



Social

ASSESSMENT OF RESPIRATORY SYMPTOMS AND ASSOCIATED FACTORS AMONG HOUSE PAINTERS IN KINONDONI MUNICIPALITY TANZANIA

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Abstract

Background: House painters are increased as people prefer to live in good and decorated houses. Mishandling of paints and inhalation of paint materials become a problem as this paints contain chemicals which are poisonous upon inhalation. However, few studies have assessed respiratory symptoms among house painters in the Africa. The main objective of this study was to assess respiratory symptoms and associated factors among house painters.

Methods: We used a questionnaire to interview 172 house painters and 148 non exposed group in different construction sites. A sub sample of 25 house painters was evaluated for lung function using EasyOne spirometer

Results: The study revealed significant results when respiratory symptoms were compared among painters and non-exposed group ($p < 0.05$). Low level of knowledge among workers and poor use of PPE were the main factors associated with exposed to paints. Protection of those workers would be only successfully if enforcement policy is enacted about every site to provide personal protective equipment (PPE) to workers.

Conclusion: House painters are exposed to different painting materials and therefore appropriate measures are recommended.

Keywords: Painting Activity; House Painters; Respiratory Symptoms; Spirometry; Questionnaire; Building Construction Site.

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1. Introduction

1.1. Background to the Problem

House painters are increasing as people prefer to live in good and decorated houses. Mishandling of paints and inhalation of paint materials become a problem as this paints contain chemicals which are dangerous upon inhalation. It is widely known that many chemicals are poisonous and pose a significant health hazards to workers potentially causing cancer, respiratory and skin and eye diseases. House painters are exposed to various hazards with consequent risk to health including respiratory problems. Different chemicals used in spray painting have shown to cause serious respiratory problems to painters. House painters become exposed to toxic materials and flammable or explosive mists, particulates and vapours or absorption of irritants through the skin. Inhalation of mists and vapors can be dangerous to health depending upon the agent's toxic characteristics and the amount and method of exposure. Other hazardous substances that spray painting workers could be exposed to include thinners, resins, degreasers, surface preparation products, dusts from sanding, rust converters and rust removers (*OSHA1984, OSHR1996*)

Outcomes associated with exposure to these organic compounds in oil based paints and coatings by construction and maintenance painters include increased rates of lung, throat and larynx cancer, leukemia, impaired nervous system function, kidney and liver disease, diseases of the blood or blood forming organs; and birth defects among offspring (*IARC, WHO 1989*).

The use of solvent-based paints was seriously related to respiratory problems to painters. However the introduction of water-based paints has not eliminated the problem. According to the research done in UK (*Beach et al ,1997*) they concluded that, water-based paints now frequently used for house painting still contain small amounts of volatile organic compounds (VOCs) , with the potential to exacerbate symptoms of asthma.

A study done by *Weislander. G et al (1994)* indicate that house painters have an increased risk of airway problems and a contributory cause could be exposure to volatile organic compounds or other volatile compounds emitted from water-based paints.

However a paint sprayer is supposed to equip himself with all the necessary PPE such as special overalls, nose mask, glasses, boots, gloves and hat to prevent inhaling toxic vapours and mist, swallowing paints and absorbing irritants through the skin and eyes (*Rongo, 2004*). In a study of 600 workers in Dar es salaam, (*Rongo, 2004*) observe that most of the workers operate in the open and did not use PPE, therefore recommended the use of PPE as the appropriate measure for hazards protection in small scale industries since their open air did not make engineering intervention appropriate.

Painting is an informal sector and informal workers work under this sector. These informal workers work under conditions where occupational health and safety protection is almost non-existent (*Singh et al, 2012*).

Most of researchers have devoted their efforts on addressing issues like liver function alteration, neuropsychological symptoms, skin and eye problems, reproductive problems and brain drain

caused by exposure to paints while very few studies done in UK and US addressing respiratory problems and no any published report in Tanzania addressing this problem.

In the United Kingdom spray painting was found to produce the highest exposure and was one of the main causes of occupational asthma and sprayers had an 80 fold higher risk of getting asthma compared to the rest of the working population (*Richard, 2006*).

Several studies conducted in different parts of the world shows in one way or another a certain relation concerning my study. Few studies conducted in UK and US addresses respiratory problems among house painters. Other studies address respiratory problems among car spray painters. In Ghana assessment of respiratory problems were assessed in specific spray painting industries. However in Tanzania the situation concerning respiratory health symptoms among house painters is unknown.

1.2. Problem Analsi Diagram

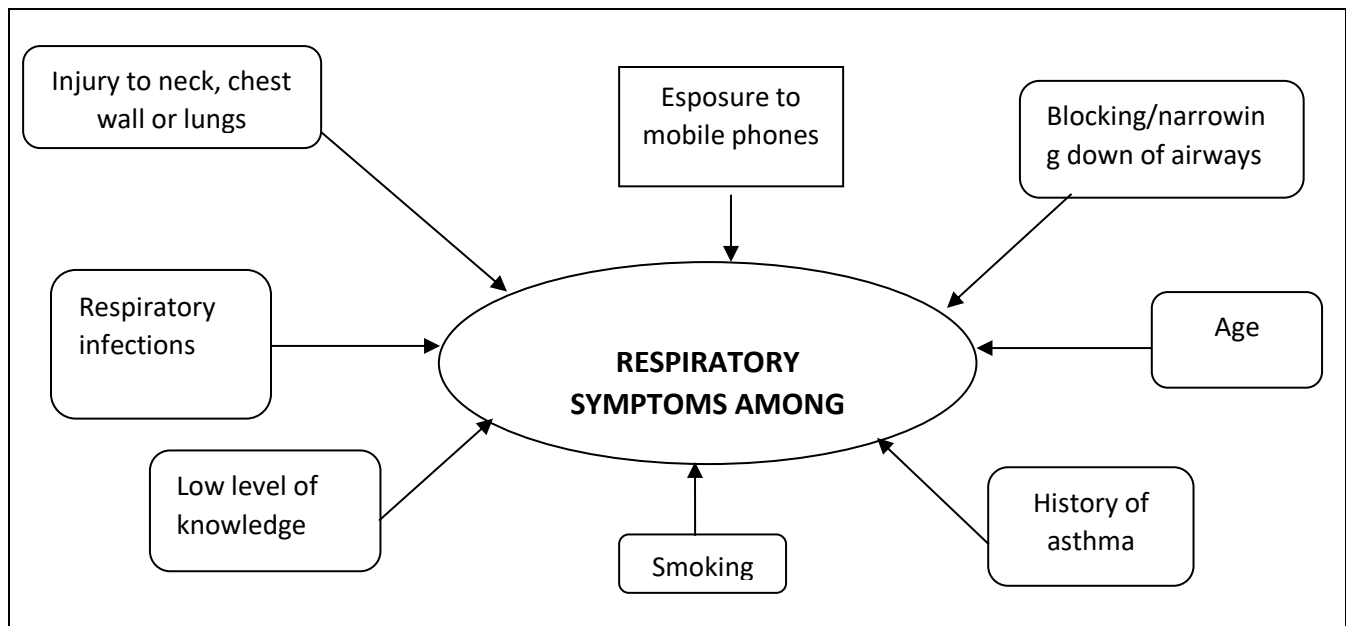


Figure 1: Problem analysis diagram

1.3. Statement of the Problem

House painting associated with many health problems including respiratory problems due to usage of different chemicals in the painting process. Different painters have been affected due to exposure to paints especially through inhalation of vapour and mists. As such respiratory symptoms are characterized by shortness of breath, chest pain, wheezing, and coughing associated with sputum production as their primary symptoms.

However different inventory mechanism have been put in place to reduce the problem including the introduction of water- based paints and introduction of PPE to reduce the problem of painters to be exposed to paints but respiratory symptoms continue to become a problem. The water based paints still contain some harmful ingredients which can result into respiratory problems if

painting procedures are not followed properly. Also the PPEs are available but associated with some discomfortness and if not properly handled they become a hazard.

So despite all the interventions, respiratory problems still exists. So far there is no any published report in Tanzania that has been conducted to assess respiratory symptoms among house painters. Therefore this study intends to assess respiratory symptoms and associated factors among house painters in Kinondoni Municipality Dar es Salaam.

1.4. Literature Review

House painters have a mixed exposure, including aerosols from spray painting and grinding, and VOCs from paint emissions. Despite this, there is scarce information on airway diseases in house painters (Wieslander. G et al, 1996). The general wellbeing and quality of workers are impaired and adversely affected. According to *Signh et al (2012)* informal workers often work under harsh conditions where occupational health and safety protection is almost non-existent and painting is among the informal sector.

Many paints are classified as hazardous substances because they contain potentially harmful ingredients exposure to which may cause injury and illness through inhalation of toxic vapours and mists, or absorption of irritants through the skin. Other hazardous substances that spray painting workers could be exposed to include thinners, resins, degreasers, surface preparation products, dusts from sanding, rust converters and rust removers (OSHA1984, OSHR1996).

Outcomes associated with exposure to these organic compounds in oil based paints and coatings by construction and maintenance painters include increased rates of lung, throat and larynx cancer, leukemia, impaired nervous system function, kidney and liver disease, diseases of the blood or blood forming organs; and birth defects among offspring (IARC, WHO 1989). The study explain mainly cancer related problems but nothing explained about short term effects of being exposed to paint like headaches, irritation of eyes, nose and throat, nausea, fatigue, and dizziness. The current study will explore deeply the symptoms associated with exposure to paint on the respiratory system.

Another study explains inhalation as a primary means of painter exposure to paint, however there are other routes of exposure to paints like skin contact and absorption but these results into other problems other than respiratory problems. A study done by *Rongo (2007)* observe that, low level of awareness among employers and workers on health hazards related to handling of toxic chemicals and poor hygienic practices were the main factors associated with high exposure to chemicals.

Another study done in UK (*Beach et al1997*) observes that water-based paints now frequently used for house painting still contain small amounts of volatile organic compounds (VOCs), with the potential to exacerbate symptoms of asthma. Other studies explain that, the object being sprayed can influence the risk; and the spray-painting process used therefore the object should be positioned such that workers do not spray paint towards each other, towards other workers or up wind of other workers. Also Richard Nfama Mamba (2006) shows that, if spray painting is always done in a properly designed, well-maintained spray booth, using safe and well-

maintained equipment, following safety and health procedures, and wearing suitable PPE, then employees are less likely to be directly exposed and the risk is reduced.

However a paint sprayer is supposed to equip himself with all the necessary PPE such as special overalls, nose mask, glasses, boots, gloves and hat to prevent inhaling toxic vapours and mist, swallowing paints and absorbing irritants through the skin and eyes (Rongo, 2004). Also the study observes that these PPE are available to protect the spray painter from the paint itself and from the fumes generated in painting. The current study will assess the use of PPE among house painters and the occurrence of respiratory symptoms.

A study done in Johannesburg (Richard Mfana Mamba, 2006) shows high percent of workers about 75% of the workers, doing spray painting had some kind of personal protection provided however the usage rate was very low. According to *Richard*, some said they were not using the PPE because they were now “experts” in their work and therefore did not need to. These show that they were having low knowledge concerning the effects of painting.

A study done by Weislander. G et al (1994) indicate that house painters have an increased risk of airway problems and a contributory cause could be exposure to volatile organic compounds or other volatile compounds emitted from water-based paints. These shows that respiratory problems among house painters are still a problem.

In the United Kingdom spray painting was found to produce the highest exposure and was one of the main causes of occupational asthma and sprayers had an 80 fold higher risk of getting asthma compared to the rest of the working population (*Richard, 2006*). Another study shows high percent (>90 percent) self reported occupational health problems, particularly respiratory related problems (*Adei et al 2011*). The current study will explore the level of exposure among painters in Kinondoni Dar es Saam.

All studies which were conducted in different countries shows in one way or another a certain relation concerning my study. Few studies conducted in UK and US addresses respiratory problems among house painters. Other studies address respiratory problems among car spray painters. In Ghana assessment of respiratory problems were assessed in specific spray painting industries. In Tanzania there is no any published research which was done to assess respiratory symptoms among house painters. Therefore this study assessed respiratory symptoms and associated factors among house painters in Kinondoni Municipality and the level of exposure among them.

2. Materials and Methods

2.1. Study Setting

The study was conducted in building construction sites; the tasks done at the sites include construction of the building to finishing process. One of the the finishing activities is painting process in which the painter may be exposed to paints and dusts during preparation of surface to be painted. This makes painters susceptible to respiratory health problems.

The critical hazards with respect to respiratory health and painting activities are chemical hazards particularly dusts, fumes, poisonous gases and mist from paints.

All house painters in the construction site were identified and included in the study. Workers like food vendors, office workers and other persons doing jobs that are not related to chemical exposure were recruited as controls.

2.2. Design of the Study

The study was descriptive quantitative study design, aimed at assessing respiratory health symptoms among house painters in Kinondoni Municipality. The variable set was the duration of painter exposure, the frequency of exposure per working shift, level of knowledge and proper use of Personal Protective Equipment (PPE). Other confounding factors like smoking, history of asthma, and tuberculosis were also assessed.

2.3. Study Area

The study was done in Kinondoni municipality at Dar es Salaam because in this area many buildings were at the finishing stage ready for painting using different paint materials.

2.4. Study Population

The study population was all house painters who were painting different houses in different construction sites in Kinondoni Municipal. Five wards were selected randomly and from each ward three construction sites were selected to obtain painters to be studied. The control population was workers doing works which were not directly related to painting activities such as office workers and food vendors and other persons doing works not directly related to chemical exposure around the construction sites like watchmen.

2.5. Sample Size and Sampling Technique

Simple random sampling was used to obtain the sample of 20 construction sites as follows: 6 were from Msasani, 4 from Magomeni, 4 from Mwenge, 3 from Kijitonyama and 3 from Ubungo ward.

A convenient sample size of 172 painters and 148 controls were recruited from the selected construction site. Subsamples of 25 painters were selected randomly from 172 painters and were evaluated for their lung function.

2.6. Data Collection and Instruments

The questionnaire was translated by a physician competent in English and Kiswahili into Kiswahili, the National language of Tanzania. Another physician translated it into English and it was compared to the original. No differences of importance for the meaning of the questions were seen (Larama Rongo et al., 2002). . Data collection was done using structured questionnaire

with questions on demographic data, education and health information, health of respiratory system, and the use of PPE.

2.7. Lung Function Measurement

Lung function measurements were performed using Easy One spirometer and age was recorded in full years, standing height was measured with a tape measure attached to the body weight scale, and weight was also recorded. The spirometry was used to determine FVC, FEV1 and the ratio of FVC to FEV1 was determined. Subjects performed the lung function test while seated, wearing a nose clip, each subject was instructed to practice a deep inspiration and forceful expiration before completion of the forced expiration. The subjects were allowed to rest between each measurement. A total of 25 workers participated in the lung function test.

2.8. Data Management and Analysis

Control of data collected was done through review of data collected in the field. Data were entered into a computer using Statistical Package for Social Scientists (*SPSS version 20*) computer program, any error was crosschecked and cleaned.

The data was analyzed using SPSS to provide frequency tables. Chi-square test was used to assess whether observed differences between the exposed and non-exposed workers to painting material were statistically significant if the p-value was less than 0.05.

2.9. Ethical Clearance

The ethical clearance to conduct the research was obtained from Muhimbili University of Health and Allied sciences, Dar es Salaam Tanzania. Permission to conduct research to building construction sites was obtained from Tanzania Constructors Registration Board (CRB) and the responsible Authorities at the respective construction sites.

2.10. Ethical Consideration

Respiratory health problems were assessed among house painters in the construction sites in Kinondoni municipality. Written informed consent to participate in the study was provided to the authorities at particular construction sites; whereas oral informed consent was provided to house painters. The respondents were asked for their willingness to participate in the study and they were assured for confidentiality and anonymity of information they provide. Description of the study objectives, potential benefit, and risk was given to the study subject so that he or she can willingly participate. Painters were informed that participation in the study was voluntary and therefore they should feel free to withdraw any time during the study.

3. Results and Discussions

3.1. Study Sample

Table 1: Distribution of study sample by age, education level, time spent working per day, duration of work and exposure category

| CHARACTERISTICS | EXPOSED n=172 | NON EXPOSED n=148 | TOTAL n=320 |
|-------------------------------------|------------------|----------------------|----------------|
| Age (years) | n (%) | n (%) | n (%) |
| ≤ 19 | 6 (3.5) | 1 (0.7) | 7 (2.2) |
| 20-24 | 48 (27.9) | 38 (25.7) | 86 (26.9) |
| 25-29 | 62 (36) | 54 (36.5) | 116 (36.3) |
| 30-34 | 32 (18.6) | 31 (20.9) | 63 (19.7) |
| 35-39 | 15 (8.7) | 16 (10.8) | 31 (9.7) |
| 40-44 | 7 (4.1) | 7 (4.7) | 14 (4.4) |
| 45-49 | 2 (1.2) | 1 (0.7) | 3 (0.9) |
| Education level* | | | |
| primary level | 130 (75.6) | 87 (58.8) | 217 (67.8) |
| ordinary level | 42 (24.4) | 53 (35.8) | 95 (29.7) |
| college | 0 (0) | 8 (5.4) | 8 (2.5) |
| Hours spent working* per day | | | |
| 8 | 14 (8.1) | 11 (7.4) | 25 (7.8) |
| 9 | 18 (10.5) | 2 (1.4) | 20 (6.3) |
| 10 | 107 (62.2) | 68 (45.9) | 175 (54.7) |
| 11 | 33 (19.2) | 40 (27) | 73 (22.8) |
| 12 | 0 (0) | 27 (18.3) | 27 (8.4) |
| Duration of work(years) | | | |
| 0-4 | 101(58.8) | 100(67.6) | 201 (62.8) |
| 5-9 | 46(26.8) | 39(26.4) | 85 (26.6) |
| 10-14 | 14(8.2) | 8(5.4) | 22 (6.9) |
| 15≥ | 11(6.5) | 1(O.7) | 12 (3.8) |

*P<0.05.

3.2. Smoking Habits

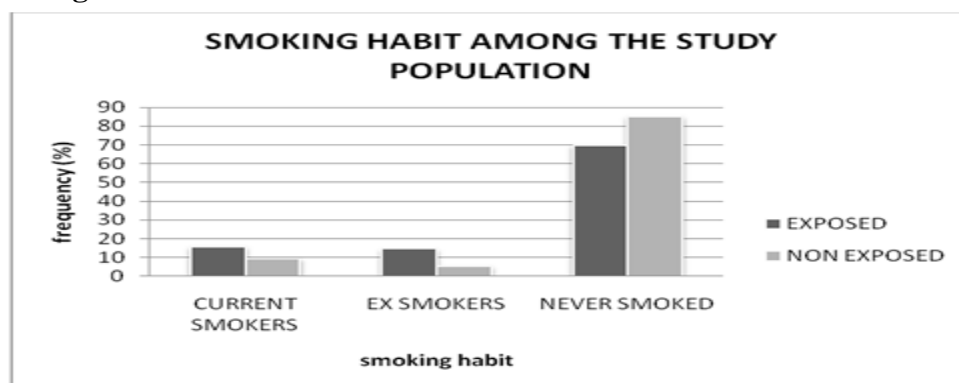


Figure 1: Smoking habits among the study population

3.3. Respiratory Symptoms

Table 2: Distribution of respiratory symptoms among painters and control group

| RESPIRATORY SYMPTOMS | EXPOSED n=172 | NON EXPOSED n=148 | TOTAL n=320 |
|--|------------------|----------------------|----------------|
| Cough in the morning | 131 (76.2%) | 62 (41.9%) | 193 (60.3%) |
| Cough during day or at night | 91 (52.9%) | 17 (11.5%) | 108 (33.8%) |
| Shortness of breath on level ground or slightly hill | 114 (66.3%) | 26 (17.6%) | 140 (43.8%) |
| Bring phlegm from chest in the morning | 131 (76.2%) | 42 (28.4%) | 173 (54.1%) |
| Bring phlegm from chest during day or at night | 76 (44.2%) | 17 (11.5%) | 93 (29.1%) |
| Had chest illness for as much as a week | 99 (57.6%) | 22 (14.9%) | 121 (37.8%) |
| Chest tightness when or after work* | 65 (37.8%) | 9 (6.1%) | 74 (23.1%) |
| Having flue when or after shift work | 162 (94.2%) | 80 (54.1%) | 242 (75.6%) |
| Nose irritation and sneezing | 152 (88.2%) | 36 (24.3%) | 188 (58.8%) |

Show significant relation among exposed and non exposed ($P < 0.001$, $df = 1$, $*df = 3$)

3.4. Risk Factors for Respiratory Problems

Table 3: associated factors showed by the study sample which may led to respiratory problems

| Characteristics | Exposed | Non exposed | |
|--|---------|-------------|---------|
| Chronic respiratory symptoms | n (%) | n (%) | p value |
| Injury or operation on lung, neck or chest | 2 (1.2) | 1 (0.7) | 0.65 |
| heart trouble problems | 2 (1.2) | 4 (2.7) | 0.13 |
| chronic cough | 2 (1.2) | 0 (0) | 0.19 |
| tuberculosis | 4 (2.3) | 5 (3.4) | 0.57 |
| History of asthma | 7 (4.1) | 9 (6.1) | 0.41 |

No significant relation between exposed and non exposed $p > 0.05$

3.5. PPE

Use of Personal Protective Equipment

Distribution of personal protective equipment's at the sites assessed and their availability against inhalation of paint materials by workers were as follows; 56.4% of the assessed participants reported that nose and mouth mask were available at the sites, while 43.6% reported not available.. Although nose and mouth masks were available the usage rate was very low and only 14% of painters were given training on the importance of using PPE.. Although some painters had their own PPE they used them when they like because they were not given by their employers. The general comment was that, they needed these PPE and were very important to them but their employers are not providing them.. Studies in different setting have also shown

the same weakness of not always using protective devices (Venance Buliga, Larama Rongo and Simon Mamuya, 2017).

3.6. Lung Function Tests

Table 4 in Appendix B shows: general characteristics and lung function values of house painters in Kinondoni municipal

During spirometry those who were having FEV1/FVC $\geq 75\%$ were considered normal and those who were having FEV1 $< 80\%$ were considered with lung obstruction, while those who were having FVC $< 80\%$ were considered with lung restriction. Some had FEV1/FVC $\geq 75\%$ but other values do not give up; this may be due to inability/failure to blow out during spirometry testing which indicate a problem.

Of the 25 participants, 28% were found normal, about 28% found with only airway obstruction, 12% found with only lung restriction whereas 32% were found with both airway obstruction and lung restriction problems.

3.7. Discussion

3.7.1. Demographic Characteristics

Painting activities conducted in Kinondoni Municipal, Dar es Salaam involves people of different ages ranging from 18 years to 47 years of age. Of the 320 workers interviewed, 71.5%, were males aged 20 to 34 years. A study done in Ghana by Adei et al (2011) shows that more than 70 percent were male sprayers between 26-40 years. When the age of workers were compared between the exposed and non exposed population it was found that there was not statistical significant.

About 172 of the study sample were house painters, 79 males while about 21% females. About 148 participants were the non exposed population who were found on the construction site during data collection doing other activities which do not involve chemical exposure. The males were 65 while females were 37%. The difference in sex between exposed and non exposed population was statistically significant.

Of the 320 workers about 68.7% had primary level of education, while very few among the study population have reached higher education of college level (5.4%). This shows the level of knowledge among the participants was low. There was a statistical significance when comparing the level of education between exposed and non exposed population.

3.7.2. House Painters

All 172 exposed workers reported to use a mixture of both water based paints and oil based paints at different parts of their work. Therefore house painters have a mixed exposure of both water based paints and oil based paints. The findings were similar to a study done by Wieslander et al 1996 in Sweden.

The seriousness of chemical exposure upon which house painters were exposed upon inhalation should not be underestimated. House painters were using different painting materials which have been documented to contain different poisonous chemical upon inhalation.

3.7.3. Use of PPE

Workers were aware about the use of protective equipment although the usage rate was very low. The same results were found by the study done in Johannesburg (Richard Mamba, 2006) which shows that, about 75% of workers doing spray painting were having some kind of personal protection provided but the usage rate was very low. About 56.4% of the assessed participants say that the nose and mouth mask were available at the sites, while about 43.6% they reported that nose and mouth mask were not available at their sites. Only about 14% of painters were given training on the importance of using PPE. Some of workers complained that those protective equipments were not available at their site so they conducted their work without PPE. In other construction sites these protective equipments were available but the workers did not always use them, because they reduced their efficiency as those PPE did not allow the worker to breathe smoothly.

3.7.4. Other Protective Measures Reported by the Painters

More interestingly, painters know well about the hazards associated with inhalation of painting materials and they were just thinking that drinking fresh milk before and after work was the only solution to protect them from respiratory problems. The same result were obtained by Adei et al 2011 for which the workers believe the use of soda water or milk as a body detoxifying agent after a considerable exposure. This may be because of their low level of knowledge and as they do not receive any training concerning the importance of using PPE (86%). Also lack of enforcement for these facilities to be available at the working sites was another issue. But this needs further investigation.

3.7.5. Respiratory Symptoms Among Painters and Non Exposed Group

The assessment of degree of exposure to paint material was high for painters as respiratory symptoms reported highly for the exposed population compared to the non exposed population. The proportion of painters with respiratory symptoms was high among the exposed population compared to non exposed population. Several workers reported to experience more than one symptom at the time of interview. The predominant symptoms were having flu (75.6%), usual cough in the morning (60.3%), nose irritation and sneezing (58.8%), bringing phlegm from the chest in the morning (54.1%) and chest tightness was reported for about 23.1%. There was a statistical significant for the complaints on respiratory symptoms between the exposed and non exposed population with $p < 0.001$. This shows a strong association between painting activities and respiratory symptoms.

The study also shows that there was no any relation between respiratory symptoms and the other associated factors like a person with a history of injury or operation on neck, chest or lungs, a person with tuberculosis, a person with chronic cough, heart trouble and a person with history of

asthma. 4.7% reported a history of asthma. This was similar to a longitudinal study done by Wieslander et al 1996 for which 5% reported asthma as adult.

During spirometry, lung function test was done for about 25 house painters for which about 28% were found normal, also 28% of them found with only airway obstruction problem, 12% found with only lung restriction problem whereas 32% were found with both airway obstruction and lung restriction problem. The study shows a significant relation between respiratory symptoms and FEV1. This finding is similar to a study done by Wieslander et al 1996 for which a significant relation between FEV1 and respiratory symptom index was also observed.

Cigarette smoking was also studied in relation to respiratory symptoms among the painters. Among the exposed population about 15.7% were current smokers, 14.5% were ex smokers while about 69.8% said they had never smoked cigarette, and for the non exposed population about 9.5% were current smokers, 5.4% were ex smokers while about 85.1% said they had never smoked cigarette. It was generally observed that the prevalence of respiratory symptoms increased with increasing number of cigarettes the workers was smoking per day. However, by comparing smokers to non smokers there was no significance association between cigarette smoking and respiratory symptoms. The findings suggest that the respiratory symptoms are possibly not due to cigarette smoking, but due to other factors or other agents, this needs to be proven by another research. The findings of this study do not support findings in literature. This can be explained by the study done by Wieslander et al 1996 for which about 91% were found as current smokers.

According to this study the range of respiratory symptoms among exposed and non exposed population was statistically significant, the association between painting and respiratory symptoms was statistically significant with $p < 0.001$.

4. Conclusions and Recommendations

4.1. Conclusion

This academic research concludes that, house painters are in danger of compromising their health while struggling for survival by doing painting activities. Exposure of these workers to painting materials cannot be prevented in painters unless training to them about the health hazards of these painting materials is conducted and increase awareness of the effects of this painting materials. Improvement of the working conditions in terms of treating their employers in such a way that they protect the employees by giving them the required personal protective equipments like nose and mouth mask, gloves, overall and eye goggles should also be emphasized. The problem is bigger because there is no working enforcement policy which can protect these workers by enforcing the provision of the PPEs and enforcing painters on their usage. Some of painters were complain to be uncomfortable in using them, many of them were complain that they are not protected by their employers, by being given these protective equipments.

4.2. Recommendation

- 1) Policy to protect house painters in the work place should be formulated so as to ensure that house painters are fully protected and prevented from being exposed to painting materials through provision of personal protective equipment.
- 2) Enforcement of safety practices should also work together with employer and employees to enforce the employer to provide PPE to employees and enforce the employees in using them to protect themselves from health hazards of chemicals emanating from painting materials.
- 3) Inservice Training should be done to these house painters. They must read and understand the importance of material data sheet and PPE. House painters should be educated on the importance of protecting themselves from chemical emanating from painting materials rather than complaining on uncomfortability.
- 4) The construction sites should regularly being inspected to check if PPE are available and used effectively by the workers to minimize the danger of them to become exposed to paints
- 5) Those who have been affected by these painting materials should reduce their time of work or change to another work which is free from chemical exposures so as to maintain their health
- 6) There is a need to carry out a research on eye and skin problem associated with painting activity as the workers also complain about these problems.

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Appendices

APPENDIX A

LUNG FUNCTION FORM – PROJECT FG

| | |
|------------------------|----------------|
| Name | |
| Company ID | |
| Personal ID | |
| Date of birth (or Age) | ____/____/____ |

| | |
|--------------------|----------------|
| Date fieldwork | ____/____/____ |
| Research assistant | _____ |
| weight | _____ |
| length | _____ |

| |
|---------------------------------------|
| Temperature (°C) _____ pressure _____ |
| Best values: |
| FVC _____ |
| FEV1 _____ |
| PEF _____ |
| Comments |

Table 4: general characteristics and lung function values of house painters in kinondoni municipal

| NO: | sex | FVC | FEV1 | FEV1/FVC | INTERPRETATION |
|-----|-----|---------------------|--------------------|----------|--------------------------------------|
| 1. | M | 1.88 (65%pred) | 1.70 (67%pred) | 0.90 | Airway obstruction, lung restriction |
| 2. | M | 1.30 (35%pred) | 0.73 (23%pred) | 0.56 | Airway obstruction, lung restriction |
| 3. | M | 3.60 (94%pred) | 3.57 (109%pred) | 0.99 | Normal |
| 4. | M | 2.93 (84%pred) | 2.77 (94%pred) | 0.94 | Normal |
| 5. | M | 2.27 (68%pred) | 1.68 (59%pred) | 0.74 | Airway obstruction. Lung restriction |
| 6. | F | 2.22 (67%pred) | 2.21 (80%pred) | 0.99 | Airway obstruction |
| 7. | F | 2.01 (66%pred) | 1.79 (69%pred) | 0.89 | Airway obstruction, lung restriction |
| 8. | F | 2.76 (108%pred) | 1.33 (59%pred) | 0.48 | Airway obstruction |
| 9. | F | 8.35 (264%pred) | 3.02 (109%pred) | 0.36 | Airway obstruction |
| 10. | M | 3.92 (105%pred) | 3.61 (114%pred) | 0.92 | Normal |
| 11. | M | 2.50 (74%pred) | 2.47 (89%pred) | 0.98 | Lung restriction |
| 12. | M | 10.45 (270%pred) | 3.53 (107%pred) | 0.34 | Airway obstruction |
| 13. | M | 3.99 | 2.49 | 0.62 | Airway obstruction |

| | | | | | |
|-----|---|--------------------|--------------------|------|--------------------------------------|
| | | (111%pred) | (84%pred) | | |
| 14. | M | 3.99 (111%pred) | 3.29 (110%pred) | 0.82 | Normal |
| 15. | F | 1.86 (70%pred) | 1.82 (81%pred) | 0.98 | Lung restriction |
| 16. | M | 2.00 (50%pred) | 1.61 (50%pred) | 0.81 | Airway obstruction, lung restriction |
| 17. | M | 3.45 (109%pred) | 2.54 (99%pred) | 0.74 | Airway obstruction |
| 18. | M | 4.13(121%pred) | 3.52 (119%pred) | 0.85 | Normal |
| 19. | M | 7.42 (166%pred) | 3.69 (98%pred) | 0.49 | Airway obstruction |
| 20. | M | 3.11 (78%pred) | 2.86 (87%pred) | 0.92 | Lung restriction |
| 21. | M | 3.86 (111%pred) | 3.68 (126%pred) | 0.95 | Normal |
| 22. | M | 1.05 (26%pred) | 0.85 (25%pred) | 0.81 | Airway obstruction, lung restriction |
| 23. | M | 1.27 (40%pred) | 1.26 (45%pred) | 0.99 | Airway obstruction, lung restriction |
| 24. | M | 2.09 (58%pred) | 1.54 (49%pred) | 0.74 | Airway obstruction, lung restriction |
| 25. | M | 3.92 (98%pred) | 3.60 (105%pred) | 0.92 | Normal |

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