

Assessment of Respiratory Symptoms Among cleaners in Governmental Hospitals in Addis Ababa, Ethiopia; Comparative Cross-sectional study

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Research note

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Abstract

Objective Respiratory disorders are the most common occupational diseases. Occupational exposures to dust, fumes, chemicals and gases are associated with increased prevalence of respiratory symptoms. Although cleaning represents a significant part of the working population worldwide, it is a relatively understudied occupation and respiratory health of professional cleaners in hospitals have not been significantly addressed in Ethiopia. The aim of this study was to assess the respiratory symptoms of cleaners working in hospital setting. A comparative cross sectional study design was employed on 140 study participants. The study was composed of 70 cleaners and 70 control subjects. Respiratory symptoms were assessed using standardized questionnaire. The data was coded, entered, cleaned and analyzed using SPSS version 20. Results Prevalence of dry cough, productive cough, wheezing, breathlessness and chest pain for cleaners was higher than the control group. Cleaners had odds of wheezing 2.05 times (OR 2.05, 95% CI: 0.77-5.50) than the controls. The odds of dry cough among cleaners was 4.7 times than among non-cleaners which was the most prevalent respiratory symptom. Based on the study the risk of developing respiratory symptoms were higher among cleaners than controls ($p < 0.05$ to dry cough and breathlessness).

Introduction

Occupational exposures to dust, fumes, chemicals and gases are associated with increased prevalence of respiratory symptoms and impairment of lung function [1]. Exposure to dust has long been associated with the prevalence of varying degrees of airway obstruction and respiratory symptoms in human [2]. Substances found in the workplace cause the airways of the lungs to swell and narrow, leading to attacks of wheezing, shortness of breath, chest tightness, and coughing [3].

Dust and different chemicals impairs lung function and causes respiratory symptoms such as cough, wheezing, shortness of breath and chest pain. The incidence depends upon the chemical composition of dust, size of the particles, duration of exposure and individual susceptibility [4] and severity depends on several factors including the chemical nature, physical state of the inhaled substance, the size & concentration of the dust and chemical particles and the duration of exposure [2].

Cleaning services include a broad range of activities and are performed in different work environments, such as homes, offices, industries, schools, shops, aircrafts and hospitals. The risks that cleaners may be exposed to therefore depend on the tasks they perform. Moreover, cleaning worker often lack training, tools and information in order to perform their work in the best healthy and safe manner [5].

Cleaning agents contain both volatile and nonvolatile substances. The application of common cleaning products results in excessive exposure to potentially harmful volatile pollutants [6]. Cleaning products have emerged as a significant respiratory hazard for cleaners. Most cleaning agents have an irritating effect on mucous membranes and the skin (e.g. Chlorine and Ammonia) and have a sensitizing potential

(e.g. monoethanolamine and aldehydes). Thus, these products have been implicated in different respiratory conditions, including work-related asthma [6].

Ammonia is often included in glass cleaner and other hard-surface cleaner chemicals, and can irritate the skin, eyes, throat, and lungs. Ammonium quaternary compounds are a family of chemicals known for their disinfectant and detergent properties. They are found in cleaning products like disinfectant sprays and toilet cleaners, and have been identified as a known inducer of occupational asthma among cleaning workers [7].

Chlorine bleach or sodium hypochlorite is the most commonly used disinfecting and cleaning agent. It is now used in daily life for a variety of applications such as water and food disinfection and cleaning of surfaces in public and private buildings [8]. However, chlorine bleach is unstable and highly reactive chemical. When mixed with other cleaning agents, chlorine bleach can release chlorine or tri-chloramine, two gases which are strong irritant to the eyes and the respiratory tract. Exposure to chlorine gas can cause coughing, shortness of breath, chest pain, nausea, or other symptoms [7, 8]. The acute inhalation in toxic concentrations of the respiratory irritants such as hypochlorite and chlorine gas results in a clinical entity described as reactive airways dysfunction syndrome [9].

Monoethanolamine (MEA) is a surfactant commonly found in detergents which enhances the cleaning power of it. MEA is used in cleaning products such as laundry detergents, and floor cleaners and has been identified as a known inducer of occupational asthma in cleaning workers [7].

Aldehydes are extensively used in medical facilities for disinfecting heat sensitive equipment such as fiber optic endoscopes. They can cause mucous irritation, respiratory symptoms, and immunoglobulin IgE-mediated hypersensitivity reactions, and are well-known causative agents of occupational asthma [6].

Even though great attention has been given to different occupations on health, pulmonary function complications of cleaners have been poorly characterized. The alterations of pulmonary function of professional hospital cleaners have not been significantly addressed previously in Ethiopia.

Hence, this study was planned to assess the prevalence of respiratory symptoms among cleaners working in a hospital setting and compare the results with a control group who are not exposed to cleaning products and dust at work. The study will further improve the rate of morbidity and mortality in patients with pulmonary function impairment by creating prior awareness and behavioral changes which will be used to minimize unnecessary health costs through promoting the use of personal protective devices.

Materials And Methods

A comparative cross sectional study design was employed to assess respiratory symptoms among randomly selected 70 female cleaners and 70 non cleaners who work in governmental hospitals in Addis

Ababa. For both study and control groups, those with tuberculosis, self-reported or known diagnosis of lung or chest wall disease like asthma, chronic bronchitis, pneumothorax, common cold, and history of smoking were excluded from the study.

Respiratory symptoms were assessed using face-to face interview. After informed written consent was taken from participants, data was gathered by the researchers based on a standardized structured questionnaire prepared based on British Medical Research Council questionnaire (BMRC). The questionnaire assessed symptoms including cough (dry & productive), wheezing, shortness of breath, and chest pain related complaints.

Statistical Analysis

Data were coded, entered, cleaned and analyzed using Statistical Package for Social Science (SPSS) version 20. Descriptive statistics and binary logistic regression were conducted in the data analysis and interpretation.

Results

Respiratory Symptoms

Results of the descriptive statistics of the present study showed that the prevalence of dry cough, productive cough, wheezing, breathlessness and chest pain for cleaners was higher than control groups (Figure 1).

The binary logistic regression was conducted to compare the respiratory symptoms of cleaners with the control group. The odds of dry cough among cleaners was 4.7 times than among non-cleaner groups. The statistical analysis showed that the difference for both dry cough and breathlessness were significant ($p < 0.05$), which may be due to high exposure to sensitizers (Table 1).

The exposed participants had odds of wheezing 2.05 times (OR 2.05, 95% CI: 0.77-5.50) than the controls. Though the prevalence was higher among cleaners, the differences for productive cough, wheezing and chest pain between the groups were statistically insignificant (Table 1).

Table 1: The results of binary logistic regression of respiratory symptoms of both cleaners and non-cleaners study groups at Governmental Hospitals in Addis Ababa, Ethiopia

| | | | N=140 |
|------------------|------|------------|--------|
| Variables | OR | 95% CI | P |
| Dry cough | 4.7 | 1.54-15.5 | 0.007* |
| Productive cough | 2.9 | 0.75-13.35 | 0.13 |
| Wheezing | 2.05 | 0.77-5.5 | 0.153 |
| Breathlessness | 3.69 | 1.37-9.97 | 0.010* |
| Chest pain | 3.78 | 0.76-18.87 | 0.105 |

OR: Odds Ratio CI: Confidence Interval *: P<0.05

Practice of Personal Protective Device

Regarding the use of personal protective devices, all respondents agreed with the idea that cleaners should wear personal protective devices during work. The types of personal protective devices used by the cleaners were also investigated. As indicated in figure 6, 41.4 % (n=29) wear glove & uniform; 48.6 % (n=34) wear glove, mask & uniform; and 10% (n=7) wear glove, mask, safety shoes & uniform. Based on the result of this study 41.4% of cleaners do not use face masks and 90% of them do not use safety shoes and all cleaners use glove and uniform (Figure 2). According to the response of some cleaners, the distribution of these personal protective devices was not sufficient. None of them used safety goggles and respirators because there was scarcity of these devices.

With regard to knowledge of cleaners about hazards of cleaning agents, 92.9% (n=65) of them responded that they know the hazards of cleaning agents and dust on their respiratory health. Out of seventy cleaners, 57.1% (n=40) of them got trainings about hazards of cleaning agents, dust, and the use & importance of personal protective devices. The rest 42.9% (n=30) did not get any training on cleaning hazards.

Discussion

As this study revealed that dry and productive cough were more common among cleaners than controls. Dry cough was the most prevalent respiratory symptom among cleaners with higher risk of (4.7 times) developing than controls. This finding is in line with a study conducted in Turkey [10], which suggested that there was higher prevalence of cough among cleaners than controls and was statistically significant.

Breathlessness was the other respiratory symptom which was more prevalent among cleaners than controls and was found to be statically significant. The risk of developing breathlessness among cleaners was 3.69 times than the control groups. This result was in agreement with the study conducted in Iran [11], which depicted higher prevalence of breathlessness of exposed groups than controls with a significant p-value. Another study in Northern Europe [12] also found that respiratory symptoms and disease were more common among cleaners.

There was also a higher prevalence of productive cough, wheezing and chest pain among cleaners than the controls. The risk of productive cough, wheezing and chest pain among cleaners were 2.9, 2.05 and 3.78 times than control groups, respectively. The study was in line with the results of the studies conducted among female professional cleaners showing higher risks in prevalence of respiratory symptoms than controls [13, 14]. High prevalence of respiratory disorders observed among the cleaners may be due to the different irritating and sensitizing cleaning agents and floor dust which are allergic and may therefore irritate and sensitize the respiratory tract leading to cough and other respiratory symptoms. The fact that hospital cleaners inadequately used personal protective devices such as respirators and exposed to a high cleaning agents and dust generated at the cleaning sites may have contributed to increase in the prevalence of the respiratory symptoms.

The habit to utilize personal protective devices (PPDs) was very low. All cleaners agreed on the importance of using personal protective devices to protect themselves from cleaning hazards. Even though they agreed on the advantages of protective devices, the result showed that there was no full supply of PPD from the hospitals they work. Because of the inadequate supply of PPDs, workers were not sufficiently protecting themselves from cleaning hazards during work. No one among cleaners used safety goggle and respirator in this study. As a result, there could be higher opportunity to have risks of developing respiratory symptoms and pulmonary function disorders due to free inhalation of vapor forms of cleaning agents and dust which increases the probability of developing respiratory symptoms and pulmonary function disorders among cleaners. In order to minimize occupation-related pulmonary risk of air pollution, prevention and continuous monitoring systems are necessary to provide norms for adequate personal respiratory protective measures for chronically exposed people.

Conclusion

Based on the results of this study, it can be deduced that cleaners are more frequently exposed to respiratory irritants and sensitizers, consequently are prone to adverse respiratory symptoms. There was higher prevalence of cough, wheezing, breathlessness and chest pain among cleaners.

All in all, the results of the present study showed that working in hospital sanitary service without taking proper care has adverse effect on respiratory health among cleaners.

Limitations

This study is not without limitations. The study did not include both sexes because of the unavailability of male cleaners in the sampled hospitals. Hence, further investigation has to be done to compare the effect of respiratory irritants and sensitizers on both sexes while working in hospital sanitary service. Therefore the findings of our research are still relevant and valid in drawing attention to the population.

Abbreviations

BMRC: British Medical Research Council questionnaire

IgE: Immunoglobulin E

MEA: Monoethanolamine

OR: Odds Ratio

PPD: personal protective devices

SPSS: Statistical Package for Social Science

Declarations

Ethics Approval and Consent to Participate

This study was carried out after approval was obtained from a review committee of Addis Ababa University. Objectives and benefit of the study were explained to the study participants by the investigator before the actual data collection. Written informed consent was obtained from each study participants and those who gave consents participated in the study. The personal data collected during this study was used only for the stated objectives.

Consent for Publication

Not applicable.

Availability of Data and Materials

All data analyzed during this study are available from the corresponding author on reasonable request.

Competing Interest

All authors have no competing of interest to declare.

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No financial support was gained to conduct the study.

Author's Contributions

BG, DD, MMM, TT and AA contributed to writing the proposal, collecting the data, analyzing the data, writing the manuscript and revising the manuscript prior to the final submission following the reviewer's comment. DWH contributed to reviewing the proposal, supervising the data collection, reviewing and editing the manuscript. All authors have read and approved the manuscript.

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Figures

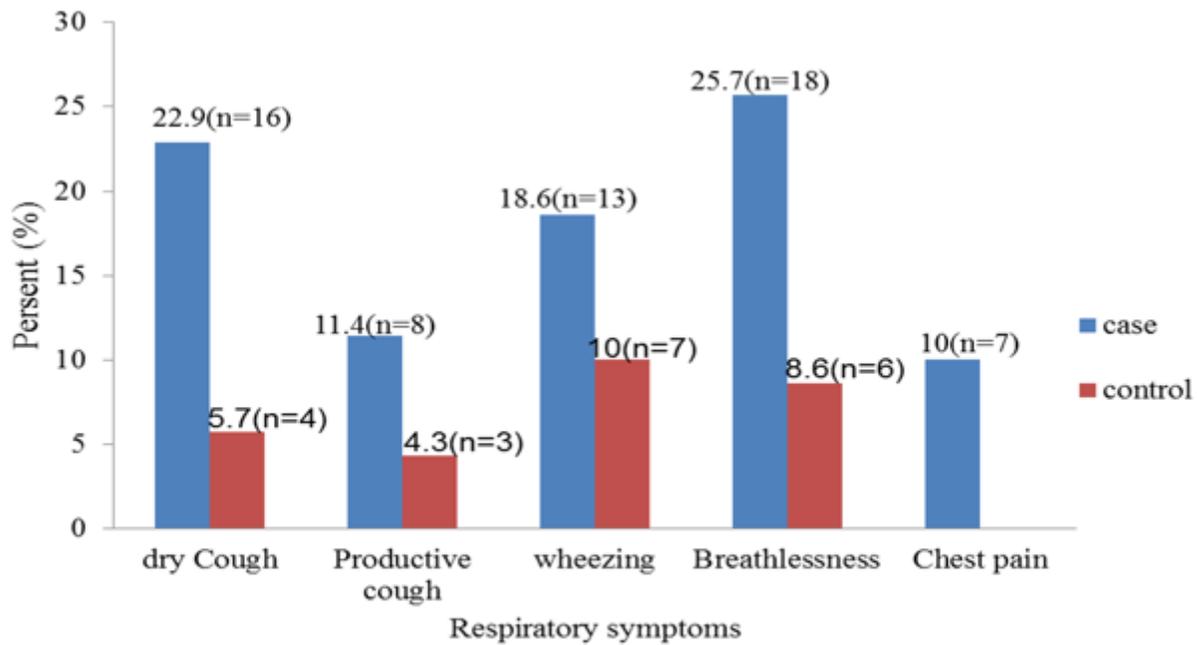


Figure 1. Prevalence of the respiratory symptoms among the exposed and non-exposed (control) groups at Governmental Hospitals in Addis Ababa, Ethiopia.

Figure 1

Prevalence of the respiratory symptoms among the exposed and non-exposed (control) groups at Governmental Hospitals in Addis Ababa, Ethiopia.

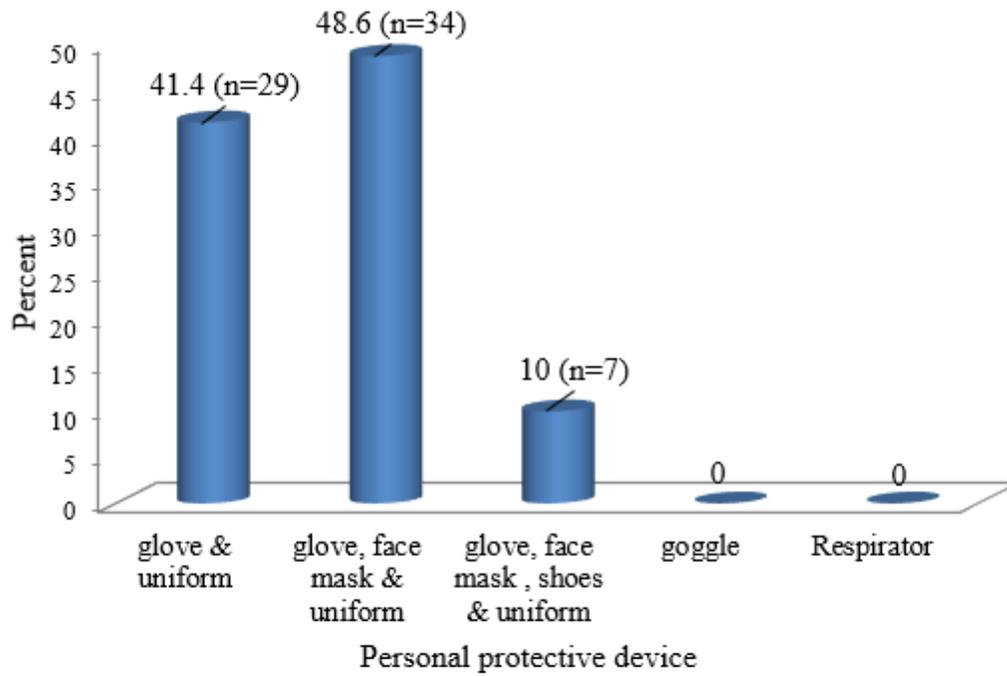


Figure 2. Type and prevalence of personal protective devices used by cleaners during work at Governmental Hospitals in Addis Ababa, Ethiopia.

Figure 2

Type and prevalence of personal protective devices used by cleaners during work at Governmental Hospitals in Addis Ababa, Ethiopia.