UTILIZATION OF PERSONAL PROTECTIVE EQUIPMENT (PPE) AND SAFE WORK PRACTICES BY CONSTRUCTION PAINTERS AT A PRIVATE UNIVERSITY IN KENYA: AN OBSERVATIONAL STUDY

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The use of construction paints is among the most risky occupations in the world today. Professional painters have an elevated cancer risk of up to 40%, among a myriad of other negative health outcomes. While the use of adequate PPE can significantly reduce exposure to harmful paint chemicals, onsite assessments are rare especially in Kenya where most workers are left exposed to occupational hazards without intervention. This study assessed the onsite utilization of PPE and protective work practice measures by construction painters at a private university in Kenya. Data was collected using covert structured direct observation technique and analyzed descriptively on SPSS version 23. None of the participants had full protective gear and all had observable evidence of dermal contact with paint. Though none of the participants smoked, ate, chew or drunk anything while painting, all of them conversed during the process and all but one (80%) wore sandals. The study concluded that utilization of PPE was inadequate thereby endangering the health of the participants. Provision of PPE by contracting employers and sensitization would improve access and utilization of PPE among construction painters.

Keywords: Paints, painters, PPE, utilization, work practice

Introduction

Occupational safety and health is among the leading public health concerns in the world today. Studies have shown that the global burden of occupational-related fatalities exceeds 2 million per annum, with the greater burden falling in the lower-income parts of the world (Takala et al., 2014; Kharel, 2016).

Among the most risky occupations around the world is the use of construction paints. The WHO estimates that professional painters have an elevated cancer risk of up to 40%, and several studies have linked exposure to paint and paint fumes to various illnesses including headaches, allergies, asthma, dermatoses, eye irritation, respiratory infections and neurologic disorders (Porwal, 2015; Park, Park, & Jang, 2016; Reis, Benbrick, Bonneterre, & Spencer, 2016).

Construction paints are classified as either water-based, often referred to as acrylic emulsions, or solvent-based commonly referred to as oil-based paints (Ramezani, 2015). Water-based paints are relatively less toxic than oil-based and their use is recommended by researchers as the most environmental-friendly option.

Nonetheless, oil-based paints are still in widespread use due to their glossy finish and ease of cleaning despite their well-documented health effects. Though, relatively less toxic, exposure to water-based paints is the most common cause of contact dermatitis among painters and has been implicated in airborne allergic contact/systemic dermatitis etiology (Lundov, Kolarik, Bossi, Gunnarsen, & Johansen, 2014; Amsler et al., 2017; Aerts, Cattaert, Lambert, & Goossens, 2013), as well as pulmonary and immunotoxicity (El-Gharabawy, El-Maddah, Oreby, Salem, & Ramadan, 2013).

Exposure to toxic paint chemicals can occur through inhalation, skin contact and ingestion but also depends on factors such as a worker's dexterity, work techniques, skill, working habits, hygiene, and the contents of coating materials (Estlander, Jolanki, & Kanerva, 2012). Application of paints can be by use of brush/roller or spray-painting. By comparison spray painting is more risky than brush painting due to dispersion of pain mist that can easy enter the body by inhalation.

There are numerous chemicals used in construction paints many of which are known toxins but of particular concern is Volatile Organic Compounds (VOCs). Painting products are the second-largest source of VOCs emissions after automobiles. Other than their environmental effects such as formation of photochemical Ozone, their health effects extend from minor headaches to cancer and neurological damage. One study on construction painters reported

that the level of exposure to Total Volatile Organic Compounds (TVOCs)—including carcinogenic and reprotoxic compounds, in many of their painting tasks exceeded standard exposure limits (Park et al., 2016).

The use of adequate PPE and safe working practices can significantly reduce exposure to harmful paint chemicals and is generally recommended by health authorities and occupational health researchers (Park et al., 2016; Whittaker, 2016; Estlander et al., 2012; Chang, Chen, Cheng, Shih, & Mao, 2007), but compliance with these recommendations need investigation.

According to Park et al. (2016), a few onsite studies have focused on this occupational group due to the volatile nature of their work. Besides, not many utilize PPEs generally, citing for their noncompliance a number of reasons including lack of knowledge, high cost, inconvenience, discomfort and poor fitting (Gutierrez, Galang, Seva, Lu, & Ty, 2014; Umoren, Ekanem, Johnson, & Olugbemi, 2016).

In Kenya, this subject is even more particularly important. The International Labor Organization (ILO) (2013) has indicated that most workers in Kenya are left exposed to occupational hazards without intervention —a problem that definitely needs to be addressed if we are to meet national health objectives, achieve the vision 2030 dream and keep abreast with the novel Sustainable Development Goals (SDGs).

In this quest, the study aimed to assess onsite utilization of PPE and safe work practices among construction painters by, a) determining the proportion of the painters wearing full protective gear while painting; b) describing the types of PPE worn by the construction painters while on the job; c) determining the proportion of the participants having observable evidence of skin contact with paint, and, d) determining the proportion of the painters engaging in selected risky work practices while painting.

Ethical Considerations

The participants of the study were not named in the research neither was the university specified in order to enhance confidentiality and avoid victimization thereby upholding the principle of respect for persons. Secondly, since supporting occupational safety and health research facilitates changes in the policy environment and the health and safety practices of various occupational groups in developing countries (Rutherford & Forget, 1997), the dissemination of outcome of the study will upholds the principle of beneficence.

Materials and Methods

The study was conducted at a private university in Kenya that serves a population of over 2000 people including faculty, staff and students. The painters (N=5), all of whom were included in the study, were hired by the University for the renovation of some classrooms, labs and offices in the month of May/June 2017. Employing a descriptive observational case study design, data was collected covertly using structured direct observation technique since the objective was to evaluate an ongoing event whose physical outcomes could readily be seen (Holmes, 2013).

The participants (n=5) were systematically observed for a period of five (5) hours while working and data collected on participants' gender, demeanor, painting techniques, types of paint, painting activities, dermal contact with paint and range of PPE. The data so obtained was analyzed descriptively on SPSS version 23 using frequencies and percentages and results presented in charts and tables with the aid of MS Excel and MS Word 2013.

Results and Discussion

Demographics and Corollary Data

Observable demographics and corollary data indicated that all participants were adult males— suggesting this is a predominantly male occupation; brush/roller was the painting technique employed and both water-based and solvent-based paints were used though activities involving water-based paints predominated. Painting activities comprised both indoor and outdoor painting involving paint reconstitution, walling, ceiling, skirting, roofline/fascia and flooring.

Although water-based paints—which were the predominant paint in this study, are admittedly less toxic than solvent-based, they are nonetheless substantially hazardous and requisite protection is still necessary (Whittaker, 2016). A recent study in Nigeria found that current water-based paints contained unacceptably high amounts of lead and cadmium—elements that have long been recognized as detrimental to human health (Apanpa-Qasim. Adeyi, Mudliar, Raghunathan, & Thawale, 2016). Brush/roller painting—the two painting techniques used by the participants

in this study, is generally safer than spray painting in terms of airborne paint chemicals (Qian, Fiedler, Moore, & Weisel, 2010), but the presence of paint splashes on the face of one of the participants highlights the need for extra caution in brush/roller painting technique.

Utilization of Personal Protective Equipment

On utilization of PPE it was observed that none of the participants had full protective gear but all had partial protection. Full PPE was taken to include chemical protective suit, Hood, Respirator, Safety boots, face shield and Rubber gloves while partial protection comprised any one of these or their alternatives.

This lack of full protection makes the painters vulnerable to exposure to toxic paint products that could cause a myriad health problems including headaches, allergies, asthma, dermatoses, eye irritation, respiratory infections, cancer and neurologic disorders (Porwal, 2015; Park et al., 2016; Reis et al., 2016). It has been reported that lack of knowledge, high cost and inconvenience are among the common factors contributing to none-use of PPEs (Umoren et al., 2016). It is probable therefore that one or all of these could be the reason why none of the participants had full protective gear. Nonetheless, further study is needed to unravel this.

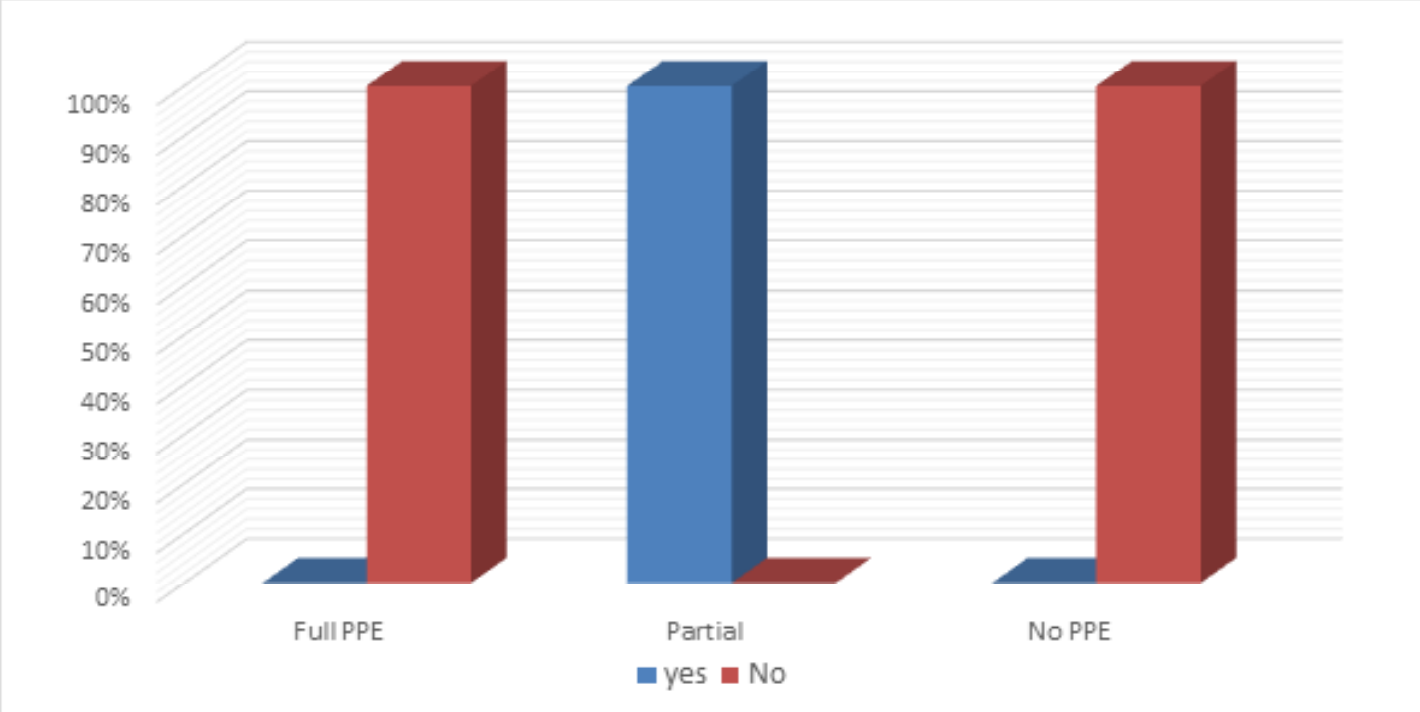

Figure 1. Participants' utilization of PPE.

Range of PPE

The PPE worn by the painters (illustrated in figure 2) included coveralls (60%), nose mask (40%) and caps (60%). But none of these were, strictly speaking, suitable for their job. The coveralls, shoes and caps were, from appearance, absorbent— contrary to the recommendation that they should be made of impermeable materials (Estlander et al., 2012). Indeed the caps were just common-type and the nose masks were, in real sense, dust masks and are so-labelled by the manufacturer.

Nonetheless, it can be deduced from this observation that the participants were willing to protect themselves but having no suitable PPE were left to improvise the best they could. While further study may be necessary to ascertain the real reason behind this discrepancy, provision of PPE by the contracting institution may improve utilization. Indeed in the US, it is required by law that employers provide personal protective equipment to workers free of charge and it has been documented that construction workers are more likely to use PPE regularly when provided at no cost (Grzywacz et al., 2012).

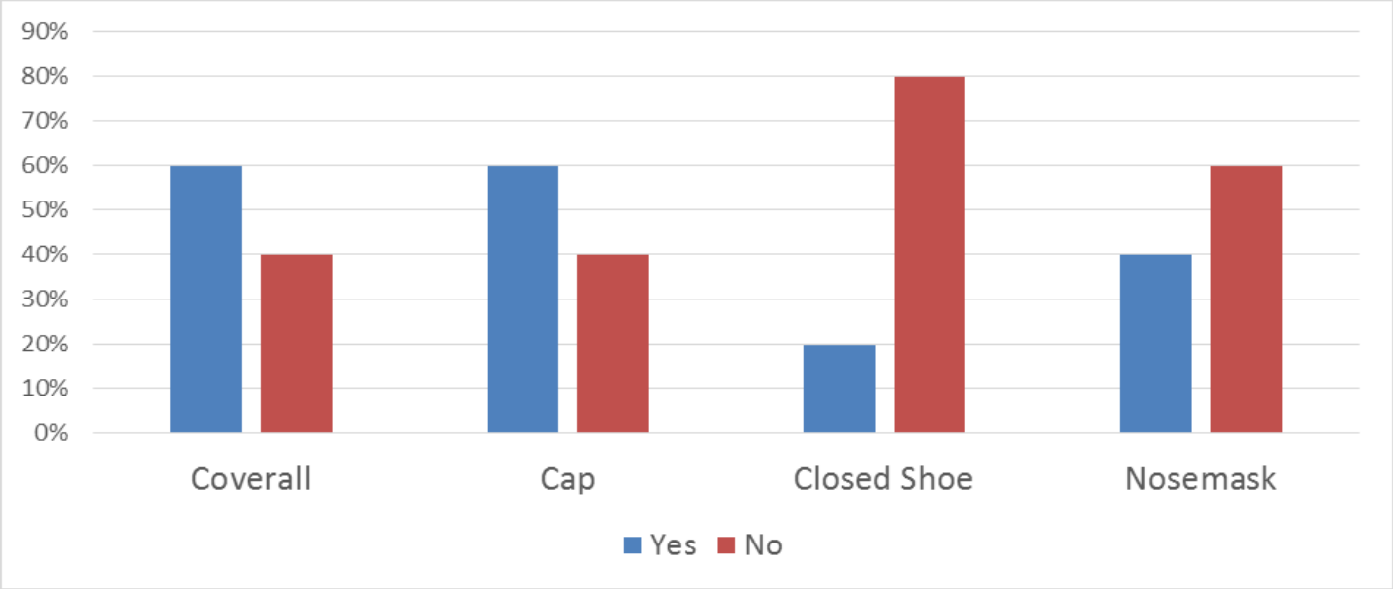

Figure 2. Range of PPE worn by participants.

Further, the nose masks were, for the most part, not worn and there was evidence of re-use though they were of such a nature as could not be washed. Of the two participants that had them, one seldom wore it properly. He was observed donning it properly just for a few minutes then removing it—suggesting perhaps discomfort. This has been cited in previous studies as one of the common reasons for not wearing nose protection by painters (Gutierrez et al., 2014).

The combination of the mask's thin plastic edges, tight band and considerable re-use would certainly cause some discomfort for the wearer; and since it was not of a chemical grade, it could not be effective in eliminating paint odors—which evidently beats its purpose. Beside, having been used more than twice at least, it is possible the pores had been considerably blocked thus making breathing difficult and thereby exacerbating the user's discomfort.

More convenient and effective equipment are available in the market and their use should be encouraged (Gutierrez et al., 2014). This none-use or inadequate use of proper breathing protection equipment exposes the victims to risk of respiratory infections resulting from inhalation of Volatile Organic Compounds (VOCs) especially when dealing with solvent-based paints. One study on construction painters reported that the level of exposure to Total Volatile Organic Compounds (TVOCs)—including carcinogenic and reprotoxic compounds, in many of their painting tasks exceeded standard exposure limits (Park et al., 2016).

Moreover, all the coveralls were heavily stained with paint—suggesting their owners were regular painters, but only one of them wore closed shoes and none had any glove or face protection of any kind. If this is their common practice, they are in danger of chronic exposure to a myriad toxic chemicals including carcinogens, immunotoxins and neurotoxins which can be absorbed into their body through the skin as the work (Park & Park, 2016). Such repeated exposure has the potential to result in bioaccumulation of harmful chemicals in the body. Besides, contaminated work clothing increases exposure and are among the common sources of skin irritation for painters (Estlander et al., 2012). Therefore, protective clothing should be made of impermeable easy to clean material.

A recent study found that DNA damage in blood lymphocytes among construction painters was significantly higher than the control group thus implicating conventional paints in genotoxicity. This further elucidates the danger of construction paints and underscores the need for protective measures (Kianmehr, Amiri, Ebrahimzadeh-Bideskan, & Hajavi, 2016). Indeed,the staining of these overalls itself highlights the role protective clothing plays in preventing exposure to paint while painting.

Dermal Contact with Paint

As illustrated in figure 3, all the participants had observable evidence of skin contact with paint with one having paint stains on face (including lips and eyelids). All participants had stains on their hands and a majority had stains on their feet. This is

most likely because of inadequate personal protective equipment. None of the observees wore hand gloves and only one of them wore closed shoes.

Indeed it was observed that none of the participants wore hand gloves of any kind even while reconstituting paints and one participant was observed washing their brush with bare hands using white spirit—a solvent that is classified as an irritant and that could be detrimental when acutely exposed. This suggests ignorance of the effects of this chemical on the part of the participants. As painters are among the occupational groups that most commonly experience occupational contact dermatitis (Mose et al., 2012), they ought to be encouraged to read and carefully observe instruction provided on Material Safety Data Sheets (MSDS) for each of the chemicals they use.

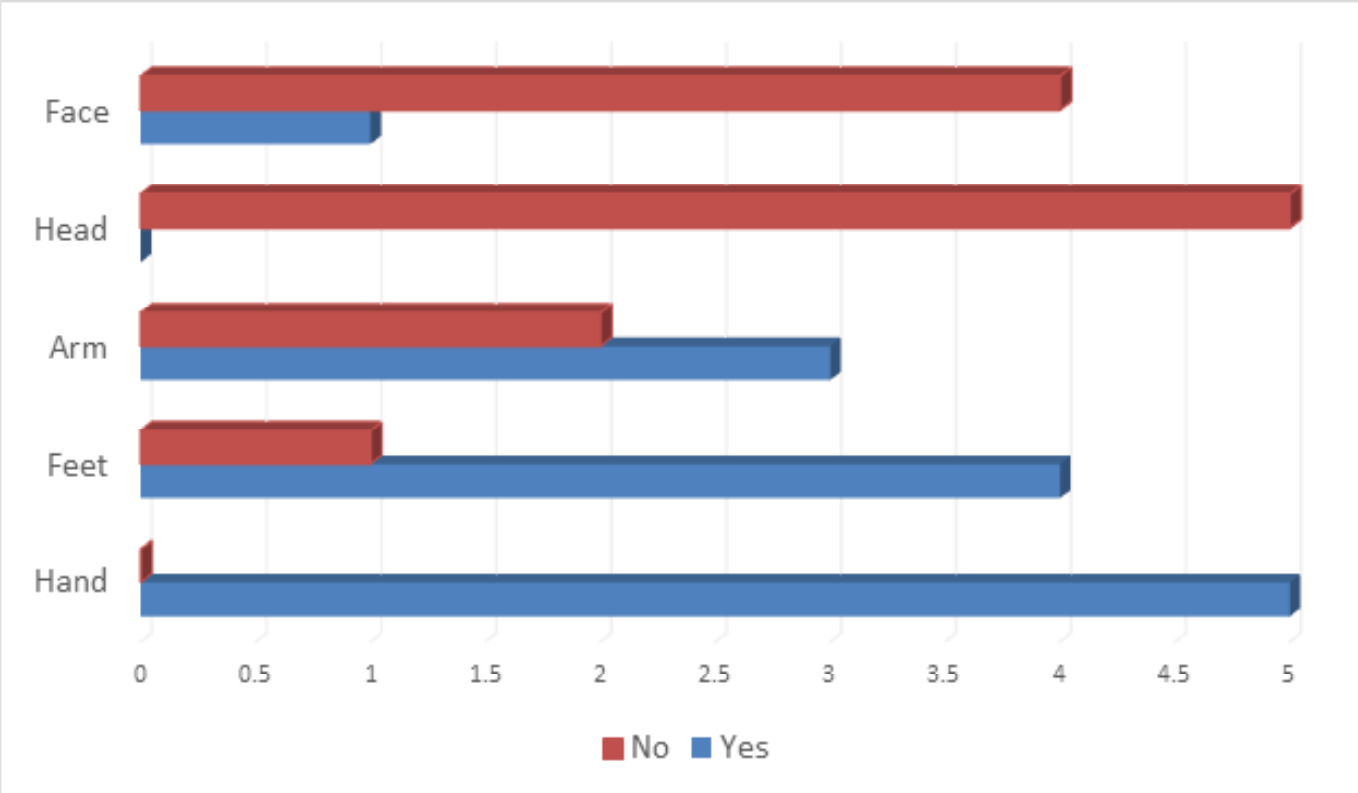

Figure 3. Proportions of participants having observable dermal contact with paint.

Work Practice Measures

As regards risky onsite work practice (figure 4), none of the participants smoked, ate, chew or drunk anything while painting, but all of them conversed and all but one (80%) wore sandals. Talking while painting could increase chances of accidental ingestion of paint. This risk was evidenced by the fact that one of the participants had paint stains on his lips (figure 3). Supposing this accidental splash occurred while the participant was talking, the paint would have entered his mouth. As awareness creation leads to more careful working habits (Estlander et al., 2012), the researcher suggests it as a probable intervention in this case.

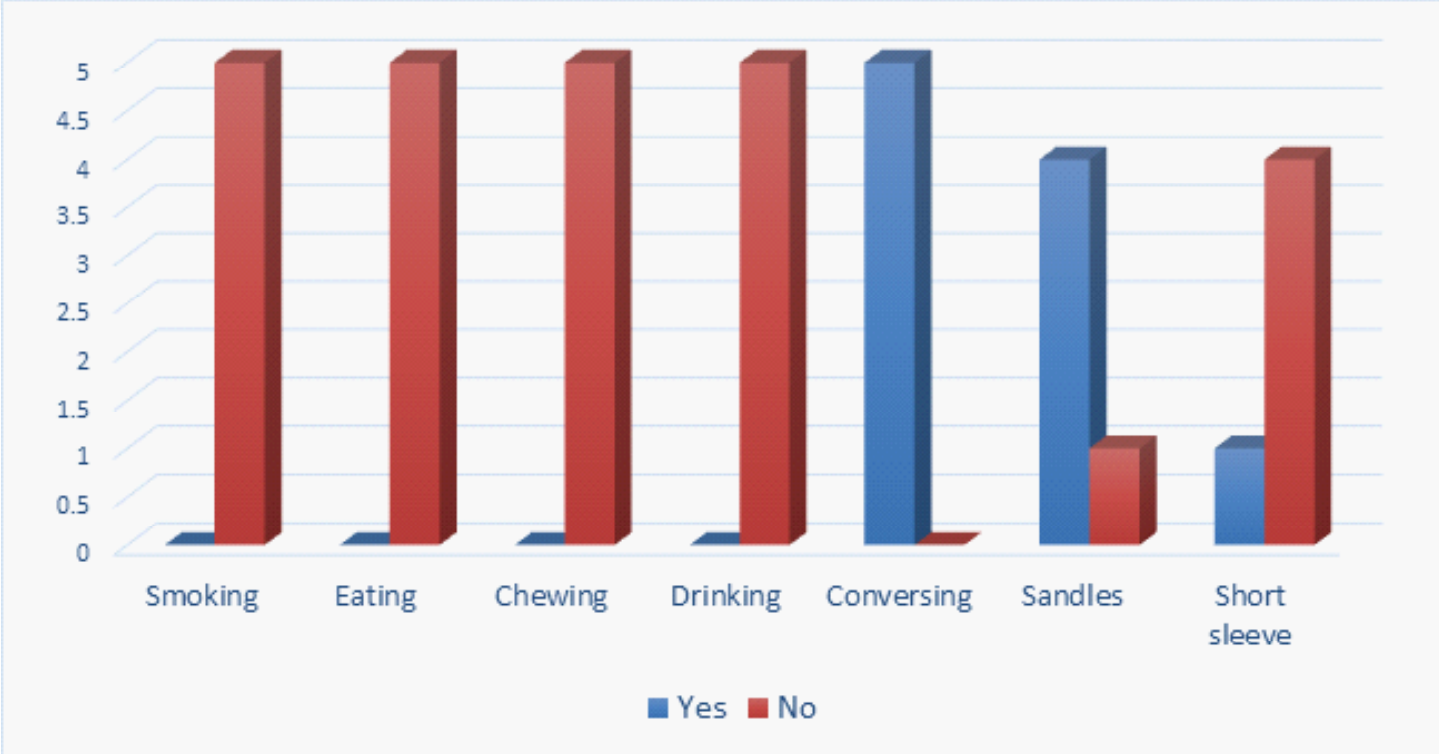

Figure 4. Proportions of participants engaging in risky practices while working.

Conclusion and Recommendations

This study was conducted to assess the utilization of PPE and work practice measures by construction painters at a private university in Kenya using covert structured direct observation technique augmented by unstructured interview. Results indicated that the utilization of PPE among observed participants was inadequate and the painters engaged in some risky practices while painting which could increase their chances of exposure to paint chemicals thereby endangering their health.

While further study is required to determine factors influencing this underutilization of PPE, provision of PPE by the contracting employer, as well as sensitization of the painters on importance of PPE use, could significantly improve utilization. Besides, there is need to assess the painters' knowledge of risky work practices and to establish standard operating procedures for this relatively neglected occupational group.

Study Limitations

This was a convenience observational study at a single university with relatively few participants. The findings of the research may thus not be generalizable to all painters in the country. It is therefore recommended that a more robust study be conducted to assess this important preventive measure in Kenya.

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