EFFECTS OF INCENSE BURNING EXPOSURE ON PULMONARY FUNCTIONS IN TEMPLE PANDITS.

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ABSTRACT

Aim - To assess the effects of incense burning exposure on pulmonary functions in temple pandits. **Need of study -** Temple pandits are potentially exposed to high concentration of various pollutant emitted from incense burning, Hence the purpose of this study was to assess whether or not there is an excess of adverse health outcomes among temple pandits. As incense burning is a common religious practice but whether exposure to long term heavy incense smoke has effect on lung function is unclear, Hence there was a need for study. Various studies have been done on the populations that is exposed to incense burning in home setting, environmental exposures in young adolescents; and some of the studies are conducted in temples in countries where incense burning is a daily practice, including Taiwan, East Asian and Arabian Countries, but very studies have been conducted in India out of these studies; the result have not been conclusive and is unclear. **Study design -** Observational study. **Procedure -** The study was started by taking ethical approval by the temples trust. Pandits and pujaris were selected on the basis of inclusion & exclusion criteria. Before starting the project, informed consent was taken by the pandits and pujaris Procedure was explained to them. PFT was recorded in sitting position. The best of 3 for each of the pandits was considered & recorded Data analysis and interpretation was done on the basis of obtained results. **Conclusion -** Hence our findings suggest that frequent exposure to incense burning at temples is associated with the decline of lung function in Pandits and Pujaris. The study conclude that there is a decrease in pulmonary function in temple pandits due to incense exposure. Hence Temple Pandits should be provided with breathing exercises to improve their lung efficiency.

Keywords – PFT Software, Pandits

INTRODUCTION

Incense is aromatic biotic material that releases fragrant smoke when burned [10]. Incense burning is a popular cultural and religious practice mostly seen in Asian and Taiwanese countries where Buddhism and Taoism are mainstream religions [8]. Indians adopted incense burning techniques from East Asia and mainly used herbs like cassia, cinnamon, sandalwood, sarsaparilla seeds and cypress etc.[10]. The main method of burning incense in India is the incense sticks or Agarbathi. In India, an estimated 7 million Hindus die each year who are cremated tradionaly on pyre; which also require incense burning [10]. Also approximately 1.5 million frequent visitors visit more than 14500 temples across India and are subject to burn incense inside the temples [12].

Incense burning is found to be the significant sources of large amount of particulate matters (PM), heavy metals, gascon's pollutants and Polycyclic Aromatic Hydrocarbons (PAH) [5].Incense burning is available in various forms and degrees of processing. They are generally classified into two types: [10] Indirect incense burning/ Non- combustible incense burning & Direct/Combustible incense burning.

The following types are commonly encountered, through direct incense burning by usage: [10]

- Coil incense, Cone incense, Sandalwood cored stick

Types of indirect incense burning are: [10]

- Powder incense, Paper incense, Rope incense & Moxa tablets

Due to the nature of its long, slow and incomplete combustion process, this practice produces non – stop smoke. Since burning incense for worshipping deities is a daily religious ritual in India, hence temple pandits are continuously exposed to smoke emitted from incense burning [5]. The WHO reported that burning of incense is a serious public health problem worldwide, previous studies have demonstrated that incense particles cause DNA damage, ROS (reactive O2 species) formation, (Chang Yang et.al., 2003, Ho et.al.,2005;2008); which have been associated with adverse human health effects but whether exposure to incense smoke has effects on lung function is unclear. Hence this article focus on latter.

METHODOLOGY

- Study design : Observational study
- Sampling method : Purposive Sampling
- Study population : Pandits & Pujaris
- Sample size : 60
- Study area : PCMC, Pune

OUTCOME MEASURES

- Pulmonary Function Test:

- FEV1 (forced expiratory volume in 1sec.)
- FVC (forced vital capacity)
- FEV1/FVC (FEV1 as percentage of FVC in %)
- PEFR (peak expiratory flow rate in L/s)
- FEF25-75% (forced expiratory flow rate during 25-75% of expiration

PROCEDURE

The study was started by taking ethical approval by the temples trust. Pandits and pujaris were selected on the basis of inclusion & exclusion criteria. Informed consent was taken by the pandits and pujaris. All the parameters were noted Age, Height, Weight, Hours of exposure per day, Days of exposure per week, Years of Exposure to incense smoke. history of smoking, history of any allergy, Asthma, any respiratory condition and history of any recent abdominal, thoracic, ear or eye surgery were also noted. History of recent symptoms including throat dryness, cough, chest pain, and dyspnea were noted. Procedure was explained to them.

PFT was recorded in sitting position. Pandits and pujaris were seated in a back supported chair. And was asked them to relax their upper body .i.e. shoulder girdle and were asked to hold the mouthpiece tightly in mouth and were instructed to take a deep breath and then exhale forcefully and then inspire again. Same procedure was repeated for three times. The best of 3 for each of the pandits was considered & recorded. According to the American THORACIC Society Criteria the lung function data used in this study includes FVC & FEV, FEV1/FVC, PEFR and FEF25-75%. Data analysis and interpretation was done on the basis of obtained results.

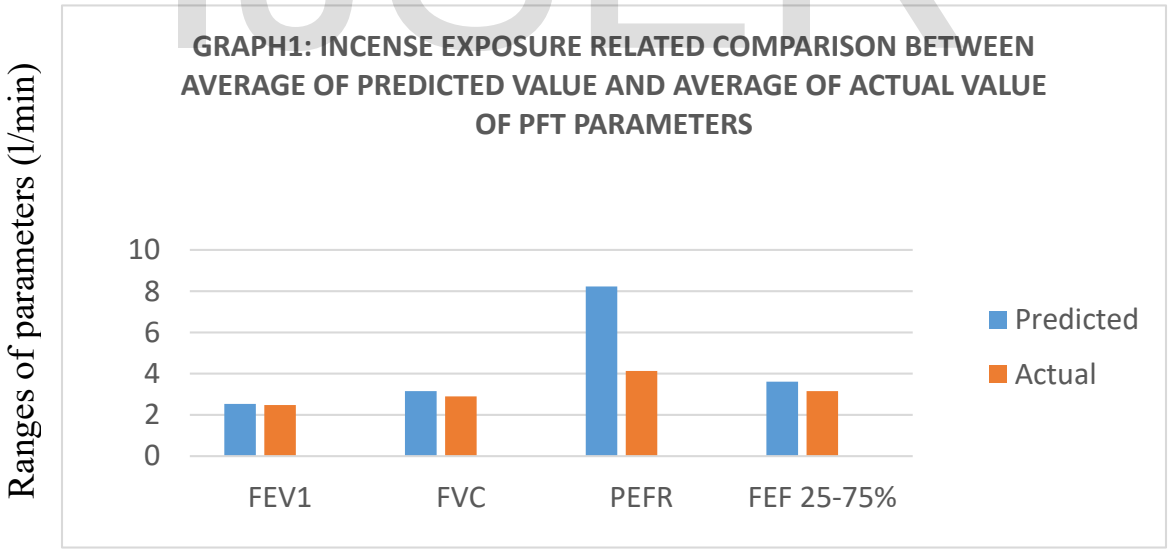
DATA ANALYSIS AND STATISTICAL ANALYSIS

- Data was analyzed using Microsoft Excel
- The discrete variables were measured by using mean and standard deviation and categorized variables were manually analysed.
- Microsoft excel was used to enter the variables and for formulating graphs including bar charts and pie diagrams.

- Incense exposure related comparison between average of predicted value and average of actual value of pulmonary function testing parameters and their standard deviations were done.

PFT Parameters	Predicted value±SD	Actual value±SD
FEV1	2.53 ± 0.37	2.48 ± 0.55
FVC	3.15 ± 0.44	2.90 ± 0.73
PEFR	8.23 ± 0.89	4.13 ± 1.26
FEF 25-75%	3.61 ± 0.57	3.15 ± 1.02

TABLE 1: MEAN ±SD OF PFT PARAMETERS



- As per the graph the average FEV1 of predicted value and the average FEV1 of actual value is nearly similar with respective values -

2.53 ± 0.37 (Predicted value), 2.48 ± 0.55 (Actual value)

- From the comparison between the average FVC of predicted value and the average FVC of the actual value is decreasing with respective values -

3.15 ± 0.44(Predicted value), 2.90 ± 0.73 (Actual value)

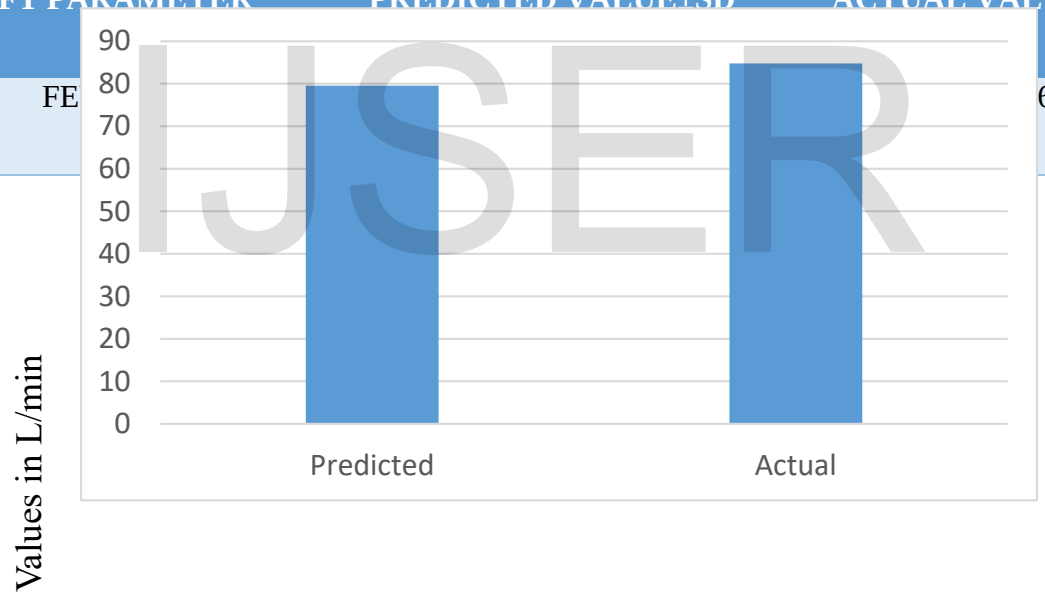
- From the comparison between the average PEFR of predicted value and the average PEFR of the actual value is markedly decreasing with respective values -

8.23 ± 0.89 (Predicted value), 4.13 ± 1.26 (Actual value)

- From the comparison between the average FEF 25-75% of predicted value and the average FEF 25-75% of the actual value is decreasing with respective values-

3.61 ± 0.57 (Predicted value), 3.15 ± 1.02 (Actual value)

PFT PARAMETER	PREDICTED VALUE±SD	ACTUAL VALUE±SD
FE		65



FEV1/FVC ratio

GRAPH2: FEV1/FVC RELATED COMPARISON BETWEEN AVERAGE OF PREDICTED VALUE AND AVERAGE OF ACTUAL VALUE

- As per the graph the average of FEV1/FVC ratio of predicted value compared to average of FEV1/FVC ratio of actual value is increasing with respective values -

79.53 ± 10.77 (Predicted value), 84.77 ± 17.65 (Actual value)

- According to the incense exposure - A total of 60 Pandits were taken out of which 15 Pandits were having FeV1 value less than the normal range, 38 Pandits were having FeV1 value within the normal range, and 7 Pandits were having FeV1 value more than the normal range.

FeV1	% of value received
< 80%	25 %
80% to 120% (N)	63.33%
>120%	11.66%

TABLE 3: % OF FEV1 VALUES RECEIVED

- According to the incense exposure - A total of 60 Pandits were taken out of which 51 Pandits were having FVC value less than the normal range, 6 Pandits were having FVC value within the normal range, and 3 Pandits were having FVC value more than the normal range.

FVC	% of value received
< 3.5 L	85%
3.5 - 4.5 L	10%
> 4.5 L	5%

TABLE 4: % OF FVC VALUES RECEIVED

- According to the incense exposure - A total of 60 Pandits were taken out of which 15 Pandits were having FEV1/FVC ratio less than the normal range, 6 Pandits were having FEV1/FVC ratio within the normal range, 39 Pandits were having FEV1/FVC ratio more than the normal range.

FEV1/FVC	% of value received
< 70 %	25%
70% - 80% (N)	10%
> 80%	65%

TABLE 5: % OF FEV1/FVC VALUE RECEIVED

- According to the incense exposure - A total of 60 Pandits were taken out of which 53 Pandits were having PEFR value less than the normal range, 5 Pandits were having PEFR value within the normal range, and 2 Pandits were having PEFR value more than the normal range.

PEFR	% of value received
< 80%	88.33%
80% - 100% (N)	8.33%
> 100%	3.33%

TABLE 6: % OF PEFR VALUES RECEIVED

DISCUSSION

This study used data of mass screening in pandits without history of smoking, asthma, and/or allergic rhinitis to explore lung function associated with incense burning at temples. The complex mixtures emitted from incense burning include fine and ultrafine particulate matter, carbon monoxide, carbon dioxide, nitrogen oxides, and volatile organic compounds, heavy metals, and other gaseous compounds and long-term exposure to these compounds increased the oxidative stress in the lung which may impair the lung defense and lead to declined lung function. Major chemical components of PM in the incense smoke included PAH and some oxygenated PAH, which may lead to inflammatory response in alveolar epithelial cells.

The study observed that the alveolar cells exposed to incense fumes became necrotic, indicating the injury of the airways. During this study we have found that temple workers are at a greater risk of irritation in the throat and nose. The study have associated incense burning with the risk of developing asthma and the smoke may aggravate wheezing in asthmatics. Daily incense burning may contribute high levels of emitted pollutants leading to elevated oxidative stress, inducing an irritancy response, changing pulmonary structures, and decreased lung function.

In this study, the prevalence of pandits exposed to incense fumes was associated with decreased in PEFR, FEV1/FVC RATIO, FVC and FEV1. The concentration of emitted gases was associated with following symptoms; dry throat, cough, tiredness, dizziness and respiratory infection. Our results also showed that temples situated near to areas with traffic had lead to decrease lung function in pandits. Particles, with diameters below 1 μm, which may be inhaled into alveoli was associated with reduced FEV1 and FVC, which have associated impaired airway and declined lung function. The religious incense burning is generally practiced before breakfast and/or supper in the living room or dining room in houses and mostly in temples which may have a greater exposure to the incense smoke than the secondary smoke at polluted area.

The carcinogenic risk assessment of PAH remains difficult, particularly due to the very high number of these compounds (in the hundreds) present in mixtures to which the pandits may be exposed, as well as due to the possible contemporary presence of other risk factors and to possible synergistic and/or antagonistic effects. Taking physiological and biochemical characteristics into account in exposure can provide true internal doses of chemicals that would correlate more accurately with toxicity in pandits than that developed solely on external exposure. However, combining physiologically based pharmacokinetic aspects with quality data can help us enhance exposure assessment for carcinogenic PAHs in heavy incense burning temple

CONCLUSION

Hence our findings suggest that frequent exposure to incense burning at temples is associated with the decline of lung function in Pandits and Pujaris. The study conclude that there is a decrease in pulmonary function in temple pandits due to incense exposure. Hence Temple Pandits should be provided with breathing exercises to improve their lung efficiency.

LIMITATIONS OF THE STUDY

- Study can be done comparing other occupations compromising respiratory system.
- It can be compared with healthy individuals.

The effects of social status and diet were not considered

RECOMMENDATION AND FUTURE SCOPE OF STUDY

- Pulmonary function testing can be considered as an assessment tool for temple pandits and also could be used for monitoring periodically.
- Study can be done with large sample size.

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