Assessment of Physical and Chemical hazards Among Health Care Workers in Wasit Governorate

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Abstract. Health care workers are on the front lines of this worldwide pandemic, with the significant burden of identifying and treating an increasingly expanding number of severely sick patients, sometimes making vital decisions under physical and psychological stress. This study is descriptive; a cross-sectional study conducted at four hospitals in Wasit governorate. The data collection started from December 2020 till March 2021. The Data were collected by direct interview with the health worker by the researcher, by using a self-reporting questionnaire from the occupation hazard dimension, which includes two domains: physical hazards and chemical hazards. The statistical method used includes Mean, Standard Deviation, and Chi-square. Statistical significance was considered whenever the P-value was equal to or less than 0.05. The current study found that the highest percentage 254 (57.6%) were in the age group <30 years, there was a distinct female's preponderance of 242(54.9%). There is a highly significant positive correlation (P-value <0.01) between physical hazards and prevention and control methods (r= 0.144*); a highly significant positive correlation (P-value <0.01) between chemical hazards, and prevention and control methods (r= 0.770*).where the chemical hazard reached to241(54.6%) while followed physical hazards reached to 196(44.4%) the results also showed Weighted Mean for physical hazard equal 3.28±0.67which is within the medium level risk.

Keywords: Assessment, Physical, Chemical hazards, Health care workers.

1 Introduction

Occupational hazard in Iraq poses a danger to the individual in the working environment in addition to the consequences such as fatal accidents, minor to serious injuries and immediate allergic and systemic effects [1]. Occupational hazard is the risk, harm, or danger that an individual is exposed to at the workplace. Workers are exposed to a variety of risks throughout work times, virtually as many as the diverse types of labour, including physical, biological, mechanical, chemical, psychological, and ergonomic issues. These are to account for one of many negative health effects[2]**.** In the health sector at present, many health workers and other workers are exposed to the risks of ionizing and non-ionizing radiation that are used in daily use in medical tasks. It is considered of importance at the diagnostic and therapeutic levels [3]. Health workers, who are estimated to number more than two million, deal with radiation as a result of related practices, exposing half of this number to artificial and ionizing radiation [4]. The risks posed by chemicals are processed, produced, processed, and transported and they have an environmental and human health impact. A chemical hazard is a form of chemical exposure occupational hazard. Chemical occupational exposure can have short-term and long-term health

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effects. Neurotoxins, immunologic agents, dermatologic agents, carcinogens, toxic substances, reproductive substances, systemic toxins, asthma genes, and sensitizers, to mention just a few, are toxic substances [5]. In health-care environments such as hospitals, doctor's offices, and clinical labs, personal protective equipment (PPE) is done routinely. Personal protection equipment (PPE) acts as a barrier between infectious elements such as viruses and bacteria and the body, mouth, nose, and eyes (mucous membranes) when worn properly. PPE can stop contaminants from being spread by blood, bodily fluids, or respiratory secretions [6].

1.1 Aims of the Study

1. To assess physical and chemical hazards among health care workers in Wasit governorate.
2. To find out the relationship between physical and chemical hazards and health workers' demographic information and some related factors.
3. To find out the relationship between physical and chemical hazards and prevention and control methods.

2 Methodology

This study is a descriptive cross-sectional study conducted at four hospitals in Wasit governorate which are AL-zahraa teaching hospital, AL-suwaira hospitals, AL-naemania hospitals, and AL-shaheed fairooz hospital. Data were collected during the period starting from December 2020 till March 2021. The worker's participation in the study were441 workers in these hospitals. Data were collected using direct interviews of health workers using a questionnaire. the questionnaire from consists of four-part: First part socio-demographic characteristic of the studied health worker regarding age, gender …etc. The second part is the occupational characteristic of the studied health worker regarding professional, years of expertness, and place work. The third part the occupational hazard dimensions which include four domains: Physical hazard (14 items), Chemical hazard (11 items), and prevention and control methods (23 items) was assessed by using a five Likert scale. Analysis of data was carried out using the available statistical package of SPSS-25 (Statistical Packages for Social Sciences- version 25). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values). The significance of difference for different percentages (qualitative data) was tested using the Pearson Chi-square test (χ2-test). Statistical significance was considered whenever the P-value was equal to or less than 0.05.

3 Results

Table 1 represents the Socio-demographic characteristics of the study population. The results found that the mean ± SD of their ages was 30.8±8.12 years, the age range of the health worker in the study was between 20-56 years, The highest percentage 254(57.6%) were in the age group <30 years. There was a distinct female preponderance242 (54.9. As for residence and educational level, the study revealed that most participants in studied hospitals from urban regions 394 (89.3%), while the highest percentage 354 (80.3%) of health workers have an educational level (institute and College) followed by 74(16.8%) had secondary educational level the result of this study indicated that 265(60.1%) of the study population were married and

161(36.5%) of participation were single in the study hospital. The study demonstrated that the first rank of health care workers were nurses 125 (28.3%) followed by 107(24.3%) of medical assistants, laboratory assistants, and radiology assistants in all studied hospitals. While the overall frequency of Technicians was 86(19.5%) in all hospitals. Which found that most participants had years' experience ≥5 is 244(55.3%). The result of this study indicated that the highest proportion of participants were 117(26.5%) working in medical Laboratories followed by 82 (18.6%) working in admission units for patients in all studied hospitals.

Table 1. Socio-demographic characteristics of health care workers.

Socio-demographic characteristics		No	Percent
age groups	<30 years	254	57.6
	≥30 years	187	42.4
	Mean ±SD(Range)	30.83±8.123 (20-56)	
Gender	Male	199	45.1
	Female	242	54.9
Residence	Urban	394	89.3
	Rural	47	10.7
Educational level	Primary	4	0.9
	Intermediate	9	2.0
	Secondary	74	16.8
	Institute and College	354	80.3
social status	Married	265	60.1
	Single	161	36.5
	Others	15	3.4
experience years	<5 years	197	44.7
	≥5 years	244	55.3
	Mean ±SD(Range)	7.83±7222 (1-35)	
Place of working	Administrative units	22	5.0
	consulting unit	10	2.3
	Radiology department	16	3.6

	Admission unit for patients	82	18.6
	Health units	45	10.2
	Pharmacy unit	44	10.0
	Emergency	36	8.2
	Operation department	45	10.2
	Blood bank	9	2.0
	Medical Laboratories	117	26.5
	Maternity hall	15	3.4
Professional	Physicians	29	6.6
	Pharmacists	34	7.7
	Technicians	86	19.5
	Nurse	125	28.3
	Biologist and Chemist	33	7.5
	Medical assistant and laboratory assistant and Radiology	107	24.3
	Administrative employees	27	6.1

Table 2 represent the distribution of HCW according to physical hazards in. showed that the mean of for question (1) (conditioning is available in the workplace and suitable for use), was (3.57), for question (11) (the electrical lifts are in good and safe condition) was (2.59), for question (12) (enough lighting is available at the workplace)was (3.74). While the stander deviation for question (1)was (1.369), for question (11) was(1.323), was(1.176),for question(12) was (1.208).

Table 2. The Distribution of Healthcare Workers According to Physical Hazards.

Physical **hazard**	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	SD
	No	%	No	%	No	%	No	%	No	%		

1.Air conditioning is available in the workplace and suitable for use	120	27.2	182	41.3	33	7.5	40	9.1	66	15.0	3.57	1.369
2.Central ventilation systems are available in the work environment	76	17.2	143	32.4	75	17.0	79	17.9	68	15.4	3.18	1.334
3.Windows is available in the work environment and help to enter lighting and air circulation	146	33.1	163	37.0	35	7.9	42	9.5	55	12.5	3.69	1.349
4.A sterilization gate is available at the entrances to the health institution	100	22.7	107	24.3	59	13.4	94	21.3	81	18.4	3.12	1.445
5.Cleaning workers put a warning sign when the start sanitizing work floors	55	12.5	121	27.4	89	20.2	95	21.5	81	18.4	2.94	1.313
6.Protective barriers are available to be placed on doors and windows to prevent direct contact with patients	78	17.7	96	21.8	78	17.7	96	21.8	93	21.1	2.93	1.409
7.There are indications on the floors for social distancing of 2 meters or one and a half meters	51	11.6	69	15.6	90	20.4	112	25.4	119	27.0	2.59	1.339
8.Wash basins(sink)are available at the exits of the rooms	63	14.3	133	30.2	98	22.2	84	19.0	63	14.3	3.11	1.275
9.The work environment is suitable for personal protective equipment to wearing throughout the working hours	85	19.3	179	40.6	93	21.1	44	10.0	40	9.1	3.51	1.176

10.Follow up of preventive methods when using lifts as wearing a mask and sterilization	115	26.1	157	35.6	73	16.6	43	9.8	53	12.0	3.54	1.300
11.The electrical lifts are in good and safe condition	57	12.9	113	25.6	114	25.9	66	15.0	91	20.6	2.95	1.323
12.Enough lighting is available at the workplace	128	29.0	177	40.1	75	17.0	16	3.6	45	10.2	3.74	1.208
13-Availability of personal protective equipment (PPE) in the workplace to prevent exposure to medical radiation.	79	17.9	147	33.3	86	19.5	62	14.1	67	15.2	3.25	1.319
14.Fire extinguishers are available	149	33.8	200	45.4	32	7.3	18	4.1	42	9.5	3.90	1.193
Weighted Mean= 3.28±0.67												
positive phrases mean <2.60 low, mean 2.60-3.39mediumand mean ≥3.40high, while negative mean <2.60 high, mean 2.60-3.39medium, and mean ≥3.40 high												

Table 2.1, the result of the found that study the highest percentage 71(74.7%) of the study population had a good score (low risk) about physical hazards in Al- Zahraa teaching hospital followed by 58.3% in Al-Shaheed Fairooz hospital. While the overall percentage of physical hazards in the studied hospitals were reached 245 (55.6%) (Low risk) and high risk reached 196(44.4%) The differences between the four hospitals concerning the scoring level were statistically significant P value equal 0.05.

Table 2.1. The Relationship between the Study Hospitals and Total Risk Score of The Physical Hazards.

Name hospital			Total Score		
			Poor (High Risk <42)	Good/Acceptable (Low Risk ≥42)	P. Value
	Al-Zahraa hospital	No	24	71	0.000*
		%	25.3%	74.7%	
	Al-Shaheed Fairooz	No	48	67	
		%	41.7%	58.3%	

	Al-swiara	No	75	54	
		%	58.1%	41.9%	
	al-Nuamania	No	49	53	
		%	48.0%	52.0%	
Total		No	196	245	
		%	44.4%	55.6%	

Table 2.2 represents the relationship between the demographic characteristics of the studied sample concerning all questions was not statistically significant P>0.05, except social status P value equal 0.047, professional P value equal 0.025, and experience years P value equal 0.026 were significant.

Table 2.2. The Relationship between Demographic Characteristics of Healthcare Workers and The Total Risk Score About Physical Hazards.

Association	Total Physical Hazards Score		
Socio-demographic	**DF**	**Chi-Square (X^2)**	**P. value**
age groups	1	0.314	0.575
Gender	1	0.440	0.507
Residence	1	0.934	0.334
Educational level	3	6.079	0.108
social status	2	6.129	0.047*
Professional	6	14.480	0.025*
experience years	1	4.962	0.026*
Place of working	10	17.329	0.067

Table 3 Represent the distribution of HCWs according to chemical hazards. The results of this study indicated that the mean regarding (labels are placed to explain which detergents to avoided mix with other chemicals it may cause toxic gas) was (3.73) were rest on agreed respond level. While the SD of (1.462).

Table 3. The Distribution of Healthcare Workers According to chemical Hazards.

Chemical hazard	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	SD
	No	%	No	%	No	%	No	%	No	%		
1. Sterilizers and disinfects are used	120	27.2	116	26.3	44	10.0	80	18.1	81	18.4	3.26	1.485
2.Guidance labels are placed	55	12.5	87	19.7	89	20.2	116	26.3	94	21.3	2.76	1.325

for sterilizers to explain their safe use												
3-labels are placed to explain which detergents to avoided mix with other chemicals it may cause toxic gases	198	44.9	96	21.8	40	9.1	46	10.4	61	13.8	3.73	1.462
4.Observation of the production and expiration date of the sterilizing materials and cleaning materials are done frequently	56	12.7	91	20.6	28	6.3	86	19.5	180	40.8	2.45	1.498
5. led the use of sterilizers or cleaning materials to irritates the eye, nose, and throat.	179	40.6	70	15.9	9	2.0	98	22.2	85	19.3	2.64	1.628
6.Did inhalant long-standing aesthetic gas sterilization or cleaning materials cause your poisoning.	180	40.8	84	19.0	33	7.5	94	21.3	50	11.3	2.43	1.474
7. you suffer from allergies and burn in the skin as a result of using sterilizers.	59	13.4	70	15.9	70	15.9	164	37.2	78	17.7	3.30	1.299
8. You suffer from sensitive skin as a result of using latex gloves or any medicinal substance that contains latex.	52	11.8	76	17.2	92	20.9	115	26.1	106	24.0	3.33	1.326
9. Did use cleaning and sterilization	52	11.8	64	14.5	97	22.0	136	30.8	92	20.9	3.34	1.282

materials use your causes suffocation or shortness of breath.												
10.The oxygen bottles are stored in suitable places and maintained permanently	33	7.5	86	19.5	28	6.3	100	22.7	194	44.0	2.24	1.380
11.Did there warning signs and symbols for chemicals	53	12.0	91	20.6	22	5.0	90	20.4	185	42.0	2.40	1.489

Table 3.1 Represent the total score percentage of chemical hazards level was found poor score 241(54.6%) and high score200 (45.4%) in the study. The association between the four hospitals concerning the scoring level was statistically significant P value equal to 0.047.

Table 3.1. The Relationship between the Study Hospitals and Total Risk Score of the Chemical Hazards.

					P. Value
Name hospital			Total Score		
			Poor (High Risk <33)	Good/Acceptable (Low Risk ≥33)	0.047*
	Al-Zahraa hospital	No	64	31	
		%	67.4%	32.6%	
	Al-Shaheed Fairooz	No	58	57	
		%	50.4%	49.6%	
	Al-swiara	No	67	62	
		%	51.9%	48.1%	
	al-Nuamania	No	52	50	
		%	51.0%	49.0%	
Total		No	241	200	
		%	54.6%	45.4%	

Table 3.2 Represent the Relationship between the demographic characteristics of the studied sample concerning all questions was not statistically significant P>0.05, as appear in Table 7. Except gender was significant P-value equal 0.049.

Table 3.2. The Relationship between Demographic Characteristics of healthcare workers and the Total risk Score about Chemical hazards.

Association	**Total Chemical Hazards Score**		
Socio-demographic	**DF**	**Chi-Square (X^2)**	**P. value**
age groups	1	0.866	0.352
Gender	1	3.882	0.049*
Residence	1	0.045	0.832
Educational level	3	5.289	0.152
social status	2	2.213	0.331
Professional	6	2.717	0.843
experience years	1	0.495	0.482
Place of working	10	11.186	0.343

Table 4 Represent the distribution of HCW according to prevention and control methods in health institutions. The mean for question (1)(training courses are conducted to educate health care workers about coronavirus)was(2.24), for question(21) (the first aid kit is available and usable) was(3.74), were resting on agree to responses level. While SD for question (1) was(1.380) , for question (21)was(1.060).

Table 4. Distribution of Healthcare Workers according to the Prevention and Control Methods.

Prevention and Methods	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		M	SD
	No	%	No	%	No	%	No	%	No	%		
1.Training courses are conducted to educate health care workers about corona virus	33	7.5	86	19.5	28	6.3	100	22.7	194	44.0	2.24	1.380
2.instruction on infection prevention and control is available on coronavirus	53	12.0	91	20.6	22	5.0	90	20.4	185	42.0	2.40	1.489
3.Discouraging a direct contact with employees(hugging and shaking hand)	61	13.8	88	20.0	27	6.1	83	18.8	182	41.3	2.46	1.519

4.the workplace shall be disinfected at appropriate intervals	56	12.7	91	20.6	28	6.3	86	19.5	180	40.8	2.45	1.498
5. the medical devices are disinfected before and after use	85	19.3	98	22.2	9	2.0	70	15.9	179	40.6	2.64	1.628
6.soap and tissue paper are provided e near the handwashing basin	50	11.3	94	21.3	33	7.5	84	19.0	180	40.8	2.43	1.474
7.hands washing before entering the work environment and after takeoff the personal protective equipment and when leaving the work environment	58	13.2	96	21.8	9	2.0	85	19.3	193	43.8	2.41	1.532
8.Avoidance frequent contact with common surfaces where possible (leaving doors open where possible)	111	25.2	231	52.4	71	16.1	22	5.0	6	1.4	3.95	1.857
9.prevent the gatherings in elevators or elevators for transporting people which is considered unsafe under the current conditions of the coronavirus and beware of contact points in elevators	85	19.3	199	45.1	93	21.1	42	9.5	22	5.0	3.64	1.052
10. the employees and auditors who enter the health institution are examined searching for symptoms of coronavirus	33	7.5	86	19.5	28	6.3	100	22.7	194	44.0	2.24	1.380
11.Availability of adequate quantities of personal protective equipment(mask, gloves, eyeglasses, boots, work suit)	53	12.0	91	20.6	22	5.0	90	20.4	185	42.0	2.40	1.489
12.Provide personal protective equipment in appropriate sizes for	61	13.8	88	20.0	27	6.1	83	18.8	182	41.3	2.46	1.519

every employee or person visiting the workplace												
13.Prevention equipment is examined periodically and maintained and replaced when needed	56	12.7	91	20.6	28	6.3	86	19.5	180	40.8	2.45	1.498
14.Personal prevention equipment is eliminated in safe ways do not pollute the work environment and others	85	19.3	98	22.2	9	2.0	70	15.9	179	40.6	2.64	1.628
15.the wounds are covered before the laboratory enter	50	11.3	94	21.3	33	7.5	84	19.0	180	40.8	2.43	1.474
16. the jewelry is covered(it should not affect the gloves)and removed before entering any workplace where this is required	58	13.2	96	21.8	9	2.0	85	19.3	193	43.8	2.41	1.532
17.portable electronic devices are kept in areas that cannot be contaminated and disinfected frequently	103	23.4	220	49.9	69	15.6	33	7.5	16	3.6	3.82	0.993
18. A warning signs exist in biological laboratories have	101	22.9	178	40.4	95	21.5	39	8.8	28	6.3	3.65	1.117
19.Records of waste removal destruction and treatment are available	84	19.0	183	41.5	100	22.7	40	9.1	34	7.7	3.55	1.129
20.waste workers are being drawn to coronavirus-related waste	110	24.9	190	43.1	77	17.5	36	8.2	28	6.3	3.72	1.117
21.first aid kit is available and usable	99	22.4	209	47.4	79	17.9	28	6.3	26	5.9	3.74	1.060
22.A published contingency plan is available	33	7.5	86	19.5	28	6.3	100	22.7	194	44.0	2.24	1.380

23.A workplace response plan is an available case someone develops symptoms of coronavirus and employees are aware of them	53	12.0	91	20.6	22	5.0	90	20.4	185	42.0	2.40	1.489
Weighted Mean= 2.81±0.78												

Fig 1 Represent the total score prevention and control methods. The highest percentage of the studied sample which reached 266(60.0%) had a poor score (high risk) regarding prevention and control methods, while reached to175 (40.0%%) of them had a good score (low risk) toward it.

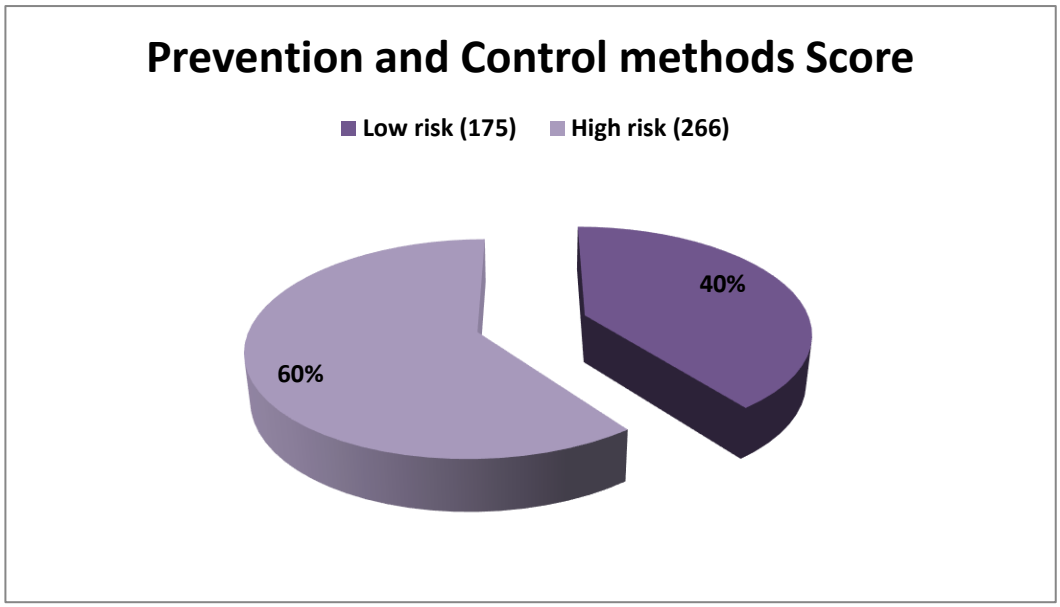

Fig 1. The total score of the Prevention and Control Methods.

Table 5 represents Pearson's correlation coefficients physical hazards, and prevention and control methods. It shows that there is a highly significant positive correlation (P-value <0.01) between physical hazards and prevention and control methods (r= 0.144**).

Table 5. Pearson's correlation coefficients physical hazards, and prevention and control methods.

		physical hazard
Prevention and control methods	Pearson Correlation	0.144**
	Sig. (2-tailed)	0.002

	N	441

Table 6 represents Pearson's correlation coefficients chemical hazards, and prevention and control methods. It shows that there is a highly significant positive correlation (P-value <0.01) between chemical hazards and prevention and control methods (r= 0.770**).

Table 6. Pearson's correlation coefficients chemical hazards, and prevention and control methods.

		Chemical hazards
Prevention and control methods	Pearson Correlation	0.770**
	Sig. (2-tailed)	0.000
	N	441

4 Discussion

The present study found that 254(57.6%) were in the age group of health care workers <30 years. These results are consistent with the previous study was done in Palestine hospitals [7], which found that 60% of the study participants fall included the age group (20-30 years) This may be due to the increasing number of graduates from medical institutes and colleges in Iraq and Their enrolment in the direct job more than before. in this study, there was a distinct female's preponderance 242(54.9%). These results agreed with the study findings done in Nigeria [6], which found that most of the participants were females, and another similar study in India [9] revealed that the highest percentage (80%) of the study samples were females. Furthermore, these results are consistent with the study findings done in Riyadh, Saudi Arabia [10], which found the participants proportion in the study for females higher than males. But, these results differ from the findings study in Palestine [11] who found that most participants were males. The results of this study indicated that 265(60.1%) of the study population were married, and 161(36.5%) of Participants were single in studied hospitals. These results are consistent with the study done in Nigeria[8], which revealed that the highest percentage (63.0%) of the study samples were married. The current findings that the first rank of health care workers were nurses 125 (28.3%) followed which reached to 107(24.3%) of medical assistants, laboratory assistants, and radiology assistants in all studied hospitals. While the overall frequency of Technicians was 86(19.5%) in all hospitals. This may be due to the increasing number of private and government colleges that graduate large number of nurses .These results agreed with the study conducted in the Northern West Bank Hospital Palestine [12], which found that the first rank of health care workers were practical nurses (46.4%).
In this study, most of the participants respond with "agree and strongly agree" regarding" the electrical lifts are in a good and safe condition" and" enough lighting is available at the workplace". These findings agreed with the previous study in Egypt[13]. Which found that most of HCWs reported that electrical installations and lighting were in good condition

This study revealed there are differences between the four hospitals concerning the physical hazards level were statistically significant P value equal 0.05. These findings were agreed to the study conducted in a Greek hospital [14], which found that most participants declared low to

medium levels of risk concerning physical hazards. But, these results disagreed with the study conduct in Egypt[15], which found that physical hazards were the first rank among radiation health teams compared to other occupational hazards.
The association between the four hospitals concerning the chemical hazard scoring level was statistically significant P value equal to 0.047. These results disagree with another study conducted in Benin-city, Nigeria [16], which found that chemical hazards levels were 68% among health care workers and the association between the study hospitals concerning the exposure level were statistically significant P value equal 0.005.
The study was done in Palestine, Almurr, 2013who reported that respondents do not take training regarding safety practices [12]. Also, a study, conducted in a European Gaza hospital Saqer, 2014) found there is a lack of occupational training for health care providers towards knowledge of occupational health and safety risks at European Gaza Hospital. The finding agreed with our result in this study [17].
In Palestine, a study revealed that only (27.3%) of health care personnel indicated the lack of infection-prevention equipment such as gloves, hats, closed shoes, and work suits. This result disagreed with the study of our findings in Palestine [18]. A study conduct in Gaza [19], who showed apparent progress in adherence of healthcare workers in the implementation of infection prevention. This finding disagrees with our results in this study.

5 Conclusion

There are some following conclusions:

1- The study showed that the hazards in hospitals were moderate for chemical hazards followed by physical hazards.
2- The study revealed that the less commitment to prevention and control methods, the greater the risks to workers.
3- The study revealed that the relationship between the study sample and the physical hazards with the regarded to demographic characteristics are (social status, professional and experience years) $p>0.05$.

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