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Exploring The Neglected and Hidden Dimensions of On-The-Job Occupational Health Hazards among Hospital Janitors and custodians

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Abstract

Background: Hospital janitors and custodians are low-status workers exposed to various hazards. They have an incidence rate of nonfatal occupational injuries of 107.5 per 10,000 full-time workers. **Objective:** To investigate work-related health hazards among hospital janitors and custodians. **Method**: A cross-sectional study was conducted on 570 hospital janitors and custodians using an interview questionnaire that consisted of socio-demographic and occupational history, safety practices and self-reported health hazards. Physical examination and investigations were also conducted. **Results**: the majority of participants (79.6%) had knowledge about occupational hazards at work. The highest median risk analysis score was among the ergonomic risk (high risk), and the least were accident and physical risks (low risk). The nervous system manifestations were the most prevalent self-reported health hazard of 43.9%, and the least one is hepatitis C infection by percentage of 9.5%. Statistically significant negative correlations were found between different risk analysis scores and personal protective clothing use and safe work practices ($P < .05$). Statistically significant correlations were found between diurnal variations in Peak Expiratory Flow Rate with workplace safety behavior score, use of BMI, age duration of work ($P < .05$). **Conclusions:** The most self-reported health problem was nervous system manifestation while HCV was the least reported one. PEFR diurnal variation was mostly influenced by smoking and least affected by the duration of work.

Key-words: Janitors – Custodians – Workplace – Hazards

Introduction:

In 2017, according to the Bureau of Labor Statistics (BLS), janitors and building cleaning workers held about 2.1 million jobs. Approximately 7% were employed in healthcare [1]. In the United States, during the year 2016, workers classified as janitors and custodians (N= 2,384,600) incurred more than 36,000 work-related

injuries resulting in days away from work and an incidence-rate of 235.4 nonfatal occupational injuries and illnesses per 10,000 full-time workers requiring days away from work, which is higher than the rate for private industry as a whole (86.9 per 10,000 full-time workers)[2,3].

Janitors and custodians are considered under-served groups as defined by National Institute for health and care Research (NIHR). Characteristics that are common to several under-served groups are: Lower inclusion in research, High healthcare burden that is not matched by the volume of research designed for the group and important differences in how a group responds to or engages with healthcare interventions compared to other groups, with research neglecting to address these factors[4].

On March 22, 2020, a day announced as curfew, people took to their balconies and rooftops clapping, cheering, singing, and ringing bells to pay their gratitude to the health-care workers and essential service employees who were risking their lives every day to save people from the pandemic. It was disappointing that all news channels and other media were talking about doctors, nurses, and police personnel with very little mention of hospital janitors[5].

Janitors and custodians are low-wage, low-status workers who are exposed to physical, chemical, biological and psychosocial hazards in the course of their work. Well-documented risk factors of cleaning and guarding work include musculoskeletal hazards from repetitive movement, awkward postures, and high-hand postures. Other hazards may include chemical exposure, noise, and electrical hazards, safety hazards from ladders and wet floors, and psychosocial stress[6].

They have a high burden of occupational injury and illness due to the wide range of physical demands and chemical exposures experienced on the job. These include but are not limited to work-related asthma and respiratory disorders, musculoskeletal issues, and dermal and ocular irritation[7].

Compared to other domains in the field of health care facilities, the workers in cleaning and security craft unfortunately have the least health care attention. Considering they are moving free as the other medical staff they could be exposed to the same health hazards in this facility. To date, no study has framed hospital janitors and custodians as a population providing direct patient care or has aimed to describe how they view themselves within healthcare settings been done. Thus, this study provides an opportunity to learn from staff of diverse cultural backgrounds, working various shifts on different units.

Objective:

1) To investigate work-related health hazards among hospital janitors and custodians.

2) To analyze safety practice at work among hospital janitors and custodians.

3) To assess the knowledge of hospital janitors and custodians about safety at work.

Subjects and Methods:

1. **Study design:** This is a cross-sectional study.

2. **Study setting:** Two governmental tertiary hospitals in Benha city. Benha University Hospital was chosen for convenience and Benha Teaching hospital was chosen by random sampling.

3. **Study period:** The field work of this study was carried out from the first of August 2022 to the end of January 2024.

4. **Target population of the study:** Hospital janitors and custodians from Benha city who are fulfilling the following inclusion criteria.

Inclusion criteria:

All hospital janitors and custodians from different departments of the chosen hospitals and working for at least one year prior to the study.

Exclusion Criteria:

- Workers with employment duration of less than 1 year,
- Those suffering from chronic respiratory conditions
- Those with muscular and skeletal deformity.

5- Sampling type and technique:

The study was carried out at two governmental tertiary hospitals in Benha city. Benha University Hospital was chosen for convenience and by using cluster random sampling technique**,** another tertiary hospital was chosen randomly from all the remaining four tertiary hospitals in Benha city (Benha Insurance Hospital, Benha Teaching Hospital, Benha Children Hospital and Benha Fever Hospital). All janitors and custodians at these two hospitals who met the specific inclusion criteria were enrolled in this study**.**

6- Sample size:

The total number of the janitors and custodians from different departments in Benha University Hospitals is 335 and 100 respectively, while the total number of janitors and custodians working in Benha Teaching Hospital is 150 and 95 respectively. So, the total population is 680 janitors and custodians. 640 out of 680 were fulfilling the inclusion criteria and accepted to participate in the study. Sixty-five workers were included in a pilot study and excluded from the sample. Five were dropouts due to feeling uncomfortable with the investigation done. Thus, the present study included data from 570 workers.

6. Study methods and tools:

Data was collected using, interview questionnaire, physical examination, and investigations.

A- Interview Questionnaire consists of the following;

(1) A sociodemographic data: It consisted of personal information such as age, sex, country of birth, level of education, marital status, and smoking habit.

(2) Occupational history: full detailed occupational history was taken as job duration, place of work, working shift (day or night), safety behavior and use of personal protective equipment (PPE).

(3) Occupational hazards:

By using the International Hazard Datasheets on Occupation for orderlies of the health services [8] a data sheet listed in a standard format the different hazards to which workers in hospital specially janitors and custodians may be exposed to in the course of their daily normal work. Then each hazard was asked about its frequency and consequence level and the risk score was calculated for each hazard as follows:

Total risk score = frequency X consequence [9]

(4) Health impacts of occupational hazards on janitors and custodians: it included questions about health hazards and symptoms that occurred during work.

B- Physical and systemic examination; pulse, blood pressure, weight, height and chest auscultation for wheeze.

C- Investigation: Peak expiratory flow rate was measured pre and post work-shift using the vitalograph peak flow meter (MK18 Ltd, 1sw, England), and the diurnal difference was calculated as follow [10]:

(pre shift reading – post shift reading) / Pre shift reading.

Administrative consideration:

Official permissions were obtained from the managers of Benha University Hospital and Benha Teaching Hospital to conduct this study.

Ethical consideration:

- An approval from Research Ethics Committee in Benha faculty of medicine was obtained {no.: MD 4.6.2022}.
- An informed written consent was obtained from all participants. It included data about the aim of the work & study design to assure safety and confidentiality.

Data management and statistical analysis: -

The collected data were recorded and statistically analyzed by computer using SPSS 26.0 for windows (SPSS Inc., Chicago, IL, USA).

The normality of distribution for the analyzed variables was tested using Kolmogorov-Smirnov test. The collected data were summarized in terms of median and interquartile range (IQR) for quantitative data and as number and percentage for qualitative data. Comparisons between the different study groups were carried out using the Chi-squared (χ^2) to compare qualitative data. Two population proportions were compared using the Z test. Mann-Whitney test (z) was used to compare median of two groups of quantitative non-parametric data. Kruskal Wallis test was used to compare median of more than 2 groups of quantitative non-parametric data. Correlation analysis was done to determine the association between variables using Pearson and Spearman correlation coefficient (r).

All tests were two sided. The accepted level of significance in this work was ($p < 0.05$).

Results:

Results of this study show that the median age of the study participants was 35 years. More than half of the study participants

(51.8%) were females. Regarding educational level, only around eight percent were illiterate, while 38.4% of them belonged to diploma education. The median Body Mass Index (BMI) of the workers was 24.8 and (63.5%) were non-smokers. The median duration of work by year of the study participants was 3 years. The majority of the study participants (64.7%) had a day shift work and (35.3%) of them were night shift workers. 40.6%of study group were workers in medical departments , 34.7% in surgical departments while 24.7% in emergency departments. The median diurnal variation of PEFR between pre and post shift was 8.97 L/min **(Table 1).**

In this study, the majority of participants (79.6%) had adequate knowledge of occupational hazards at work. More than half (64.2%) agreed that working as janitors or custodians in a hospital environment is more vulnerable to hazards than any other workplace. Only 11.8% of workers had a worse health status while working in hospital than before. Around 56% of janitors and custodians did not have special feelings toward their work in hospital but just doing it for a living. **(Table 2)**

When calculating the risk assessment in this study, the highest median score was (16) and was attributed for the ergonomic risk, followed by psychological risk with a median score 9 indicating a moderate risk, then biological risk with median score of 8 indicating a moderate risk, chemical risk with median score of 6 indicating a moderate risk, and finally accident and physical risks with median score of 4 indicating a low risk **(Table 2)**

Among the self-reported health status; the nervous system manifestations were the frequently reported one by percentage of 43.9%, followed by accidents such as slips, trips and falling by 37.4%, GIT problems 36.8%, respiratory problems 35.4%, stress problems 30%, varicose vein and hemorrhoids 27%, irritation of mucous membrane 25.3%, skin manifestation 13%, HBV and HCV infection 10.7% and 9.5% respectively. **(Figure 1)**

The results show significant negative correlation between accident risk score and PPE use score (r= - 0.68), safe work practice score (r= - 0.278), age (r= - 0.237) and duration of work (r= - 0.166). Significant negative correlation was noticed between physical risk score and PPE use score (r= - 0.329) and safe work practice score (r= - 0.253). On the other hand, there was positive correlations between physical risk score and duration of work (r=0.269) and body mass index (r=0.193). It's noticeable that there was statistically significant positive correlation between chemical risk and PEFR difference (r=0.450), age (r=0.263) and body mass index (r=0.184) and negative correlation between chemical risk and PPE use score (r= - 0.546) and safe work practice score (r= - 0.108). There was statistically significant negative correlation between biological risk and PPE use score (r=-0.744), safe work practice score (r=-0.297) and age (r=-0.290) and a positive correlation between biological risk and body mass index (r=0.136). It's noticed that ergonomic risk showed statistically positive correlation with duration of work (r=0.416), age (r=0.278) and BMI (r=0.237). It's noticeable that there was a statistically significant positive correlation

between psychological risk and duration of work (r=0.101) **(Table 3).**

There were statistically significant negative correlations between PPE use score and self-reported mucous membrane irritation (r=-0.232), risk score of accidents (r=-0.222), hepatitis B virus infection (r=-0.217), varicose veins (-0.182), hepatitis C virus infection (r=-0.142), nervous system manifestations (r=-0.136) and GIT problems (r=-0.101). It is noticeable that there was a statistically positive correlation between PPE use score and reported accidents (r=0.150) **(Table 3).**

There was highly statistically significant negative correlation between PEFR diurnal variation with each of workplace safety behavior score (R=-0.416) and use of PPE (R= -0.728). It's noticeable that there were statistically significant positive correlations between PEFR diurnal variation with body mass index (R=0.531), age (R=0.170) and duration of work (R=0.160) **(Table 3).**

A multiple linear regression analysis showed that younger age, smoking, high BMI, short duration of work (low experience), and low compliance in workplace safety behaviors were all predictors of high PEFR difference **(Table 4).**

Table (1): Sociodemographic and occupational history among the studied population (n=570).

Sociodemographic and occupational history		**N. (n= 570)**	**% (100.0)**
Sex	Male	275	48.2
	Female	295	51.8
Age (year)	Median (IQR)	35 (8)	
	≤35	335	58.8
	>35	235	41.2
Educational level	Illiterate	46	8.1
	Primary	76	13.3
	Preparatory	167	29.3
	Secondary	62	10.9
	Diplom	219	38.4
BMI	Median (IQR)	24.8 (3.01)	
Smoking	Smoker	208	36.5
	Nonsmoker	362	63.5
Duration of work (years)	Median (IQR)	3 (7.1)	
Department	Medical	231	40.6
	Surgical	198	34.7
	Emergency	141	24.7
Shift	Day	369	64.7
	Night	201	35.3
PEFR difference %	Median (IQR)	8.97 (14.59)	

Table (2): Frequency distribution of occupational hazards knowledge and attitude among the studied population (n=570).

occupational hazards knowledge and attitude		**N. (n= 570)**	**% (100.0)**
know the concept of occupational hazards at work	Yes	454	79.6
	No	116	20.4
working environment has multiple hazard	Yes	391	68.6
	No	179	31.4
Working in hospital is more vulnerable comparing to working at any other place	Yes	366	64.2
	No	204	35.8
Feeling affected adversely by occupational hazards	Not at all	252	44.2
	Occasionally	138	24.2
	Sometimes	148	26
	Often	26	4.6
	Very often	6	1
Comparing to health status before working in hospital	Better than before	186	32.6
	Quite same	317	55.6
	Worse than before	67	11.8
Working in hospital environment	challenging and difficult	70	12.3
	simple and comfortable	20	3.5
	stressful and exhausting	133	23.3
	boring and disappointing	17	3
	flexible and cheerful	8	1.4
	I don't have special feelings but just doing it for a living	322	56.5
Risk assessment of hospital hazards		**median**	**IQR**
Accidents risk		4	8
Physical risk		4	3
Chemical risk		6	7
Biological risk		8	7
Ergonomic risk		16	10
Psychological risk		9	3

Table (3): Correlation Analysis of Hospital Risks, Occupational Health Status, and PEFR Differences Among the Studied Population (n=570)

Risk analysis score	Accidents risk		Physical risk		Chemical risk		Biological risk		Ergonomic risk		Psychological risk	
Parameter	r*	*P* value	r*	*P* value	r*	*P* value	r*	*P* value	r*	*P* value	r*	*P* value
Age	-0.237	.000**	.073	.084	0.263	.000**	-0.290	.000**	0.278	.000**	.030	0.474
Duration of work (year)	-0.166	.000**	0.269	.000**	-.049	0.243	.049	0.243	0.416	.000**	0.101	.016*
BMI	.013	0.754	0.193	.000**	0.184	.000**	0.136	.001**	0.237	.000**	-053	0.203
PPE use score	-0.680	.000**	-0.329	.000**	-0.546	.000**	-0.744	.000**	0.103	.082	0.036	0.214
Safe work practice score	-0.278	.000**	-0.253	.000**	-0.108	.010*	-0.297	.000**	0.053	0.102	-0.016	0.138
PEFR difference (L/min.)	0.091	.910	.046	0.272	0.450	.000**	0.050	0.450	0.109	.074	.070	.097

Occupational health status	PPE use r*	P value
Nervous system manifestation (n=250)	-0.136	.001**
Accidents (slips, trips, falling) (n=213)	-0.222	.000**
Reported accident	0.150	.028*
GIT problems (n=210)	-0.101	.016*
Respiratory problems (n=202)	-.036	0.393
Stress problems (n=176)	-.014	0.740
Varicose vein (n=156)	-0.182	.000**
Mucous membrane irritation (n=144)	-0.232	.000**
Skin problem (n=74)	.013	0.762
HBV (n=61)	-0.217	.000**
HCV (n=54)	-0.142	.001**

PEFR difference Parameter	R*	P value
Age (year)	0.170	.000**
BMI	0.531	.000**
Duration of work (years)	0.160	.000**
Workplace safety behaviors score	-0.416	.000**
Use of PPE score	-0.728	.000**

r* = spearman correlation coefficient * Significant ** Highly significant

Table (4): Multiple linear regression analysis for prediction of PEFR difference using some parameters among the studied population (n=570).

PEFR difference	Multiple linear regression		
Parameter	**B**	**P value**	**95% CI**
Sex	-1.070	0.067	-2.213-0.074
Age (year)	-0.151	.000**	-0.235- -0.067
Smoking	3.739	.000**	2.503-4.975
BMI	0.450	.000**	0.355-0.546
Duration of work (years)	-0.147	.019*	-0.269- -0.024
Working department	0.489	0.138	-0.158-1.137
Workplace safety behaviors score	-0.771	.000**	-0.849- -0.694
Use of PPE score	0.100	0.258	-0.074-0.274

* Significant ** Highly significant B= coefficient B CI= Confidence Interval

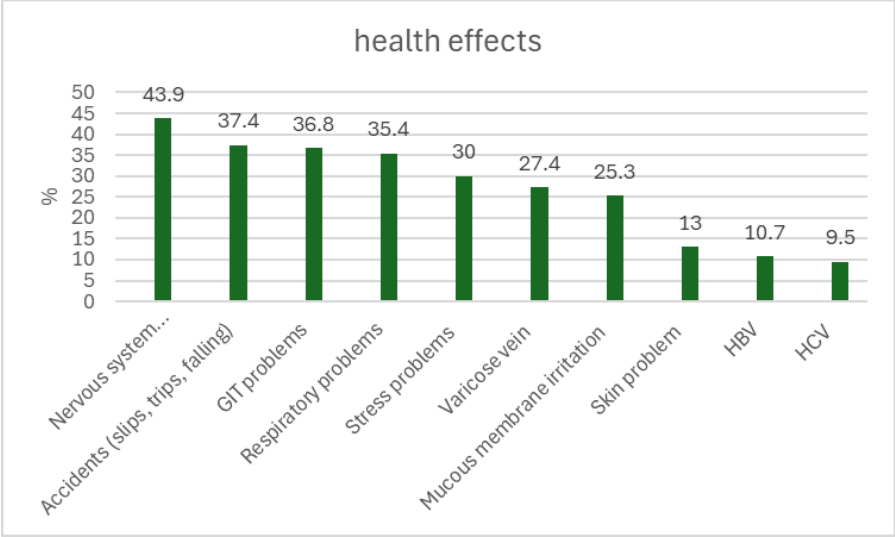

Figure (1): Descriptive statistics of occupational health status among the studied population (n=570).

Discussion:

Hospital janitors and custodians belong to a category that is often forgotten in the labor context but they are exposed to a high risk of occupational health hazards. They are often invisible and undervalued as workers.

This study revealed that the median age of the study participants was 35 years. More than the halves of the study participants 51.8% were females (Table 1). These results were less than the finding of a cross-sectional study included 183 cleaning workers employed in an academic medical center and affiliated health sciences campuses in Northern California, the mean age of the participants was 48 years old, and the majority was female (56%) [11].

The proportion of current smoking among the study population was 36.5% (Table 1) which is higher than total adults using tobacco products in Egypt (24.4%) [12]. After finishing the interview, we informed and warned the workers about the harmful effects of smoking.

In our study, we used cross-shift PEF measurements to find median PEF variability 8.97 for a workday (Table 1). This finding was lower than who conducted a cross-sectional study on 278 professional cleaning workers at a university hospital in Turkey. They found daily mean PEF variability of 20.6 for workdays [13].

The current study highlighted that the majority of participants (79.6 %)had adequate knowledge of occupational hazards at work (Table 2). This is close to the finding of a cross-sectional study among 116 employees of the South Tongu District Hospital His results revealed that the majority of the employees were aware of occupational health and safety hazards and measures in the hospital as 73.5% had high awareness level[14].

Furthermore, the results of showed that the majority (74.7 %) were satisfied with working in the Hospital while 25.3% of the respondents were not satisfied [14]. Contrary to that we found that more than half of the participants (56%) did not have any special feeling toward their work in hospital but just doing it for a living (Table 2).

The psychological hazards (51.5%) and biological hazards (41%) were the major occupational hazards in a cross-sectional study conducted among 260 randomly selected healthcare workers in Western Ethiopia[15]. In comparison to our study, psychological hazards (median; 9) and biological hazards (median; 8) were found to be the major hazards after ergonomic hazard (median; 16) (Table 2). This is supported by previous research that has identified that most injuries resulting in lost work time among cleaners are attributable to musculoskeletal injuries [16].

Furthermore identified that musculoskeletal injuries are the leading cause of morbidity and disability in the healthcare workforce but are rarely reported. Patient transfer is a common activity in hospitals, especially among janitors, with no available patient transfer aids like roll-on and slide boards devices. Patients on life support devices, operative and postoperative cases, obese patients, patients on hemodialysis, etc. are generally

non-ambulatory and need transfer from stretcher to patient beds or other departments for investigation or any procedure, and vice versa. During this act, several HCWs have reported sustaining injuries and developing musculoskeletal illnesses [17].

This study revealed that among the self-reported health status nervous system manifestations in the form of headache, muscle pain and spasm were the highest (43.9 %)(Figure 1). This was higher than finding of who conducted a cross-sectional study on 78 Brazilian hospital workers and 39 Spanish hospital workers, carried out in two public general hospitals, one in Brazil and one in Spain. Regarding somatic CNS symptoms as headache, Brazilians averaged 29.5% and Spaniards 28.2%[18].

Among the self-reported health status workers reported, mucous membrane irritation as (25.3%) (Figure 1). This came in line with Eijkelenboom et al., 2020 who conducted a survey analysis on 566 health care workers and aimed to identify comfort and health in relation to different room types. They found that irritation of mucus membranes of nose and throat, dry throat (21%) and irritated eyes (27%) [19].

In this study skin manifestation was reported by 13% of workers (Figure 1). Similarly, a cross-sectional study included 183 cleaning workers in Northern California, where skin problems were reported by about 12% [11].

It's evident that hospital workers are exposed to chemical hazards, some of which can be carcinogenic. It is therefore important that healthcare workers are screened for cancer on a regular basis. Furthermore, training of workers about skin care and use of safety equipment and other useful interventions, such as sunscreen cream. Such efforts can help in early detection, prevention, and intervention [20].

Luz and colleagues [20] also, conducted a cross-sectional study, involving 157 workers at a University Hospital in the state of Rio Grande do Sul, Brazil, found that longer experience at the institution and on the job revealed a higher prevalence of musculoskeletal problems (70.7%) [21]. In line with the results of our study, that ergonomic risk showed statistically positive correlation with duration of work (r=0.416) (Table 3). The explanation derives from the effect of the cumulative trauma in the workers' body segments, as long working hours results in prolonged exposures to hazards and limited recovery time which translates into physiologic depletion that continues to the next workday [22].

This study revealed that there's negative correlations between personal protective clothing use and biological hazards (r=-0.744), accidents hazards (r=-0.680), chemical hazards (r=-0.546) and physical hazards (r=-0.329) (Table 3). This was consistent with study findings from who found that the healthcare workers who lacked PPEs in the health facility were about four times more likely to get occupational hazards as compared to those who had access to PPEs [15]. Also, who conducted a cross-sectional study on 53 nurses in Jombang and found that the higher the level of compliance of PPE usage, the lower the near miss (correlation coefficient is -0.455) [23].

These findings suggest that availing of adequate PPEs all time in the health facilities has substantial importance in the reduction of occupational health hazards among hospital workers.

Our study revealed that, there were significant negative correlation between PPE use score and self-reported mucous membrane irritation, accidents, hepatitis B virus infection , varicose veins, hepatitis C virus infection, nervous system manifestations and GIT problems (Table 5). Similar to other cross-sectional study done by among 5000 hospital cleaning workers from 13 tertiary hospitals in Menoufia, Egypt reported that, absence of protective clothes except for gloves were independent risk factors for physical health problems (presented in respiratory symptoms, skin symptoms, combined respiratory and skin symptoms and musculoskeletal symptoms) [24].

Our study showed that there was statistically significant positive correlation between PEFR diurnal variation and age (Table 3). This is supported by who conducted an observational study on 88 healthy, non-smoker subjects, 30 females and 58 males, aged 20–80 years, from Poland, found that there is a worsening of PEF values by age[25]. This can be explained by the rigidity of the chest wall increasing with age, as well as by reduction of the elastic recoil of the lungs.

A multiple linear regression analysis in this study showed that younger age and high BMI were all predictors of high PEFR difference (Table 4). In the similar feature, in a cohort study showed that variables parameters as age, body weight, body length, and gender was the meaningful independent variable that was related to PEF variability, FVC, and FEV1 by multiple linear regression analysis[26].

In addition, showed that gender, weight, height and increasing BMI were remarkable factors in PEF variability in his cross-sectional study on 400 employees of Zanjan University of Medical Sciences in Iran[27].

In the current study the risk of PEFR variability in smokers was significantly 3.739 times more than non-smokers by a multiple linear regression (Table 4). This was similar to who conducted a cross-sectional comparative study among 50 smokers and 50 non-smokers in an urban slum community of Hyderabad, India. They found that risk of abnormal PEFR variability in smokers was 3.33 times more than in non-smokers and this association was statistically significant ($p<0.05$). This is most likely due to the inflammatory process causing structural wall changes of the bronchial tree to decrease the pulmonary function [28].

Conclusion:

Working as a janitor or custodian in a hospital environment carried different health effects. These effects and their risk factors were identified by the data in this study. As regards workers knowledge it was obvious that there was fair knowledge of occupational hazards at the workplace among janitors and custodians (79.6%). More than half (64.2%) agreed that working as janitors or custodians in a hospital environment is more vulnerable to hazards than any other workplace. Around 56% of janitors and custodians didn't have special feeling toward their work in hospital but just doing it for a living.

Broadly translated our findings indicate that the median risk assessment score was the highest among the ergonomic risk with median score of 16 indicating a high risk, and lastly accident and physical risks with median score of 4 indicating a low risk. It was noticed that the most prevalent self-reported health hazard was the nervous system manifestations (43.9%), and the least reported one was HCV by percentage of (9.5%).

The study revealed some risk factors that were associated with risk assessment of hospital hazards such as age, duration of working in the hospital, body mass index, and risky behaviors such as low compliance in wearing protective clothing and safe work practice.

The multiple linear regression analysis showed that younger age, smoking, high BMI, short duration of work, low compliance in workplace safety behaviors and using PPE were all predictors of increasing PEFR variability.

References

1- **Bureau of Labor Statistics.** Occupational Employment and Wages, 2018, May 2017; 37-2011 Janitors and Cleaners, Except Maids and Housekeeping Cleaners. Washington, DC: United States Department of Labor.

2- **Anderson, N. J., Smith, C. K., & Foley, M. P.** Work-related injury burden, workers' compensation claim filing, and barriers: Results from a statewide survey of janitors. American journal of industrial medicine 2022, 65(3), 173-195.

3- **BLS.** Incidence rates of nonfatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and industry, All U.S., private industry, 2018 - 2019. United States Bureau of Labor Statistics. Occupational Injuries/Illnesses and Fatal Injuries Profiles Web site. 2019. Accessed March 22, 2024.

4- **National Institute of Health Research.** Improving Inclusion of Under-Served Groups in Clinical Research: Guidance from INCLUDE Project 2020.

5- **Shukla, V., Saha, R., Mishra, A., Mukherjee, M., Basu, M., and Misra, R.** The other corona warriors: A KAP study on COVID-19 among janitors and housekeeping staff from a tertiary care hospital in Eastern India. Indian Journal of Health Sciences and Biomedical Research (KLEU) 2021, 14(2), 218.

6- **Bitzas, S., Ma, S., Pesanelli, K., & Zaia, A. M.** Risk factors and impacts of slips, trips, and falls in janitorial populations: A literature review. Applied ergonomics 2022, 102, 103745.

7- **Eggerth, D. E., Ortiz, B., Keller, B. M., & Flynn, M. A.** Work experiences of Latino building cleaners: an exploratory study. American journal of industrial medicine 2019, 62(7), 600-608.

8- **ILO.** Orderly, medical services: International Hazard Datasheets on Occupation. https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_192391.pdf 2000

9- **Pascarella, G., Rossi, M., Montella, E., Capasso, A., De Feo, G., Botti, G., et al.** Risk analysis in healthcare organizations: Methodological framework and critical variables. Risk Management and Healthcare Policy 2021, 2897-2911.

10- **Moore, V. C., Jaakkola, M. S., Burge, C. B. S. G., Pantin, C. F. A., Robertson, A. S., & Burge, P. S.** Shift work effects on serial PEF measurements for occupational asthma. Occupational medicine 2012, 62(7), 525-532.

11- **Lee, S. J., Nam, B., Harrison, R., & Hong, O.** Acute symptoms associated with chemical exposures and safe work practices among

hospital and campus cleaning workers: a pilot study. American journal of industrial medicine 2014, 57(11), 1216-1226.

12-WHO EMRO. Egypt Tobacco. https://www.emro.who.int/egy/programmes/tobacco-free-initiative.html (accessed in May 2024)

13-Ecin, S. M., Sandal, A., Çetintepe, S. P., Koyuncu, A., Kurt, Ö. K., Yıldız, A. N., et al. Prevalence and risk factors of work-related asthma in hospital cleaning workers. Turkish Thoracic Journal 2022, 23(3), 203.

14-Gbadago, P., Amedome, S. N., & Honyenuga, B. Q. The impact of occupational health and safety measures on employee performance at the South Tongu District Hospital. Global Journal Inc.(USA) 2017, 17(5), 13-19.

15-Ayenew, E., Akafu, W., & Wolde Daka, D. Prevalence of Work-Related Health Hazard and Associated Factors among Health Workers in Public Health Institutions of Gambella Town, Western Ethiopia: Cross-Sectional Survey. Journal of Environmental and Public Health, 2022(1), 6224280.

16-Smith, C. K., & Anderson, N. J. Work-related injuries among commercial janitors in Washington State, comparisons by gender. Journal of safety research 2017, 62, 199-207.

17-Sahoo, B., Sahoo, M. C., & Pillai, J. S. Making our hospitals a safe workplace: hazard identification and risk assessment at a tertiary-level public hospital in eastern India. Cureus 2024, 16(4).

18-Rocha, M. R. A., Marin, M. J. S., & Macias-Seda, J. Living, working conditions and mental health: a study with Brazilian and Spanish workers who work in hospital cleaning services. Ciência & Saúde Coletiva 2020, 25, 3821-3832.

19-Eijkelenboom, A., Kim, D. H., & Bluyssen, P. M. First results of self-reported health and comfort of staff in outpatient areas of hospitals in the Netherlands. Building and Environment 2020, 177, 106871.

20-Che Huei, L., Ya-Wen, L., Chiu Ming, Y., Li Chen, H., Jong Yi, W., & Ming Hung, L. Occupational health and safety hazards faced by healthcare professionals in Taiwan: A systematic review of risk factors and control strategies. SAGE Open Medicine 2020, 8, 2050312120918999.

21-Luz, E. M. F. D., Magnago, T. S. B. D. S., Greco, P. B. T., Ongaro, J. D., Lanes, T. C., & Lemos, J. C. Prevalence and factors associated with musculoskeletal pain in hospital cleaning workers. Texto & Contexto-Enfermagem 2017, 26, e00870016.

22-Mossburg, S., Agore, A., Nkimbeng, M., & Commodore-Mensah, Y. Occupational hazards among healthcare workers in Africa: a systematic review. Annals of global health 2019, 85(1).

23-Oktavera, A. T., & Wardaya, I. I. Relationship of Compliance of Personal Protective Equipment Usage and Housekeeping with Near Miss among Nurses. The Indonesian Journal of Occupational Safety and Health 2023, 12(2), 176-184.

24-Elbadry, A. S. Prevalence and risk factors associated with health disorders among hospital cleaning workers: a cross-sectional study. Egyptian Journal of Occupational Medicine 2019, 43(2), 205-214.

25-Składanowski, M. R., Jarosz, P., & Mackiewicz, B. Comparing variations of peak expiratory flow among healthy adults from the Kuyavia-Pomeranian and Lublin districts of Poland. Archives of Medical Science-Civilization Diseases 2019, 4(1), 1-6.

26-Lai, S. H., Liao, S. L., Yao, T. C., Tsai, M. H., Hua, M. C., Chiu, C. Y., et al. Raised-volume forced expiratory flow-volume curve in healthy Taiwanese infants. Scientific Reports 2017, 7(1), 6314.

27-Ghodrati, S., Kiasatfar, J., Parsamanesh, N., Samakkhah, S. A., Asadi-Khiavi, M., &

Pezeshgi, A. The positive association between various demographic characteristics and peak expiratory flow in employees of Zanjan university of medical sciences. Immunopathologia Persa 2022, 10(1), e33402-e33402.

28-Sawant, G. V., Kubde, S. R., & Kokiwar, P. R. Effect of smoking on PEFR: a comparative study among smokers and non smokers in an urban slum community of Hyderabad, India. Int J Community Med Public Health 2016, 3(1), 246-50.

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