HEALTH HAZARDS AMONG PAINTERS: AN EXPERIMENTAL STUDY

SUMMARY
of
THESIS

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SUMMARY

Paint is a mixture of liquid and powder; the powder is the pigment that gives the paint colour, while the liquid holds it together and spreads it. The paint "vehicle" in paints, mostly made up of volatile organic compounds (VOCs), is a mixture of the binder and solvent. The vehicle disperses pigments and additives. The quantity of every constituent differs depending on the type of paint. For example, toluene, xylene, methyl ethyl ketone, and methyl isobutyl ketone are the most common solvents. Additionally, the solvent (thinner) is utilised to facilitate the spreadability of the paint (Kameti, 2013).

Paints can be broadly categorized into industrial and decorative (domestic) paints. Buildings and homes are typically decorated on the inside or outside using decorative paints that are either oil- or water-based.

There are many different types of decorative paint used in India. Most white paint pigments comprise titanium, calcium, zinc, lead, barium, antimony, silicon, aluminium, magnesium oxides, sulphates, carbonates, and sulphides. The main components of inorganic coloured pigments are cadmium, iron, chromium, nickel, and molybdenum compounds. The two most typical lead pigments are white lead and lead chromate. White lead is a superior paint pigment used in automobile paints and has incredible concealing power. Lead chromates are often used in producing yellow, orange, red, and green paints (Kameti, 2013).

These substances are hazardous and can cause skin irritation, eye discomfort, and breathing issues. Children and adults often exposed to lead suffer from kidney damage, encephalopathy, and reduced cognition. Solvent inhalation over an extended period causes emphysema, impaired lung function, and sensory damage. In order to avoid the risks associated with them, it is necessary to identify the amounts of these dangerous metals in various items (Kameti, 2013).

Painting professionals have much experience upgrading both indoor and outdoor buildings. In older times, the painter was in the role of preparing the paint by combining supplies of pigments, oils, thinners, and driers and in order to achieve the desired results, painters would find the appropriate mixture according to the work requirements. Nowadays, the primary responsibility of a painter is to fix the outermost layer, which is to be coated, like repairing cracks in walls, by covering tape, putting on the paint, and cleaning up. As a painter, they are responsible for painting the building's inner or outer design to give it a livelier and more

appealing appearance. They must be well knowledgeable about the paint brushes and painting equipment.

Painting involves preparing various surfaces for paint before final coating (Kielmas, 2022). As defined by the Bureau of Labor Statistics, industrial painting involves the application of paint to buildings, industrial structures, and facilities to protect and finish them (Bureau of Labour Statistics, 2012). Painting is necessary for many industrial, commercial, and residential applications, and it is pervasive in many commercial areas and seems like it could be more dangerous after a while. Despite appearances, workers in these areas potentially face higher health hazards than they anticipate (Long, 2021).

Paint workers have been vigorously exposed to various natural solvents, for instance, white spirit, xylene and toluene, for a long time. The exposure to agents other than solvents, for example, binders, colours, and adhesives, has been constrained to charging crude materials. These compounds can cause skin irritation when inhaled via the nose, accidentally consumed, or absorbed by the skin and eyes upon contact. The quantity of lead and exposure frequency significantly impacts the level of lead that will contaminate the blood.

When inhaled, these harmful vapours can cause neurological disorders, cancer, lung disease, difficulties with conception, and other health concerns (Januzzi & Wolfe., 2016). Millions of people are working with organic solvents every year and getting exposed due to their extensive use in nearly every aspect of current sectors, such as the production of coatings, the production of synthetic fibres, cleaning industries and the building sector" (Mattei et al., 2016).

This is essential for the nation to ensure everyone works in a secure and healthy atmosphere. Every worker must adhere to environmental, health, and safety regulations. Each individual inside the industry must work in a safe and secure working place (Verma & Singh, 2015). Occupational or contact dermatitis produced by direct contact with chemicals and paints is a visible illness classified into primary disruptors and allergic stimulators (OSH, 2020).

The study contains two parts in which the first one analyses the components of paints using different methods, and the second one is about the occupational health risk faced by painters working with various types of paints. Occupational diseases exclusively affect painters exposed to specific hazards related to their jobs.

This work summarised the occupational health hazards and risks in painters concerning the painting occupation, occupational diseases, personal protective wear, and general preventive measures for occupational diseases and safety precautions for painters.

RATIONALE OF THE STUDY

Paint manufacturing is still flooded with micro productions and daily pay labourers who break safety laws. Painting has been viewed as a cancer-causing occupation by the International Agency for Research on Cancer (IARC) because of reliable overabundances of lung and urinary bladder disease found in a few investigations. At the same time, the evidence for the carcinogenicity of occupational exposure in paint manufacturing is considered inadequate due to the inconsistent results of the few studies performed.

Painting jobs entail applying paint to surfaces, designing and decorating, which exposes painters to health risks. Physical risks like falling from a height, chemical risks like inhalation in paint fumes and other chemicals, biological risks like insect bites, snake bites, and exposure to different living organisms, ergonomic risks like using faulty tools and psychosocial risks like intimidation and bullying are just a few examples of the health risks.

Paint industries are constantly using hazardous chemicals in the production of their final products. Nanoparticles are now widely used to substitute some metals. NPs are the primary focus of recent research due to their toxic effects. However, more information is needed on their toxicity when added to complex paint or coating patterns. These substances in the paint get into painters through inhalation of fumes, dust, gas absorption through the skin, and ingestion when eating on the job and find their way into the blood streams and lungs when no safety or protective devices are used, causing serious health problems such as respiratory disorders, lung cancer, and urinary bladder cancer. Therefore, majority of the painters are vulnerable to hazards to their health and safety that may cause illnesses and deaths. However, more research must be done on the prevalence of muscular injuries and exposure among painters in Uttar Pradesh. Without prompt action, painters' safety and well-being will decline and slow the nation's economic progress.

The present study is centred on the identification of harmful particles embedded in paints and their impact on painter’s health. The study additionally aims to investigate the occupational health hazards and workplace risk exposure without the use of personal protective equipment.

OBJECTIVES OF THE STUDY

- To analyse the morphology and characteristics of paints components by using SEM/EDX.
- To determine the presence of nanoparticles and heavy metals in paints with the help of XRD and AAS analysis.
- To assess the harmful effects of particles and metals embedded in paints on painters' health.
- To explore the working pattern and evaluate the occupational activities that could lead to occupational health hazards among painters.
- To design a webpage to create awareness regarding the harmful impact of paints on painters and public health.

Recommendations and suggestions of this study will assist in enhancing the safety of the workplace and formulation of policy for reducing health hazards among painters.

HYPOTHESES:

A null hypothesis (H_0) is a hypothesis to be disproved. Null hypotheses are widely used in the study of the sciences but also social sciences, according to the research report. The scientific method begins with formulating a null hypothesis, which is then followed by scientific research to try to disprove it. A new null hypothesis is created, and the process is repeated if it can be refuted.

1. **H_0:** There are no possible health problems that occur due to nanoparticles and inorganic elements embedded in paints.
2. **H_0:** There are no possible health problems that occur due to heavy metals embedded in paints.
3. **H_0:** There is no significant difference between eyes problems in painters and painting occupation.
4. **H_0:** There is no significant difference between respiratory problems in painters and painting occupation.
5. **H_0:** There is no significant association between respiratory problems and working pattern of painters.
6. **H_0:** There is no significant difference between postural discomfort among painters and painting occupation.
7. **H_0:** There is no significant difference between intensity of body pain in painters and painting occupation.

MAJOR FINDINGS OF THE RESEARCH

PART- I STRUCTURAL ANALYSIS OF PAINTS FOR DETECTION OF HEAVY METALS & NANOPARTICLES

This part of the study includes the structural analysis and identification of nanoparticles and heavy metals in selected paint samples.

Atomic absorption spectrometry (AAS), X-ray diffraction (XRD), and scanning electron microscopy (SEM/EDX) techniques are used to determine the levels of heavy metals, solvents, and nanoparticles in paint samples. This chapter discusses these analysis approaches used for the structural analysis and detection of heavy metal elements and nanoparticles in commercial paints are summarised and discussed.

- The present study examined Pb, Cd, Cr and Mn levels in fresh paint samples sold in Lucknow. Among all the heavy metals, cd was noted to be at the minimum concentration, while chromium was detected maximum. The concentration of lead and manganese was almost equal.
- In all the 10 paint samples collected and analyzed, concentrations of lead were in the range 2.4 (W-R) to 56.8 ppm (D-W) is within the permissible limit of 90 ppm (US CPSC, 2008).
- Cadmium levels in all the samples were within the maximum recommended limit of 100 ppm, according to the European Union (EU).
- The level of chromium was high in the samples and was above the permissible limit of 60 ppm of (US CPSIA, 2008). In addition, 7 out of 10 paint samples were found to be having chromium concentrations above 100 ppm up to 758.25 ppm.
- The concentration of Mn was found to be minimum in the water red (W-R) sample and was noted at -6.9 ppm and the maximum of 50.55 ppm D-W sample. However, the levels of Mn were within the allowable limit.

Various components included in the paint samples were identified by analysing the XRD spectra of the samples with a standard diffractometer. Four samples were analysed water-borne paints, solvent-based paint, distemper white paint and degraded paint flex. Presence of nanoparticles was determined through XRD analysis and the morphology using SEM techniques.

The XRD analysis confirms the presence of nanoparticles in the first two samples of water-based and solvent-based paints; it shows the crystalline and an amorphous structure, while the other two samples do not contain any nanoparticles.

- TiO_2 is the main pigment used in water-born paints due to its high refractive index and coverage capability. Solvent-based paint sample mainly contains high peaks of Rutile TiO_2. The presence of TiO_2 is the cause of irritation in the eyes, nose and throat among painting workers.
- Distemper white paint was identified with the most relevant peaks corresponding to Dolomite and Calcite. This sample also identified SiO_2 in some amount of amorphous form. Dolomite contains varying levels of crystalline silica which can cause damage to lungs or even cancer when it is breathed.
- Degraded paint flex samples were identified with a diffraction angle range of 10–90∘, consisting of the most informative peaks corresponding to dolomite and calcite.
- XRD analysis also identified dolomite CaMg $(CO_3)^2$, Calcite $Ca_{0.936}Mg_{0.064}$ (CO_3), Magnesium and Barium Niobium Oxide Hydroxide ($Ba_6Nb_3O_{13}$) (O.H.) as the ground layer's components.

The surface morphology of various paint samples was tested via scanning electron microscopy. The scanning electron microscopy studies confirmed that the coating surface morphology relies upon the composition of the paint.

- In water-based paint, more than one graphite layered sheet can be observed. In the thin layer of graphene, the granules shape of TiO_2 can be determined as EDS already confirm the presence of TiO_2.
- In the spectra of solvent-based white-coloured paint, it can be clearly observed that the sample contains layered and granular shape, suggesting the presence of TiO_2 and SiO_2.
- The distemper white paint structure includes silica debris tightly packed with small spacing and features dice systems.
- The degraded paint sample contains small dice shape granules that were tightly packed.

PART- II OCCUPATIONAL HEALTH HAZARDS AMONG PAINTERS

An occupational hazard is a hazard faced during work. As a term, occupational hazard refers to both long-term and short-term risks linked with working surroundings. It is an area of occupational safety and health, and public health. This includes a wide range of risks, such as chemical, biological, psychosocial, and physical hazards. Physical injury is a short-term risk, whereas long-term risks include a higher risk of getting occupational disease, such as cancer or heart disease. In general, short-term risks create reversible health impacts, but long-term risks cause irreversible health effects.

DEMOGRAPHIC PROFILE OF THE RESPONDENTS

The analysis of the demographic factors of painters reveals the following:

- It was found that the average age group of painters was between 26 to 45 years. 78% of the painters were aged less than 45 years, and only 22% were in the age group more significant than 45 years.
- The data shows that cent percent of the respondents were male.
- The number of married respondents (62.7%) was more than the number of unmarried respondents (26.7%) and divorced (10.7%).
- It is found that the maximum (63.3%) respondents belong to a joint family, and 37.7% of the respondents live in a nuclear family. Studies show that painters' values and attitudes are still generally in favour of a joint family. They feel it is safe and easy to get help from parents, especially for child upbringing. About 56% of the respondents lived in a family with more than six members, while 10.7% of members lived with less than a four-member family.
- The study represents that respondents were categorised based on their religion, in which 77.3% belong to Hindu, 17.3% from Muslim and 5.3% from other religions.
- It is evident from the data that the majority of the total respondents (34.7%) were educated at the level of primary, followed by illiterate (21.3%); it may be due to the drop-outs from schools and the financial crisis; very few numbers of respondents have completed their middle level and higher level education.
- The study confirms that 80% of the respondents were natives of the places currently living, while 20% were migrants.

SOCIO-ECONOMIC PROFILE OF THE PAINTERS

The analysis of the socio-economic conditions of painters reveals the following:

- It can be portrayed from the data by assessing all three sections related to the socio-economic scale that the socio-economic condition of the painters is significantly lower than average. Most painters (50.7%) belonged to the lower class, followed by the Upper lower class 33.3%, 6.7% were from the lower middle class, 5.3% were from the Upper middle class, and only 4% of the respondents belonged to the Upper class.

OCCUPATIONAL PROFILE OF THE RESPONDENTS

- It can be summarised from all the occupational details of the respondents that majority (53.3%) had a work experience of 5-15 years.
- In addition to this, 68% of the respondents were working all seven days a week. The data on working time in a day showed that the majority of the respondents are found to be working for 7-9 hours/ day.
- The primary body position during the respondents' work was categorised into four types in which majority of the respondents worked in standing and bending positions as per the work requirement.
- The work people of the respondents were determined in detail comprising of types of breaks, no. of breaks and time of breaks which are the most important factors for assessing the working pattern and occupational health. Majority of the respondents (38.7%) have two breaks during work, while most take only 15 min of tea breaks in a day, and about 21.3% said that they do not get any breaks for tea.

HEALTH RISK ANALYSIS OF THE RESPONDENTS

EYE PROBLEMS IN RESPONDENTS

- In the current study, significant differences were noted between the eye problems in respondents and the use of safety tools. The data indicates that most respondents felt eye irritation if not using safety tools. Eye swelling, excessive tearing, yellowish eye

discharge, Itching and burning and extra sensitivity to light were detected as high among no-safety tools users while minimum in regular users.

- Painters, who have worked for 10-15 years or more than 15 years, face maximum eye irritation, swelling, excessive tearing, itching, burning and blurred vision. The respondents working for more than 15 years were found to be extra sensitive to light compared to those working for 0-5 years.
- Eye irritations, eye problems, redness, itching and burning eyes were observed highest among the respondents working six days/week. This data was highly significant. Eye swelling, excessive tearing and yellowish discharge were found maximum among painters working for seven days/ week.
- Eye problems associated with working duration were also examined. The data indicate that the painters who worked more than 9 hours showed higher eye problems. The data was statically significant.

RESPIRATORY PROBLEMS IN RESPONDENTS

- The association between the respiratory problem and the respondent's age has been examined in this study; a significant difference between the respondent's age and respiratory health was found. Data indicates that respondents faced high breathlessness, severe cough problems, cough produces phlegm and blood problems, Wheezy chest sound, tightness in the chest from cold air and irritation when working with paints in the respondents belonging to the age group of 61-75 years, while minimum problems were observed in the age group of 19-32 years.
- In this study, we found a significant difference between the working experience of the respondents and respiratory health. This data indicates that respondents who faced high breathlessness, severe cough problems, cough produces: phlegm and blood problems, wheezy chest sound, tightness in the chest from cold air and facing irritation when working with paints were found maximum in workers with more than 15 years of experience.
- The majority of the respondents faced trouble with smelling odours and have more than 15 years of experience ($\mu = 3.74$); a statistically significant feeling of lung and chest problems increases with working experience. The respondents, who were currently taking medicine, have 15 years of experience.

- The association between lung problems due to working days/ week. Working days/ week were divided into three categories: five days, six days, and seven days/ week. The respondents who worked all seven days a week had more respiratory problems. Data indicate that the majority of the respondents faced Shortness of breath/breathlessness, cough problems, problems with phlegm and blood with cough, and Tightness in the chest due to cold air, and worked for all seven days.
- A significant difference was found between the respondents' working duration and respiratory health. These data indicate that respondents who were identified with maximum breathlessness, severe cough problems, phlegm and blood problem, Wheezy chest sound, tightness in the chest from cold air and facing irritation with paints worked for more than 9 hours/day, and minimum problems observed 5-7 hours working.
- Taking or receiving any form of medication is significantly associated with increasing work hours. Maximum respondents taking any medication worked for more than nine hours.
- Shortness of breath/breathlessness, severe cough problems, phlegm and blood problem, wheezy chest sounds, tightness in the chest from cold air and facing irritation with paints were significantly related to using safety tools during work. Maximum problems were observed among the respondents who never used any safety instruments.
- Respiratory issues were significantly related to the use of masks during work. Maximum problems were observed among the respondents who never used masks during work compared to regular masks.

BODY PAIN AND POSTURAL DISCOMFORT

- The data indicates that the majority of the painters feel backache pain, spinal pain, Strain of the neck and shoulder while working and feel uncomfortable during sleeping belong to the age group of 61-75 years, and the least pain is felt by the 19-32 years of age group. The feeling of backache while working in a bending position is the statistical significance ($p= 0.000$).
- Data indicate the association between years of working in this occupation and body discomfort among painters. The table indicates that the majority of the painters felt

backache pain, spinal cord pain, and pain in the neck, worked for more than 15 years, and the least were noted among the respondents who worked for 0-5 years.

- Painters had to flex or extend the joints in awkward positions while performing their job. The majority of the respondents who felt the maximum problem during flexion worked for more than 15 years, while those who had fewer problems only worked for the last five years.
- Data described the statistically significant discomfort found in all groups of painters in the backaches, neck, shoulders, lower back and other parts. So, it was clear that these were the regions of the body which mainly affected most of the painters.
- Postural discomfort and MSD were significantly related to the working days of the respondents. Most respondents ($\mu = 3.43$) felt backache, musculoskeletal problems, and neck pain, working seven days/week and least among those who worked five days a week.
- Musculoskeletal problems significantly associated with working duration were examined. The data indicate higher back pain, spinal cord pain, flex or extending the joints of their limbs in awkward positions shows in the painters who worked for more than 9 hours and minimum were in 5-7 hours. Strained at the neck and shoulder while working were also having the same result and increased with working duration.
- Majority of the respondents felt that they could not maintain comfortable body postures in a standing position while using the heavy material worked for more than 9 hours and a minimum of 5-7 hours. The data was statistically significant ($p=0.000$).
- Most of the respondents felt uncomfortable while sleeping due to body pains. This was significantly observed among the workers working for more than 9 hours, and minimum problems were observed in 5-7 hours.
- Primary working posture during work is significantly associated with musculoskeletal problems. Backache, pain in the spinal cord, musculoskeletal problems, neck pain, and body pain was found to be maximum in the sitting position and less in the standing position. This data was significant.
- Strained at neck and shoulder found maximum among sitting position and least in bending position.
- Result indicates the association between the use of safety instruments and the feeling of postural discomfort. The majority of the respondents feel backache, spinal cord pain, musculoskeletal problems, neck pain, Strain in the neck and shoulder while working in a bending position for long hours and feel uncomfortable while sleeping

due to body pains; they never used safety instruments in comparison to those who always used them during work. The data was found to be significant (p=0.00).

- The association between the intensity of body pain and the age of the respondent has been examined. The table indicates that the intensity of neck pain in both the lower arm, the intensity of Buttocks pain, and both legs pains were expressed maximum in the age group 47-60 years while minimum in the 19-32 age group.
- It was obvious from the data that the intensity of pain in both the shoulders, right and left, upper back pain, and both right and left upper arm and mid back pain was expressed maximum in the 47-60 years age group and least in 61-75 years age groups. The intensity of pain in these parts shows significant differences (p=0.00).
- The study explains the result of the intensity of pain due to the worker's working experience. The working experience is significantly related to the intensity of pain in the different body parts of the painters. The maximum intensity of pain in various body parts was found in the respondents who worked for 10-15 years and more than 15 years, while the minimum was in those who worked for 0-5 years.
- The result of the study also explains the association between the working days of the respondents and the intensity of pain. The working experience is significantly related to the intensity of pain in the different body parts of the painters. The maximum intensity of pain in the neck, left and right shoulder, upper back pain,
- The right and left upper arm, mid back, right and left lower arm, lower back pain, buttocks, right and left thigh and both legs, right and left, were found in the respondents who worked for seven days and had the least pain in 5 days. The data was statically significant.
- The association between the intensity of body pain and the working duration/ day of the respondent has been examined. The table indicates that the intensity of body pain was expressed maximum in the respondents working for more than 9 hours and minimum in those who worked for 5-7 hours. It was also statically significant, indicating that the intensity of body pain seems to increase with working duration.
- The association between the intensity of body pain and the breaks taken during their work in a day by the respondent have been examined. The no. of breaks taken during work was statically significant with the intensity of pain in the body parts of the painters. As the breaks increase, the pain minimises. The table indicates that the intensity of body pain was expressed maximum by the respondents who have taken one break and minimum in four breaks/day.

- The study results further explain the association between the intensity of pain according to the main body position during work. The working position is significantly related to the intensity of pain in the different body parts of the painters. The maximum intensity of pain in upper body parts like neck, shoulder, and mid back pain was found in the respondents who worked in a sitting position and least neck pain in a standing position. When the painters work in a sitting position, their heads and shoulder are upward or downwards, which leads to straining muscles and ligaments that support the neck.

CONCLUSIONS

This section is a conclusion of the study results. The study revealed significant links between exposure to and disease symptoms associated with painting. This was to ensure that the disease symptoms suffered by painters are, most likely, a result of exposure to health hazards associated with their occupation and no other effects or at least to minimise the compounding impact of external factors.

The study came up with conclusions based on the objectives of the research in the study area. They were as follows:

- Based on the review of this study, it can be concluded that painters are a high-risk group of workers exposed to occupational hazards, which poses a threat of exposure to dangerous substances if they must stay safe and live long while on the job.
- This study also concludes that the painting sector is male-dominated, and all the samples were male in this particular study; hence more men are exposed to health risks with paints than women.
- The study also established that the paint workers reported having suffered from MSDs symptoms, with the lower and upper back being the most reported body parts.
- The increase in the exposure time and duration was the subsequent development of various disease symptoms associated with painting. This concluded that different work experiences and duration had an adverse health effect on the painters.
- It was observed that spray painters in the study were using little or no form of protection while engaged in painting activities and concluded that this lack of protection was increasing exposure time, which increased the likelihood of contracting disease symptoms associated with painting.
- The study confirmed the presence and association between painting activities and respiratory issues, bronchitis symptoms, eye problems, dermatitis and musculoskeletal

disorder symptoms. It was concluded that the high proportion of painters suffering from various disease symptoms associated with painting was due to health hazards related to the painting occupation.

- Finally, it was concluded that painting on a small scale in the Lucknow, Varanasi and Chandauli districts of Uttar Pradesh, India, is associated with health hazards.

LIMITATIONS

- Human error in sample collection and storage may also be responsible.
- A major problem in analysing all the elements is the separation of the elements from the organic paint matrices with which they are associated. The digestion steps are sources of considerable error compared to the subsequent instrumental determinations.
- The poor precision of this method can be traced to incomplete oxidation or losses sustained during the oxidation processes. The wet chemical digestion methods may include the contamination of samples.
- AAS is the only method applied to determine all the elements in paint. However, the technique usually requires 2 or 3 times experiment that has to be carried out in a laboratory if the results are not expected.
- The Xrd analysis was applied only to paint type; it can also be analysed based on colour and pigments used in different paints.
- Powder analysis may be different because it was treated before analysis, as liquid paint samples were chosen.
- Analysis of pigments was absent in the result due to less sample size. We are unable to characterise based on pigments.

RECOMMENDATIONS AND SUGGESTIONS

Based on this work review, the following recommendations were made:

- The Indian government and the media should support Sustainable Research and Action in creating awareness and campaigns to educate people on the harmful effects of these metals, especially in households.
- The Indian Paint Association (IPA) should ensure that paint companies to be certified use metals within the permissible limits and also indicate concentrations of these metals used as well as give guidelines and directions for use in homes to safeguard

public health and to prevent exposure of the population to these metals, which are known to be especially dangerous to humans.

- Paint manufacturing companies should reduce the percentage or quantity of poisonous, toxic or carcinogenic substances in paints to reduce the rate or level of effect on inhalation, absorption or ingestion into the body.
- This study recommends safety training for all painting workers before deployment, particularly on ergonomics.
- Another recommendation is awareness creation among paint workers on the importance of routine medical examinations for early detection and control of MSDs and other health issues in such an environment.
- There is a need for painters to use respirators. Also, painters should position ladders properly or avoid using ladders where they can maintain good ventilation while working and so on and reduce worker exposure to highly hazardous places.
- Painters should reduce work time with these materials or products to reduce the exposure effect of it.
- The Indian Paint Association (IPA), the major regulating body of the Indian paint industry and painting bodies, should organise workshops and seminars to educate painters on the hazards associated with the job and the safety measures they can adopt to stay safe.
- Individuals who hire the services of painters should ensure that the painters have or wear appropriate personal protective wear before the commencement of work.
- Finally, the study recommends awareness among painting contractors and construction site managers on effectively implementing engineering and work practice controls and using PPE to prevent ergonomic health risks. Painters must use safety tools while at work.
- The study proposes the need for In-depth qualitative research on the same area for further effective Social work intervention.
- The study suggests changes in the provisions of the law for domestic workers. It is essential to implement provisions of law.
- Research could be undertaken to explore the laws, policies and programs that can be implemented to improve painters and their working and living conditions.

IMPLICATIONS OF THE STUDY

- This research will contribute to the growing number of painters and help them fulfil the requirement by ensuring the trust of secured health in the existing workplace.
- Furthermore, this study will be aware of the harmful effect and motivate painters to take proper precautions at worksites to minimize the impact.
- The current study of health is the key point; although it is related to a particular occupational group, it is equally important and part of our society.
- The current study will play a vital role in assisting our government to develop services, policies, and products that are responsive to an identified need.
- The research publication makes the information available to society. The publication related to paint analysis will help people be aware of its harmful impacts and then try to work safely.