Research Article / Araştırma Makalesi

Knowledge and Attitudes of Medical Students towards Occupational Diseases

Tıp Öğrencilerinin Meslek Hastalıklarına İlişkin Bilgi ve Tutumları

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Abstract

Background: Occupational diseases can be prevented by implementing the appropriate occupational health and safety measures against occupational hazards in the workplace. Unfamiliarity with and mismanagement of occupational diseases by physicians is often linked to inadequate medical training. This study aims to investigate medical students' awareness of, knowledge and attitudes towards occupational health, exposure to occupational hazards, and preventive measures.
Materials and Methods: This cross-sectional study was conducted with medical students between March and June 2021. Due to the introduction of online education during the COVID-19 pandemic, the questionnaire was sent to the students in the electronic medium. The data analysis was performed with SPSS (version 21). Pearson chi-square test and Fisher's exact test were used for the comparison of the categorical variables for two independent groups.
Results: Of the 547 medical students who participated in the study, 56.7% (n= 310) were female, and 43.3% (n=257) were male. The median age was 22 (18-30) years. Of the students, 29.4% (n=161) were attending the preclinical classes, 27.8% (n=152) were 6th-year, 21.9% (n=120) were 4th-year, and 20.8% (n=114) were 5th-year. Of the participants, 12.2% (n=67) scored their level of knowledge about the perceived occupational diseases 1 out of 5, 40% (n=219) scored 2 out of 5, 38.6% (n=211) scored 3 out of 5, 9.1% (n=50) scored 4 out of 5. It was found that the level of knowledge increased with the class level.
Conclusions: This study showed that the medical students' knowledge about occupational diseases is at a moderate level, and it is essential to offer a dedicated course on occupational diseases during medical training in order to increase their knowledge about these diseases.

Key Words: Occupational diseases, medical faculty, medical student

ÖZ.

Amaç: Mesleki tehlikelere karşı işyerinde gerekli iş sağlığı ve güvenliği önlemlerinin alınması ve uygulanması ile meslek hastalıkları önlenebilmektedir. İşle ilgili hastalıkların tanınmaması ve yanlış yönetilmesi genellikle yetersiz tıp eğitimiyle bağlantılıdır. Tıp fakültesi öğrencilerinin mesleki tehlikelere maruz kalma konusundaki ve önleyici tedbirler hakkındaki farkındalıklarını, bilgilerini ve iş sağlığına yönelik tutumlarını araştırmayı amaçlamaktadır.
Materyal ve Metod: Kesitsel nitelikte olan bu çalışma, Mart 2021-Haziran 2021 tarihleri arasında tıp fakültesi öğrencileri arasında gerçekleştirilmiştir. Pandemi sürecinde online eğitim olması nedeniyle çalışmanın anketi, öğrencilere elektronik ortamda gönderildi. Verilerin analizi için SPSS v21.0 paket programı kullanıldı. İki bağımsız grubun karşılaştırılmasında kategorik değişkenler için Pearson ki-kare testi ve Fischer Exact Testi kullanıldı.
Bulgular: Çalışmamıza katılan 547 öğrencinin %56.7'si kadın, %43.3'ü erkek ve yaş median değeri 22 (18-30) idi. Öğrencilerin %29.4'ü preklinik sınıf, %27.8'i 6. sınıf, %21.9'u 4. sınıf, %20.8'i 5. sınıfa devam etmekteydi. Tıp fakültesi öğrencileri, algıladıkları meslek hastalıkları hakkındaki bilgi düzeyini 5 puan üzerinden %12.2'si 1, %40'ı 2, %38.6'sı 3, %9.1'i 4 olarak tanımladılar ve sınıf düzeyi artması ile birlikte bilgi düzeyinin arttığı saptandı.
Sonuç: Bu çalışma, tıp fakültesi öğrencilerinin meslek hastalıkları hakkındaki bilgi düzeyinin orta düzeyde olduğunu ve daha fazla bilgi sahibi olmak için tıp fakültesi eğitimi boyunca meslek hastalıkları dersinin ayrıca verilmesi gerekli olduğunu göstermektedir.

Anahtar kelimeler: Meslek hastalığı, Tıp fakültesi, Tıp öğrencisi

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Introduction

The international authorities such as the World Health Organization (WHO) and the International Labor Organization (ILO) define occupational diseases (ODs) as a group of diseases in which a cause-and-effect relationship can be demonstrated between a harmful factor specific to the work being done and the human body affected by it (1). According to the ILO estimates, around two million workers die from work-related injuries and diseases worldwide (2). In addition, ODs cause significant labor loss by reducing the productivity and capacity of the employees. It is estimated that the cost of work-related diseases in the European Union (EU) is at least €145 billion per year (3).

Occupational diseases can be prevented by implementing the appropriate occupational health and safety (OHS) measures for occupational hazards in the workplace. The OHS is one of the basic components of medical education as a technical as well as a medical discipline. Most work-related health problems are commonly managed by non-specialist physicians. The unfamiliarity with and mismanagement of ODs is often linked to inadequate medical training (4). For this reason, physicians' knowledge about the potential causal relationship between occupations and diseases should be up-to-date, not only to provide patients with information about OHS but also to diagnose, treat, and prevent ODs (5). Thus, it is critical for physicians to have the training that will enable them to identify the occupational health problems they may experience themselves or observe in their patients. It is also possible to provide this training during medical school (6, 7). The content and duration of occupational health training provided during medical school differ among different countries and universities (8). These variations in the level, duration, content, and examination procedures suggest that the medical training about OHS is neglected (9). It has been emphasized that medical training on occupational health is limited in many countries (10). In Turkey, specific courses are not allocated for ODs or OHS, but training with varying content and duration is given in different clinical departments. A recent study of 25 medical schools in Turkey reported that all participating public health departments provide training on occupational health. It was also reported that most of the training involved classroom lectures or small group work and that the average total instruction time was 8.1 hours. Practical sessions were held in approximately half of the medical schools (44%), and workplace visits were performed in one-third (32%) (11).

In Cerrahpaşa School of Medicine at Istanbul Cerrahpaşa University, occupational health topics are mainly discussed within the scope of the Public Health Program, while various aspects of occupational diseases are covered within the scope of clinical courses in pulmonary diseases.

The Undergraduate Education Program for Public Health is designed to cover occupational health topics in the first, third, and sixth years of the medical school curriculum. Occupational Health and Diseases was approved as a field of sub-specialization by the Ministry of Health in Turkey in 2012 and is offered to specialists of pulmonary diseases, public health, and internal medicine who choose to take the training, which is given in a three-year program (12).

This study aims to investigate the awareness and knowledge of medical school students about occupational hazards and preventive measures and their attitudes towards occupational health before and during their practical training and to analyze the factors affecting their awareness, knowledge, and attitudes.

Materials and Methods

Study Design

This cross-sectional study involved medical students and was conducted between March 2021 and June 2021.

Measurement Tools

The data was collected by using a questionnaire developed by the researchers. The questionnaire consisted of five parts and 21 items. The first part included questions about the sociodemographic characteristics of the students; the other parts probed their knowledge and opinions about the ODs and the Specialization in Occupational Diseases (second part), the risk factors for ODs (third part), and the protection from ODs (fourth part) and their attitudes and behaviors towards protection from ODs (fifth part). Participants were asked to score their perceived level of knowledge about occupational diseases from 1 to 5 points. The 1st, 2nd, and 3rd-year medical students were considered preclinical.

Data Collection

In the 2020-2021 academic year, 2428 medical students training at Istanbul University-Cerrahpaşa, Cerrahpaşa School of Medicine were included in the study, no sample calculation was made. A total of 547 medical students answered the questionnaire; thus, 22.5% of the individuals in the universe of the study could be reached. Due to the introduction of online education during the Covid-19 pandemic, the questionnaire was prepared using the Google Forms program and sent to the students in an electronic medium (Whattsap). Participants were required to give informed consent online in order to proceed to the survey. After clicking on the link sent to them, the participants agreed to participate in the survey and were able to fill out the survey. The study was approved by the Ethics Committee of Cerrahpaşa School of Medicine at Istanbul Cerrahpaşa University (Date: 02.03.2021 No. 50468).

Data Analysis

The data was evaluated and analyzed by using the SPSS (version 21, SPSS Inc., Chicago, IL, USA) package program. The data were presented as the median (minimum-maximum) for the continuous variables; frequency and percentage were used for the qualitative data. Pearson chi-square

test and Fisher's exact test were used for the comparison of two independent groups in terms of categorical variables. A p-value of <0.05 was accepted as the statistical significance level.

Results

Of the 547 students who participated in the study, 56.7% (n= 310) were female, and 43.3% (n=237) were male. The median age was 22 (18-30) years. Of the students, 29.4% (n=161) were in the preclinical level, 21.9% (n=120) were in the 4th-year, 20.8% (n=114) were in the 5th-year, and 27.8% (n=152) were in the 6th-year. The sociodemographic characteristics of the students are given in Table 1.

Table 1. The sociodemographic data of participating medical students

Variables	n	%
Gender		
Female	310	56.7
Male	237	43.3
Level		
Preclinical	161	29.4
4th-year	120	21.9
5th-year	114	20.8
6th-year	152	27.8
Smoking		
Yes	76	13.9
No	471	86.1
Alcohol use		
Yes	142	26
No	405	74

Of the students, 48.3% (n=264) reported that they were aware of the sub-specialization about ODs; this rate increased with the students' year in medical school (p<0.001). Of the students, 83.9% (n=459) stated that they wanted to know more about ODs, and 83.7% (n=458) agreed that separate courses about ODs should be offered during medical school. The percentage of students who wanted to know more about ODs decreased as the grade level increased (p<0.001).While 38.9% (n=213) of the students could name three OD diagnoses, 36% (n=197) could name none, and the percentage of students who could name ODs increased with the grade level (p<0.001). Of the ODs for healthcare workers, hepatitis B infection was identified by 83.7% (n=458) of the students, HIV infection by 73.5% (n=402), anxiety/depression by 88.7% (n=485), lumbar/neck hernia by 78.6% (n=430), varicose veins by 72.6% (n=397), tuberculosis by 64.4% (n=352), and contact dermatitis by 43.9% (n=240). There were significant differences among grade levels regarding the rates of identification of hepatitis B, tuberculosis (p<0.001), HIV (p=0.036), anxiety/depression (p=0.003), neck/lumbar hernia (p=0.001), and contact dermatitis (p=0.004). Of the students, 79.5% correctly identified that the ODs should be reported, 55.9% correctly identified that cancers could also be considered an OD; there were significant differences among grade levels regarding the rates of correct responses to these questions (p<0.001). Students identified their knowledge levels as 1/5 (12.2%), 2/5 (40%), 3/5 (38.6%), and 4/5 (9.6%); their perceived knowledge levels increased as the grade level increased (p<0.001) (Table 2).

The students' knowledge about the risk factors for ODs is shown in Table 3. Chemical factors were correctly identified as risk factors for the ODs by 94.3% (n=516) of the students, physical factors by 93.4% (n=511), biological factors by 82.8% (n=453), ergonomic factors by 81.9% (n=448), and psychosocial factors by 63.3% (n=346). The rates of correctly identifying them were significantly different among grade levels (p<0.05). When asked about the categories for risk factors for the ODs encountered by healthcare professionals, chemical factors were correctly identified as a group of risk factors by 87.6% (n=479) of the students, psychosocial factors by 87.4% (n=478), biological factors by 86.5% (n=473), physical factors by 81.5% (n=446), and ergonomic factors by 56.5% (n=309). The rates of correctly identifying psychosocial factors were significantly different among grade levels (p=0.006) (Table 3).

The students' knowledge and opinions about protection from ODs are given in Table 4. More than half of the students (55.9%) had received training on the use of personal protective equipment (PPE), and this rate increased with the grade level (p<0.001). Of the students, 14.1% (n=77) thought that PPEs completely protected against ODs, and there was a significant difference between grade levels about their opinion on this matter (p<0.001). The rate of those believing that the hepatitis B vaccine is protective was 91.8% (n=502), which increased with the grade level (p<0.001). For the protection of healthcare workers from ODs, 96% (n=525) agreed that PPEs should be used, 95.8% (n=524) agreed on vaccinating against biological agents, 86.7% (n=474) agreed on receiving OHS training, and 77.3% (n=423) agreed on having an annual health screening. The percentage of students who thought that they should have an annual health screening was significantly different between classes (p=0.001). There was a significant difference among the grade levels regarding the rate of students who thought that PPEs should be used while working with ultrasound imaging, magnetic resonance imaging (MRI), radioscopy, computed tomography (CT), electroencephalography (EEG), and electromyography (EMG) due to the risk of radiation (p<0.005).

The students' attitudes about protecting themselves from their ODs are shown in Table 5. The rate of vaccination against Hepatitis B was 65.4% (n=358), which increased with grade level (p<0.001). Students most commonly used hand sanitizers (92.9%) or soap and water (85%) for hand hygiene during their internships at hospitals; there was a significant difference between grade levels regarding the use of hand hygiene products (p<0.001). Most of the students reported using PPE while performing procedures on patients in the clinics (96.7%) and practicing hand hygiene before and after contact with the patient, blood, and body

fluids. There was a significant difference between grade levels regarding the use of hand hygiene after contact with the patient and after contact with blood or body fluids (p=0.042, p<0.001, respectively). Among the reasons to shy away from using PPEs, 72.9% (n=399) of the students cited physical discomfort, 68.2% (n=373) cited restricting their mobility, 41% (n=224) cited that PPE was not provided, 17.4% (n=95) cited that PPE was insufficient for protection, 9.3% (n=51) cited that they believe PPEs were unnecessary for the tasks they performed. There were significant differences between grade levels regarding the reasons cited (p<0.005).

Table 2. Knowledge and opinions of medical students about occupational diseases and the sub-specialization

Question	All n (%)	Preclinical (1+2+3) n (%)	4th year n (%)	5th year n (%)	6th year n (%)	p
Did you know that there is a sub-specialization for ODs?	264(48.3)	44(27.3)	64(53.3)	56(49.1)	100(65.8)	<0.001
Yes	283(51.7)	117(72.7)	56(46.7)	58(50.9)	52(34.2)	
No						
Should there be a separate course on ODs in medical schools?						
I agree	458(83.7)	125(77.6)	102(85)	102(89.5)	129(84.9)	0.059
I do not agree	89(16.3)	36(22.4)	18(15)	12(10.5)	23(15.1)	
Would you like to know more about ODs?						
Yes						
No	459(83.9)	155(96.3)	96(80)	94(82.5)	114(75)	<0.001
	88 (16.1)	6(3.7)	24(20)	20(17.5)	38(25)	
Can you write three ODs diagnoses that you know?						
0						
1	197(36)	88(54.7)	58(48.3)	26(22.8)	25(16.4)	
2	49(9)	24(14.9)	10(8.3)	8(7)	7(4.6)	<0.001
3	88(16.1)	15(9.3)	22(18.3)	24(21.1)	27(17.8)	
	213(38.9)	34(21.1)	30(25)	56(49.1)	93(61.2)	
What are the ODs for healthcare workers?						
Hepatitis B infection						
Yes	458(83.7)	119(73.9)	112(93.3)	102(89.5)	125(82.2)	<0.001
No	89(16.3)	42(26.1)	8(6.7)	12(10.5)	27(17.8)	
HIV infection						
Yes	402(73.5)	114(70.8)	84(70)	96(84.2)	108(71.1)	0.036
No	145(26.5)	47(29.2)	36(30)	18(15.8)	44(28.9)	
Anxiety/depression						
Yes	485(88.7)	142(88.2)	96(80)	106(93)	141(92.8)	0.003
No	62(11.7)	19(11.8)	24(20)	8(7)	11(7.2)	
Neck/lumbar hernia						
Yes	430(78.6)	118(73.3)	84(70)	96(84.2)	132(86.8)	0.001
No	117(21.4)	43(26.7)	36(30)	18(15.8)	20(13.2)	
Varicose						
Yes	397(72.6)	116(72)	90(75)	84(73.7)	107(70.4)	0.847
No	150(27.4)	45(28)	30(25)	30(26.3)	45(29.6)	
Tuberculosis						
Yes	352(64.4)	87(54)	98(81.7)	72(63.2)	95(62.5)	<0.001
No	195(35.6)	74(46)	22(18.3)	42(36.8)	57(37.5)	
Contact dermatitis						
Yes	240(43.9)	54(33.5)	50(41.7)	60(52.6)	76(50)	0.004
No	307(56.1)	107(66.5)	70(58.3)	54(47.4)	76(50)	
Are ODs one of the diseases that should be reported?						
Yes						
No	435(79.5)	139(96.3)	80(66.7)	90(78.9)	126(82.9)	
No idea	45(8.2)	2(1.2)	24(20)	6(5.3)	13(8.6)	<0.001
	67(12.2)	20(12.4)	16(13.3)	18(15.8)	13(8.6)	
Can cancers be defined as ODs?						
Yes	306(55.9)	77(47.8)	52(43.3)	74(64.9)	103(67.8)	
No	100(18.3)	24(14.9)	30(25)	26(22.8)	20(13.2)	<0.001
No idea	141(25.8)	60(37.3)	38(31.7)	14(12.3)	29(19.1)	
Your level of knowledge about ODs						
1	67(12.2)	42(26.1)	4(3.3)	12(10.5)	9(5.9)	<0.001
2	219(40)	78(48.4)	60(50)	44(38.6)	33(21.7)	<0.001
3	211(38.6)	39(24.2)	52(43.3)	48(42.1)	72(47.4)	<0.001
4	50(9.1)	2(1.2)	4(3.3)	10(1.8)	38(25)	<0.001

OD: Occupational disease

Table 3. Knowledge of medical students about the risk factors for occupational diseases.

Question	All n (%)	Preclinical (1+2+3) n (%)	4th year n (%)	5th year n (%)	6th year n (%)	P
Which of the following categories include risk factors for ODs?						
Biological						
Yes	453(82.8)	117(72.7)	108(90)	96(84.2)	132(86.8)	<0.001
No	94(17.2)	44(27.3)	12(10)	18(15.8)	20(13.2)	
Physical						
Yes	511(93.4)	143(88.8)	116(96.7)	110(96.5)	142(93.4)	0.025
No	36(6.6)	18(11.2)	4(3.3)	4(3.5)	10(6.6)	
Chemical						
Yes	516(94.3)	143(88.8)	112(93.39	112(98.2)	149(98)	0.001
No	31(5.7)	18(11.2)	8(6.79	2(1.8)	3(2)	
Psychosocial						
Yes	346(63.3)	147(91.3)	96(80)	88(77.2)	117(77)	0.003
No	201(36.7)	14(8.7)	24(20)	26(22.8)	35(23)	
Ergonomic						
Yes	448(81.9)	89(55.3)	70(58.3)	84(73.7)	103(67.8)	0.006
No	99(18.1)	72(44.7)	50(41.7)	30(26.3)	49(32.2)	
Which of the following categories include risk factors for the ODs encountered by healthcare professionals?						
Biological						
Yes						
No	473(86.5)	141(87.6)	108(90)	102(89.5)	122(80.3)	0.062
	74(13.5)	20(12.4)	12(10)	12(10.5)	30(19.7)	
Physical						
Yes						
No	446(81.5)	131(81.4)	96(80)	88(77.2)	131(86.2)	0.284
	101(18.5)	30(18.6)	24(20)	26(22.8)	21(13.8)	
Chemical						
Yes						
No	479(87.6)	139(86.3)	102(85)	100(87.7)	138(90.8)	0.493
	68(12.4)	22(13.7)	18(15)	14(12.3)	14(9.2)	
Psychosocial						
Yes						
No	478(87.4)	153(95)	100(83.3)	98(86)	127(83.6)	0.006
	69(12.6)	8(5)	20(16.7)	16(14)	25(16.4)	
Ergonomic						
Yes						
No	309(56.5)	90(55.9)	61(50.8)	74(64.9)	84(55.3)	0.174
	238(43.5)	71(44.1)	59(49.2)	40(35.19	68(44.7)	
Can you write three physical risk factors that you know?						
0	435(79.5)	132(82)	96(80)	90(78.9)	117(77)	0.593
1	61(11.2)	21(13)	10(8.3)	12(10.5)	18(11.8)	
2	26(4.8)	4(2.5)	6(5)	6(5.3)	10(6.6)	
3	25(4.6)	4(2.5)	8(6.7)	6(5.3)	7(4.6)	

OD: Occupational disease

Table 4. Knowledge and opinions of medical students about protection from ODs

Question	All n (%)	Preclinical (1+2+3) n (%)	4th year n (%)	5th year n (%)	6th year n (%)	p
Did you receive training about the use of PPEs during your medical school education?						
Yes	306(55.9)	59(36.6)	64(53.3)	70(61.4)	113(74.3)	<0.001
No	241(44.1)	102(63.4)	56(46.7)	44(38.6)	39(25.7)	
Does the use of PPE completely protect from ODs?						
I agree	77(14.1)	28(17.4)	28(23.3)	6(5.3)	15(9.9)	<0.001
I do not agree	470(85.9)	133(82.6)	92(76.7)	108(94.7)	137(90.1)	
Do you think the hepatitis B vaccine is protective?						
Yes	502(91.8)	125(77.6)	115(95.8)	112(98.2)	150(98.7)	<0.001
No	45(8.2)	36(22.4)	5(4.2)	2(1.8)	2(1.3)	
What should healthcare workers do to protect themselves from ODs?						
Should use PPEs						
Yes	525(96)	151(93.8)	114(95)	110(96.5)	150(98.7)	0.154
No	22(4)	10(6.2)	6(5)	4(3.5)	2(1.3)	
Should get vaccinated against biological risk factors						
Yes	524(95.8)	151(93.8)	116(96.7)	108(94.7)	149(98)	0.258
No	23(4.2)	10(6.2)	4(3.3)	6(5.3)	3(2)	
Should get an annual health screening						
Yes	423(77.3)	136(84.5)	82(68.3)	96(84.2)	109(71.7)	0.001
No	124(22.7)	25(15.5)	38(31.7)	18(15.8)	43(28.3)	
Should participate in OHS training						
Yes	474(86.7)	139(86.3)	102(85)	100(87.7)	133(87.5)	0.918
No	73(22.7)	22(13.7)	18(15)	14(12.3)	19(12.5)	
For which of the following devices is it necessary to use PPE (lead apron, glasses, screen, etc.) due to the risk of radiation?						
Ultrasound imaging						
Yes	37(6.8)	20(12.4)	10(8.3)	4(3.5)	3(2)	0.001
No	510(93.2)	141(87.6)	110(91.7)	110(96.5)	149(98)	
MRI						
Yes	130(23.8)	70(43.5)	32(26.7)	8(7)	20(13.2)	<0.001
No	417(76.2)	91(56.5)	88(73.3)	106(93)	132(86.8)	
X-ray imaging						
Yes	524(95.8)	157(97.5)	112(93.3)	110(96.5)	145(95.4)	0.364
No	23(4.2)	4(2.5)	8(6.7)	4(3.5)	7(4.6)	
Radioscopy						
Yes	301(55)	59(36.6)	60(50)	82(71.9)	100(65.8)	<0.001
No	246(45)	102(63.4)	60(50)	32(28.1)	52(34.2)	
CT						
Yes	504(92.1)	135(83.9)	112(93.3)	110(96.5)	147(96.7)	<0.001
No	43(7.9)	26(16.1)	8(6.7)	4(3.5)	5(3.3)	
EEG						
Yes	46(8.4)	32(19.9)	6(5)	6(5.3)	2(1.3)	<0.001
No	501(91.6)	129(80.1)	114(95)	108(94.7)	150(98.7)	
EMG						
Yes	40(7.3)	28(17.4)	6(5)	4(3.5)	2(1.3)	<0.001
No	507(92.7)	133(82.6)	114(95)	110(96.5)	150(98.7)	

PPE: Personal protective equipment, OD: Occupational disease, OHS: Occupational health and safety, MRI: Magnetic resonance imaging, CT: Computed tomography, EEG: Electroencephalography, EMG: Electromyography

Table 5. Attitudes of medical students about the prevention of ODs

Question	All n (%)	Preclinical (1+2+3) n (%)	4th year n (%)	5th year n (%)	6th year n (%)	P
Have you had the Hepatitis B vaccine?						
Yes	358(65.4)	66(41)	66(55)	84(73.7)	142(93.4)	<0.001
No	189(34.6)	95(59)	54(45)	30(26.3)	10(6.6)	
What do you use for hand hygiene in the clinics where you had your internship?						
Soap and water	465(85)	135(83.9)	106(88.3)	80(70.2)	144(94.7)	<0.001
Hand sanitizer	508(92.9)	135(83.9)	116(96.7)	110(21.7)	147(96.7)	<0.001
Wet wipes	55(10.1)	38(23.6)	8(14.5)	6(5.3)	3(2)	<0.001
Do you use PPE (mask, gloves, apron, etc.) when dealing with patients in clinics where you had your internship?						
Yes	529(96.7)	153(95)	116(96.7)	112(98.2)	148(97.4)	0.510*
No	18(3.3)	8(5)	4(3.3)	2(1.8)	4(2.6)	
In which situations do you practice hand hygiene?						
Before contact with the patient	539(98.5)	159(98.8)	120(100)	114(100)	146(98)	NA
After contact with the patient	516(94.3)	157(97.5)	114(95)	102(89.5)	143(94.1)	0.042
Before contact with blood and body fluids	446(81.5)	148(91.9)	86(71.7)	94(82.5)	118(77.6)	<0.001
After contact with blood and body fluids	528(96.5)	153(95)	116(96.7)	112(98.2)	147(96.7)	0.597*
What are your reasons for not using PPEs?						
Restricts my mobility	373(68.2)	122(75.8)	68(56.7)	82(71.9)	101(66.4)	0.006
Causes physical discomfort	399(72.9)	135(83.9)	86(71.7)	80(70.2)	98(64.5)	0.001
I think that PPE is unnecessary for my work	51(9.3)	12(7.5)	4(3.3)	10(8.8)	25(16.4)	0.002
PPEs are not provided	224(41)	45(28)	44(36.7)	54(47.4)	81(53.3)	<0.001
I think PPE provides insufficient protection	95(17.4)	40(24.8)	14(11.7)	8(1.5)	33(21.7)	<0.001

NA: Analysis failed, PPE: Personal protective equipment
**Fisher's exact test*

Discussion

Our study investigated the awareness and knowledge of medical school students about exposure to occupational hazards and preventive measures, their attitudes towards occupational health before and during practical training in a university hospital, and the associated factors. Of these medical students, 12.2% scored their perceived level of knowledge about ODs as 1 out of 5, 40% as 2, 38.6% as 3, and 9.1% as 4; it was found that the level of knowledge increased with the year in medical school.

Occupational diseases are not a separate area of specialization in Turkey, but it was approved by the Ministry of Health in 2012 as an area of subspecialty. The subspecialty (fellowship) training in ODs is given as a three-year program for the specialists in pulmonary diseases, public health, or internal medicine who choose to do so (12). Education for occupational health and diseases is offered as a theoretical course by the departments of public health or pulmonary diseases, usually in the third and fifth years of medical school. In our study, almost half of the students stated that they knew about the ODs as an area of subspecialty, and this rate increased with the school year. It is thought that this may be because there was an ODs specialist actively working, and the 5th-year students were offered

a course on ODs at the university where the study was conducted. In our study, 83.9% of the students reported that they wanted to know more about ODs, and 83.7% agreed that separate courses on ODs should be offered during medical school. In a study of the medical school curriculum, it was reported that 6th-year students in the School of Medicine at Ege University indicated that ODs were not covered during their clinical internships, except for the internship in pulmonary diseases, and that almost all of the students desired to receive this training and to see case examples starting from the 3rd-year (13). In many medical schools, ODs are integrated into the subjects taught in a single medical department (mostly pulmonary diseases), but they are a significant part of clinical education because they require a holistic approach and a multidisciplinary education system. In addition, in order to identify the accurate prevalence of ODs, it is recommended that they are taught as a part of the basic curriculum in medical education (14-15). In our study, 38.9% of the students could name three diagnoses of ODs, while 36% could not name any, and the percentage of students who could name ODs increased with the grade level. In previous studies in Turkey, approximately one-third of the participants claimed that they knew the most common/reported OD in Turkey; almost all of these named a respiratory disease, although not all of them were correct (16, 17). In one of these studies, none of the participants mentioned work-related stress when asked about the most common ODs (16), although work-related stress is one of the most common ODs and becomes increasingly more common (18). In our study, 87.4% of the participants correctly indicated that psychosocial risk factors could cause ODs. Studies conducted in various countries have reported that there are very few training programs in medical schools covering the relationship between environment and occupation, and therefore the number of physicians who received training on ODs before graduation is low (17, 19, 20).

In a study examining the knowledge and attitudes of physicians working in another university hospital in Turkey about ODs, 54% of the participants stated that they received training on ODs. Of these, 83.4% indicated receiving such training during medical school, 8.5% during residency training, 7.5% as in-service training at the hospital. In that study, 76.8% of the participants were aware that ODs are diseases to be reported; this rate was similar to the one reported in our study (79.5%) (16). Üzmezoğlu et al. studied the physicians in the first and last year of their residency training in internal medicine in various university hospitals in Ankara, Turkey, and found that 57.6% of the participants received training about ODs during their medical school, but only 17.5% of them stated that this training was adequate. In that study, only one-fourth of the participants stated that they received adequate training about ODs during their residency training (17).

In 1992, WHO and ILO recognized hepatitis B infection as an OD for healthcare workers (21). In a previous study that investigated the medical students' awareness about the occupational health risks for healthcare workers in Turkey, the rate of those who correctly identified the diseases transmitted through contact with blood or other body fluids was 83.3% among first-year students and 90.9% among sixth-year students (22). Similarly, 83.7% and 73.5% of the students correctly identified hepatitis B and HIV infections as ODs for healthcare workers, respectively; the rate of correct answers increased with grade level.

A focus on the perception of risks should be an important component of future educational programs to promote preventive behaviors in medical students. In addition, medical students should be able to receive training in a safe learning environment, which is related to the experiences that allow them to practice and make mistakes in a threat-free environment. In our study, 55.9% of the students stated that they received training on the use of PPE, and 96.7% stated that they used PPE during their internship. In a study conducted at a large tertiary teaching hospital in Sydney, Australia, Barratt et al. investigated the self-reported experiences of interns about the use of PPEs (23). Unlike our study, many of the interns participating in that study reported that they had not previously received formal training about the skills required for optimal PPE use, and consequently, they developed potentially unsafe habits.

The World Health Organization has recommended that healthcare professionals and medical students be given special consideration in screening and vaccination for hepatitis B virus (24). The vaccination status of 553 students at a medical school in France was investigated, and the frequency of having the hepatitis B vaccine, which was compulsory, was found to be 74.7%. The authors suggested systematic monitoring for the students' vaccination status (25). In a study conducted with 650 medical school students in Germany, it was found that the rate of vaccination against hepatitis B was higher among the students in clinical training (96.6% and 78.3%, respectively) compared to those in preclinical training (26). In our study, the overall rate of vaccination against hepatitis B was 65.4%, while this rate increased to 93.4% among 6th-year students, which may suggest that the rate of vaccination increases with the increased knowledge level in advanced classes. In another study, Nair et al. reported that 91.3% of the participants had sufficient knowledge about hand hygiene, but only 25.2% were aware that it was necessary to wash hands before injections (27). On the contrary, in our study, almost all of the students in all grade levels reported practicing hand hygiene when necessary. It is also thought that the present COVID-19 pandemic has increased the awareness about hand hygiene.

This study investigated the knowledge of medical students at all grade levels in Turkey about ODs and their attitudes towards risk factors for ODs. However, as a cross-sectional study using self-reported data, this study has various limitations. Since this was a single-center study in Turkey, its

results may not be generalized to other institutions or countries. The participation of this study is low, which may be due to online surveys during the pandemic period. Finally, due to the cross-sectional nature of our study, a causal relationship could not be established.

Conclusion

This study demonstrated that the medical students' knowledge level about occupational diseases was moderate and that it is necessary to offer a separate course on occupational diseases during medical school training in order to equip them with more extensive knowledge about the subject. Implementing a multidisciplinary training program with the cooperation between the departments of occupational diseases and faculties, if necessary, might be more effective. Introducing compulsory courses on occupational diseases during the medical school programs will be a critical intervention for the future of occupational diseases. Starting from medical school and expanding to all levels of medical training and profession, providing training on the diagnosis and treatment of occupational diseases and on related legal issues may enable physicians to be more competent in occupational diseases and move our country forward in the diagnosis, treatment, and prevention of occupational diseases.

Ethical Approval: The study was approved by the Ethics Committee of Cerrahpaşa School of Medicine at İstanbul Cerrahpaşa University (Date: 02.03.2021 No. 50468).

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Critical revision of manuscript: . N.G., S.K.

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