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OCCUPATIONAL RISK FACTORS FACING MEDICAL LABORATORY PERSONNEL

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Abstract

Objectives: The purpose of this study was to assess the understanding and views of hospital laboratory workers related to risk factors in their work environment.

Methods: This quantitative analysis included 234 laboratory employees in a university hospital. The data were obtained using a survey consisting of 19 questions: 8 items solicited demographic

characteristics of the respondents, 3 questions determined their observations about the work environment, and 8 questions asked about occupational risk perception. Risk perception was evaluated using a scale designed specifically for laboratory employees. Frequency, percentages, and averages were used to present descriptive data. A t-test and analysis of variance were used to analyze occupational risk perception according to participant characteristics and responses.

Results: A total of 162 women and 72 men (mean age: 40-49 years) participated in the study. The most common health problem observed was lower extremity pain. The occupational risk perception level was found to be above average (3.13±0.68). There was a statistically significant difference between the occupational risk perception score and the length of employment in the unit ($p<0.05$); however, no statistical significance was found between occu- pational risk perception and other variables (gender, age, field of work, education, or length of overall professional experience).

Conclusion: The occupational risk perception score of laboratory workers with 11-16 years of experience was higher than that of more recent employees. Training is known to be effective and would appear to be a valuable investment in the development of risk perception among laboratory employees to ensure a safe and effective environment.

Keywords: Hospital, health workers, laboratory, risk factors

Introduction laboratories can be a source of risk to employee health and safety. Safe working conditions are necessary for healthcare staff to remain healthy and provide good services (Adıgüzel & Keklik., 2011). Employees in hospitals and healthcare institutions face several sources of risk, including physical, chemical, biological, psychological, and ergonomic factors (Kaplan & Emin., 2018; Yıldız, et al., 2018). Physical risk factors include noise, vibration, ventilation, dust, radiation, and improper electrical systems. Laboratory workers may be exposed to toxic, allergic, carcinogenic, or harmful effects of numerous chemicals (such as reagents, disinfectants, drugs, or anesthetics). Blood, tissue, or body fluid samples, as well as medical waste, pose a potential biological risk and represent the most important foci of infection for laboratory workers (Yıldız, et al., 2018)
An individual's subjective judgment about the characteristics and severity of risks that could threaten their safety is defined as risk perception. A high level of risk perception generally indicates greater practice of safe behaviors (Arezes & Miguel., 2008). The sensitivity of laboratory workers to work environment risks may differ according to demographic features. The present study examined the occupational risk perception of laboratory workers related to health problems arising from work environment risks and analyzed the effect of demographic characteristics and views on the work environment. This study was designed to provide laboratory managers with measures to be implemented to mitigate work environment risks and encourage safe behavior.

Materials and method:
At Makkah, Saudi Arabia The survey study was deemed appropriate as the data collection method in the study. After ethical and administrative approvals were obtained, the questionnaire forms were distributed between 1-25 February 2022 after giving information about the study, and the participants were asked to read and answer these forms. The quantitative analysis method was used to evaluate the data gathered in this descriptive research study. The survey comprised 2 components: a personal information form and an occupational risk perception scale.
The personal information form consisted of 11 items to record the demographic characteristics of the participants and the features of the work environment.
The occupational risk perception scale used is a sub dimension of a risk perception scale developed by the principal author in 2014. The scale consists of 8 items scored using a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: undecided, 4: agree, and 5: strongly agree). The occupational risk perception form used a scoring system of 1-5 for each item, where a score of 5 indicates the highest risk, and the mean was calculated (KARAMAN., 2011; Boyacı et al., 2021) The Cronbach’s alpha

coefficient for the occupational risk perception scale was 0.73. The significance value of Bartlett's test was χ^2=2249.33 ($p<0.000$). The Kaiser-Mayer-Olkin sampling value of the survey data was determined to be 0.78.

Statistical analysis

The study data were analyzed using SPSS for Windows, Version 21. Percentages, means, and frequency values were used in evaluation of the meta-data. In- dependent sample t-test and independent sample analysis of variance were performed in order to analyze the occupational risk perception of the laboratory workers based on their de mographic characteristics. Tukey's test was used as post-hoc test to determine any differentiation. Statistical significance was defined as $p<0.05$.

Results:

The distribution of the demographic characteristics of the participants is presented in Table 1. In the study group, 40.6% were between the ages of 40 and 49 years, 69.2% were women, 38.5% held an associate degree, and 40.4% were employed as a laboratory technician. The mean length of employment of 44% of the participants had been working in the profession for 17 years. 42.7% of the participants had been employed in the same unit for less than 5 years.

Table 1. Distribution of the demographic characteristics of the participants (n=234)

Variances	n	Percentage (%)
Female	162	**69.2**
Male	72	**30.8**
Age (years)		
20-29	70	**29.9**
30-39	49	**20.9**
40-49	95	**40.9**
≥50	20	**8.5**
Department		
Emergency laboratory	16	**6,8**
Biochemistry-genetics research	20	**8.5**
Microbiology	34	**14.5**
Blood center	26	**11.1**
Pediatric biochemistry	19	**8.1**
Service laboratories	21	**9.0**
Position		
Biologist-chemist	72	**32.0**
Other lab worker	15	**7.1**
Laboratory technician	97	**40.4**
Nurse	25	**9.8**
Engineer	6	**2.7**
Doctor	19	**8.1**
Education		
Medical vocational high school	30	**12.8**
Associate's degree	90	**38.5**
Bachelor's degree	66	**28.2**
Postgraduate/doctorate and above	48	**20.5**
Employment in the profession		
0-5 years	61	**26.0**
6-10 years	35	**15.0**
11-16 years	35	**15.0**
≥17 years	103	**44.0**
Employment in the department		
0-5 years	100	**42.7**
6-10 years	36	**15.4**

11-16 years	28	**12.0**
≥17 years	**70**	**29.9**

Table 2 illustrates the distribution of responses related to the work environment. It was determined that 65.4% of the participants chose their position (it was not an assignment) and were satisfied. The participants were asked to identify factors they thought were risks in their work experience: infectious samples, work environment conditions, (noise, lighting, ergonomics, etc.), radiation exposure, chemical use, sharp-object injuries, contact with patients, and inadequate safety protocols/procedures. The most common health problems noted were lower extremity pain, diseases potentially caused by air conditioning quality, and upper extremity pain.

Table 2. Findings related to the participants' work environment (n=234)

Variances	**n**	Percentage (%)
Employees' satisfaction level and choice of position		
I chose voluntarily and I am satisfied	153	**65.4**
I chose voluntarily and I am not satisfied	29	**12.4**
I did not choose voluntarily but I am satisfied	36	**15.4**
I did not choose voluntarily and I am not satisfied	16	**6.8**
Risk factors employees think have an impact on their health in the working environment*		
Infectious samples	133	**61.1**
Sharp-object injuries	21	**9.6**
Chemicals	38	**17.4**
Work environment conditions, (noise, lighting, ergonomics, etc.)	112	**52.6**
Contact with patient	13	**5.9**
Inadequate safety protocols/procedure	5	**2.3**
Health problems experienced by laboratory employees due to the work environment*		
Hepatitis	42	**17.9**
Eczema	23	**9.8**
Upper extremity (hand, arm) pain	67	**28.6**
Varicosis	47	**20.1**
Psychological disorders	42	**17.9**
Diseases sourced to air conditioning	76	**32.5**
Lower extremity (foot, leg) pain	85	**36.3**
Other	19	**8.1**

***More than one option could be selected.**

Table 3. Distribution of occupational risk perception average (n=234)

Occupational risk perception In the laboratory where I work,	**Mean**	**SD**
I think the noise caused by the devices is excessive.	3.59	1.27
I have health problems due to insufficient air conditioning/ventilation.	3.42	1.36
I think that the quality of the personal cleaning agents (hand disinfectants, etc.) used is low,	3.34	1.32
which increases my risk of getting an infection.		
I think my infection risk is greater because I have contact with patients.	3.27	1.29
I think my infection risk is greater than that of employees of other departments due to exposure to blood and body fluids.	3.13	1.34
I think there are hazardous substances in the workplace that threaten my health.	2.88	1.28
I think I am exposed to infection risk due to working with inadequate equipment and materials.	2.84	1.38
I think I am exposed to radiation (radioactive agents).	2.61	1.45
Totally score	3.13	0.677

Table 3 provides the distribution of the occupational risk perception. The mean score was 3.13±0.677; the participants perceived their work environment as hazardous. The statement "I think the noise

caused by the devices is excessive" was the perceived risk with the highest score (3.59±1.27), and the statement "I think I have been exposed to radiation" was the lowest (2.61±1.45).

The distribution of the demographic variance and occupational risk perception is given in Table 4. A comparison of the occupational risk perception scale mean score and demo- graphic characteristics revealed that there was a statistically significant difference only in the duration of employment in the specific department. Participants who had worked in the same department for 11-16 years had a higher risk perception than those employed for 0-5 years ($p<0.05$). There was no significant difference between age, gender, education, marital status, work in another unit, the length of overall employment at the institution, or the duration of employment in the pro fession.

Table 4. Comparison of demographic variances and occupational risk perception average (n=234)

Occupational risk perception (mean±SD)		**f**	**t**	**p**
Gender			1.06	0.5
Female	3.10±0.716			
Male	3.20±0.577			
Age		1.16		0.32
20-29 years	3.15±0.563			
30-39 years	3.28±0.68			
40-49 years	3.05±0.769			
≥50 years	3.13±0.529			
Department	1.072		0.380	
Central laboratory	3.11±0.702			
Emergency laboratory	3.30±0.506			
Biochemistry-genetics research	2.98±0.816			
Microbiology	3.24±0.589			
Blood center	3.27±0.533			
Pediatric biochemistry	3.14±0.600			
Service laboratories	2.92±0.853			
Position			1.493	0.193
Biologist-chemist	3.16±0.579			
Other lab worker	3.08±0.668			
Laboratory technician	3.18±0.712			
Nurse	3.16±0.833			
Engineer	3.29±0.452			
Doctor	2.74±0.626			
Education			0.169	0.918
Medical vocational high school	3.14±0.818			
Associate’s degree	3.15±0.710 3.16±0.584 3.07±0.655			
Bachelor’s degree				
Postgraduate –doctorate and above				
Employment in the profession			2.369	0. 071
0 - 5 years	3.06±0.552			
6 - 10 years	3.21±0.628			
11 - 16 years	3.39±0.675			
≥17 years	3.07±0.743			
Employment in the department			3.130	0.026*
0 - 5 years(a)	3.04±0.640			
6 - 10 years	3.06±0.721			
11 - 16 years(b)	3.46±0.671			
≥17 years	3.18±0.678			

*P<0.05 was considered significant. Tukey=(b>a). f: Frequency; t: Student’s t test.

Discussion:

This research of hospital laboratory workers' perceptions of occupational risk factors related to the work environment was performed to provide guidance to anticipate risks that may arise in the future and to take the necessary measures to provide a safe laboratory environment. The results of our survey indicated that 40.6% of the participants were between the ages of 40 and 49 years, 69.2% were women, 38.5% had an associate's degree, and 40.4% were employed as a laboratory technician.
Infection-infected samples, work environment conditions, radiation and chemical exposure, and sharp-object injuries were considered risk factors in the working environment. In other research in Turkey, Boyacı et al (2021) found that the risk factors most cited were infection, sharp-object injuries, contact with body fluids, exposure to chemicals, and musculoskeletal problems Kılıç et al (2014) reported that the greatest risks in the work environ ment were sharp-object, biological, psychosocial, physical, and chemical injuries. Pedrosa et al (2011) observed in a study con- ducted in Brazil that 92% of blood-borne infections occurred in hospitals. According to GÜNEŞ & Canga (2019) 40.9% of health workers had a work accident; 84.5% reported sharp-object injuries, 33% experienced musculoskeletal injuries, and 36.9% had exposure to contamination with blood or body fluids. Boyacı et al (2021) found that among healthcare employees, 64% were infected at least once due to exposure to blood or body fluid. In our sur- vey, infectious samples were reported as the greatest source of risk. This is consistent with previous studies. However, our study differed from other research in that sharp-object injuries were found to present a low risk.

A study conducted on chemical exposure in a research labora tory in Italy yielded a response that 54.4% felt very exposed to chemical risk (Papadopoli et al., 2020). Our results revealed a relatively low ratio of perceived chemical risk (17.4%). In our research, the most common health problem identified was lower extremity pain (36.3%). Healthcare workers have a significantly greater exposure to musculoskeletal disorders than some other occupations (Boyacı et al., 2021). The number of lower extremity injuries reported in our survey may be related to a lack of sufficient training about how to avoid such injuries. The routine activities of healthcare employees can cause muscu loskeletal disorders over the course of time (Chhabra., 2016).

In our study, noise, insufficient ventilation, contact with dangerous substances, cleaning materials used, and patient con- tact were perceived as risky. Hazardous materials, inadequate equipment, and radiation were not perceived as great sources of risk. The occupational risk perception scale results indicated that noise was perceived as the greatest risk and radiation exposure was considered the lowest risk. Boyacı et al., 2021 also noted that noise ranked first among the important risk factors de-fined by healthcare professionals. In the study conducted by Vehid et al., 2011 noise was a highrisk factor. It has also been reported that medical waste, electrical devices, noise, and air conditioning systems were sources of potential exposure to injury for nurses (Özkan & Emiroğlu., 2006). In our study, the mean occupational risk perception of nurses was high (3.16±0.833). Results in the literature support our findings.
Aluko et al (2016) reported that 96.2% respondents said they believed they were at risk due to an occupational hazard and 40% stated that the basic safety equipment in the workplace was insufficient. In our study, the laboratory workers perceived the risk due to inadequate equipment to be low.
A comparison of the demographic variables of the participants and the occupational risk perception scores indicated that male employees reported a higher perception of occupational risk than females. Occupational risk perception was found to be higher in the 30-39 age range, those with an associate's degree, those with a title of laboratory technician, and those working in the unit for 11-16 years. Buxton et al (2011) observed that laboratory technicians have significant expertise and experience in the laboratory. However, a study conducted in Egypt in 2019 reported that there was no statistically significant relationship between risk perception score and the frequency of occupational accidents (Jafari et al., 2019).
The occupational risk perception scale used in this study was developed by the principal researcher and to our knowledge, it is the only risk perception scale specifically designed for lab- oratory

workers. The mean score was 3.13±0.677 in our study, which indicates that laboratory workers high risk in the environment.

Kvist et al., 2014 used an individual workload perception scale in 2011 and Mollaoğlu et al (2010) assessed the perceptions of nurses working in hospitals about their working environment. A statistically significant relationship was found between the perception of the general work environment and the general level of job satisfaction. According to Taylor and Snyder (2017), the relationship between risk perception and safety behavior is uncertain. We found no previous study in the literature specifically examining the occupational risk perception of laboratory workers. We observed a significant difference between occupation- al risk perception and the length of time working in the department: The occupational risk perception of the laboratory workers with 11-16 years of experience was higher ($p<0.005$).
Considering the role of the training in individuals' behavior, short training sessions at regular intervals may help to develop and maintain greater risk perception. There was no statistically significant difference for the demographic variables of age, gender, department, position, length of employment in the profession, or educational status.
Aktürk and Karadağ (2020) stated that there is no relationship between the actual risk faced by the employees and the Employment Period in the department. In our study, a relation- ship was found between occupational risk perception and length of employment in the unit.

Conclusion

In conclusion, additional, more comprehensive studies should be conducted to eliminate the existing deficiencies regarding the risks faced and perceived by laboratory employees. Training should be provided to inform employees of occupational risks, particularly new laboratory workers, to provide the safest and most effective environment possible.

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