e-ISSN: 2980-0803

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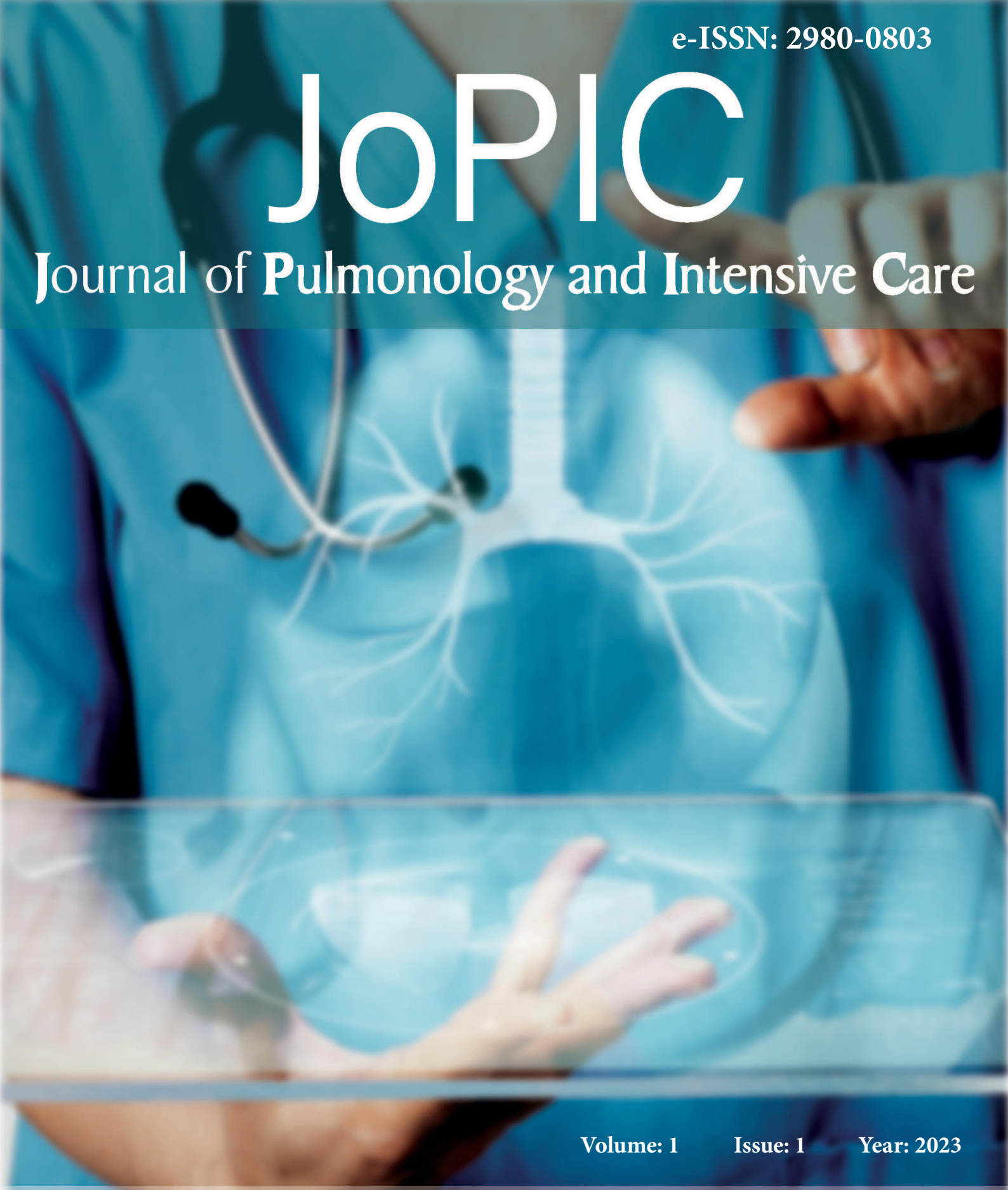
Journal of Pulmonology and Intensive Care



Volume: 1 Issue: 1 Year: 2023

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EDITORIAL

Dear Colleagues,

As of February 2023, we have published the first issue of **Journal of Pulmonology and Intensive Care (JoPIC)** under the shield of Medihealth Academy. In addition to all researchers, referees and editorial board who contributed to the preparation of the journal; we would like to thank the printing team for their effort in preparing it for publication. Our main purpose in realizing the idea of this journal is to create a new platform for resarch that we believe will contribute to the literature in the fields of Chest Diseases and Intensive Care, as well as to increase the motivation of researchers with fast and effective article evaluation and publication processes. This first issue includes three original research, one review article and a case report. Periodicals are popular with their readers and researchers. In the upcoming period, with your support, our goal is for JoPIC to be indexed in nationally and internationally accepted scientific indexes. I would like to thank you in advance for your contribution.

Assoc. Prof. Dr. Berna Akıncı Özyürek
Editor in Chief

Journal of
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Original Article

DOI: 10.51271/JOPIC-0001

Evaluation of sharp injuries in healthcare professionals

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Cite this article: Ak N, Sarı G, Şimşek C. Evaluation of sharp injuries in healthcare professionals. J Pulmonol Intens Care 2023; 1(1): 1-4

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Submit Date: 09/01/2023 **Accept Date:** 26/01/2023

ABSTRACT

Aims: We carried out this descriptive study to retrospectively explore the occupational accidents in our hospital between January 01, 2016 - December 31, 2019.

Methods: We present the descriptive statistics as means, standard deviations, frequencies, and percentages.

Results:While 49.3% of the participants were aged 18-29 years, 75.2% were females. About half of the participants (52.2%) held a secondaryschool diploma. While 31.3% worked as trainee nurses, 24.4% were employed as nurses. Similarly, approximately half of the participants (48.9%) were deployed in clinics, and 16.0% engaged in care in intensive care units. Given the way the participants experienced the occupational accident, 53.3% were injured with a needle-stick (syringe/branule) and 21.9% with a lancet.

Conclusion:It is well-known that sharp object injuries constitute a significant portion of occupational accidents occurring to healthcare professionals. Accordingly, the measures to be adopted to prevent such undesirable situations may be led by uncovering the frequency of and underlying factors for sharp object injuries, causing worries among healthcare professionals and loss of workforce and even death.

Keywords: Occupational health, accidents, sharp object injuries, occupational injuries

INTRODUCTION

The International Labor Organization (ILO) defines an occupational accident as a situation leading to injury and damage resulting from an unplanned and unexpected event.[1] In the Occupational Health and Safety Law No. 6331 published in the Official Gazette No. 28339 dated June 30, 2012, it is defined as an event occurring in the workplace or due to the conduct of the work, causing death or making bodily integrity mentally or physically disabled.[2]

Working with an adorable devotion both in the world and in our country, healthcare professionals frequently encounter a number of dangers during working hours and, as a result, suffer from occupational accidents. The most common one may be considered an occupational accident resulting from injuries by sharp and penetrating objects such as needles, branules, suture needles, scalpels, intravenous catheters, and lancets.[3] Due to such and similar dangers while offering healthcare services, hospitals are included in the list of "very hazardous" class workplaces, according to the Workplace Hazard Classes Communiqué on Occupational Health and Safety published in the Official Gazette No. 28602 dated March 29, 2013.[4]

Biological factors (e.g., Hepatitis B, Hepatitis C, and HIV) that may be transmitted due to sharp object injuries are considered major health problems for healthcare professionals.[5,6] Of the two million injuries among healthcare professionals each year, it is estimated that 66,000 cause HBV, 16,000 lead to HCV, and about 1,000 cause HIV. The risk of infection following a needle-stick injury with a contaminated needle is calculated to be 0.3% for HIV, 2-40% for HBV, and 2.7-10% for HCV.[7] According to the Centers for Disease Control and Prevention (CDC) data, the number of needle-stick injuries among healthcare professionals is increasing every year, implying that 385 thousand needle injuries and an average of 1,000 sharp object injuries entrap hospital workers per day.[8] It was previously reported that 16,000 healthcare professionals experience injuries with an HIV-contaminated needle-stick in a year in the USA and that 5,000 are exposed to Hepatitis B, Hepatitis C, and HIV agents each year due to workplace injuries.[3] In the USA, about 250 healthcare professionals lose their lives each year due to HBV infection and related complications.[8] The most common cause of occupational accidents among healthcare professionals was reported to be percutaneous injuries in the literature in Turkey. In addition, they were said to occur mostly among nurses and in hands.[9-11]

It is well-known that sharp object injuries constitute a significant portion of occupational accidents occurring to healthcare professionals. Accordingly, the measures to be adopted to prevent such undesirable situations may be led by uncovering the frequency of and underlying factors for sharp object injuries, causing worries among healthcare professionals and loss of workforce and even death. Hence, there is a need for research to reveal the risk factors for occupational accidents among healthcare professionals.

In the present study, we attempted to explore the reasons for occupational accidents and underlying factors among healthcare professionals having had an occupational accident in a tertiary health institution.

METHODS

The target population of this retrospective descriptive study consisted of all occupational accidents reported to the Employee Health Unit (EHU) of Ankara Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital between January 01, 2016 - December 31, 2019. Then, we recruited the files of 137 healthcare professionals had an occupational accident. Among the occupational accidents, we used the data of the health workers surveyed for sharp object injuries. The data were extracted from the occupational accident notification and evaluation forms, which must be filled out by the EHU following any notification of an occupational accident.

The Ethics Committee of Keçiören Training and Research Hospital granted ethical approval to our study (Date: 02.23.2021, Decision No: 2012-KAEK-15/2219). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The data were analyzed using the SPSS 15.0 program, anddescriptive statistics are presented as means, standard deviations, frequencies, and percentages.

RESULTS

About half of the participants (49.3%) were aged 18-29 years, while 19.8% were aged 30-39 years (M = 31.5±11.4). The majority of them (75.2%) were females, and 52.2% held a secondary school diploma. While 31.3% worked as trainee nurses, 24.4% were employed as nurses. Similarly, approximately half of the participants (48.9%) were deployed in clinics, 16.0% engaged in care in intensive care units (ICU), and 14.6% were staffed in operating rooms (**Table 1**).

The vast majority of the participants (93.4%) had an occupational accident due to sharp object injuries. About 43.0% were injured by a needle-stick and 24.7% by a lancet. Finally, 93.2% of the participants reported being injured in their hands (**Table 2**).

More than half of the participants (58.4%) reported that the injury-leading instrument was contaminated with the patient's blood and body fluids, and we found that 34.0% of the patients had a blood-borne disease. Of these diseases, 68.7% were HBV, and 31.3% were HCV. In the event of the injuries reported, 88.8% of the participants reported utilizing personal protective equipment (PPE). While the majority (97.4%) used gloves, 8.8% wore masks (**Table 3**).

Table 1. Participants' descriptive characteristics(Ankara, 2020)

	n	(%)*
Age groups (n=126)		
18-29 years	62	49.3
30-39 years	25	19.8
40-49 years	29	23.0
50 years and older	10	7.9
Sex(n=137)		
Female	103	75.2
Male	34	24.8
Educational attainment(n=92)		
Primary school	6	6.5
Secondary school	48	52.2
Vocational school	11	12.0
Undergraduate degree	27	29.3
Title (n=131)		
Trainee nurse	41	31.3
Nurse	32	24.4
Hospital janitor	21	16.0
Physician	14	10.7
Other**	23	17.6
Unitdeployed (n=137)		
Clinic	67	48.9
ICU	22	16.0
Operation room	20	14.6
Emergency department	7	5.1
Other***	21	15.3

*Column percentage
**The most frequent responses in this group were 'Anesthesia Technician,' 'Medical Waste Worker,' and 'Disinfection Staff.'
***The most frequent responses in this group were 'Blood Collection Unit' and 'Medical Waste Unit.'

Table 2. Some characteristics of participants' occupational accidents (Ankara, 2020)

	n	(%)*
Form of occurrence of accident (n=137)		
Needle-stick (needle/branule)	73	53.3
Lancet	30	21.9
Suture needle	7	5.1
Other**	27	19.7
Scope of occupation accident(n=137)		
Sharp object injury	128	93.4
Contamination with blood and body fluids	4	2.9
Fall/stroke/injury	3	2.2
Other***	2	1.4
Instrument causing occupation accident (n=121)		
Needle	52	43.0
Lancet	30	24.7
Branule	16	13.3
Suture needle	7	5.7
Other****	16	13.3
Injured Area (n=118)		
Hands	110	93.2
Eyes	4	3.4
Other*****	4	3.4

*Column percentage
**The most frequent responses in this group were 'Injury with Scalpel' and 'Splash of Blood and Body Fluids.'
***The most frequent responses in this group were 'Exposure to Chemicals' and 'Slip.'
****The most frequent responses in this group were 'Insulin Pen Needle' and 'Frozen Section Knife.'
*****The most frequent responses in this group were 'Frozen Section Knife' Legs' and 'Head.'

Table 3. Participants' injury-related characteristics(Ankara, 2020)

	n	(%)*
Injury-leading instruments' contamination with the patient's blood and body fluids (n=137)		
Contaminated	80	58.4
Not contaminated	57	41.6
Patient's blood-borne disease status(n=47)		
Yes	16	34.0
No	31	66.0
Blood-borne diseases (n=16)		
HBV	11	68.7
HCV	5	31.3
Participants' use of PPE at injury (n=89)		
Yes	79	88.8
No	10	11.2
PPE used (n=79)≠		
Gloves	77	97.4
Mask	7	8.8
Googles	4	5.1
Protective apron	3	3.7

*Column percentage
≠: More than one response was given to the question. The percentage was calculated considering the number of respondents.

DISCUSSION

About half of our participants having suffered occupational accidents were younger than 30 years and secondary school graduates. Similarly, nearly half of them (55.7%) worked as nurses. Overlapping with the findings in the relevant literature, it can be asserted that the incidence of occupational accidents becomes more common among nurses, who are in frequent contact with patients, and younger age groups with inadequate experience.

The most common cause of occupational accidents in healthcare institutions in the world and Turkey is sharp object injuries, among which needle-stick injuries are prominent. In a Kuwait-based study, 75.9% of the participants reported having a needle-stick injury.[12] Another study in Australia showed that 56% of sharp object injuries were classified as needle-stick injuries.[13] In a study in Isparta, 50.9% of the participants reported having had a needle-stick injury.[14]

Özdemir et al. explored sharp object injuries among intern physicians and internal medicine and surgery residents of a medical faculty. They found that 78.1% of the residents and 48.8% of the interns stated having had a sharp object injury during their education or professional life and that the most common type of such an injury was needle-stick injury.[15] In another study, it was stated that 86.8% of occupational accidents by healthcare professionals were due to sharp object injuries.[16] Similar to the literature, 93.4% of our participants had an occupational accident due to a sharp object injury, and more than half of them stated having experienced a needle-stick injury. These findings may be due to the adoption of injection treatments in hospitals quite frequently and the increased fatigue, insomnia, and related careless behaviors among healthcare professionals as a result of the intense working pace while providing such services. The lack of training of inexperienced staff may also be a prominent reason for such accidents.

In this study, 93.2% of our participants had a sharp object injury in their hands. In a study in Isparta, the authors found the primary injury site of 60.4% of those having had a shape object injury was hands-finger.[14] In our study, the vast majority of the participants were injured by a sharp object. Such injuries to hands may be due to various reasons, such as nurses' ignoring to close the needle cap during or after the injection, janitors' carelessness while emptying the waste boxes, and physicians' pricking the suture needle into their hands mistakenly while suturing.

The findings showed that 16 participants with an occupational accident due to a sharp object injury contacted the body fluids of patients with hepatitis infection. Among them, 68.7% were diagnosed with Hepatitis B, and 31.3% with Hepatitis C.

It is known that the risk of transmission in the case of contact with the blood of a patient with Hepatitis B antigen-positivity is 22-31%. It is 1-6% in the case of contact with the blood of a patient with Hepatitis B antigen-negativity and 0.4-1.8% in the case of contact with the blood of a patient with HCV positivity.[17]

However, the follow-ups of the participants did not result in Hepatitis B and C infection due to contact with patients infected with these viruses, indicating the success of the vaccination program in our country and the significance of immunization in primary prevention against infectious diseases. The Hepatitis B vaccine, included in the routine vaccination schedule in our country in 1998, is also among those recommended for healthcare professionals by the Advisory Committee on Immunization Practices.[18]

An Indian-based study reported that 44.6% of healthcare professionals having had an occupational accident due to a sharp object injury and splashes of patient secretions were physicians.[19] In the same study, it was uttered that 7.7% of the source patients had Hepatitis B, 2.6% had HIV, and 1% had HCV-positivity and that more than 80% of healthcare workers preferred to have the Hepatitis B vaccine and immunoglobulin following the occupational accidents.[19] Accordingly, healthcare professionals are likely to encounter significant risks, particularly infectious diseases (e.g., Hepatitis B, Hepatitis C, and HIV), and experience occupational accidents in the provision of healthcare services. Such occupational accidents are then likely to end in mortality, severe injury, or deterioration in the quality of life.[20,21]

Viral hepatitis is included among occupational infectious diseases in the occupational diseases list of the Social Security Institution (SSI) in our country.[22] It is evident that healthcare professionals often face such infectious diseases in their working settings. Yet, these diseases are entirely preventable. Education, immunization, elimination of risk at source, and regular use of PPE seem critical regarding protection from infectious diseases.

Despite not being efficient in preventing a sharp object injury, the use of gloves can reduce the amount of contamination. In our study, the majority of our participants (88.8%) reported having utilized PPE during the accident, among whom 97.4% used gloves. Thus, wearing gloves seems critical given that the hands are the most frequently injured area in occupational accidents in a healthcare setting and that contact with the hands poses a higher risk of contamination of various health problems. Although using PPE is key in preventing occupational accidents, it should be noted that the very first measure needs to eliminate the risk at the source.

CONCLUSION

It is known that physicians, nurses, and other healthcare professionals in primary, secondary, and tertiary healthcare institutions face various risks during working hours. Occupational accidents, characterized mainly by sharp object injuries, are often encountered among young, inexperienced healthcare professionals and in the group with lower educational attainment. Thus, healthcare professionals may need to be recruited for training at regular intervals to increase their knowledge about various risks to be encountered in the provision of health services. Awareness-raising instruments, such as posters and brochures, may also contribute to their awareness of such risks.

We discovered that the participants mostly had an accident due to a needle-stick injury in their hands. Yet, it is likely to minimize or even entirely prevent occupational accidents among healthcare professionals. Therefore, both their physical working environments and working hours can be rearranged, and relevant support should be offered to those in need of psychosocial assistance. Healthcare professionals should also be informed about the issues that one needs to close the needle cap following injection and properly throw used syringes and sharp medical objects into the medical waste box. In this regard, infection control committees may need to cooperate with clinic staff in hospitals. While providing the necessary occupational health and safety training to healthcare professionals, the principle of eliminating the risk entirely or, if not possible, minimizing it should be adopted according to the control hierarchy.

In addition to all the precautions to be taken, it is essential to convey the importance and the proper use of PPE to the staff to protect themselves from possible risks. Inspection of PPE to be used in relevant units and planning of training for their proper use need to be carried out in cooperation with the occupational health and safety unit and infection control committees.

ETHICAL DECLARATIONS

Ethics Committee Approval: The Ethics Committee of Keçiören Training and Research Hospital granted ethical approval to our study (Date: 02.23.2021, Decision No: 2012-KAEK-15/2219).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Journal of
Pulmonology and
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Original Article

DOI: 10.51271/JOPIC-0002

The evaluation of chronic obstructive pulmonary diseases by gender in Turkey: incidence, prevalence, and mortality

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Cite this article: Dinçer M, Karataş YE, Akyol M. The evaluation of chronic obstructive pulmonary diseases by gender in Turkey: incidence, prevalence, and mortality. J Pulmonol Intens Care 2023; 1(1): 5-8

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Submit Date: 02/01/2023 **Accept Date:** 18/02/2023

ABSTRACT

Aim: The aim of this study was to evaluate the incidence and prevalence of chronic obstructive pulmonary disease (COPD) and COPD-related deaths by gender in Turkey.

Methods: The data used in the study, covering the years 1990-2019, were taken from the estimation data prepared for Turkey within the global burden of disease study by the Institute for Health Metrics and Evaluation (IHME). Mann-Whitney test was applied to compare the variables according to gender. Non-parametric Spearman rank correlation coefficient was calculated to determine the relationships between variables.

Results: The difference between the mean ranks of the total number of prevalences, the total number of incidences, and the total number of deaths by gender were statistically significant. A strong and linear association was found between the risk factors and deaths due to COPD.

Conclusion: Policies are needed to decrease the risk factors that lead to the development of COPD. The more risk factors can be controlled, the more lives can be saved.

Keywords: Burden of disease, COPD, risk factors

INTRODUCTION

Environmental and behavioral factors are among the determinants of health and consequently constitute important risk factors for chronic obstructive pulmonary disease (COPD).[1,2] Environmental influences such as smoking, exposure to cigarette smoke (passive smoking), dust, physical and chemical stimuli, and exposure to harmful gases and fumes are among the risk factors of COPD.[3] Aging and incomplete lung development are also risk factors for COPD.[4] The maximum function of the lungs occurs at approximately 20 years of age in women and 25 years of age in men, and it remains stable with little change between 20 to 35 years of age, after which it declines.[5] Interactions between risk factors and genetic traits contribute to the development of COPD.[2]

An approximately 3 million people die from COPD, the third leading cause of death globally,[6] and is prevalent in the middle- and low-income countries.[7] COPD ranked sixth in 2000 and fifth in 2004, rising to fourth between 2005 and 2019 and causing 30.08 deaths per 100,000 people.[8] This study aimed to investigate the incidence, prevalence and risk factors of COPD and deaths related to COPD in Turkey.

Smoking is reported to be the most important behavioral risk factor for COPD.[9-11] Environmental risk factors include exposure to cigarette smoke, even if the person does not smoke, and air pollution.[12] Occupational exposure to dust, chemicals (such as vapors, irritants, and fumes), and ambient air pollution are also prominent as work-related risk factors.[13]

METHODS

Ethics committee decision was not required since publicly accessible data were used in this study. All procedures were carried out in accordance with the ethical rules and the principles.

The data used in the study, covers the period from 1990 to 2019 years, were taken from the estimation data prepared for Turkey within the global burden of disease study by the Institute for Health Metrics and Evaluation (IHME- healthdata.org).14 Study data comprises the number of deaths due to COPD (number of deaths in the population), percentage (proportion of deaths from a specific cause compared to deaths from all causes), and rate (deaths per 100,000 population), as well as risk factors, prevalence, and incidence, by year, gender, and age group. Behavioral risk factors are primarily associated with tobacco and tobacco products, while environmental and occupational risk factors are associated with environmental and workplace air pollutants and inappropriate temperatures. Age 20 is the age at which the lungs reach maximum capacity, and hence the study was started in this age group.

The conformity of the number of deaths, frequency, and rate variables to the normal distribution was analyzed graphically using the Shapiro-Wilk test. Variables analyzed were skewed. Mann-Whitney test was applied to compare the variables according to gender. Non-parametric Spearman rank correlation coefficient was calculated to determine the relationships between variables. MS-Excel 2007 and IBM SPSS Statistics 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) software were used. In statistical decisions, the p<0.05 value was accepted as a sign of a significant difference.

RESULTS

The study's results are presented under three headings: the change in the number of COPD deaths according to years and age groups, the statistical results of the difference according to gender, and the relationship between risk factors.

Changes in the Number of COPD Deaths over Time and by Age Groups

In the study, deaths due to COPD between 1990 and 2019 were analyzed. Results showed that there were 620,041 deaths due to COPD, of which 216,231 were female and 403,810 were male. The distribution of cases according to years and gender is shown in **Figure 1**.

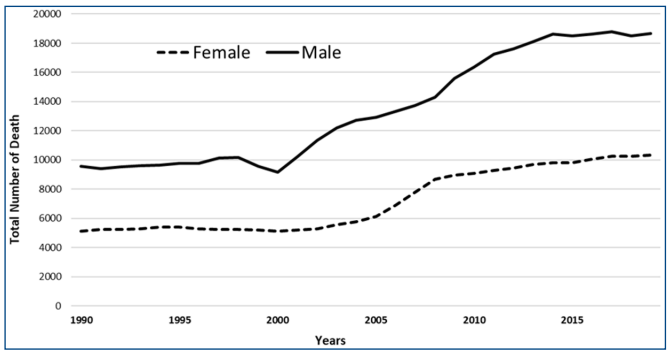

Figure 1. Initial evaluation chest radiograph

While **Figure 1** shows the number of deaths due to COPD, **Figure 2** shows the total number of COPD deaths by age group and sex for the years 1990 to 2019.

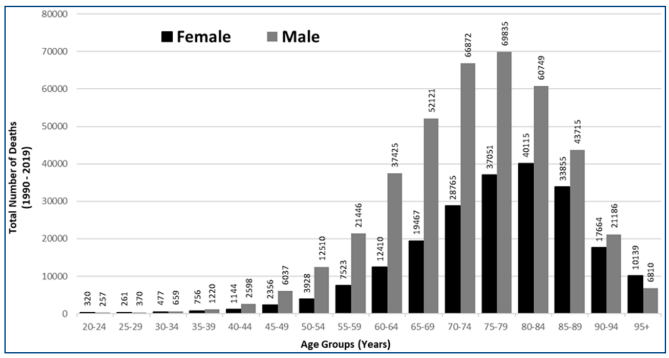

Figure 2. Number of deaths due to COPD by age groups and sex (1990-2019)

Statistical Findings of Difference According to Gender

The difference between the mean ranks of the total number of deaths according to gender was statistically significant (Z=5.603; p<0.001). The number of men who died due to COPD was higher than women. The difference between the mean ranks of the total percentage variable according to gender was also statistically significant (Z=6.553; p<0.001). For the rate of causes of death, COPD deaths in men were found to be higher than COPD deaths in women. The difference between the mean ranks of the total rate variable according to gender was also statistically significant (Z=3.951; p<0.001). The mortality rate of males per 100.000 due to COPD was higher than that of females. These findings are presented in **Table 1** according to the age groups.

The difference between the mean ranks of the prevalence variable according to gender was statistically significant (Z=4.371; p<0.001). The prevalence number was found to be higher in males than in females. The difference between the mean ranks of the incidence variable according to gender was also found to be statistically significant (Z=3.830; p<0.001). The incidence number was found to be higher in males than in females.

Table 1. Number, Percentages and Rates of COPD Deaths by Age Groups and Gender

Age groups (years)	Number *		Percent (%) **		Rate ***	
	Female	Male	Female	Male	Female	Male
20-24	320	257	0.008134	0.003246	0.3	0.3
25-29	261	370	0.006869	0.004590	0.3	0.4
30-34	477	659	0.010524	0.007714	0.6	0.8
35-39	756	1,220	0.012709	0.010650	1.1	1.6
40-44	1,144	2,598	0.014653	0.016886	1.8	4.0
45-49	2,356	6,037	0.021329	0.025485	4.4	10.7
50-54	3,928	12,510	0.025953	0.037844	8.5	26.9
55-59	7,523	21,446	0.035260	0.047488	19.7	55.0
60-64	12,410	37,425	0.040916	0.064759	37.4	118.2
65-69	19,467	52,121	0.047391	0.081380	73.0	220.2
70-74	28,765	66,872	0.054178	0.094378	146.6	390.4
75-79	37,051	69,835	0.060205	0.105840	264.2	611.0
80-84	40,115	60,749	0.061346	0.104377	433.7	857.7
85-89	33,855	43,715	0.061184	0.097732	692.1	1251.0
90-94	17,664	21,186	0.054214	0.086822	912.7	1711.6
95+	10,139	6,810	0.053647	0.065721	1,445.5	2,012.5
Total	216,231	403,810	3.553195	5.343191	4,041.9	7,272.4
Female vs male	Z=5.603; p<0.001		Z=6.553; p<0.001		Z=3.951; p<0.001	

*Number of deaths in the population
**Proportion of deaths for a particular cause relative to deaths from all causes
***Deaths per 100,000 population

Table 2. Mean, Incidence and Prevalence of COPD by Age Groups and Gender

Age groups (years)	Mean of prevalence		Mean of incidence	
	Female	Male	Female	Male
20-24	17,980	18,739	1,489	1,573
25-29	24,208	25,371	1,402	1,494
30-34	29,148	30,643	1,262	1,362
35-39	31,656	33,358	1,122	1,211
40-44	35,915	42,298	3,144	5,974
45-49	52,208	76,761	5,157	9,366
50-54	67,261	100,556	4,667	7,455
55-59	76,257	110,882	4,067	5,886
60-64	80,421	118,080	4,039	9,883
65-69	79,281	130,484	4,002	10,734
70-74	72,170	128,368	3,668	8,267
75-79	61,554	103,304	3,347	5,110
80-84	48,667	72,119	3,014	2,496
85-89	32,104	36,811	2,074	885
90-94	16,205	12,802	992	251
95+	7,196	3,497	402	69
Total	732,231	1,044,073	43,848	72,016
Female vs Male	Z=4.371; p<0.001		Z=3.830; p<0.001	

Risk Factor Relationship

A strong linear relationship (rho=0.969; p<0.001) was found between the number of deaths and the number of behavioral risk factors, as behavioral risks increased the number of deaths due to COPD increased. Similarly, a linear and very strong (rho=0.998; p<0.001) relationship was found between the number of deaths due to COPD and environmental and occupational risk. As the number of people exposed to environmental and occupational risks increased, the number of deaths due to COPD increased. These associations were also found for women (rho=0.972; p<0.001 and rho=0.998; p<0.001, respectively) and men (rho=0.999; p<0.001 and rho=0.999; p<0.001, respectively). For both genders, behavioral, environmental, and occupational risks were strongly linearly associated with deaths due to COPD.

Table 3. Association between Risk Factors and Mortality

Age Group	Death-Behavioral risk number		Death -Environmental and occupational risk	
	r	p	r	p
20-24	N/A	N/A	0.979*	<0.001
25-29	0.477***	<0.001	0.994*	<0.001
30-34	0.839*	<0.001	0.981*	<0.001
35-39	0.981*	<0.001	0.985*	<0.001
40-44	0.994*	<0.001	0.986*	<0.001
45-49	0.994*	<0.001	0.990*	<0.001
50-54	0.985*	<0.001	0.968*	<0.001
55-59	0.998*	<0.001	0.993*	<0.001
60-64	0.994*	<0.001	0.995*	<0.001
65-69	0.993*	<0.001	0.993*	<0.001
70-74	0.999*	<0.001	0.998*	<0.001
75-79	0.878*	<0.001	0.988*	<0.001
80-84	0.820*	<0.001	0.992*	<0.001
85-89	0.757**	<0.001	0.996*	<0.001
90-94	0.672**	<0.001	0.980*	<0.001
95+	0.463***	<0.001	0.995*	<0.001

*Very Strong Relationship, ** Strong Relationship, *** Moderate Relationship

DISCUSSION

According to the study findings, male deaths from COPD are higher than female deaths. Although studies conducted in the past have reported that the prevalence and mortality from COPD were higher in men, it was seen that the prevalence of COPD is almost equal in men and women, especially in developed countries.[13] Women hospitalized with COPD have a better outlook for survival and re-hospitalization than men due to women seeking early care and phenotypic differences between the sexes.[15] Differences in comorbidities in men and women and differences in sex hormones have been reported to be other reasons for gender differences in COPD mortality and prevalence.[16] In this respect, the total results of incidence and prevalence of COPD-related deaths differing in men and women supports the results of current study.

Risk factors appear to have more substantial impact on deaths in the 40-74 age range than in ages outside this range. There is a steady increase in deaths until 80 for men and 84 for women, after which there is a decline. The age range of 50-74 years depicted the highest number of deaths. Smoking, a behavioral risk factor for COPD, is responsible for many cases.[3] This has been attributed to a change in smoking habits, i.e. increased tobacco use in women.[13] On the effectiveness of COPD treatment, it has been reported that women who quit smoking permanently had over two-fold improvement in lung function within the first year compared to men.[17] Smoking habit is essential behavioral risk for COPD.18 In their study, which included 2,501 patients over 40 diagnosed with COPD, smoking was one of the factors associated with mortality in COPD.[19] Among 24,871 participants, 3,473 (7.6% of never-smokers with COPD) examined the COPD risk factors of never-smokers and identified occupational exposure as a risk factor. The described studies show that the relationship between behavioral and environmental risk factors and COPD mortality parallels our research findings.

Women's sensitivity to COPD risk factors differs from men's.[20] Eisner et al.[10] in 2010, reported that consistent associations had been observed between workplace agents and COPD because of occupational exposures through various consistent definitions such as respiratory symptoms, physician diagnosis of COPD and death from COPD. Indeed, exposure to harmful dust and gases is a risk factor for all respiratory diseases. The higher mortality, incidence, and prevalence of COPD in men may be explained by men being more exposed to harmful gases and dust than women. After all, men are more intensively employed in industry than women. Other risk factors for the development of COPD include smoking, occupation, low socioeconomic status, diet and possibly some environmental exposures early in life.[12]

CONCLUSION

Due to the high disease burden of COPD, it is necessary to reduce the negative environmental factors that cause the disease and to make the working environment and lifestyle characteristics healthier with public health policies. The risk of COPD is determined by environmental exposures such as air pollution and cigarette smoke or their interactions, which are exposed from childhood onwards. It is essential to keep children away from these exposures because prevention is better than a cure.

The incidence, prevalence and mortality of COPD are higher in men, with an increase in mortality with age. Deaths from COPD are common in the 50-74 age group and predominantly affect the productive population. Therefore, although it is impossible to eliminate risk factors, macro-level policies should be developed to reduce them. In this way, the adverse effects of death and disability will be prevented, and there will be no loss of productivity.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethics committee decision was not required since publicly accessible data were used in this study.

Informed Consent: Informed consent was not required since publicly accessible data were used.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors had no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Journal of
Pulmonology and
Intensive Care

Original Article

DOI: 10.51271/JOPIC-0003

Determination of bacteriae isolated from catheter culture and antibiotic susceptibility of patients in intensive care unit

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Cite this article: Kaya Kılıç E, Cesur S, AltınDemircan Ş, et al. Determination of bacteriae isolated from catheter culture and antibiotic susceptibility of patients in intensive care unit. J Pulmonol Intens Care 2023; 1(1): 9-12

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Submit Date: 05/02/2023 **Accept Date:** 19/02/2023

ABSTRACT

Aim: Catheter-related bloodstream infections are important causes of mortality and morbidity. In this study, it was aimed to retrospectively determine the distribution of bacterial agents isolated from intra-catheter blood culture and antibiotic susceptibility rates of patients diagnosed with catheter infection in the intensive care unit of Ankara Training and Research Hospital, Cardiovascular Surgery and Neurosurgery.

Methods: In the intensive care unit of Ankara Training and Research Hospital, Cardiovascular Surgery, and Neurosurgery, 79 bacteria isolated from intra-catheter blood cultures of patients diagnosed with catheter infection between January 1, 2021, and December 31, 2022, were included in the study.Antibiotic susceptibility of the bacteriae reproducing in catheter blood culture was obtained from the hospital information system. Antibiotic susceptibilities of bacteria isolated from intra-catheter culture were determined by the disc diffusion method or VITEK-2 automated system.

Results: The frequency of bacteriae reproducing from intra-catheter blood culture of patients hospitalized in the intensive care unit of cardiovascular surgery and neurosurgery were *Enterococcus* spp., *Klebsiella pneumoniae*, *Staphylococcus epidermidis*, and *Escherichia coli* retrospectively. *Klebsiella pneumoniae* isolates from intra-catheter blood cultures were resistant to ceftriaxone 75%, piperacillin-tazobactam 25%, amikacin 6.25%, but not to imipenem and meropenem. Antibiotic resistance rates of *Staphylococcus aureus* isolates isolated from intra-catheter blood cultures were as follows: 100% with penicillin, no resistance to vancomycin. In *Escherichia coli* isolate isolated from intra-catheter blood cultures, resistance to ceftriaxone was 6.3%, to piperacillin-tazobactam, 12.5%, to imipenem and meropenem, 16.6%, but not to amikacin. *Acinetobacter baumannii* isolates isolated from intra-catheter blood culture showed 100% resistance to ceftriaxone, 100% to piperacillin-tazobactam, 85.7% to imipenem, 83.3% to meropenem, and no resistance to amikacin. In the *Stenotrophomonas maltophilia* isolates isolated from intra-catheter blood culture, resistance to ceftriaxone, piperacillin-tazobactam, imipenem and meropenem was 100% and levofloxacin was 25%, while no resistance to trimethoprim/sulfamethoxazole was detected.

Conclusion: Determining the antibiotic susceptibility of bacteria isolated from catheter culture will contribute to the determination of the appropriate treatment option in the empirical treatment of catheter infections in our hospital and contribute to decreasing in mortality and morbidity rates due to catheter infections.

Keywords: Catheter infection, catheter-related bloodstream infection, bacteriae, antibiotic susceptibility

INTRODUCTION

Complications such as catheter-related bloodstream infection, thrombophlebitis, endocarditis and sepsis may develop depending on the intravenous catheter use. Catheter infections have an important place in healthcare-related infections because they cause mortality and morbidity and increase the length of hospital stay and costs.[2-4]

The most common causes of catheter infections are *Staphylococcus epidermidis* and other coagulase-negative *Staphylococcus*, *Enterococcus* spp. and *Candida* spp., which are found most frequently in the skin flora and produce a glycocalyx called slime factor, respectively. Gram-negative bacilli such as *Pseudomonas aeruginosa*, *Acinetobacter baumannii* (*A. baumannii*), *Klebsiella* spp., *E. coli*, *Enterobacter* spp. and other Gram-negative bacteria are less frequently reported as factors of catheter infection.[3-6]

Determination of bacteriae isolated from catheter culture and antibiotic susceptibility rates is very important in the selection of appropriate empirical antimicrobial therapy in the treatment of catheter infections. In this study, it was aimed to retrospectively determine the microorganisms and antimicrobial resistance rates isolated from catheter blood

samples of patients hospitalized in the Intensive Care Unit, Cardiovascular Surgery and Neurosurgery Clinic of Ankara Training and Research Hospital, between January 1, 2021 and December 31, 2022.

METHODS

Seventy-nine bacteriae were isolated from intra-catheter blood cultures of patients diagnosed with catheter infection between January 1, 2021 and December 31, 2022, in the Intensive Care Unit, Cardiovascular Surgery and Neurosurgery Clinic of Ankara Training and Research Hospital, were included in the study. The study is a retrospective laboratory study, it does not contain any biological material. For that ethics committee approval is not necessary. All procedures were carried out in accordance with the ethical rules and the principles. Antibiotic susceptibility of the bacteriae reproducing in catheter blood culture was obtained from the hospital information system. Antibiotic susceptibilities of bacteria isolated from intra-catheter culture were determined by the disc diffusion method or VITEK-2 automated system (Biomerioux, France).Antibiotic susceptibility in isolated bacteria was determined by the disc diffusion method according to EUCAST recommendations.[1]

RESULTS

Fourty-eight (60.7%) Gram-positive bacteria and 31 (39.2%) Gram-negative bacteria were isolated from a total of 79 intra-catheter blood cultures. The frequency of Gram-positive bacteria isolated from intra-catheter blood culture were *Staphylococcus epidermidis*, *Staphylococcus aureus*, and *Enterococcus* spp. respectively (**Table 1**).

Gram-negative bacteria isolated from intra-catheter blood culture were *Klebsiella pneumoniae* (*K. pneumoniae*), *Escherichia coli* (*E. coli*), *Stenotrophomonas maltophilia* (*S. maltophilia*), and *A. baumannii*, respectively (**Table 2**). Antibiotic resistance rates (%) of Gram-positive bacteria isolated from intra-catheter blood culture are given in **Table 1**, and antibiotic resistance rates (%) of Gram-negative bacteria are given in **Table 2**.

DISCUSSION

Catheter infections are an important cause of mortality and morbidity, especially in patients hospitalized in the intensive care unit. The bacteriae isolated from catheter infections may vary according to factors such as the type of catheter, the location of the catheter, the immune system of the host, the unit where the patient is located, hospitals and the geographical region.[3-9] Catheter infections are reported more frequently in patients with central venous catheters hospitalized in the intensive care unit, in patients with catheters hospitalized in hematology and oncology services, and in hemodialysis patients.[2-5]

In recent years, an increase in catheter-related bloodstream infections (CRBSI) rates has been reported due to the multidrug resistance of Gram-negative bacilli. However, while coagulase-negative *Staphylococcus remain* the most common cause of catheter infection, the rate of *Staphylococcus aureus* (*S. aureus*) infections is decreasing.[4]

Although the rate of catheter-related bloodstream infections in the United States decreased by 46% between 2008 and 2013, approximately 30,100 catheter-related bloodstream infections (CRBSI) are still reported in intensive care units and units providing acute support.[9]

In a study conducted in Greece in 2018, *A. baumannii* was reported to be the most common factor among the CRBSI factors. In the same study, *A. baumannii* isolates were reported to have multiple antibiotic resistance.[5]

In a study conducted in India, Pandit et al.[6] reported Serratia marcescenswas to be the most frequently isolated bacteriae in patients developing CRBSI. In the study, the rate of methicillin resistance in coagulase-negative *Staphylococcus* (CNS) was 33.3% and vancomycin resistance in *Enterococcus faeciumisolates* was 33.3%.

In this study, *Enterococcus* spp. *K. pneumoniae*, and *Staphylococcus epidermidis* (*S. epidermidis*) were the most common causative bacteriae of catheter infections in cardiovascular surgery and neurosurgery intensive care units. Unlike the literature, it was noteworthy that the microorganisms of catheter infection were *Enterococci* and *K. pneumoniae* isolates. Ceftriaxone resistance was detected in *K. pneumoniae* strains 75% percent and 4.76% penicillin resistance in *Enterococci*. In our study, 62.3% penicillin resistance was present in *S. epidermidis* and 56.25% cefoxitin resistance, which is the indicator of methicillin resistance. While all *S. aureus* isolates were resistant to penicillin, the resistance rate of cefoxitin was 9.09% and was quite low. One of the possible reasons for this may be the decrease in methicillin-resistant *S. aureus* infections in intensive care units in Turkey.

Erdem et al.[10] reported a rapid decrease in the incidence of *S. aureus* infections in intensive care units in 88 intensive care units of 36 tertiary hospitals in Turkey in 2013. Despite this significant decrease in the incidence of *S. aureus*, a significant

Table 1 Antibiotic resistance rates of gram-positive bacteria (%)

Bacteria (number, n) /Antibiotics	Penicillin	Cefoxitin	Vancomycin	Teicoplanin	Daptomycin
Enterococcus spp. (21)	4.76	0	0	0	0
Staphylococcus epidermidis (16)	62.3	56.25	0	0	0
Staphylococcus aureus (11)	100	9.09	0	0	0

Table 2. Antibiotic resistance rates of gram-negative bacteria (%)

Bacteria (number, n) / Antibiotics	Ceftriaxone	Piperacillin/ Tazobactam	Imipenem	Meropenem	Amikacin	TMP-SMZ*	LEV**
K. pneumoniae (16)	75	25	0	0	6.25	-	-
Enterobacter spp. (4)	25	0	0	0	0	-	-
E. coli (6)	46.3	22.5	16.6	16.6	0	-	-
A. baumannii (2) ***	3	3	3	3	0	-	-
S. maltophilia (3) ***	3	3	3	3	3	0%	1

TMP-SMZ*: Trimethoprim-sulfamethoxazole, LEV**: Levofloxacin***: Since the number of strains is low, the number of resistant strains is given in this line, and the percentages are given in other lines.

increase in the incidence of infections due to resistant Gram-negative bacilli has been reported in intensive care units in Turkey in recent years.[11-14]

Ergönül et al.[14] reported carbapenem resistance as 38% and colistin resistance as 6% in *K. pneumoniae* isolates in their study on patients who developed Gram-negative bloodstream infection related with health care in 17 different centers.

In our study, while carbapenem resistance was not detected in *K. pneumoniae* isolates, resistance to ceftriaxone was found to be 75% and amikacin was found to be 6.25%. In *E. coli* isolates, resistance was found to be 46.3% for ceftriaxone, 22.5% for piperacillin-tazobactam, and 16.6% for imipenem and meropenem.

Hatipoğlu et al.[15] reported that the most frequently isolated microorganisms from catheter infections in the Neurology and Neurosurgery ICU of Ankara Training and Research Hospital were methicillin-resistant coagulase-negative *Staphylococcus* (8/32; 25%), penicillin-resistant *Enterococcus* spp. (8/32; 25%) and *Candida albicans* (4/32; 12.5%).

Can et al.[2] isolated a total of 243 microorganisms from 211 catheter cultures. Isolated microorganisms were reported as coagulase-negative *Staphylococcus* (CNS), *S. aureus* and *Pseudomonas auginosa*, respectively. In the study, vancomycin and teicoplanin resistance was not detected in methicillin-resistant CNS and methicillin-resistant *S. aureus* (MRSA) isolates. In the same study, 62% penicillin resistance was reported in enterococcal bacteria. Can et al. reported that the rate of penicillin resistance in *Enterococci* was higher than the rate of 4.76% penicillin resistance found in *Enterococci* in our study. In *K. pneumoniae* isolates, Can et al. reported 53% resistance to ceftriaxone and 20% resistance to amikacin. In our study, the resistance rate (75%) we detected in *K. pneumoniae* isolates was higher than the rate reported in this study.

Öncü et al.[16] reported the distribution of microorganisms isolated in 300 patients with central venous catheter infection as 53.4% Gram-positive cocci, 44.5% Gram-negative bacilli, and 2.1% yeast in their study conducted in Istanbul.

In their study conducted in Ankara, Sarı et al.[17] found that of the 72 pathogens isolated from patients with central venous catheters, 28 were Gram-positive (28.9%), 31 were Gram-negative (43.6%), and 13 were fungal (18.5%). In the study, coagulase-negative *Staphylococcus* (22%), *Candida* spp. (18.8%) *Acinetobacter* spp. (16.6%) were reported as the most common etiological agents. Methicillin resistance was found to be 75% in coagulase-negative *Staphylococcus*and 67% in *S. aureus*. In our study, the methicillin resistance (9.09%) in *S. aureus* isolates and the methicillin resistance (56.25%) in *S. epidermidis* were lower than the methicillin resistance rates reported in this study. This difference may be due to the difference in hospital infection agents and antibiotic resistance rates between hospitals.

In their study on 201 patients diagnosed with CRBSI, Aktaş et al.[18], reported the CRBSI agents as *Acinetobacter* spp. and CNS spp. retrospectively. In the study, vancomycin and teicoplanin resistance was not detected in MRSA and MR-CNS.

Bekçibaşi et al.[19] evaluated the agents and risk factors of blood circulation infection related with central venous catheter and reported the distribution of the factors as coagulase-negative *Staphylococcus* (15.2%), *Candida* spp. (13%) and *K. pneumoniae* (13%).

In their study examining the bloodstream infections developed in patients with hematological malignancy in adult hematology and bone marrow transplantation units, Çam and Ulu Kılıç[20] reported the frequency of microorganisms isolated from blood culture as 27.6% and 17.2% in *E. coli* and *S. epidermidis*, respectively. In the study, while methicillin resistance was found to be 73% in *S. epidermidis*, they reported 9.8% meropenem, 4.5% imipenem in *K. pneumoniae*; and 37% imipenem and %41.2 imipenem in *E. coli* isolates.

CONCLUSION

As a result, determining bacteria isolated from intra-catheter blood culture and antibiotic susceptibilities in hospitals will guide clinicians in determining the appropriate treatment option in the empirical treatment of catheter infections.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study is a retrospective laboratory study, it does not contain any biological material. For that ethics committee approval is not necessary. Approval was obtained from the institution.

Informed Consent: The study is a retrospective laboratory study, it does not contain any biological material. Informed consent is not necessary.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Journal of
Pulmonology and
Intensive Care

Review

DOI: 10.51271/JOPIC-0004

Clinical forms and diagnosis of tuberculosis

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Cite this article: Cesur S. Clinical forms and diagnosis of tuberculosis. J Pulmonol Intens Care 2023; 1(1): 13-19

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Submit Date: 12/02/2023 **Accept Date:** 18/02/2023

ABSTRACT

Tuberculosis is an infectious disease whose diagnosis dates back to very early ages, which still maintains its importance in the world and in our country, can be treated and prevented with preventive (prophylactic) treatment. It is one of the leading causes of death in HIV/AIDS positive patients. Tuberculosis can be seen in two ways, mainly lung tuberculosis and extra-pulmonary tuberculosis. Tuberculosis forms other than lung and laryngeal tuberculosis are not contagious. Today, the HIV epidemic and international migration are the main causes of the increase in the number of tuberculosis cases. In this collected work, lung and non-pulmonary forms of tuberculosis, clinical diagnosis, and current developments in diagnosis are summarized.

Keywords: Tuberculosis, pulmonary tuberculosis, extra-pulmonary tuberculosis, diagnosis, new diagnostic tests

INTRODUCTION

Tuberculosis is still one of the leading causes of death among treatable infectious diseases. It continues to be an important public health problem all over the world and in Turkey.[1] Before the COVID-19 pandemic, it was the most important public health problem and was among the infectious diseases that most frequently caused death.

EPIDEMIOLOGY OF TUBERCULOSIS

Tuberculosis ranks 9th-13th among the causes of death due to infectious diseases all over the world. According to the World Health Organization's 2020 report, there is approximately 10 million tuberculosis (TB) patients worldwide. The increase in the number of immunosuppressive patients, especially HIV epidemic and HIV, is the most important risk factor for the increase in the number of tuberculosis cases. In addition, international migrations also pose a risk in terms of the spread of the disease. Most patients with tuberculosis live in Asia's most populous countries, Bangladesh, China, India, Indonesia and Pakistan, which account for half (48%) of new cases each year.[2]

In Turkey, 11,401 TB patients were reported in 2019.[3]

MYCOBACTERIA CAUSING TUBERCULOSIS

The causative agent of tuberculosis is the human pathogen *Mycobacterium tuberculosis* (*M. tuberculosis*).

Less frequently, located in the *M. tuberculosis* complex; *M. bovis* (zoonosis), *M. africanum* (human pathogen), *M. microti* (zoonosis, can be transmitted from rodent to human), *M. caprae* (human and animal pathogen), and *M. pinnipedii* (from seals to humans) may also be causative.[4] Tuberculosis can hold almost all organs and tissues, except hair and nails.

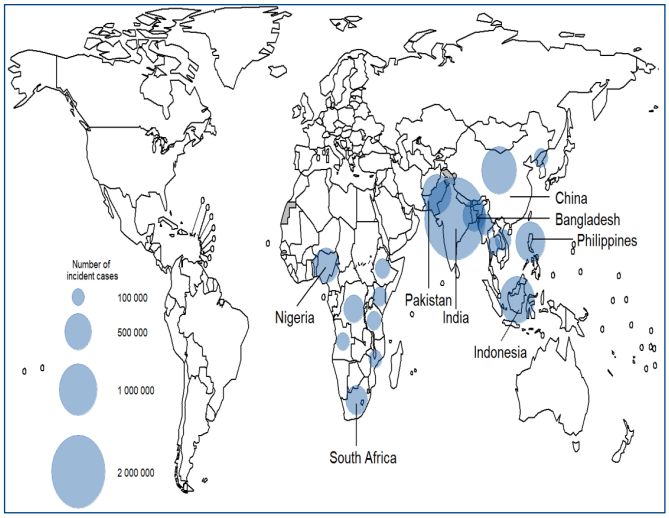

Figure 1*. Eight countries (Nigeria, South Africa, Pakistan, India, Indonesia, China, Bangladesh and the Philippines), which are in the top eighth place in terms of number of cases and account for two-thirds of global cases in 2020

(*) Retrieved from source 2

CLINICAL FORMS OF TUBERCULOSIS

Tuberculosis can be seen in two clinical forms, mainly pulmonary TB and extra-pulmonary TB (EPTB). EPTB can be grouped mainly as TB lymphadenitis (Scrofula), miliary TB, TB meningitis, TB pleurisy, TB pericarditis, TB spondylodiscitis (Pott's disease), and other forms.

LUNG TB AND DIAGNOSIS

Patient's anamnesis, physical examination findings, pulmonary film and pulmonary TB are suspected. The

definitive diagnosis of lung TB is bacteriological. At least three sputum samples should be taken from patients with suspected lung, pleura, larynx, and miliary TB. The most ideal for sputum samples is the examination of the first sputum in the morning for three days. Induced sputum or fasting gastric juice is examined 3 times in patients who cannot expectorate. If the sample cannot be taken, bronchoscopic lavage fluid is taken. The ideal is to examine the first sputum in the morning for 3 days.

The amount of sputum should be 3-5 ml, a post-condensation examination should be performed. Diagnosis rate increases with condensation (decontamination/concentration). Sensitivity is low in non-cavitary disease and HIV-positive patients.

NaOH-NALC (N-acetyl-L-cysteine (Cubica method) is the most commonly used method for condensation.5 Sensitivity increases by 10% in the second sputum sample and by 2% in the third sample.[4] After microscopic examination of the sputum, the remaining sputum samples should be added to both broth and agar mediums. In broth mediums (mgit, Bactec 460, TK medium, etc.), the reproduction rate and reproduction ratio are generally higher. It is recommended that each patient undergo a culture and drug susceptibility test (DST) at the beginning of treatment. Xpert MTB/Rif test, which is one of the molecular tests, should be applied to determine both rapid diagnosis and RİF resistance.[5]

EXTRAPULMONARY TUBERCULOSIS (EPTB)

Tuberculosis bacilllus can hold all organs and systems. EPTB is responsible for approximately 15-25% of all tuberculosis cases. EPTB may occur with or without lung involvement. It is especially common in HIV-positive patients.

EPTB Pathogenesis

EPTB can develop in three main ways:

1. Spread from superficial mucosal foci: Spread of infectious pulmonary secretions from the respiratory and gastrointestinal system superficial mucosa
2. Neighborhood (direct) spread: Spread from a subpleural focus to the pleural cavity
3. It may develop as a result of lymphohematogenic spread from established chronic lung or extra-pulmonary foci during primary infection.[4]

EPTB in Turkey

According to the 2019 data of the Department of Tuberculosis War, the number of EPTB cases in women in Turkey is 2393 (47.8%) and 1655 (24.4%) in men, and the number of EPTB cases in women is higher. According to the same report, the number of lung TB cases was 4766 (70.3%) in males and 2351 (46.9%) in females, and the number of lung TB cases was higher in males than in females.[3]

EPTB Diagnosis

Detailed anamnesis and physical examination should be performed. In the diagnosis of EPTB, microscopic examination (EZN, Auramine-Rhodamine staining), culture, molecular diagnostic methods (polymerase chain reaction, etc.) and serological tests can be used. Histopathological examination should also be performed.

Clinical Forms of EPTB

Tuberculous lymphadenitis (Scrofula): Lymphadenitis is the most common form of EPTB. The tuberculin skin test (purified protein derivative; PPD) is mostly positive. It most commonly occurs as a painless, firm mass along the upper border of the sternocleidomastoid muscle.

Lymphadenopathy outside the cervical and supraclavicular area usually indicates more severe TB with systemic symptoms. Fine-needle aspiration cytology shows granuloma, but smear microscopy or cultures are usually negative. Histopathological imaging may also be seen in other mycobacterial or fungal infections.

The culture of the biopsy material is necessary for diagnosis. The culture of biopsy material is required for diagnosis.[4]

In the diagnosis, the sensitivity and specificity of the Xpert Ultra test in lymph node aspirate, one of the molecular tests, were reported to be 70% and 100%, respectively.[6]

Mediastinal TB Lymphadenitis: During primary infection, mediastinal adenopathy can be seen frequently radiographically, especially in children. Mediastinal lymphadenopathy is common in patients with HIV/AIDS positive TB.

The presence of low-density areas in the lymph nodes on CT scan suggests TB, however; mediastinoscopy is usually required for diagnosis. Diagnosis is made by microscopic examination (EZN staining) and culture of biopsy material taken by mediastinoscopy.

Fibrosing Mediastinitis: TB can cause fibrosing mediastinitis. Patients may present with shortness of breath with exertion due to compression of the pulmonary veins and arteries or, less frequently, with superior vena cava syndrome. Hilar lymphadenopathy or active lung disease is rarely found. Thoracotomy is required for diagnosis.

Mesenteric TB lymphadenitis: Involvement is often intra-abdominal, and sometimes obstruction may develop in the bile ducts, ureters, or intestine. Low-density centers and peripheral contrast enhancement are observed in the lymph nodes. Involvement is more often intraabdominal than retroperitoneal, and sometimes obstruction is observed in the bile ducts, ureters, or intestine. Diagnosis is made by microscopic examination and culture of biopsy material.[4]

2. Miliary TB

It defines progressive disseminated hematogenous TB. It accounts for approximately 1% of all TB cases.[4] Miliary TB is defined as the detection of miliary organ involvement in at least two separate organs that are not adjacent to each other in biopsy or autopsy. The presence of tubercle is the main condition for diagnosis.[7] Pleural effusion, peritonitis or meningitis are observed in 3/2 of the affected cases. Physical examination is generally not specific, but may provide a careful examination and biopsy diagnosis for cutaneous eruptions, sinus tracts, scrotal masses, and lymphadenopathy.[4] Choroidal tubercle is an important finding in the eye examination in 15-21% of cases.[7]

Miliary infiltrate is the most useful finding on chest radiography and is the possible cause of suspected miliary TB (**Figure 2**)

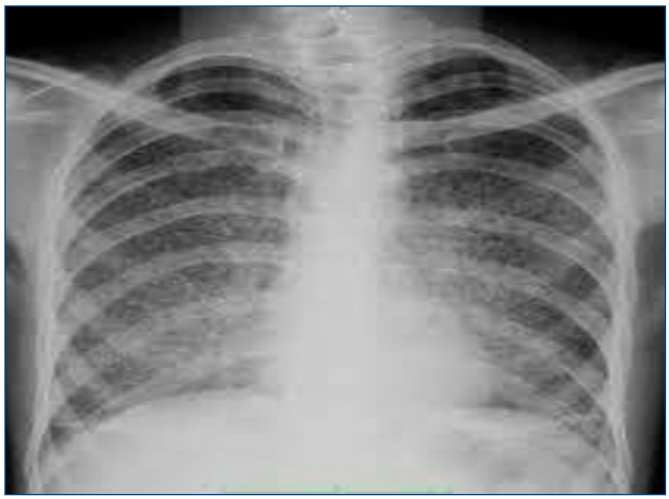

Figure 2. Micronodules on high-resolution lung CT (nodular infiltrative view showing patchy glass view in places on the right)

Micronodules can be detected in high-resolution lung CT, its sensitivity is superior to PA chest X-ray (**Figure 3**).

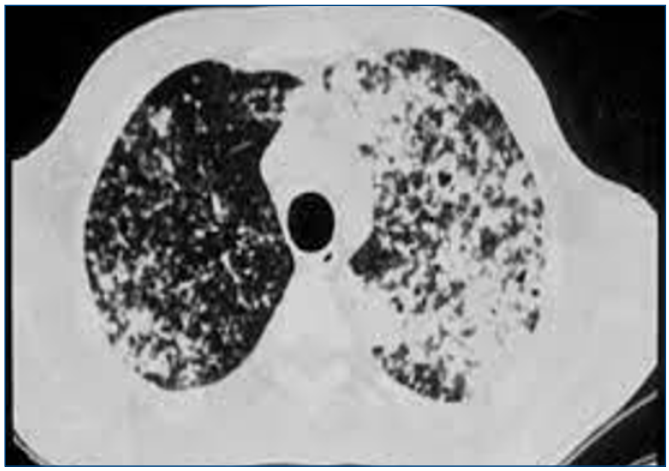

Figure 3. Micronodules on high-resolution lung CT (nodular infiltrative view showing patchy glass view in places on the right)

Diagnosis is usually made by examination of tissue (lymph nodes, scrotal masses, if any, liver biopsy or bone marrow samples). Blood cultures for mycobacteria may also be positive. Tissue sampling by transbronchial biopsy is valuable for diagnosis. The detection of cashed granuloma or acid-resistant bacilli is diagnostic. The sensitivity of molecular tests (e.g. PCR) to detect *M. tuberculosis* body fluid and tissue samples in the diagnosis of miliary TB has been reported to be between 37-100%.[6]

3. Primary Hepatic TB

Rarely, miliary TB may mimic cholangitis with fever, liver function test abnormalities suggestive of obstructive disease, and little evidence of hepatocellular disease. The diagnosis of primary hepatic TB is made by liver biopsy.[4]

4. TB Meningitis

The clinic begins with resentment, intermittent headaches, and a low level of fever. Then, within 2-3 weeks, long-term headache, vomiting, confusion, meningismus and focal neurological symptoms develop.[4] If left untreated, the mortality rate and sequellae development rate are high.[8] TB meningitis and miliary TB are the most severe forms of tuberculosis. Cases of TB meningitis, if left untreated, result in death within 5-8 weeks.[8]

The clinical spectrum can range from chronic headache or mild mental status changes to sudden, severe meningitis that progresses to coma. Fever may not be seen, and the number of leukocytes is usually normal. Hyponatremia due to mild anemia and inappropriate ADH secretion is common. Concomitant extrameningeal TB evidence is available in ¾ of the cases. In most cases, there are no clinical or anamnesis clues to suggest TB.[4]

Tuberculous meningitis is seen in 3 stages:

- **Stage-1;** Conscious, no focal neurological symptoms and hydrocephalus.
- **Stage-2;** Confusion and focal neurological findings; cranial nerve paralysis, hemiparesis
- **Stage-3;** Stupor or pronounced paraplegia, hemiplegia.[9,10]

The basis of diagnosis is the examination of CSF. The number of cells usually ranges from 0 to 1500/mm³, the amount of protein is increased, CSF glucose is characteristically low. Lymphocytic cell is dominant in CSF. Identification of bacilli often requires examination of large volumes of CSF taken by recurrent lumbar puncture. PPD skin test has a sensitivity of 62% and a specificity of 82%.[4]

The Interferon Gamma Release Assay (IGRA) sensitivity has been reported as 72% in CSF, 69% in blood, and its specificity in CSF is 97%, 89% in blood. It has been reported that PCR test in CSF is positive in roughly 60% to 90% of culture-positive CSF samples.[11]

In a meta-analysis, when the Xpert Ultra test was compared with the culture, it was reported to have 89.4% sensitivity and 91.2 specificity.[6] In another study, the sensitivity and specificity of lipoarabinomannan (LAM) test in CSF in the diagnosis of TB meningitis were reported to be 52% and 98%, respectively.[12]

5. TB Pleurisy (Effusion Serofibrinous pleurisy)

Pleural fluid typically contains 500-2500 leukocytes/mm³ and contains more than 90% lymphocytes. The level of pleural fluid protein is usually more than 2.5 g/dL, the glucose concentration is generally moderately low compared to serum values, rarely below 20 mg/dL. Increased pleural fluid adenosine deaminase levels are highly sensitive and specific for tuberculous pleurisy, however; much lower limit values should be used in patients over 45 years. Open pleural biopsy or thoracoscopy is required in almost all cases for diagnosis.[4]

When the Xpert Ultra test, one of the molecular tests in the diagnosis, was compared with the pleural fluid culture, its sensitivity was determined as 75% and its specificity as 87%.[6]

6. TB Pericarditis

Tuberculous pericarditis most commonly develops as a result of spread from mediastinal or hilar lymph nodes. Echocardiography shows effusion and a large number of loculations suggestive of TB can be detected. Pericardiocentesis is indicated to provide hemodynamics. In some cases, biopsy shows only nonspecific inflammation. Tuberculous pericardial fluid shows many features of TB pleural fluid; ARB is rarely positive and culture is positive in 50% of cases.[4]

7. Vertebral Tuberculosis (Pott's disease, TB spondylodiscitis)

It often develops as a result of hematogenous spread. TB, which holds the skeletal system, develops as a result of

lymphatic spread from hematogenous focus or pleural disease in 1/3 of cases. The earliest focus is the anterior upper or lower angle of the vertebral body.

This usually spreads to the intervertebral disc and adjacent vertebrae. The classical radiological image is destruction in the intervertebral disc and adjacent vertebral corpus. On physical examination; gibbus palpated from the back can be detected.

The lower thoracic vertebra is most commonly involved, followed by the lumbar vertebra. In endemic countries, Pott's disease is usually seen in older children and young adults, while in developed countries it is seen in older individuals. TB bacilli are infrequent and only 50% of cases are positive for PU or ARB and culture in the tissue.

In histological examination, caseification with or without caseification can be detected in ¾ of the cases. Abscess and sinus formation develops in 50% or more of paraspinal cold abscesses, in some cases after treatment has begun. In some cases, the lesion can only be seen by CT or MRI.

The abscess can sometimes spread the infection to distant vertebral corpuses without affecting the intervening vertebrae.

Epidural or psoas abscess can also complicate TB spondylitis. The interferon gamma release assey (IGRA) tests and PPD skin test can be used to support the diagnosis. In one study, the sensitivity rate of IGRA test in Pott's disease was reported as 84% and the specificity rate as 95%.[13]

8. Peripheral Osteoarticular TB

Peripheral tuberculous arthritis is in the form of chronic, slowly progressive monoarthritis in 90% of the cases. It most commonly involves the hips or knees. A history of trauma is common, followed by slow progression of inflammation weeks or months later. Systemic symptoms in the elderly population are seen as multiple joint involvement and periarticular abscess formation. It can cause hand tenosynovitis, wrist arthritis, and carpal tunnel syndrome. The earliest symptom of tuberculous arthritis is pain that appears weeks or months before signs of inflammation and radiographic changes.

Initially, soft tissue swelling, later osteopenia, periarticular bone destruction, periosteal thickening, and eventually cartilage and bone destruction can be seen on the radiograph. Cold abscesses and drainage sinuses are often seen in chronic cases. Biopsy is required for diagnosis. TB osteomyelitis can involve any bone, including the ribs, skull, phalanx, pelvis, and long bones. TB is the most common infectious cause of single or multiple osteomyelitic rib lesions.[4]

9. Renal TB

It develops after hematogenous spread. Asymptomatic renal cortical foci can be detected in all forms of TB. The time between infection and active kidney disease is usually years, and sometimes a decade (10 years). Local symptoms are predominant and advanced tissue destruction may occur long before the diagnosis. Contrast-enhanced abdominal CT is usually abnormal. Fever, weakness, dysuria, pollacuria, side pain, hematuria (50% of cases) may occur. Hydronephrosis, parenchymal cavitation and autonephrectomy may be seen in the advanced stage. Focal calcification is particularly suggestive of the disease. The disease is usually one-sided. Sterile pyuria, hematuria and proteinuria are common in renal TB. Three urine cultures taken 3 times in the morning make the diagnosis in 80%-90% of cases. If there is a renal abnormality, however; If the urine cultures are negative, the culture of the material obtained by cytological examinations and fine-needle biopsy may be diagnostic. PPD skin test is positive between 88-95% in patients with renal TB.[4]

10. Male genital TB

80% of male genital TB is associated with concomitant renal disease. In advanced stage renal TB, involvement in genital organs accompanies. The infection spreads from the renal focus to the prostate, seminal vesicles, epididymis and testicles, respectively. The most common clinical finding is a sensitive or drained sinus containing scrotal mass. It may cause oligospermia and infertility. Epididymal or prostate calcification suggests a diagnosis; however, prostate calcification is also seen in chronic prostatitis. The definitive diagnosis is usually made by biopsy.[4]

11. Female Genital TB

It starts from the focus in the first endosalpinx by hematogenous route, from there it can spread to the endometrium, ovaries, cervix, and vagina. It may resemble a mass carcinoma to a granulomatous ulcer in the cervix. Common complaints are infertility or menstrual irregularities and abdominal pain. The clinical picture suggests pelvic inflammatory disease that does not respond to treatment. Spread to the peritoneum may be seen. Pelvic TB can cause ectopic pregnancy. Tubovarian abscess can be detected on CT, multiloculated mass can be detected in the ovary. Menstrual blood or endometrial scraping cultures may be positive, but the diagnosis is often made by examining the tissue taken during surgery. The response to antituberculosis treatment is quite good. Surgical intervention may be required only for residual large tuboovarian abscesses.

12. Gastrointestinal TB

Gastrointestinal tuberculosis can involve any region from the mouth to the perianal region.[4,14] The most common involvement is in the ileocecal region. The disease can be seen as a result of swallowing the infected sputum of patients with advanced cavitary lung or laryngeal TB or drinking the milk of an animal infected with Mycobacterium bovis.

Radiological evidence of lung TB is less common. Ulcers that do not heal in the tongue or oropharynx and ulcers that do not heal after tooth extraction may be due to TB.

Obstruction or tracheoesophageal fistula formation may be seen in esophageal involvement. Stomach and duodenal involvement may cause ulcerative lesion, obstruction, or peptic ulcer findings. Small bowel involvement may cause perforation, obstruction, enteroenteric and enterocutaneous fistulas, massive bleeding, and severe malabsorption. In ileocecal region involvement, abdominal pain, anorexia, diarrhea, obstruction, sometimes severe bleeding and often palpable mass can be detected.[4]

Clinical forms of gastrointestinal TB:

- **Pancreatic TB:** It may occur as an abscess or a mass that holds regional nodes and resembles a carcinoma.
- **Bile ducts TB:** The bile ducts may be obstructed by tuberculous granuloma and cause tuberculous ascending cholangitis.
- **Granulomatous hepatitis:** Usually asymptomatic. In this case, an elevated alkaline phosphatase that is disproportionately increased with normal transaminase and bilirubin levels can be seen (called primary TB of the liver).

Gastrointestinal TB mostly affects immunocompromised hosts, less frequently it can occur in immunocompromised individuals. Diagnosis is quite difficult as it can mimic malignancy or inflammatory bowel disease. The high clinical suspicion index and the use of many diagnostic methods together allow early diagnosis. Mortality and morbidity rates may decrease with early diagnosis and treatment. Antituberculosis treatment is the same as lung disease and invasive and special surgical interventions may be required in case of development of some complications.[14]

Tanoğlu et al.[15] evaluated 104 patients with gastrointestinal tuberculosis in a multicenter study and 65 (86.6%) of 75 patients who underwent intestinal biopsy were isolated from culture with TB bacilli. Positivity was detected in 35 (94.6%) of 37 biopsy samples by polymerase chain reaction test. *M. tuberculosis* was isolated from acid culture in 11 (57.9%) of 19 patients who received acid samples. Upper gastrointestinal endoscopy was performed in 40 (38.5%) of the patients and colonoscopy was performed in 74 (71.1%) of the patients. Surgical interventions frequently formed the source of diagnostic samples (25 laparoscopy/20 laparotomy, 45 (43.3%) samples in total); 4 (3.8%) of the patients who started antituberculosis drug treatment died, and 2 (1.9%) cases had recurrence.

In the study, the incidence of underlying immunosuppression was found to be high in gastrointestinal TB patients. Most of the patients were diagnosed with surgery, and it was reported that the mortality rate was low with appropriate and rapid diagnosis and treatment.

The definitive diagnosis of gastrointestinal TB can usually be made by surgical intervention or endoscopy, microbiological and histopathological examination of the material taken by colonoscopy.

13. TB Peritonitis

Tuberculous peritonitis is rare in developed countries, but can occur in high-risk patient groups, including patients with AIDS or cirrhosis, patients on continuous outpatient peritoneal dialysis, migrants from regions with high TB endemicity, and immunosuppressed patients. The diagnosis of TB peritonitis requires a high index of clinical suspicion and should be considered in the presence of lymphocyte dominance in peritoneal fluid and acid fluid with a serum-acid albumin gradient <1.1 mg/dl.[16]

Peritoneal fluid is exudative and often the number of cells is between 500-2000. Lymphocytes are typically dominant. ARB is rarely positive in acid fluid, and culture positivity is detected in 25% of cases.[4] The level of adenosine deaminase and interferon-gamma in the acid fluid increases. PPD skin test can be positive in 30% -100% of cases.

Microbiological or pathological confirmation is still the gold standard for diagnosis. The detection rate of the agent in acid fluid cultures is low, but the culture of samples taken by biopsy or peritoneoscopy often confirms the diagnosis.

Ultrasound and computed tomography can be used to guide acid fluid aspiration and peritoneal biopsies. Apart from resistant tuberculosis cases, 6 months of antituberculosis treatment is sufficient.[14]

The definitive diagnosis is often made by peritoneal biopsy.[4]

14. Cutaneous TB

Tuberculosis of the skin develops due to *Mycobacterium tuberculosis* (*M. tuberculosis*), *M. bovis*, and in some cases Bacillus Calmette-Guerin (BCG) (*M. bovis*ine attenuated strain) vaccine. Bacilli come to the skin through exogenous, endogenous or autoinoculation. Endogenous spread can be in three forms: spread to the environment, lymphatic spread, and hematogenous spread. The cellular immune system plays an important role in tuberculosis infection.[17]

Cutaneous TB can be seen in different ways depending on the virulence of the bacterium, its number, the general condition of the host and the immune system. The incidence of cutaneous TB is in line with the incidence of pulmonary tuberculosis in that country. The most common skin forms of TB in Turkey are scrofuloderma (tuberculosis cutis collikuative) and lupus vulgaris forms, other forms are rarely seen. Skin TB may occur as primary infection or reinfection TB.[18]

Skin TB can be classified as primary and secondary skin TB. Primary skin TB can be seen in two forms: tuberculosis primary complex and miliary skin TB. The main forms of secondary skin TB are lupus vulgaris, tuberculosis cutis verrucosa, tuberculosis cutis orificealis and metastatic TB abscesses.

Primary skin TB

1. **TB primary complex (TB chancre):** It is transmitted by the exogenous introduction of bacilli into the skin of people who have not had contact with TB bacilli before. It is often seen on the face and extremities in children.
2. **Miliary skin TB (TB cutis milliaris):** It is an extremely rare form of skin TB. It occurs as a result of the hematogenous spread of Mycobacteria, especially in infants and children, after infections in which the immune system is suppressed, such as measles and scarlet fever.

Secondary skin TB

1. **Lupus vulgaris:** It is the most common form of skin TB. It shows a chronic course and can last for years. It is more common in female gender than men. It often develops as a result of the transmission of TB bacillus from the TB focus in the body to the skin through the hematogenous, lymphogenic, or environmental spread, rarely following the BCG vaccine.
2. **Tuberculosis cutis verrukosa:** It is a verricular skin tuberculosis that occurs due to exogenous reinfection in individuals who have previously been in contact with TB bacilli and are highly immune to bacilli. A high hypersensitivity is detected with the PPD skin test.[17] Skin involvement may result from exogenous vaccination. TB verrucosa cutis is associated with vaccination.[4]
3. **Scrofuloderma (TB cutis colicuativa):** It often develops as a result of the direct spread of lymph node, bone, joint, tendon tuberculosis to the skin. Elementary lesion is gamma.
4. **Tuberculosis cutis orificialis:** It occurs by direct inoculation from the primary focus or by inoculation of mycobacteria into the mucous membranes or skin of the orifices with lymphatic spread in individuals with advanced stage organ TB and compromised immunity.
5. **Metastatic TB abscesses:** It is the form that develops as a result of the hematogenous spread of tuberculosis bacilli from the primary focus, especially in immunodeficiency conditions such as AIDS and in a period when immunity decreases in patients with severe immunodeficiency.[17]

The diagnosis of skin TB is made by microscopic examination, culture, histopathological examination of the skin biopsy material. PPD skin test is also used in diagnosis.

15. TB Laryngitis and Otitis

TB laryngitidis: More than 50% of laryngeal TB cases are caused by hematogenous spread.

TB otitis: Clinically, it is painless ear discharge with multiple tympanic perforations, exuded granulation tissue, early severe hearing loss, and mastoid bone necrosis.

16. Other Clinical Forms

- **Vascular TB:** With or without aneurysm formation, aortic TB may develop as a result of spread from neighboring infected nodes, pericarditis, spondylitis, paravertebral abscesses or empyema. Wide hematogenous spread or aortic rupture may occur.
- **Ocular TB:** Various ocular involvement can be seen, including choroidal tubercles, uveitis, iritis and episcleritis. During miliary TB in areas with high prevalence of TB, choroidal TB (usually asymptomatic) may occur in 5% to 20% of patients.
- **Tbc in the breast:** It can be seen in the form of abscess, sclerosing lesions resembling carcinoma and lesions forming multiple nodules. Diagnosis is made by microscopic examination and culture of biopsy material.4
- **Nasal TB:** It can be seen in the form of destructive nasal lesions similar to Wegener's granulomatosis both clinically and histologically.

TB of the adrenal glands may cause calcified or non-calcified adrenal enlargement such as histoplasmosis. Granulomatous adrenal TB can cause Addison's disease without calcification or adrenal enlargement.[4] Hatipoğlu et al.[19] reported a 60-year-old female patient with renal tuberculosis with Addison's disease.

NEW DIAGNOSTIC TESTS

- Investigation of Lipoarabinomannan (LAM) in Urine or CSF
- Detection of urinary antigen (LAM) is a lateral flow or ELISA test that can be applied to point-of-care testing. It has high susceptibility in untreated advanced AIDS patients (CD4<50 cells/mm³). It has low sensitivity in conditions other than advanced AIDS disease. Recently, tests to detect LAM antigen in CSF have also been used in the diagnosis of TB meningitis.[20]
- Clustered regularly interspaced short palindromic repeat (CRISPR; regular interval palindromic repeat Clusters) –*Mycobacterium tuberculosis* test: It is one of the newly used tests and its sensitivity in lung and TSF has been reported as 79% (39% of culture, 66% of Xpert test) and specificity as 98%.[21,22]

Tests used in the diagnosis of latent tuberculosis: Although interterferon gamma release tests (IGRA) used in the diagnosis of latent tuberculosis infection have been widely used in the diagnosis of tuberculosis infection in recent years, these tests are insufficient to determine the progression from infection to tuberculosis disease.[23] In recent years, the QIAreach QFT test has been used as a new and simple version of Quantiferon-TB Plus (QFT-Plus) in the diagnosis of latent tuberculosis infection. This test is portable, easy to use, does not require experienced personnel, and uses a single tube for testing. With fluorescence lateral flow reader, it can give quantitative results in 20 minutes and a single tube is sufficient for the test. With this feature, the test can be used at the bedside and does not require laboratory infrastructure.[24]

CONCLUSION

Today, lung extra-pulmonary forms of tuberculosis are still an important public health problem. Thanks to the effective control measures implemented in Turkey, there has been a significant decrease in the number of tuberculosis patients, which was an important public health problem more than a decade ago. In spite of this, lung TB and ADT can be seen as opportunistic infection factors, especially in HIV/AIDS positive patients. In addition, ADT forms should be kept in mind in the clinical differential diagnosis with different organ and system involvement and nonspecific findings. In order to maintain this decrease in the number of tuberculosis cases, it is also of great importance to maintain community health and preventive treatment services for tuberculosis before the COVID-19 pandemic.

ETHICAL DECLARATIONS

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Journal of
Pulmonology and
Intensive Care

Case Report

DOI: 10.51271/JOPIC-0005

Tuberculosis with isolated atelectasis: a case report

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Cite this article: Demirkaya A, Kurt B, Ensarioğlu K. Tuberculosis with isolated atelectasis: a case report. J Pulmonol Intens Care 2023; 1(1): 20-22

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Submit Date: 29/01/2023 **Accept Date:** 06/02/2023

ABSTRACT

Tuberculosis is a significant health issue in developing countries, with the World Health Organization reporting over 10 million cases worldwide in 2014. While methods exist for rapid investigation of Mycobacterium tuberculosis, radiological imaging may lead to an earlier suspicion, such as presence of cavitation. In this case report, a patient with only radiological finding being atelectasis will be presented. An 18 years old female patient with no specific medical background history had been evaluated at an outpatient clinic with complaints of cough and exertional dyspnea. After a fluoroquinolone treatment for 7 days given for a pericardiac density in chest radiography, patient was admitted due to limited clinical response. A chest tomography was performed while the patient was under wide spectrum antibiotics and atelectasis in right lower lobe was observed. Repeated Acid-Fast Bacilli smears and sputum samples were found negative and bronchoscopy sampling did not show any findings of obstruction. Mycobacterium tuberculosis complex DNA was later detected in the lavage samples for which antituberculosis treatment was initiated with a regimen of isoniazid 5 mg/kg, pyrazinamide 25 mg/kg, ethambutol 15 mg/kg, and rifampin 10 mg/kg. The diagnosis of tuberculosis, in this case, was probably masked during the AFB smear testing due to a treatment regimen of fluoroquinolone. The general radiological definition of tuberculosis primarily consists of older studies, with the expected presentation being a combination of cavitation and infiltration. Normal lung imaging results had also been described for tuberculosis regarding chest radiography, and studies have reported the presence of atelectasis in patients with tuberculosis, as seen in tomography case series; however, the isolation of atelectasis had not been specified in the studies. Pulmonary tuberculosis may present itself with a myriad of radiological findings. This presentation often complicates the diagnostic process; however, differential diagnosis can be achieved via a combination of clinical symptoms and rapid culture sampling.

Keywords: Atelectasis, tuberculosis, fluoroquinolone

INTRODUCTION

Tuberculosis is a significant health issue in developing countries, with the World Health Organization (WHO) reporting over 10 million cases worldwide in 2014.[1] Although Mycobacterium tuberculosis presents itself as pulmonary tuberculosis in most cases, extrapulmonary manifestations are also common enough to warrant detailed investigation. Patients often suffer from nonspecific symptoms, with fever, coughing, and weight loss being the most prominent ones.[2]

For routine evaluation, patients with suspected tuberculosis undergo radiological imaging and tuberculosis culture, often taken from phlegm samples. While methods exist for rapid investigation of Mycobacterium tuberculosis in samples, radiological imaging with specific findings may lead to an earlier suspicion, such as presence of cavitation. The usually expected radiological findings include infiltration and cavitation, with fibrosis mostly seen in untreated cases, and localization of these findings is generally present in upper lobes.[3] In this case report, a patient with only radiological finding being atelectasis will be presented.

CASE

An 18 years old female patient with no specific medical background history had been evaluated at an outpatient clinic with complaints of cough and exertional dyspnea. The patient described that her symptoms worsened during a period of house-moving, in which she had relocated to a dormitory from her own house.

The initial physical examination revealed bronchial sounds at the right lower zone during auscultation, with the other examination finding and vitals being within normal ranges. The patient's posteroanterior chest radiography revealed right pericardiac density with a preference for the lower right zone of the lung (**Figure 1**). Due to physical inspection, radiological and clinical findings, treatment of fluoroquinolone for a duration of 7 days was initiated on an outpatient basis for the patient.

After three days, the patient had been reevaluated due to worsening symptoms, mainly no response of fever to the treatment, and urticarial rashes generalized to the whole body. Due to limited response to oral treatment, lack of control of symptoms, and adverse events of dermatologic findings, the patient was admitted to the ward for further

investigation and treatment. The treatment had been halted for possible fluoroquinolone allergy, and piperacillin-tazobactam was initiated empirically, 3.5 gr thrice daily intravenously. Corticosteroid treatment was also started to control urticarial rashes with a dosage of 1 mg/kg orally per day, according to the dermatology consultation. An elevated C-reactive Protein (CRP) level of 39 mg/L with a normal range of white blood cell (WBC) count of 7.86*103 mcL was present in routine laboratory evaluation.

Figure 1. Initial evaluation chest radiograph

A thorax tomography was requested for the possibility of pulmonary sequestration, abscess, and other processes. Right lower lobe atelectasis was observed in the tomography, with no other specific radiological findings present (**Figure 2**). During the hospitalization period, no culture positivity in blood, urine, and sputum samples was seen, and six Acid-Fast Bacilli (AFB) smears from sputum samples were found negative for mycobacteria.

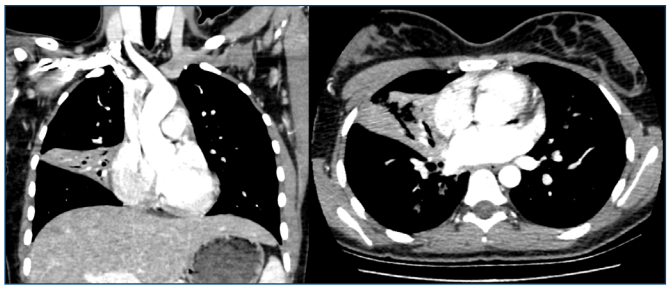

Figure 2. Hospital admission chest computed tomography

Bronchoscopy was planned for the patient to investigate resilient infectious sources further; however, due to hypertrophic conchae and edema, the intervention was then delayed until discharge. At bronchoscopy performed before discharge, the right bronchial tree starting from the main carina was observed to be covered with white secretion. The right middle lobe entrance was slightly narrowed, and lower lobe orifices were covered with the same secretion, albeit at a higher density. Bronchial lavage was performed at the lower lobe orifice level, and further sampling was performed with a protected catheter brush. Mycobacterium tuberculosis complex DNA was then detected in the lavage samples. After further investigation of family history, a case of tuberculosis was present in the patient's grandfather, for which the patient had stated infrequent visits.

With the bacteriologic findings confirming the clinical ones, the patient was diagnosed with pulmonary tuberculosis, and a treatment regimen of isoniazid 5 mg/kg, pyrazinamide 25 mg/kg, ethambutol 15 mg/kg, and rifampin 10mg/kg were initiated for two months. A treatment revision was planned if any resistance was observed in the culture results. The patient is currently on the first month of the treatment, with no side effects described, and clinical response was observed in the third week. A monthly evaluation for treatment response and side effect presence has been planned.

DISCUSSION

The diagnosis of tuberculosis, in this case, was probably masked during the AFB smear testing due to a treatment regimen of fluoroquinolone. Although a suitable treatment modality for typical and atypical pneumonia, fluoroquinolone initiation instead of a more limited regimen has grown significantly in our country, primarily due to the expectation of limited adherence of patients to dual regimens (such as amoxicillin and macrolide).

The general radiological definition of tuberculosis primarily consists of older studies, with the expected presentation being a combination of cavitation and infiltration, with hilar lymphadenopathy and pleural effusions defined as other relatively more frequently seen presentations that do not involve parenchyma.[4,5] Normal lung imaging results had also been described for tuberculosis regarding chest radiography, and studies have reported the presence of atelectasis in patients with tuberculosis, as seen in tomography case series; however, the isolation of atelectasis had not been specified in the studies.[6] While a combination of other findings with atelectasis is a possible result, to observe it as the first presentation does appear to be a rare entity.

CONCLUSION

As seen in this case, pulmonary tuberculosis may present itself with a myriad of radiological findings. This presentation often complicates the diagnostic process; however, differential diagnosis can be achieved via a combination of clinical symptoms and rapid culture sampling.

Patient Perspective

The patient shared that her initial assumption was that her diagnosis was asthma and did not expect the tuberculosis diagnosis. Coming from a family with many medical workers and doctors, such a diagnosis from a singular radiological finding was surprising to them. The patient described the diagnosis and treatment process as difficult but satisfactory.

ETHICAL DECLARATIONS

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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