ISSN: 0973-4929, Vol. 13, No. (2) 2018, Pg. 251-258

Current World Environment

Journal Website: www.cwejournal.org

Ergonomics Hazards and Musculoskeletal Disorders Among Workers of health Care Facilities

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Abstract

The present study was conducted to determine occupational health and safety hazards with special focus on ergonomic hazards among healthcare facility (HCF) workers. A structured questionnaire survey was conducted among 200 workers in five HCFs of Lahore, Pakistan. Among the reported ergonomic hazards, muscle aches/ sprains (76.5%), elbow/ wrist/ neck pain (56.0%), body posture issues (56.0%), excessive stretching of muscles (67.5%) and bending/ twisting at work (55.5%) were commonly encountered. Biological hazards included incidences of cuts/wounds/ lacerations (69.0%), contact with specimens (56.0%), exposure to airborne diseases (64.0%) and other infections (72.0%) inspite of the fact that majority (90.0%) were aware of procedures where needle stick injuries are most likely to occur and knowledgeable on occupational infections. Physical hazards included slips/trips/falls (65.0%), high noise levels (64.0%) and chemical spills (54.0%). A significant percentage of workers experienced psychosocial hazards including work related stress (77.0%) and some form of psychosocial or physical abuse (68.5%). Despite workers awareness about occupational health hazards and implementation of control measures by HCF to mitigate hazards (especially biological) prevalence of hazards was reported. Hence, there is a need to improve working standards and conditions to reduce the occurrence of ergonomic and psychosocial hazards.

Article History

Received: 13 February 2018
Accepted:11 April 2018

Keywords

Healthcare workers, Healthcare facilities, Musculoskeletal disorders, Ergonomics.

Introduction

Healthcare is, directly or indirectly, associated with the provision of health facilities to individuals. The healthcare facilities (HCF) involve a broad range of workforce such as physicians, nurses, experts, clinical research/ laboratory personnel, social and administrative workers[1]. Health care services around the world employ over 59 million personnel who are daily exposed to a variety of health and safety hazards. Healthcare, an important sector of the U.S. economy provides employment to over 8 million U.S. healthcare workers (HCW), including pharmacy and nursing workers, physicians, operative room staffs, environmental facilities employees, personnel in

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Doi: http://dx.doi.org/10.12944/CWE.13.2.10

examination laboratories, veterinary care staffs and those involved in shipping and receiving patients, who are potentially exposed to dangerous drugs as well as diverse hazards[2].

Common hazards experienced by HCW include biological, ergonomics, physical and psychosocial hazards. Biological hazards comprise needle stick injuries, exposure and susceptibility to infections such as tuberculosis, hepatitis and HIV/ AIDS occurring through direct and indirect body contact. Physical hazards include slips trips and falls, exposure to noise and chemicals such as glutaraldehyde, ethylene oxide and drugs. While violence, stress and anxiety due to work constitute psychosocial hazards[3].

Work related musculoskeletal disorders (WMSDs) are most often experienced by medical professionals with surgeons being the most susceptible, followed by nurses and physiotherapists[4]. Ergonomic hazards including problems related to backbone, neckline, shoulder and knees are common complaints among medical, dental and nursing professionals[5].

The HCW face high ergonomic risks and therefore have greater potential for musculoskeletal issues along with other work associated injuries. According to an estimate, more than 5000 injuries among HCW have been reported annually. These are mainly attributed to manual handling of patients and excessive workloads. Moreover, awkward or static postures during treatment of patients result in stresses and strains which is another cause of such problems[6]. According to an estimate, one third of all cases of sick leave among health care employees are due to musculoskeletal disorders (MSDs). Even in developed countries, MSDs among HCW are generally under reported[4]. The MSDs affect body movements, cause wounds or dys functions of nerves, tendons, muscles, cartilagebone, spinal discs and joints. These disorders comprise soreness, connective tissue damage, pain in back, hernia, problems of shoulder and knee tears[7]. According to National Institute for Occupational Safety and Health (NIOSH), numerous studies indicated direct relationship between physical work and occupational related MSDs. Several aspects that are related with MSD include constant body posture, persistent sitting positions, continuous movement, unnecessary use of force and prolonged standing[8]. Many programs on psychosocial nature of humans, physical work and medical facilities related to the prevention and effective management of MSDs have been conducted by NIOSH and OSHA[9].

Keeping in view the significance of OH&S, the current study aimed to determine various occupational hazards, especially ergonomic hazards, faced by different types of HCW, assess the level of awareness among workers regarding occupational hazards and to identify control measures provided by the employers as well as those adopted by the workers to mitigate and minimize the prevalent occupational hazards.

Materials and Methods

A descriptive cross-sectional study was conducted among 200 health care workers employed at five government and private HCFs in Lahore, Pakistan. The respondents included doctors, nurses, laboratory attendants, pharmacists, x-ray technicians and hospital sanitary workers. The total population of HCW of selected hospitals is over 3,000. An online calculator[10] was used to determine the sample size of study group, keeping margin of error less than 7%, and confidence level 86% .The calculated sample size was 200 HCW.

Questionnaire Survey

Data were collected using quantitative methods via a structured questionnaire. The questionnaire forms were completed onsite with face to face communication with the respondents.Each questionnaire form took on an average about 10 minutes to complete.The questionnaire was adapted from US Center for Disease Control (CDC), NIOSH as well as hazards reported in literature[2,11,12]. The questionnaire included section on demographic information, smoking status, education status, type of health care facility, duration of work and work experience with respect to hazards. The questionnaire comprised four more sections that addressed ergonomic, biological, physical and psychosocial hazards respectively commonly faced by HCW in the work environment. Moreover, questions on awareness of workers regarding occupational hazards and safety practices as well as control measures in place by the employers to mitigate the potential hazards in the HCFs, were also asked. The survey did not address pre-existing screening of musculoskeletal disorders.

Consent

In accordance with the guidelines for conducting such research, consent was obtained from the respondents prior to filling of questionnaire. Onsite surveys were conducted with the permission from the administration of each surveyed facility.

Statistical Analysis

IBM SPSS version 20 was used to analyze data from the questionnaire survey. Independent variable included type of health care occupation, type of health care facility, work in multiple facilities, work overtime, lifting heavy loads, bending/twisting at work and duration of work experience. Dependent variables included ergonomic hazards including muscle aches, chronic back pain, neck/wrist/ shoulder pain, fracture/body injury, problems in body posture, stretching of muscles. Bivariate correlation was determined. The applied tests were ANOVA one-way and Pearson's chi-square test.

Results

The results of the survey showed prevalence of various hazards among HCWs including ergonomic, biological, physical and psychosocial. According to the demographic data (Table 1), majority of the HCWs were females (72.5%). Respondents comprised majorly nurses (37.5%) and doctors (32.5%). Fifty-seven percent respondents belonged to government while 43.0 % were employed in private sector HCFs. Most of the workers (54.5%) had work experience of fewer than 5 years. The range of working hours varied from 6-10 hours, seven days a week. A number of respondents (43.5%) also worked overtime and 36.5% were doing job in multiple health care facilities.

Table 2 summarizes reported OH&S problems faced by HCW. Ergonomic hazards included muscle aches/ muscle sprains, carpel tunnel syndrome, chronic back pain, elbow/wrist/ hamstring/neck pain, problem of body posture, excessive stretching of muscles, bending/ twisting as well as lifting heavy loads multiple times at work. Biological hazards included experience of cuts/wounds/lacerations, airborne infections, body contact with retroviral patients and specimens, and exposure to blood borne specimens. Physical hazards included trips/falls, exposure to x-rays, high noise level and chemical spills, and experience of skin burn. Psychosocial hazards included physical abuse, stress and assaults from co-workers.

Table 3 shows the categorization of reported ergonomic hazards with respect to type of facility and nature of job/work. The results of HCW awareness regarding occupational hazards and safety practices are shown in Table 4. Majority of the workers (85.5%) had awareness regarding occupational hazards and their categories in the workplace. Post-employment workshops were most common source of occupational hazards among workers (44.5%). Table 5 identifies control measures in place by the workplace as well as individual protective measures taken by the workers.

Table 1: Characteristics of Health care workers at both Government and private health care facilities of Lahore

Characteristics	Percentage %
Gender	
Male	27.5
Female	72.5
Smoking status	
Smoker	13
Ex- smoker	6.5
Non - smoker	80.5
Health care occupation	
Doctor	32.5
Nurse	37.5
Nursing assistant	5.0
	6.0
Laboratory attendant	
Pharmacist	13.5
Radiographer	2.5
Sanitary worker	3.0
Health care facility type	
Government	57.0
Private	43.0
Work characteristics	
Work in Multiple facilities (more than one facility)	6.5
Work overtime (more than 8h)	43.5
Work experience	
>5 years	45.5
<5years	54.5

Table 2: Occupational health symptoms prevalent among health care workers

Hazards	Percentage (%)
Ergonomic risk factors	
Muscle aches/muscle sprains	76.5
Carpel tunnel syndrome	27.0
Chronic back pain	46.5
Elbow/wrist and neck pain	56.0
Hamstring	26.0
Fracture	22.5
Problems of body posture	56.0
Problem of excessive stretching of muscles	67.5
Bending/twisting at work	55.5
heavy load/ weightlifting	50.0
Physical	
Slips/Trip/Falls at work	65.0
Exposure to X-ray	51.5
Skin burns	30.5
High noise levels	64.0
Chemical spills	54.0
Biological	
Cuts/wounds/lacerations	69.0
Direct contact with specimens	56.0
Body contact with retroviral patient	36.0
Airborne diseases	64.0
Infectious disease	72.0
Blood borne pathogens	21.5
Psychosocial	
Psychosocial/physical abuse	68.5
Assaults from Co-Workers	43.5
Stress Due to Work	77.0

Table 3: Classification of prevalence of ergonomic hazards among different type of facility and nature of health care workers occupation

Ergonomic Hazard	Type of facility		Nature of Health care occupation/job									
	*Govt	Private	Doctor		Nurse	Nursing assistant	Laboratory attendant		Pharmacist		Radiographer	Sanitary worker
	%	%	%		%	%	%		%		%	%
Muscle aches/muscle sprains	53.6	46.4	34.6		38.6	5.9	4.6		9.8		3.3	3.3
Carpel tunnel syndrome	61.1	38.9	31.5		25.9	3.7	11.1		13.0		3.7	11.1
Chronic back pain	57.0	43.0	40.9		33.3	1.1	6.5		10.8		2.2	5.4
Elbow/wrist/neck pain	48.2	51.8	37.5		33.9	8.0	6.2		8.0		1.8	4.5
Hamstring	46.2	53.8	46.2		25.0	0.0	3.8		15.4		0.0	9.6
Fractured injury	42.2	57.8	40.0		28.9	4.4	6.7		6.7		2.2	11.1
Problems of Body Posture	58.9	41.1	37.5		33.9	2.7	6.2		12.5		2.7	4.5
Excessive Stretching of Muscles	61.5	38.5	34.1		38.5	5.9	4.4		11.1		2.2	3.7
Bending/twisting at work	50.5	49.5	34.2		40.5	3.6	6.3		9.0		2.7	3.6
Lift heavy load at work	56.0	44.0	25.0		46.0	5.0	5.0		10.0		4.0	5.0

*Govt: Government/ public health care facility

Table 4: Awareness and sources regarding occupational hazards and safety practices

	Respondents n (%)
Awareness regarding occupational hazard and safety practices	
Occupational hazard and category	85.5
Occupational infections	92.0
Procedures where needle stick injuries are most likely to occur	90.0
Procedures that violate the standard precaution	91.0
Occupational cross infection after clinical procedure could be	89.5

prevented by effective hand washing	
Sources of knowledge (of respondents)on occupational hazards	
Post-employment workshop	44.5
Post-employment learning in ward / clinic	15.5
Professional training	32.5
Posters / handbills	3.0
Pre-employment orientation	3.0
Mass media	1.5

Table 5: Workers responses regarding control measures provided by employer and individual personal protective measures

Control measures provided by employer	Respondents n (%)
Safety education &training on all universal precautions	93.0
Safety tools, equipment & machinery	97.5
Training on all machinery & equipment used	96.0
Personal protective equipment	95.0
Training on how to wash hands	95.5
Individual personal protective measures	
BCG Vaccination1	79.5
Hepatitis A Vaccination	81.0
Hepatitis B Vaccination	93.5
Received HIV screening/ examination	53.5

Discussion

The current study showed prevalence of various ergonomic and other hazards among HCW. Majority of the workers were females. Women represent approximately 80 percent of the healthcare workers (HCWs) around the world[5]. Majority of the respondents faced a range of ergonomic hazards in which muscle aches/ muscle sprains (76.5%), elbow/ wrist/ neck pain (56.0%), problems of body posture (56.0%), excessive stretching of muscles (67.5%), bending/ twisting at work (55.5%) were the most reported. Other ergonomic hazards included carpel tunnel syndrome (27.0%), chronic back pain (46.5%), hamstring pain (26.0%), injury due to fracture (22.5%) and lifting heavy loads of work (50.0%). This shows prevalence of MSDs among the HCW. However, similar studies show varying results. For instance, literature indicates high prevalence (77%) of lower back pain (LBP) among different types of HCW[13,14,15,16]. Comparable cross-sectional study conducted among 450 physicians in Iran reported similar ergonomic hazards; LBP (15.1%), neck pain (9.8%) and knee pain (19.8%), associated with MSD. Other reported hazards include problems with body posture[17]. Work related injuries including fractures have been found to be most common among nurses and other semi-skilled HCW[18]. Prolonged awkward or static postures, manual lifting of heavy loads and handling of patients and prolonged standing at work are considered as main causes of work related MSD in HCF[19,20]. Posture related risks have been reported to pose risk among waste workers also who are involved in waste collection tasks like lifting and dumping of waste[21].

A significant correlation between muscle aches/ sprains and work in multiple health facilities ($p < 0.05$), muscle aches/ sprains and nature of occupation ($p < 0.01$) was found. Hence, characteristics such as nature of healthcare occupation and work in multiple facilities (more than one facility) are strongly correlated with the occurrence of muscle aches/ sprains among workers. Muscle aches/ muscle sprains were mostly reported among nurses (38.6%) and doctors (34.6%) as shown in Table 3. Similarly, positive correlation was found between chronic back

pain and work in multiple health facilities ($p<0.05$) as well as working overtime ($p<0.01$). Significant correlation existed between excessive stretching of muscles and working overtime ($p<0.01$), work in multiple facilities ($p<0.05$) and lifting of heavy loads at work ($p<0.05$). Hazards associated with bending and twisting postures were found to be correlated with type of HCF ($p<0.05$) which were reported in both government (50.5%) and private (49.5%) facilities.

Health issues such as neck/back/wrist pain were significantly associated with type of work facility ($p<0.01$) as well as nature of health care occupation ($p<0.05$). Total of 51.8% of such hazards were reported in private sector, mostly among doctors (37.5%). Injuries due to fractures were found to be significantly correlated with nature of occupation ($p<0.05$), work in more than one facilities ($p<0.05$), type of healthcare facility ($p<0.05$) and overtime work ($p<0.01$). Injuries resulting from fractures were mostly reported in doctors (40.0%) and nurses (28.9%) with a higher occurrence in private HCF (57.8%). A significant correlation was found ($p<0.05$) between carpel tunnel syndrome and nature of healthcare occupation. Carpel tunnel syndrome was mostly reported by doctors (31.5%) that comprised dentists. Pain in hamstrings was significantly correlated with nature of healthcare occupation ($p<0.01$) which was mostly reported among doctors (46.2%) and associated with working conditions. Hence, the present study showed that work characteristics, such as type of work facility, nature of health care occupation, work in more than one facilities, overtime work, are linked with most of the reported ergonomic hazards.

Generally, characteristics such as working overtime, work in multiple facilities or in multiple shifts is reportedly associated with higher risks of injuries and susceptibility to ergonomic hazards[18,22]. A study conducted among registered nurses and care aides working at full time and part-time work showed that those involved in full time work shifts had higher risks of work related injuries and fractures than those working on a part time basis[23]. Several risk factors such as heavy and prolonged physical activity, increased stress and work demand as well as high body mass index (BMI) are also linked with work related MSDs among workers[17,19].

In the present study, biological hazards reported included experience of cuts/wounds/ lacerations (69.0%), direct contact with specimens (56.0%), and experience of airborne diseases (64.0%) and other infections (72.0%). Although majority of the workers (90.0%) were aware of procedures where needle stick injuries are most likely to occur and were knowledgeable on occupational infections and most likely sources of occupational infection as well of the fact that occupational cross infection after clinical procedure could be prevented by effective hand washing (89.5%). Other studies also support exposure to biological hazards such as injuries due to needles and cuts, direct contact with infectious materials and cuts/wounds due to needles and sharp objects among HCWs despite having received training in handling sharp objects and infectious material[24,25].

As regards protective measures, majority of the respondents had received different kinds of vaccinations including BCG, Hepatitis A and B vaccinations as well as HIV screening examination. All the facilities had proper control measures to mitigate and reduce the prevalence of biological hazards (Table 5). These included training on the proper use of machinery and equipment, universal precautions and hand washing, provision of safety education, safety tools, a set of personal protective equipment and a separate area for the disposal of medical waste.

With respect to physical hazards, slips/trips/falls (65.0%), high noise levels (64.0%) chemical spills (54.0%) and exposure to x-rays (51.5%) was the most prevalent risks experienced by workers. A study conducted among Zambian HCWs also found exposure to high noise levels, skin contact with chemicals and pesticides as important issues[23].

The present study also shows workers coming across psychosocial hazards including work related stress (77.0%) and some form of psychosocial or physical abuse (68.5%). Work related stress can be associated with factors such as working overtime, work in multiple health facilities, assault from co-workers and some forms of psychosocial hazards. The prevalence of psychosocial and physical abuse is a reflection of poor work ethics and work

control in these health facilities. A study conducted among the HCWs of southern India indicated the prevalence of psychosocial hazards in the form of lack of promotions, non-availability of amenities; high workload and poor grievance report and address system[11].

The survey showed that majority (85.5%) of the workers was aware of occupational hazards and their categories as most of the surveyed respondents comprised doctors and registered nurses. Major sources of knowledge and awareness were post-employment workshops (44.5%), professional workshops (32.5%) and post-employment learning in ward (15.5%).

Conclusion

The present study showed that HCW of both government and private sectors were equally exposed to ergonomics, biological, physical and psychosocial hazards. Majorly reported ergonomic hazards related to symptoms of MSDs which correlated with work characteristics such as nature of occupation, overtime and work at multiple facilities. Biological hazards comprised cuts/wounds/ lacerations, direct contact with specimens, experience of airborne diseases and other infections. Slips/trips/falls, high noise levels, chemical spills and exposure to x-rays were frequently reported physical hazards. Work related stress and some form of psychosocial or physical abuse constituted psychosocial hazards prevalent among the surveyed respondents.

Although, all health care facilities had proper control measures to mitigate and minimize biological hazards and majority of the workers were using the provided PPEs. However, there is a need to improve working standards and conditions to reduce the prevailing hazards in these healthcare facilities.

Acknowledgement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.The authors declare no conflict of interest.

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