to the nature of their job [19]. The present investigation showed a significant difference in their RR and PEFR of 41(20.5%) samples who are long time exposures in polluted environment due to their nature of work.

CONCLUSION

Hence the present study suggested that the environment polluted in many ways by our own activities, it has been linked to a number of different health outcomes starting from modest transient changes in the respiratory tract and impaired pulmonary function and continuing to restricted activity reduced performance, visits to the hospital emergency department, admission to hospital and

death. Thus from the above discussion, it is clear that in well developed nations on a per capita basis citizen consume more food, use more pesticides, herbicides, fertilizers, fuel, minerals, cars and other manufactured products of all kinds, all of which in their turn add some pollutants in our environment and cause air pollution.

So we should take steps to avoid the entry of uncounted,unwanted and harmful things to our own surrounding environment.

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