

## SPUTUM CYTOLOGY, PEAK EXPIRATORY FLOW RATE (PEFR) AND RESPIRATORY SYMPTOMS IN PEOPLE WORKING IN PETROL BUNK OF SILICON CITY

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### Abstract

**Background:** Petrol Bunk workers are increased in number due to increase in vehicles in city. They are exposed to exhaust emission from vehicle, road side dust and vapours from gasoline that are prone for respiratory illness. To study the sputum differential cell count, PEFR and respiratory symptoms in subjects working in petrol bunk. **Materials and Methods:** This is a cross sectional study conducted in north Bangalore and Tumkur in total of 136 subjects working for at least 6month & more. Detailed history age, sex, BMI, shift worker details, symptoms, PEFR measured and classified into Red, Green, Yellow zone. Spot sputum collected and differential cell count done. **Result:** The most common symptoms in study population were upper respiratory symptom (Dry throat, post nasal drip and rhinitis) during initial years of working. Cough phlegm was seen in subject working more than 3years. There was progressive decline in PEFR which was more in subjects working for more than 3years. Sputum showed eosinophilia (E>3%) and lymphopenia (L<4%). **Conclusion:** The study concludes that exposure of subjects to petrol vapors along with environmental dust and vehicle exhaust causes increased respiratory illness which worsens if continued to work for more years leading to progressive decline in lung function i.e PEFR. Protective and safety measures during work help to reduce morbidity.

## INTRODUCTION

Respiratory disorders are on rise globally and in India in recent times due to increase in urbanization, industrialization, unpredictable climatic conditions and air pollution.<sup>[1]</sup> The high prevalence of occupational lung disease in different industrial environment in India,<sup>[2]</sup> adds burden to existing respiratory morbidity and mortality in different section of people in community.<sup>[3]</sup> A very large proportion of the workforce is in the unorganized sector (more than 90% vs. less than 10% in the organized sector).<sup>[3]</sup> Workers in Petrol bunk are also categorized into unrecognized sector, people working in petrol bunk are exposed to environmental dust, vehicle fumes and irritant gases present in the petrol and diesel. Due to increase in vehicles in city, there is increase demand for petrol/diesel and more petrol bunk are increased in the city, and more people working in petrol bunk, adding cumulative burden on respiratory health of petrol bunk workers. The emission of pollutants from vehicles can be evaporative emission, exhaust

emission, out of which 20-32% is due to evaporative emission.<sup>[4]</sup> Petrol Pump workers are also exposed to evaporative emission from gasoline pollutants. A detailed study conducted in Italy to determine the benzene content in petrol pump workers has shown high benzene concentration in the breathing zone of petrol station attendants. Petrol pump workers are exposed to benzene in air who works continuously for more than 8hours per day for 5-6 days per week without using personal protection or hand hygiene. There are very few studies in literature which addresses the respiratory symptoms, lung function abnormality in subjects working in petrol pump in our Bangalore city and sputum cellular cytology study to know the pathophysiology of disease process. Hence this study was conducted to know the symptoms, PEFR and sputum differential count in Petrol Pump workers.

### Aims and Objectives

1. To study the sputum differential cell count, PEFR and respiratory symptoms in subjects working in petrol bunk

- To study the relationship between respiratory symptoms and sputum differential cell count, PEFr

## MATERIALS AND METHODS

### Inclusion Criteria

- Subjects Working in Petrol Filling Station for More Than 6month, And Who Doesn't Have Any Respiratory Illness Before Joining Work
- Subjects Aged More Than 18 Years And Willing To Participate In Study After Obtaining Consent

### Exclusion Criteria

- Subject with preexisting lung diseases, cardiac disease
- Patient with co-morbidities like diabetes, hypertension, obesity (BMI >30kg/m<sup>2</sup>), thyroid disorder
- Patient with h/o allergy.

**Study Methodology:** This is a cross sectional observational study conducted in Northern part of Bangalore Urban, Bangalore Rural and part of Tumkur district. The study was conducted between September 2022 to March 2023. Total of 48 petrol bunk were randomly selected, Total of 136 subjects were enrolled for study who were working in petrol bunk for more than 6month and are fulfilling inclusion criteria were enrolled. The institutional ethical committee approval taken, permission of manager of petrol bunk was taken after explaining the study and informed consent was taken of subjects. Details data was recorded like age, sex, BMI, habits, Education, duration of work in petrol bunk, shift workers details, past medical history, history of respiratory illness was collected. Recurrent symptoms were defined as  $\geq 3$  times in past 3month. All subjects were advised to give spot sputum sample in sterile container following infection control protocol,<sup>[5]</sup> procedure of collection was explained to them. Sputum sample was processed by trained pathologist within 2-3hours of collection.<sup>[6]</sup> Sputum was considered adequate for analysis if squamous cell contamination was <20%. Peak expiratory flow meter was checked at spot using Mini wright peak flow meter for asthma, 3 trials was given an average of 3 trials was documented as liter/minute. PEFr was classified into Green, yellow and red zone based on percentage of patient best effort. Estimated PEFr was calculated using complex formula which depends on age, sex, race, height and we used MD calc for calculating,<sup>[7,8]</sup> and classifying patients into Green (>80% of person best), yellow (50-79% of person best), Red (<50% of person best).

All the data of subject were maintained in Excel sheet and statistical analysis done with SPSS software version 16. Mean, standard deviation, chi square test, student t test was used for parametric testing. P<0.05 was considered statistically significant.

## RESULTS

In our study, total of 136 subjects were included, of mean age of 29.9±8.7 years, predominantly were Male (89%) versus female (11%). Most of the patients were Nonsmoker 79.48% and smokers were only 20%. Study population predominantly included day worker (77.2%) versus Shift worker who work at night (22.7%). PEFr of subjects 42% were in red zone followed by yellow zone in 30%.

[Table 1] showing Demographic data of study population and PEFr classified into red yellow green zones.

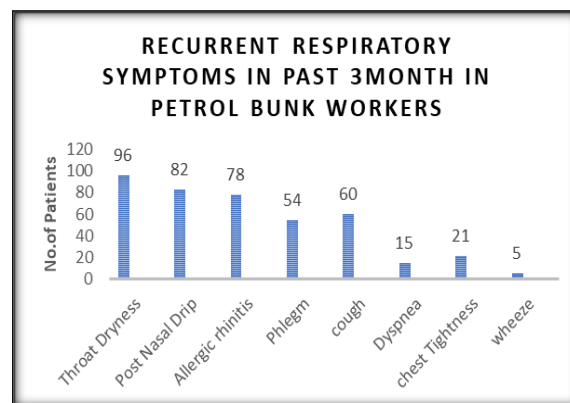


Figure 1

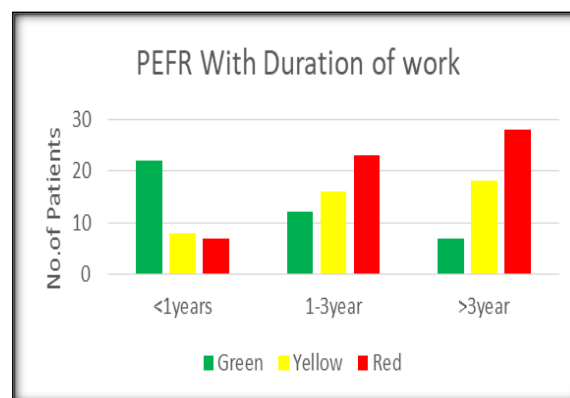


Figure 2

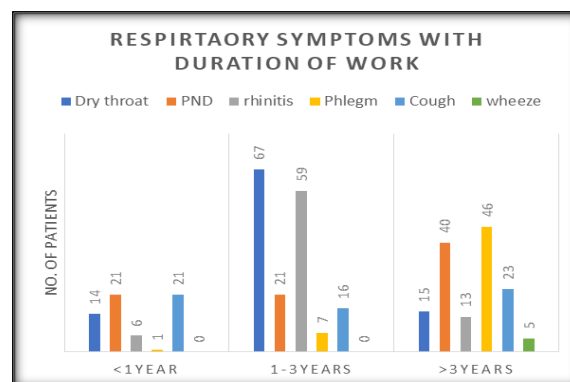


Figure 3: Comparison of graft uptake rate in Temporalis fascia graft and Tragal Cartilage graft

[Figure 1] shows distribution of recurrent respiratory symptoms. Most common symptoms

among study population was dryness of throat (70%) followed by post nasal drip in 60% of subjects then Allergic rhinitis in 57% of subjects.

[Table 2] showing sputum Differential cell count. Around 80% of patient had sputum eosinophil count more than 3%, 57% patient had neutrophil count more than 50%. 71% patient had lymphocytes less than 4%. (P<0.05)

[Figure 2] showing PEFr with duration of work. With progressive increase in duration of work more

than 1 year, Significant subject had progressive decline in PEFr (P<0.05).

[Figure 3] showing Respiratory symptoms with duration of work. Subjects working for 1-3 year duration has more dry throat 49.3% compared to subjects working <1, >3years. Post Nasal Drip (PND) was more (30%) in subjects working >3years compared to subject working <3years. Allergic Rhinitis was more in patients working for 1-3years compared to <1years. Phlegm production was more in subjects working >3years.

**Table 1: Demographic Data of subjects, N=136 Data presented as frequency and percentage from total number of subjects**

Particular	Frequency	Percentage
<b>Age ( Mean 29.9±8.7)</b>		
18-25years		25%
26-30years	74	54%
30-35years	18	13%
>36years	10	7%
<b>Sex</b>		
Male	121	89%
Female	15	11%
<b>BODY MASS INDEX</b>	Mean22.6±3.4Kg/M <sup>2</sup>	
<b>Habits</b>		
Smoker	28	20.58%
Non Smoker	108	79.42%
Alcoholic	27	19.8%
<b>Education</b>		
Below SSLC	98	72%
SSLC Pass	38	28%
<b>Duration Of Work</b>		
<1year	21	15.4%
1-3year	67	49.26%
>3year	48	35.2%
<b>Shift Worker</b>	31	22.7%
<b>Day Worker</b>	105	77.2%
<b>Pefr</b>		
Green Zone >80%	36	26.27%
Yellow Zone 50-79%	42	30.88%
Red Zone <50%	58	42.64%

**Table 2: Sputum Differential count in Petrol Bunk workers**

	Frequency	Percentage
<b>Neutrophil</b> >50%	78	57.36%
<50%	58	46.64%
<b>Eosinophil</b> <3%	28	20.59%
>3%	108	79.41%
<b>Lymphocytes</b> >4%	39	28.68%
<4%	97	71.32%

## DISCUSSION

The purpose of the study was to find out the prevalent symptoms, lung function abnormality and to understand the probable pathology involved in disease process in subjects working in petrol bunk workers. In our study we found that predominant symptoms was dryness of throat which was seen in 70% of patient who are working in petrol bunk since 1-3years, which makes them drink water repeatedly or chew some candies, followed by post nasal drip

seen in 60% of patients followed by allergic rhinitis which goes against the other studies by José Antônio Baddini Martinez et al,<sup>[9]</sup> Mustafa Mohammad Ameen et al,<sup>[10]</sup> who showed Cough as predominant symptom, reason being most of the studies did not involve upper respiratory symptom like Dryness of throat and Post Nasal drip. In our study Cough was seen in 44% of subject, among which more than 80% were smokers, Even though smoking subject in our study was less (20%) compared to Nonsmoker (80%), which suggest that

smoking exacerbates the cough in Petrol pump workers due to cumulative effect of irritant fumes or toxic gases in petrol and smoke, similar effect is in study done by Solanki RB et al.<sup>[11]</sup>

Our study found that there was progressive decline in PEFR with increase in duration of work for more than 1years, PEFR is simple technique which may also help in detecting early decline in lung function. Smoking as additive effect in further declining lung function. The progressive decline in PEFR was persistent even after more than 3years of exposure suggesting progressive nature of underlying pathologic course. Similar results were also seen in other studies conducted by Solanki RB et al.<sup>[11]</sup> Singhal M et al,<sup>[12]</sup> Hulke SM et al.<sup>[13]</sup> The decline in observed lung function among petrol pump worker may indicate obstructive or restrictive type of lung disease as shown by Keshavachandran et al.<sup>[14]</sup> Adverse effects of petroleum vapours on lung function may occur through several mechanism.<sup>[20]</sup> The petroleum fumes contains Hydrocarbons that decrease glutathione content and decrease activity of superoxide dismutase that act as defense in destroying free radicals. Hence triggering oxidative stress leading to cellular and tissue integrity.<sup>[15]</sup> The duration of exposure has greater impact on greater decline in pulmonary function which is seen in our study. Similar results were also seen in study conducted by Uzma N,<sup>[16]</sup> Aprajita,<sup>[17]</sup> and Dube S.<sup>[18]</sup>

Our study showed that 57% of study subject has neutrophil count more than 50%, which might indicate inflammatory reaction or infection secondary to irritant effect of fumes and dust which needs further study to rule out infection. Study also showed that 79% of subject had eosinophil count more than 3%, which indicate hypersensitive or allergic phenomena involved in pathologic process, which is also suggested by increase in allergic rhinitis, post nasal drip and dry throat. Eosinophilia in sputum might help to treat patient with anti-allergic and steroids. In our study, 71% of subject has lymphopenia (Lymphocytes <4%) which was also seen in study conducted by Jose et al,<sup>[9]</sup> which suggest that Chronic exposure to inhaled fuel vapors may lead to impairment of lymphocytic function, and of the immunological response in airways mucosa.

In Western countries like in USA and UK, exposure to petrol vapours is restricted by placing rubber hood over the delivery pump and using self service station.<sup>[19]</sup> In India such safety precaution doesn't exist and also there is no standardization regarding number of petrol bunk in particular area, petrol bunk are opened depending on demand due to increase vehicle, no standard safety precaution measures in place. Strict safety precaution, strict laws to control respiratory illness will help to control disease progression and reduce long term morbidity among petrol pump working subject. Prevention is better than cure.

## CONCLUSION

Our study showed that's respiratory symptoms is more common in subjects working in petrol bunk due to exposure to dust, vehicle fumes and strong gasoline smell. There is progressive increase in symptoms with increase in duration of exposure, initial symptoms involving mostly the upper respiratory tract in form of dryness of throat and allergic rhinitis. It's also noted that with increased duration of exposure more than 3years, symptoms are more involving lower respiratory tract like cough, phlegm, and dyspnea along with significant decline in PEFR. These subject population needs education, personal protection training to prevent the ongoing decline in lung function. Further studies are required to confirm the long term sequelae and health hazards among study population.

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