

Assessment of Dyspnea, Fatigue on activities of Daily living of Spray Painters exposed to Isocyanate using Modified Pulmonary Functional Status and Dyspnea Questionnaire

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Abstract- Individuals who are spray painters by profession are often exposed to a chemical called isocyanate these chemicals are powerful irritants to the eyes, respiratory tracts, it can cause severe asthma and other small airway disease The main route of contamination is respiratory, as these products are mainly used by spraying which leads to the presence of isocyanate in the air in the form of aerosol The modified pulmonary functional status and dyspnea questionnaire is a subjective tool used to asses limitation in activities of daily living having dyspnea.

I. INTRODUCTION

Isocyanate Individuals who are spray painters by profession are often exposed to a chemical called isocyanate especially HDI. Mainly the car, motorvehicle and the furniture workers (painters) are exposed to isocyanate.¹ Organic isocyanate are highly unstable chemical compounds. It is highly unsaturated. Polyurethane in a family of plastic is formed when they react with polyol. They are used in many sectors of activity such as automative industries tanneries electronic industries, painting etc.¹ isocyanate are powerful irritants to the eyes, respiratory tracts, it can cause severe asthma and other small airway disease if they exposed again.⁴ The main route of contamination is respiratory, as these products are mainly used by spraying which leads to the presence of isocyanate in the air in the form of aerosol. However excessive short term isocyanate exposure during work may produce greater risk than continues low dose exposure.⁴

At present, they are regarded as one of the main causes of occupational asthma. The large number of workers who are exposed to these chemicals have a concentration-dependent risk of developing chronic airway disorders, especially bronchial asthma. Different pathophysiologic mechanisms are involved. Immunoglobulin E (IgE)-mediated sensitization and irritative effects have been clearly seen in subjects.⁶ In addition, irritative, toxic, and mutagenic effects may occur. In strong concentration they are irritant. In weak concentration they bring on asthma. A long exposure may provoke chronic airway obstruction.⁶

Toluene isocyanate (TDI) might cause late asthmatic reactions and increase bronchial responsiveness by causing an Acute inflammatory reaction in the airways, and that airway inflammation may be responsible for persistence of occupational asthma induced by isocyanates.¹ About 90% of the automobile spray painters have reported respiratory symptoms in their occupation among which 88% had the most prevalent symptom of breathlessness followed by 84% workers had the symptom of coughing.¹ Nearly 60% of workers were aware about the safety measures, but only 33% were using the safety measures during work.¹

The modified pulmonary functional status and dyspnea questionnaire is a subjective tool used to asses' limitation in activities of daily living having dyspnea. It has three components that is influence of dyspnea on activities of daily living, influence of fatigue on activities of daily living and the change experienced by the patient in their activities of daily living. It has validity of 93% ,92%, and 90% respectively.²

It is important to remember that 'water-based' paints may contain isocyanates. Breathing in isocyanate paint mist can cause asthma and vehicle paint sprayers are about 80 times more likely to get asthma than the average worker. With continued exposure, the asthma can become permanent and severe. There is no cure. Breathing in the smallest amount of isocyanate could then trigger an attack.

Almost certainly, the sufferer would have to give up their current job. Early symptoms include one or more of the following: Recurring blocked or runny nose, Recurring sore or watering eyes, Chest tightness, Persistent cough; Flu-like shivers; Wheezing & Breathless.

II.Objectives

To assess the effect of dyspnea on activities of daily living in spray painter using pulmonary Functional status and dyspnea questionnaire.

To assess the effect of fatigue on activities of daily living in spray painters using pulmonary Functional status and dyspnea questionnaire.

To asses limitation in activities of daily living in spray paint.

III.MATERIALS AND METHODS

The study is a cross sectional study where 92 men were selected using convenient sampling. Working men who agreed to participate between the age of 40-60 years with no lung patholog were included in this study. The exclusion criteria was On exercise

rehabilitation program, Non cooperative subjects, Subjects with any pulmonary underlying pathology, Subjects addicted to smoking. Materials used in this study are Consent Form Pulmonary functional status and dyspnea questionnaire. Data recording sheet.

IV. PROCEDURE

A written informed consent was taken from the subject in the language best understood by them. Selection of the subject was done as per the inclusion and the exclusion criteria, Subjects who were willing to participate were included in the study. The purpose and procedure was explained to the subjects prior to the assessment. A detailed verbal explanation was given to the subjects, Subjects were asked certain questions regarding their daily activities And the difficulties that they encounter every day while performing activities of daily living by using pulmonary functional status and dyspnea questionnaire.

V. STATISTICAL ANALYSIS

Data was collected on a data sheet and encoded for computer analysis, tables were used making Microsoft excel sheet. Computerized statistical analysis of the data is done using Microsoft excel data analysis.

VI. RESULTS

In this study a total of 92 spray painters between the age of 40-60 years had participated

Questions	Brushing Hair	Raising Arms above the head	Bathing	Preparing Lunch	Putting on a shirt	Washing hair	Walking up a slope	Climbing up 3 steps	Walking 3 meters	Walking on uneven ground
Dyspnea	1.09%	0.00%	0.00%	0.00%	0.00%	0.00%	92.39%	4.35%	1.09%	1.09%
Fatigue	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.39%	4.35%	1.09%	1.09%
Limitation of adls	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.39%	4.35%	1.09%	1.09%

MODIFIED PULMONARY STATUS AND DYSPNEA QUESTIONNAIRE

TABLE NO 1: It represents average percentage score of each activity of respective scales.

Interpretation:

DYSPNEA SCORE:

The above table is represented out of 92 participants, during the assessment of dyspnea 92.39% had mild difficulties in walking up the slope, 4.35% had mild difficulties while climbing up 3 stairs, 1.09% had difficulties in walking 3 meters, 1.09% had difficulties in walking on uneven ground, 1.09% had difficulty in brushing hair.

FATIGUE SCORE:

The above table is represented out of 92 participants, during the assessment of fatigue 92.39% had mild difficulties in walking up the slope, 4.35% had mild difficulties while climbing up 3 stairs, 1.09% had difficulties in walking 3 meters, 1.09% had difficulties in walking on uneven ground.

LIMITATION OF ADL'S SCORE:

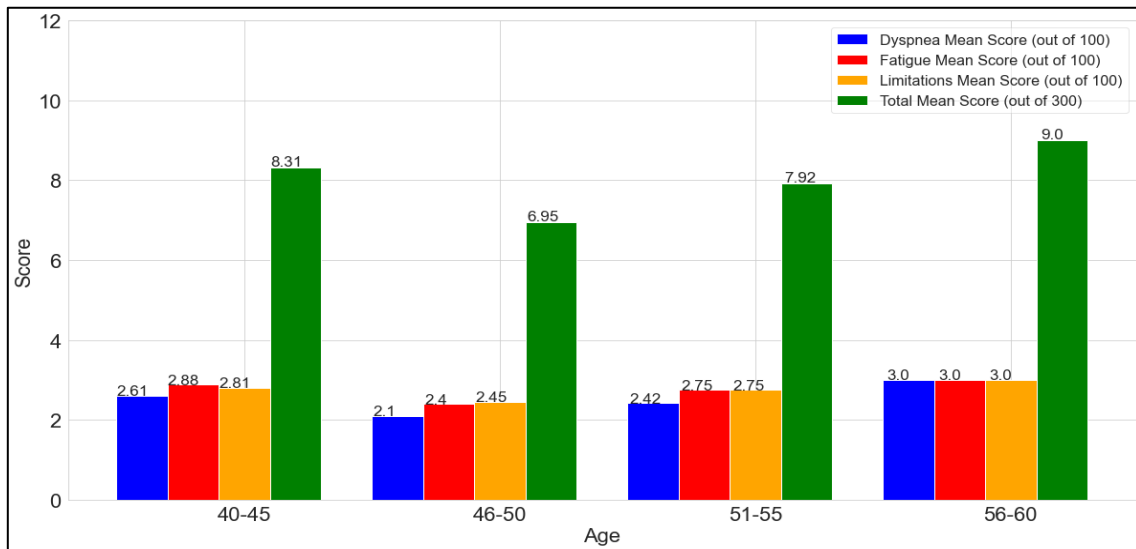
The above table is represented out of 92 participants, during the assessment of limitation of activities of daily living, 92.39% had mild difficulties in walking up the slope, 4.35% had mild difficulties while climbing up 3 stairs, 1.09% had difficulties in walking 3 meters, 1.09% had difficulties in walking on uneven ground.

Age (years)	Dyspnea Mean Score out of 100 (in %)	Fatigue Mean Score out of 100 (in %)	Limitation Score out of 100 (in %)	Total Score out of 300 in %
40 - 45	2.61	2.88	2.81	8.31
46 - 50	2.10	2.40	2.45	6.95
51 - 55	2.42	2.75	2.75	7.92
56 - 60	3.00	3.00	3.00	9.00

Table 2: Average Score by Age Bucket.

Interpretation:

The above-mentioned table represents the mean score of all three domains according to their age.



Graph 1: This represents the average score of all three domains according to their age.

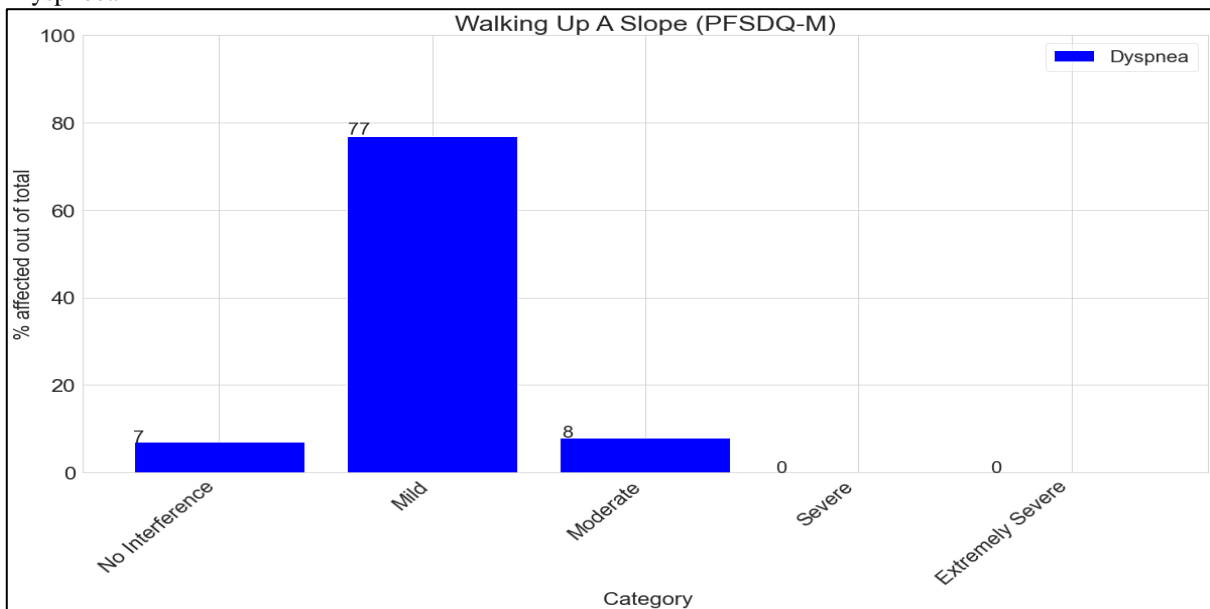
Interpretation:

The above graph represents the total scores of all three domains of the scale that is assessment of dyspnea, assessment of fatigue and assessment of limitation of activities of daily living according to their age. Total mean score is according to their age.

- Mean score of participants between the age of 40-45 years is 8.31
- Mean score of participants between the age of 46-50 years is 6.95
- Mean score of participants between the age of 51-55 years is 7.92
- Mean score of participants between the age of 56-60 years is 9.00

3) Walking Up the Slope Chart by Category

a) Dyspnoea

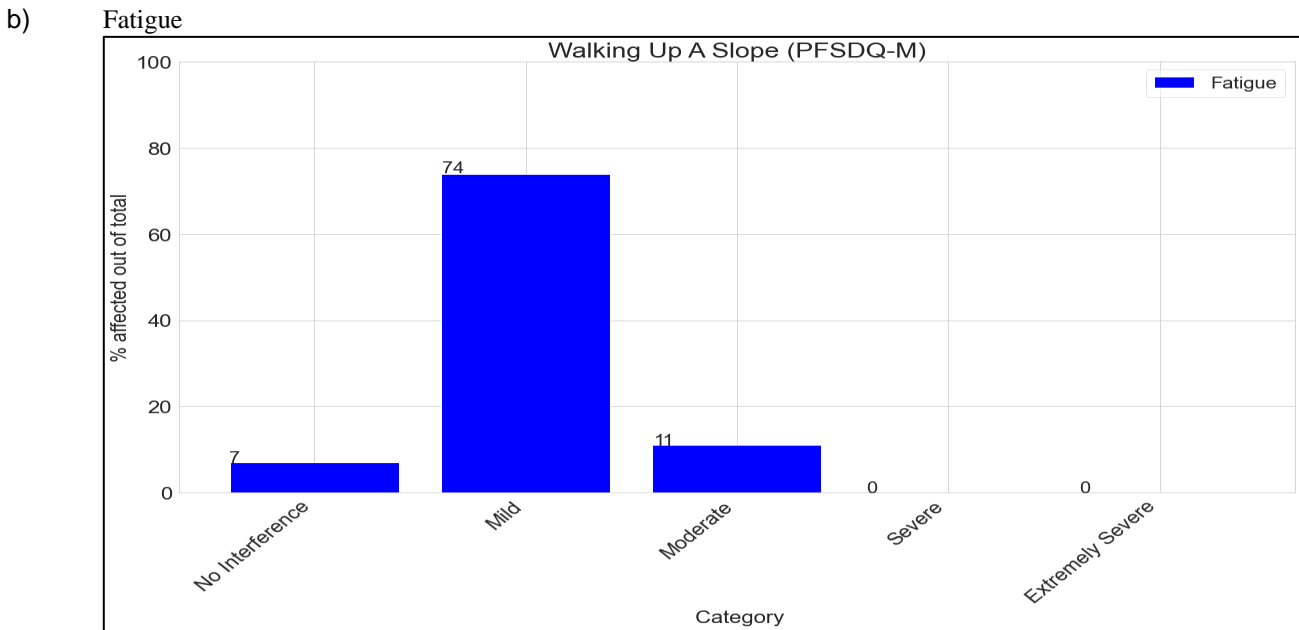


Graph 2: This graph represents percentage of affected individuals due to dyspnea in walking up the slope.

Interpretation:

The above mentioned bar graph represents total percentage of people that were affected due to dyspnea and therefore they are categorized according to the symptoms that they have recorded in the questionnaire.

Out of 92 subjects that had participated 77 people had represented mild dyspnea symptoms, 7 people had shown no interference that is no symptoms and 8 people had shown moderate dyspnea symptoms.



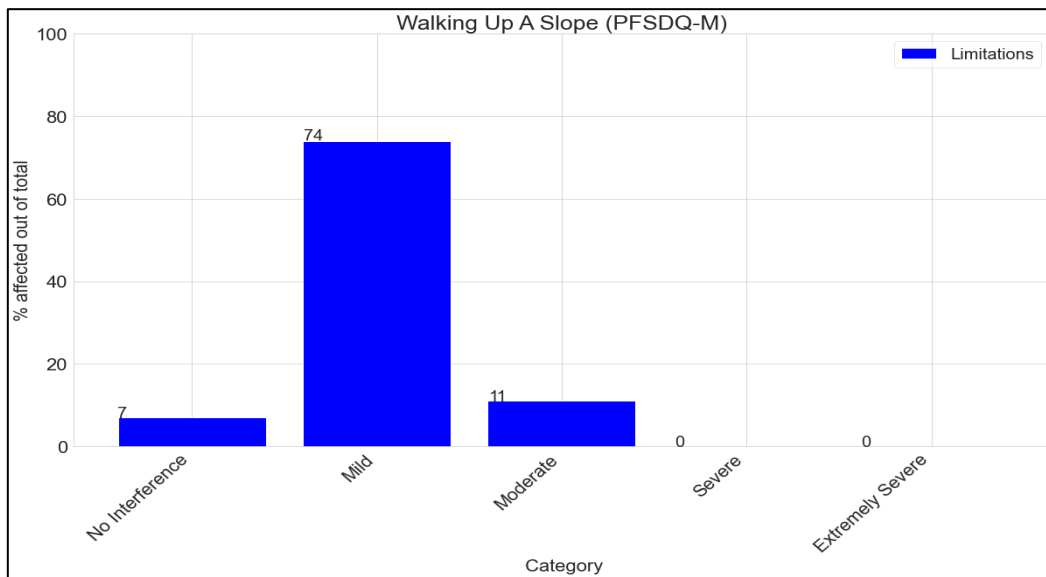
Graph 3: This graph represents percentage of affected individuals due to fatigue in walking up the slope.

Interpretation:

The above mentioned bar graph represents total percentage of people that were affected due to fatigue and therefore they are categorized according to the symptoms that they have recorded in the questionnaire.

Out of 92 subjects that had participated 74 people had represented mild fatigue symptoms, 7 people had shown no interference that is no symptoms and 11 people had shown moderate fatigue symptoms.

Limitation of activities of daily living



Graph 4: This represents percentage of affected individuals who have limitation in activities of daily living while walking up the slope

Interpretation:

The above mentioned bar graph represents total percentage of people that had limitation in activities of daily living and therefore they are categorized according to the symptoms that they have recorded in the questionnaire.

Out of 92 subjects that had participated 74 people had represented mild limitation in activities of daily living symptoms, 7 people had shown no interference that is no symptoms and 11 people had shown moderate limitation in activities of daily living symptom.

VII. DISCUSSION

The aim of the study was to assess dyspnea, fatigue, and limitation in activities of daily living in spray painters exposed to isocyanate chemical, the study consisted of 92 male participants, who fit into inclusion and exclusion criteria. However the mean age of participants was 40-45 years. A subjective assessment was done and analyzed using modified pulmonary status and dyspnea questionnaire. This questionnaire consists of 10 domains in each scale that is questionnaire for dyspnea, fatigue and limitation of activities of daily living.

Maestrelli P et.al¹² demonstrated that the isocyanate bind to the epithelial cells and an Inflammatory reactions involving eosinophils, mast cells, and T lymphocytes, especially those bearing IL-2 receptors, and increased cytokine production by T_H2 cells occur in the bronchial mucosae of patients with TDI-induced asthma, as in patients with allergic asthma, bronchial mucosa of TDI-induced asthma patients contained increased numbers of cells expressing interleukin 5 (IL-5) and IL-4. Similarly, it was found that 13% of TDI-induced asthma patients had specific IgE antibodies.

Study conducted by Sandeep Sharma et. Al¹³ in national library of medicine had stated that dyspnea is present on physical exertion due to higher metabolic oxygen demands in asthmatic patients. In this study we found out that 85 participants had represented dyspnea and 92.39% were affected during the activity of walking up the slope, 4.35% were affected during climbing up 3 steps, 1.09% were affected during walking on uneven ground, 1.09% were affected during walking for 3 meters and 1.09% were affected during bathing.

In this study we have found that out of 92 participants only 77 participants had represented mild dyspnea, and 74 participants had shown mild fatigueness during the activity of walking up the slope, which is similar to the study which was conducted by P R, Varghese et .al had stated that spray painters have about 14% breathlessness that is dyspnea and about 31% have tiredness that is fatigue⁹ In his study he had mentioned that most of the spray painters have started using mask as a preventive measure.

In this study we found out 85 participants had fatigueness out of that 92.39% were affected during the activity of walking up the slope, 4.35% were affected during climbing up 3 steps, 1.09% were affected during walking on uneven ground, 1.09% were affected during walking for 3 meters which is similar to Van Herck M et.al study stated that fatigue is prevalent in dyspneic participants¹⁰

In this study we also found out that 85 participants had limitation in activities of daily living out of that 92.39% were affected during the activity of walking up the slope, 4.35% were affected during climbing up 3 steps, 1.09% were affected during walking on uneven ground, 1.09% were affected during walking for 3 meters however limitation of activities of daily living is mainly due to dyspnea and fatigue which is similar to François Vermeulen et al study that stated activity limitation in adult asthmatic patient.¹⁴

Study conducted by P R, Varghese et .al stated majority of the spray painters have started using mask, in this study we found out that these spray painters are getting more cautious towards their safety and hence they have started using personal protection equipment's, these spray painters have got educated about the effects of isocyanate on their respiratory system and their eyes. Hence they have started using a mask or they use a cloth to cover their face while spray painting and this helps in causing less harm to the respiratory system and to their eyes.

After analyzing 92 male spray painters with no known pulmonary complications and with no addiction to smoking we can conclude that there is mild prevalence of dyspnea, fatigue and limitation in activities of daily living of spray painters exposed to isocyanate.

VIII. CONCLUSION

The study concludes that there is mild prevalence of dyspnea, fatigue and activities of daily living in spray painters exposed to isocyanate between the age of 40-60 years and with no pulmonary complications.

IX. LIMITATION

Study was solely conducted in metropolitan city

Particular age group was selected.

Population was aware about the safety measures that have to be taken during spray painting.

X. ACKNOWLEDGEMENT

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