

ORIGINAL ARTICLE

Medicine Science 2020;9(4):1027-31

Assessment of the risks of the workplace and the awareness of healthcare professionals **Itir Erkan¹**,  **Murat Akbaba²**¹*Istanbul Yeni Yuzyil University, Faculty of Health Sciences, Department of Healthcare Management, Istanbul, Turkey*²*Gaziantep University, Faculty of Medicine, Department of Forensic Medicine, Gaziantep, Turkey*Received 12 September 2020; Accepted 01 November 2020
Available online 2020 with doi: 10.5455/medscience.2020.09.186**Abstract**

The aim of this study is to evaluate the risks, which the healthcare professionals are exposed to, from the legal aspects. The survey aiming to determine the risk levels was conducted with 45 healthcare professionals working at Istanbul University Cerrahpasa Medical Faculty Hospital. The statistical analyses were performed using SPSS 19.0 package software. Considering the work environment of participants from the aspect of risks, it was determined that there was no significant difference in terms of gender, age, and years of working. Among all of the healthcare professionals, the allied healthcare personnel were found to be exposed to highest level of physical risks. Given the relationship between the occupational groups and biological risks, it was determined that laboratory analysts are exposed to statistically significant biological risks. All of the healthcare professionals are exposed to similar levels of psychosocial and ergonomic risks. On the other hand, the allied healthcare personnel are exposed to highest level of chemical, whereas the administrative personnel are under the minimum risk. It should be remembered that in case of any problem in any healthcare institution, the administration might be subjected to legal and penal sanctions due to their possible responsibility, even though they have no direct responsibility.

Keywords: Risk, legal responsibility, healthcare professional, forensic sciences**Introduction**

In their nature, the healthcare institutions are the environments, where both of the patients and healthcare professionals are exposed to various risks. These risks are classified into physical, chemical, biological, ergonomic, and psychosocial risks. The risks such as radiation, electricity, noise, carcinogenic agents, and insufficient air-conditioning are in physical risk group [1,2].

As it is well known, many chemical agents are utilized in healthcare institutions. They are mainly the anesthetic materials, cytotoxic materials, and those used in sterilization, and they are very important because of their effects and frequency of use [3]. The gases used in anesthesia such as nitrous oxide, halothane, and isoflurane are known to cause liver and renal diseases and cancer in long-term. It was shown that, in case of exposure to cytotoxic materials and when the sufficient protection measures are not taken, the mutagenic activity in urine of individuals preparing and applying especially the antineoplastic medications increases, and the chromosomal breakages occur in lymphocytes.

The chemicals used in sterilization such as ethylene-oxide, glutaraldehyde, and formaldehyde might cause dyspnea, asthma, and neurological effects, while there also are the studies indicating that these chemicals are carcinogenic at high doses [4,5].

Another significant risk for the healthcare professionals is the infectious contamination. As a result of contact with blood and bloody body fluids, the Hepatitis B, Hepatitis C, and HIV might be infected [6-8]. Besides that, another risk factor is the diseases, which are released from the patients and carried in the air, such as flu, tuberculosis, influenza, measles, and varicella and SARS viruses [9].

In case of an unconformity between the physical necessities of a profession and the physical capacity of employees, the occupational diseases may occur [10]. Working under inappropriate conditions causes the musculoskeletal diseases at most. In Europe, 1 of every 4 employees suffers from back pain (24.7%) and muscular pain (22.8%). In England, 85% of the employees believe that the highest disease and injury risk is on musculoskeletal system [11,12]. Moreover, the risks caused from lifting heavy loads, falling down, crashing or slipping may arise as a result of the non-ergonomic design of work environment [13].

*Corresponding Author: Itir Erkan, Istanbul Yeni Yuzyil University, Faculty of Health Sciences, Department of Healthcare Management, Istanbul, Turkey.
E-mail: itir.erkana@yeniyyuzyil.edu.tr

Because of the intense work pressure, the healthcare professionals may have problems such as sleep disorders, stress, depression or burnout syndrome. The violence towards healthcare professionals is another psychosocial risk factor [14]. Workplace violence is one of the most complex and dangerous hazards faced by doctors, nurses and other health professionals. This violence may be due to increased stress levels of patients and relatives, long waiting hours, unrestricted visitor access, overcrowding and so on [15-17]. The aim of this study is to determine the frequency and type of risk factors in healthcare workers.

Material and Methods

The sample of this study consists of 45 employees (physicians, nurses, allied healthcare personnel, administrative personnel) working in different departments of Cerrahpasa Medical Faculty Hospital of Istanbul University. Permission was obtained from the Ethics Committee of Istanbul Yeni Yuzyil University (Decision no. 07.02.2019/2).

A survey was conducted in order to determine the risk levels of employees. The statistical analyses of this study were carried out using SPSS 19.0 package software. The categorical variables were expressed in frequency and percentages. In 2nd group comparisons of normally distributed variables, Independent Samples t-test was employed, while Kruskal Wallis test was used in 3rd group comparisons of non-normally distributed variables. In all of the statistical analyses, statistical significance was set at $p < 0.05$.

Results

In this study, totally 45 employees 25 (55.6%) females and 20 (44.4%) males) were involved. Of the subjects, 24 (53.3%) were graduated from university, 9 (20%) from high school, 7 (15.6%) from secondary school, and 5 (11.1%) from elementary school. Considering from the occupational groups, 9 (20%) of the subjects were physicians, 15 (33.3%) nurses, 7 (15.6%) allied healthcare personnel, and 14 (31.1%) administrative personnel. The departments, years in work, and years in last department of subjects are presented in Table 1.

Considering the weekly working hours of subjects, it was determined that 11 (24.4%) of the subjects work for 19-27 hours, 8 (17.8%) for 28-36 hours, and 26 (57.8%) for 37-45 hours. 26 (57.7%) of employees stated that they had in-service training on the risks and threats, while 19 (42.2%) employees didn't have that training. All of the subjects expressed that they experienced a situation threatening their health in last 6 months; the risk factors are presented in Fig. 1. The answers of employees about the risk assessment of work environment are presented in Table 2.

When the subjects were asked about if the management took the required measures regarding the risks influencing the health in their department, 12 (26.7%) of the subjects stated that no measure was taken, 8 (17.8%) stated that the level of measures taken was not enough, 4 (8.9%) stated that they had no idea, 16 (35.6%) stated that the required measures were partially taken, and 5 (11.1%) stated that the required measures were taken. On the other hand, 32 (71.12%) of the subjects stated that they took personal measures, while 12 (28.88%) took none. All of the employees stated that

they were exposed to psychosocial risks in their departments. The relevant psychosocial risk factors are presented in Fig. 2. The titles of responders and the risks they were exposed to are presented in Table 3.

Table 1. Demographical Information

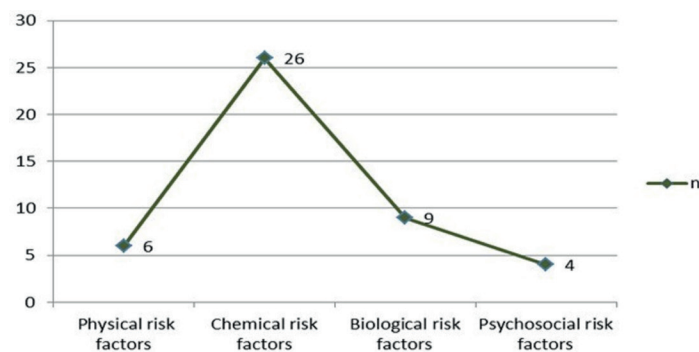
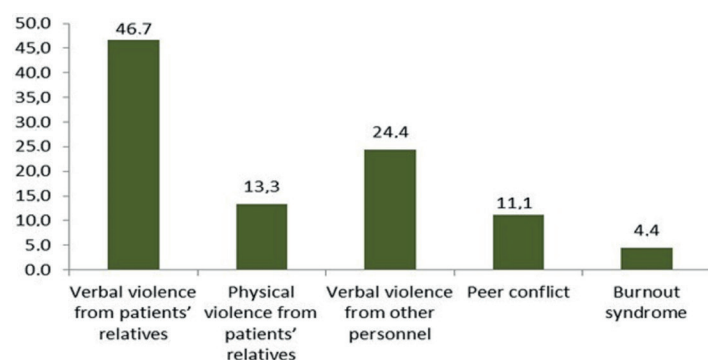
		n	%
Gender	Female	25	55.6
	Male	20	44.4
Age	21-30	9	20.0
	31-40	10	22.2
	41-50	20	44.4
	51+	6	13.3
Educational Status	University	24	53.3
	High School	9	20.0
	Secondary School	7	15.6
	Elementary school	5	11.1
Current Department	Inpatient Service	30	66.7
	Emergency Service	8	17.8
	Administrative Departments	7	15.6
Occupation	Physician	9	20.0
	Nurse	15	33.3
	Allied Healthcare Personnel*	7	15.6
	Administrative Personnel	14	31.1
Years in Work	≤5 years	10	22.2
	6-10 years	4	8.9
	11-15 years	8	17.8
	16-20 years	8	17.8
	≥21 years	15	33.3
Years in Department	<1 year	7	15.6
	1-5 years	9	20.0
	6-10 years	5	11.1
	11-15 years	7	15.6
	16-20 years	8	17.8
	>20 years	9	20.0
* Health technician, laboratory analyst			

Table 2. Risk assessment of work environment

	n	%
No risk	0	0.0
Low risk	9	20.0
Mid-level risk	17	37.8
Risky	12	26.7
High risk	7	15.6

Table 3. Distribution of risks by the titles (Kruskall Wallis test)

	Physician (n=9)	Nurse (n=15)	Allied healthcare personnel (n=7)	Administrative Personnel (n=14)	χ^2	p
Physical risks	2.90±1.24	3.3±0.85	3.71±1.29	2.10±0.96	6.446	0.04
Chemical risks	3.62±1.03	3.12±0.99	4.06±1.56	2.2±0.76	3.555	0.169
Biological risks	3.92±0.95	3.3±1.19	4.20±1.34	3.19±1.01	7.099	0.029
Psychosocial risks	3.49±0.91	3.34±1.06	3.0±1.06	3.43±1.11	0.2	0.905
Ergonomic risks	2.71±1.24	2.70±1.00	2.4±1.16	3.14±1.76	1.094	0.579

**Figure 1.** Experienced risks on last 6 months**Figure 2.** Psychosocial factors seen in work environment

Discussion

The injuries and mutilations play an important role in forensic medicine practice in healthcare facilities. As well as the employees have certain legal rights, this issue should be carefully evaluated because the employers have legal responsibilities [18]. Moreover, in principle, the management is responsible for indemnifying the damages that might be linked to the administration because of the public service offered by the institution [19]. This is called “strict liability” in law [20]. Strict liability can be defined as that the administration is liable to indemnify the special and unusual damages (except for general charges) occurring directly due to the service offered by the administration, where the causality connection with administrative activities [21]. Here, it is stated that even though the administration has no direct responsibility on the problem, the management might be subjected to penal and legal sanctions since they didn't take the required measures. This applies to almost all of the legal system in the world. French Council of State states that, to the extent that the administration can be held responsible, the administration shall be held legally responsible for the damages and diseases occurring during blood transfusion and mandatory vaccination such as Hepatitis C and AIDS. Turkish Council of State applies service fault principles in related to blood products [22].

In our study, when considered from the aspect of work environment, it was determined that there was no statistically significant difference in terms of gender, age, and year of working ($p>0.05$). On the other hand, statistically significant difference was found between the titles and the risks ($\chi^2=6.446$; $p=0.04$). Among the healthcare professionals, it was determined that the allied healthcare personnel are exposed to physical risks at most. The absence of inverse relationship between the year of working and the risk in work environment indicates that the experience of employee is not enough for feeling secure unless the physical conditions and ergonomics are corrected.

It was determined the risk of exposure to the factors such as noise, lighting, heat, and radiation is high laboratory analysts and health technicians more than other occupational groups, and this is in corroboration with the literature reviews [23-25].

Given the relationship between the occupational groups and biological risk assessment, it was found that the laboratory analysts are exposed to statistically significantly higher level of biological risks ($\chi^2=7.099$; $p=0.029$). In literature, it was reported that, when compared to other healthcare professionals, the laboratory analyses are under higher risk of contamination with viral and microbial diseases such as hepatitis, AIDS, malaria, syphilis and viruses that are conveyed through the blood and body fluids [26,27]. At present, the epidemic caused by SARS-Cov-2 originating in Wuhan, China is having drawn a high-level concern over the world. According to the experiences obtained from severe acute respiratory syndrome (SARS) outbreak in 2002, it is clear that nowadays, more emphasis should be placed on healthcare workers' protection [28]. Contact transmission is one of the main routes of the SARS CoV-2. Transmission from patients to healthcare professionals usually follows contamination of the personnel hands after touching either patients or fomites, whereas hand hygiene is considered the most important prevention measure for healthcare-associated infections. Studies showed the importance of hand hygiene after contacting or caring for COVID-19 patients which is highly consistent with other researches [29].

Improving the physical conditions of these personnel and increasing their knowledge level through the in-service trainings would minimize the risks and prevent the managers from being put on a trial within the scope of strict liability. It was also determined that there was no statistically significant difference between the occupational groups and chemical, psychosocial, and ergonomic risks ($p>0.05$). From the aspects of psychosocial and ergonomic risks, all of the healthcare professionals were found to have similar levels. While the highest level of chemical risk was observed on

the allied healthcare personnel, the administrative personnel were found have the lowest level of chemical risks. Previous studies showed that similar results [30,31].

In their study, Caliskan and Akdur (2001) examined the risks in work environment through the reports of nurses working at Medical Faculty Hospital of Ankara University. According to this study, 94.2% of the subjects stated that their work environment was risky. The main risk in work environment was found to be infection (72.2%), followed by working under stress (58.4%), and too long and intense working hours (44.2%). 14.9% of responders stated that they were working in noisy and unventilated environment. 82.2% of the subjects specified that they took personal measures, while 17.8% stated that the required measures were taken by the institution. It was determined that the institutional measures are mainly about protection from the biological risks [32]. According to the data obtained from present study, the administrative personnel are exposed to ergonomic and psychosocial risks at most, physician and nurses to psychosocial risks, and allied healthcare personnel to physical, chemical, and biological risks. The results are in accordance with recent literature about healthcare workers, about occupational risk perception that indicate the impact of such risk factors on health [33,34]. We believe that these results will shed light on how measures should be taken for whom and which in-service trainings should be offered (i.e., offering the administrative personnel a training about how to use the materials would be useful).

In the study of Dogan (1998), the risks that nurses are subjected to were examined, and it was reported that those risks occurred while sheathing the needle (22%), preliminary preparation (17.5%), IV intervention (17%), putting the contaminated needles into the trash (16%), cleaning the contaminated material (14%), and prick of needles that are in the full trashes [35].

In study of Azap et al., (2005) that was carried out in Medical Faculty Hospital of Ankara University, 64% of healthcare service providers were exposed to blood and/or body fluids. Within the scope of that research, it was reported that most of the injuries occurred during closing the cap of injector (45%). The exposure to blood and/or body fluids occurred mostly during operations (17%), bloodletting (10%), suturing (10%), and resuscitation (5%). 28% of those experienced the exposure stated that they used personal protective equipment. The most frequent reasons for not using the protective equipment were found to be hurry (63%), incapability of accessing the protective equipment (17%), and feeling uncomfortable with the protective equipment (10%) [36]. In our study, it is seen that nurses and allied healthcare personnel are exposed more than other personnel to such physical risks [Table 3].

Conclusion

Some of the measures that the administration should take against the risks in work environment are to ensure the clean work environment, to have healthcare professionals vaccinated regularly, to regulate the working hours, to have enough number of personnel, and to make regulations required for active operation of ethics departments [37]. Moreover, all of the employees should be advised about the fact that the personal protective equipment is not

an obligation but they are for the safety of personnel. Considering that the healthcare professionals have to work under intense work load, it is recommended the work environments should be in appropriate conditions from the aspect of ergonomics. Preventing the employees from being mistreated would eliminate the potential risks.

Having the managers to have in-service trainings about the risks in work environment and raising awareness about the increase in productivity alongside the decrease in risks through these trainings would also contribute to the national economy. Decreasing the environmental factors such as noise, irregular temperature, and insufficient light would increase the concentration, decline the risks and improve the employee productivity.

In addition, creating a schema for forensic case data entry in hospital automation systems, which is occurred against to health professionals in hospitals would allow better evaluation of entered data and risks, and also the management would take effective measures by determining the problems accurately. Also, considering the worldwide pandemic, hospital administrations must provide adequate hygienic conditions, make easy to access to protective equipments. Balanced working–resting hours, social and emotional support relationships between work teams and supportive services from management units are among the protective factors. As a result, the hospital administrations should proactively evaluate and prevent the existing and potential threats throughout the healthcare institution as a part of risk management. In-service training should be given continuously by experts to minimize possible risks.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

All authors declare no financial support.

Ethical approval

Permission was obtained from the Ethics Committee of Istanbul Yeni Yüzyıl University (Decision no. 07.02.2019/2)

References

1. Triolo PK. Occupational health hazards of hospital staff nurses. Part II: Physical, chemical, and biological stressors. *AAOHN J.* 1989;37:274-9.
2. Gestal JJ. Occupational hazards in hospitals: accidents, radiation, exposure to noxious chemicals, drug addiction and psychic problems, and assault. *Br J Ind Med.* 1987;44:510-20.
3. Ahlborg G, Hemminki K. Reproductive effects of chemical exposures in health-professions. *J. Occup. Environ. Med.* 1995; 37(8): 957-961.
4. Laffon B, Teixeira JP, Silva S, et al. Genotoxic effects in a population of nurses handling antineoplastic drugs, and relationship with genetic polymorphisms in DNA repair enzymes. *Am J Industrial Med.* 2005;48:128-36.
5. Milkovic-Kraus S, Horvat D. Chromosomal abnormalities among nurses occupationally exposed to antineoplastic drugs. *Am J Ind Med.* 1991;19:771-4.
6. Henderson DK. Managing occupational risks for hepatitis C transmission in the healthcare setting. *Clin Microbiol Rev.* 2003;16:546-68.
7. Sundkvist T, Hamilton GR, Rimmer D, et al. Fatal outcome of transmission of hepatitis B from an e antigen negative surgeon. *Commun Dis Public Health.* 1998;1:48-50.
8. Di Maggio SL. State regulations and the HIV-positive healthcare professional: a response to a problem that does not exist. *Am J Law Med.*

- 1993;19:497–522.
9. Istre GR, KcKee PA, West GR, et al. Measles spread in medical settings: an important focus of disease transmission? *Pediatrics*. 1987;79:356–8.
 10. Eriksen W. The prevalence of musculoskeletal pain in Norwegian nurses' aides. *Intarch Occup Environ Health*. 2003;76:625-30.
 11. Cabeças JM. Occupational musculoskeletal disorders in Europe: Impact, risk factors and preventive regulations. *Enterprise Work Innovat Stud*. 2006;2:95-104.
 12. Edlich RF, Winters KL, Hudson MA, et al. Prevention of disabling back injuries in nurses by the use of mechanical patient systems. *J Long Term Eff Med Implants*. 2004;14:521-33.
 13. Fischer I, Krauss M, Dunagan WC, et al. Patterns and predictors of inpatient fall and fall-related injuries in a large academic hospital. *Infect Control Hosp Epidemiol*. 2005;26:822-7.
 14. Akin A, Cetin B. The depression anxiety and stress scale (DASS): The study of validity and reliability. *Educ Sci Theory Pract*. 2007;7:260–8.
 15. Mohanty A, Kabi A, Mohanty AP. Health problems in health care workers: A review. *J Fam Med Prim Care*. 2019;8:2568.
 16. Wilson K, Burke C, Priest H, Salas E. Promoting healthcare safety through training high reliability teams. *Qual Saf Healthcare*. 2005;14:303–9.
 17. Lawton R, Parker D. Barriers to incident reporting in a healthcare system. *Qual Saf Healthcare*. 2002;11:15–8.
 18. Asildag MK. The medico-legal evaluation of cases who admitted to the emergency department due to occupational injuries. Residency Thesis, Gaziantep University Forensic Medicine Department, Gaziantep, 2015.
 19. Akgul A. Compensation liability of the administration from health service and council of state's new approach. *J Fac Law Gazi Uni*. 2016;20:269-302.
 20. 10th Council of State D. 24.01.2013, E:2012/1176, K:2013/407, Council of State UYAP Informatics System.
 21. 10th Council of State D. 09.10.2012, E:2010/16037, K:2012/4676, Council of State UYAP Informatics System.
 22. Kaplan G. New Developments in the field of legal responsibility caused by the execution of public health service. *J High Military Admin Court*. 2004;19:173–99.
 23. Tse V, Lising J, Khadra M, et al. Radiation exposure during fluoroscopy: Should we be protecting our thyroids? *Aust NZ J Surg*. 1999;69:847-8.
 24. Vural F, Fil S, Ciftci S, et al. Radiation safety in operating units; knowledge, attitude and behaviors of operating room staffs. *Balikesir H Sci J*. 2012;1:131-6.
 25. Erkan I, Yarenoglu A, Yukseloglu EH, et al. The investigation of radiation safety awareness among healthcare workers in an education and research hospital. *Int J Radiat Res*. 2019;17:455-61.
 26. Shapiro DS, Schwartz DR. Exposure of laboratory workers to *Francisella tularensis* despite a bioterrorism procedure. *J Clin Microbiol* 2002;40:2278–81.
 27. Sheets CD, Harriman K, Zipprich J, et al. Fatal meningococcal disease in a laboratory worker – California, 2012. *Morb Mortal Wkly Rep*. 2014;63:770–2.
 28. Li R, Xuyu C, Ying W, et al. Risk Factors of Healthcare Workers with Coronavirus Disease 2019: A Retrospective cohort study in a designated hospital of Wuhan in China. *Clin Infect Dis*. 2020;17:287.
 29. Sharma A, Kalita JM, Nag VL. Screening for methicillin-resistant *Staphylococcus aureus* carriage on the hands of healthcare workers: an assessment for hand hygiene practices. *Indian J Crit Care Med*. 2019;23:590–2.
 30. Pałaszewska-Tkacz A, Czerczak S, Konieczko K, et al. Cytostatics as hazardous chemicals in healthcare workers' environment. *Int J Occupat Med Environment Heal*. 2019;32:141-59.
 31. Asgedom AA, Bråttveit M, Moen BE. Knowledge, attitude and practice related to chemical hazards and personal protective equipment among particle boardworkers in Ethiopia: A cross-sectional study. *BMC Public Health*. 2019;19:440.
 32. Caliskan D, Akdur R. Occupational risk factors faced by nurses at Ankara University Faculty of Medicine Hospital. *J Ankara Uni Fac Med*. 2001;54:135-42.
 33. Palma-Contreras A, Ansoleaga E. Associations between psychosocial risk factors, organizational dimensions, and mental health problems related to workplace violence among workers of three Chilean hospitals of high complexity. *Cadernos de Saude Publica*, 2020;36:00084219.
 34. Maran DA. Workplace violence: Prevalence, risk factors and preventive measures across the globe. *J Heal Soc Sci*. 2020;5:13-22.
 35. Dogan F. The incidence and causes of a needle-stick injury in nurses, University Institute of Health Sciences, Master Thesis. Istanbul, 1998.
 36. Azap A, Ergonul O, Memikoglu KO, et al. Occupational exposure to blood and body fluids among healthcare workers in Ankara, Turkey. *Am J Infect Control*. 2005;33:48-52.
 37. Weaver MD, Landrigan CP, Sullivan JP, et al. The association between resident physician workhour regulations and physician safety and health. *Am J Med*. 2020;133:343-54.