

Coronavirus Pandemic

Evaluation of health literacy levels and COVID-19 awareness among tuberculosis patients

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Abstract

Introduction: For Tuberculosis (TB) and COVID-19 infections, whose transmission modes and preventive measures are similar, compliance with preventive measures and treatment is closely related to Health Literacy (HL) levels. This study aimed to evaluate the HL levels, and COVID-19 awareness of TB patients treated and followed up in TB Dispensaries serving under the Çankaya District Health Directorate of Ankara Province.

Methodology: A questionnaire including socio-demographic characteristics, COVID-19 knowledge level questions, and Health literacy scale-European union-Q16 questions were applied face-to-face to the registered TB patients. Mann-Whitney U and Spearman Correlation tests were used in the analysis.

Results: The mean age of the 107 participants (response rate: 89.1%) was 48.4 years; 42.1% were women. 56.5% of the patients were newly diagnosed, and 11.1% had resistant TB. 43.5% of the participants have had COVID-19; 23.1% thought they had disruptions in their TB treatment period due to the pandemic. The HL level of 23.1% was adequate. There was a moderate positive correlation between the HL scale score and the COVID-19 knowledge level questions ($r = 0.468$; $p < 0.001$). COVID-19 knowledge level was higher in those with adequate HL levels ($p < 0.001$).

Conclusions: The higher level of knowledge about COVID-19 in TB patients with sufficient HL levels suggests the importance of increasing the HL order in the effective fight against the pandemic and possible new outbreaks.

Key words: Awareness; COVID-19; health literacy; tuberculosis.

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Introduction

Tuberculosis (TB) is a major global health problem and maintains its importance as a public health problem in Turkey. The history of TB is nearly as old as humanity. It is estimated, by the World Health Organization (WHO), that one-quarter of the world's population is infected with *Mycobacterium tuberculosis* [1].

TB is a communicable disease that is a significant cause of ill health and one of the leading causes of death worldwide. However, TB is a curable and preventable disease. About 85% of people who develop TB disease can be successfully treated with a 6-month drug regimen, and regimens of one to six months can be used to treat TB infection [2].

According to the WHO's Global Tuberculosis Report (2022), an estimated 10.6 million people (95% CI; 9.9-11.0) globally were diagnosed with TB in 2021, corresponding to 134 cases per 100,000 people. In 2021, 1.6 million deaths occurred due to TB, 1.4 million (1.3-1.5) among HIV-negative people, and 187,000 (158,000-218,000) among HIV-positive people [3].

The COVID-19 pandemic has reversed years of progress in providing essential TB services and reducing the TB disease burden. According to the WHO, global TB targets are mostly off-track, although there are some country and regional success stories. There was a significant drop (18%, from 7.1 million to 5.8 million) in the number of people newly diagnosed with TB from 2019 to 2020. The global number of TB deaths increased in 2020. The number of people with Multi-

Drug Resistant (MDR) TB enrolled in treatment also reduced in 2020 [1].

The outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transformed into a pandemic, seized global attention, and was the biggest highlight of the year 2020. The SARS-CoV-2 outbreak has jeopardized health systems and greatly affected socio-economic parameters. With the global focus on fighting this unpredictable fight with this new virus, the biggest chronic infectious killer, *M. tuberculosis*, was hugely affected by this shift in attention. Due to certain similarities in the behavior of the two infectious agents, there have been inevitable consequences. After the start of COVID-19 vaccination, there were inequalities in access to the vaccine, especially in low-middle-income countries. Vaccination rates remained low compared to developed countries, which influenced the emergence of new variants. New variants have significantly affected countries with low vaccination rates, high poverty and TB rates. The decrease in TB incidence rate has slowed down in countries where the COVID-19 burden is high. On the other hand, with the economic crisis, many people were pushed into poverty, and malnutrition, an important social determinant for TB, deepened further [3,4]. On the one hand, administrative measures to contain SARS-CoV-2 have simultaneously led to the breaking of the TB management chain. Consequently, a regression occurred in the milestones achieved in the battle against TB. On the other hand, the same measures and heightened hygiene awareness have helped to decrease the spread of TB bacilli. With an improved understanding of the interrelations and the outcomes noticed in 2020, we can better gear ourselves to develop a more sophisticated and robust strategy to tilt the balance against TB [5].

The total number of TB cases (newly diagnosed and previously treated) in Turkey in 2021 was 9156 people. The male/female ratio was 1,3, and more than half of the new cases were diagnosed as pulmonary TB. The case rate has been decreasing over the years, and the total TB case rate in 2021 was 10.8 per hundred thousand populations, according to the Ministry of Health of Turkey records [6].

The shared symptoms of TB and COVID-19 infections, such as cough, dyspnea, and fever, can complicate the diagnosis of TB. This is particularly concerning as the underlying comorbidities in TB patients and the disease itself may predispose to a more severe COVID-19 infection, underscoring the importance of early and accurate diagnosis.

It is known that there is a significant relationship between health outcomes and Health Literacy (HL)

level. Low HL levels cause inadequacy in accessing, acquiring, understanding, and interpreting health-related information, difficulties in fulfilling medical procedures and instructions, and problems accessing health services and their effective use [7]. For this reason, HL is a competency that healthy individuals and patients should acquire. In the studies conducted, it has been shown that individuals with low HL levels cannot benefit from preventive health services sufficiently, and their participation in screening programs is low. At the same time, it is evident that the understanding of the diagnosis and treatment of their disease and their treatment adherence are adversely affected by patients with low HL levels. [8-10].

TB patients are more likely to be infected with COVID-19 and may have a negative outcome. For TB and COVID-19 infections, whose transmission modes and preventive measures are similar, compliance with preventive measures and treatment is closely related to HL levels. This study aimed to evaluate the HL levels, and COVID-19 awareness of TB patients treated and followed up in TB Dispensaries (TBD) serving under the Çankaya District Health Directorate in Ankara Province, the capital city of Turkey.

Methodology

Study settings and participants

This cross-sectional study was conducted on TB patients registered at TBDs serving under Çankaya District Health Directorate between November 15, 2021, and February 1, 2022.

Transactions such as TB diagnosis, treatment, and follow-up are carried out free of charge in TBDs. TBDs in Turkey serve under the Provincial Health Directorates of the Ministry of Health to combat TB, and there are 174 TBDs all over Turkey [11].

Ankara is a province located in the Central Anatolian Region and is the capital city of Turkey. Its total population is 5,747,325; 2,843,409 (49.5%) are males. Ankara has 25 districts, the largest of which is Çankaya, and the population of Çankaya is 949,265; of which 454,974 (47,9%) are males according to address-based population registration system results (December 31, 2021) declared by the Turkish Statistical Institute [12].

Five TBDs are in service throughout Ankara, and two are in the Çankaya district. According to the regional distribution, these five TBDs serve the patients of the districts that do not have TBDs. TB patients in approximately ten districts receive service from TBDs in Çankaya in Ankara city. The total number of TB patients registered in Çankaya TBDs was 120 in 2021.

In this study, 107 literate patients over 18 (89.2% of the registered patients) who agreed to participate constituted the study group. Patients who were illiterate and unable to communicate (such as intellectual disabilities) were excluded from the study.

The data of the study were collected through face-to-face interviews with TB patients who came to the TBD for follow-up and treatment, using questionnaires prepared by the researchers.

Instrument and measures

The questionnaire consists of three parts. The first part consists of items questioning the socio-demographic characteristics of individuals (age, gender, occupation, chronic disease status, etc.) and the disease status of TB patients. The second part consists of the items of the European Health Literacy Survey Questionnaire, 16-item version, (HLS-EU-Q16) scale developed by the European Health Literacy Consortium within the scope of the European Health Literacy Survey (HLS-EU) between 2009 and 2012. Turkish Validity-Reliability Study of the HLS-EU-Q16 scale was conducted by Emiral *et al.* in 2018 [13]. HLS-EU-Q16 is in a 5-point Likert type, and the answers for each question are scored between 0 and 4. The standardized index score is used to calculate the total score obtained from the scale (Index = (mean ^ a-1) × (50/3)). The index score ranges from 0 to 50, and the HL level of those who score 33 and above on the scale is considered adequate. The last part of the questionnaire consists of 17 propositions that are answered as "True", "False", and "I do not know", questioning the level of knowledge and attitude about COVID-19 disease. Each

correct answer given to the items was evaluated as 1 point, and wrong and "I do not know" answers were 0 points.

Ethical considerations

Necessary official permissions and approval from the Clinical Research Ethics Committee of Yenimahalle Training and Research Hospital, numbered E-2021-62 and dated 10.11.2021, were obtained. Informed consent was obtained from each participant before starting the questionnaire.

Statistical analysis

The data obtained in the study was analyzed in the IBM SPSS (version 20.0) package program. Descriptive information was presented as numbers, percentages, standard deviation, and mean values. The results were considered statistically significant for *p* value less than five percent. The conformity of the data to the normal distribution was evaluated with the Shapiro-Wilk test. Chi-square, Mann-Whitney U/Kruskal Wallis tests, and Spearman Correlation analysis were used for univariate analysis.

Results

The total number of TB patients registered in Çankaya TBDs was 120 during the study period. One hundred and seven patients over 18 participated in this study, which was ninety percent of the sample (TB patients).

42.1% (n = 45) of the study group were female, and 57.9% (n = 62) were male. Their ages ranged from 18 to 82, with a mean of 48.4 ± 16.8 years. The frequency of those with adequate HL levels was 23.1% (n = 25).

Table 1. Comparison of Health Literacy (HL) Levels according to socio-demographic characteristics.

	Properties	n (%)	HL Level		Statistical Analysis chi-square; <i>p</i>
			Inadequate	Adequate	
Gender	Female	45 (42.1)	32 (71.1)	13 (28.9)	0.845; 0.358
	Male	62 (57.9)	50 (80.6)	12 (19.4)	
Age Group	<50	57 (53.3)	40 (70.2)	17 (29.8)	2.123; 0.145
	≥50	50 (46.7)	42 (84.0)	8 (16.0)	
Marital Status	Married	71 (66.4)	54 (76.1)	17 (23.9)	0.000; 1.000
	Single	36 (33.6)	28 (77.8)	8 (22.2)	
Education Level	Uncertificated	24 (22.4)	23 (95.8)	1 (4.2)	14.386; 0.001
	Primary-Middle School	36 (33.6)	31 (86.1)	5 (13.9)	
	High school-University	47 (44.0)	28 (59.6)	19 (40.4)	
Family Type	Extended Family	24 (22.4)	17 (70.8)	7 (29.2)	0.239; 0.625
	Small Family	83 (77.6)	65 (78.3)	18 (21.7)	
Perceived Income Level	Good	12 (11.2)	9 (75.0)	3 (25.0)	0.643; 0.725
	Middle	67 (62.6)	50 (74.6)	17 (25.4)	
	Bad	28 (26.2)	23 (82.1)	5 (17.9)	
Working Status	Working	39 (36.4)	30 (76.9)	9 (23.1)	0.000; 1.000
	Not working	68 (63.6)	52 (76.5)	16 (23.5)	
Total		107 (100.0)	82 (76.9)	25 (23.1)	

Table 2. Comparison of HL Levels of the patients according to their personal history.

Properties	n (%)	HL Level		Statistical Analysis chi-square; <i>p</i>	
		Inadequate	Adequate		
Smoking Status	Smokes	28 (26.2)	23 (82.1)	5 (17.9)	0.653; 0.721
	Left	23 (21.5)	17 (73.9)	6 (26.1)	
Body Mass Index	Never Smoked	56 (52.3)	42 (75.0)	14 (25.0)	0.000; 1.000
	Weak- Normal	44 (41.1)	34 (77.3)	10 (22.7)	
Physician-diagnosed chronic disease	Overweight-Obese	63 (58.9)	48 (76.2)	15 (23.8)	1.289; 0.256
	Present	38 (35.5)	32 (84.2)	6 (15.8)	
Tuberculosis Diagnosis Status	Absent	69 (64.5)	50 (72.5)	19 (27.5)	0.465; 0.495
	Newly diagnosed	60 (56.1)	44 (73.3)	16 (26.7)	
Hospitalization because of Tuberculosis	Previously Diagnosed	47 (43.9)	38 (80.9)	9 (19.1)	0.220; 0.639
	Yes	45 (42.1)	36 (80.0)	9 (20.0)	
Have had COVID-19 Disease	No	62 (57.9)	46 (74.2)	16 (25.8)	0.465; 0.495
	Yes	47 (43.9)	38 (80.9)	9 (19.1)	
Thinking that there is a disruption in TB treatment due to the pandemic	No	60 (56.1)	44 (73.3)	16 (26.7)	0.034; 0.854
	Yes	25 (23.4)	20 (80.0)	5 (20.0)	
Status of having COVID-19 infection of relatives	Yes	82 (76.6)	62 (75.6)	20 (24.4)	4.517; 0.034
	No	52 (48.6)	45 (86.5)	7 (13.5)	
Total	No	55 (51.4)	37 (67.3)	18 (32.7)	
	Yes	107 (100.0)	82 (76.9)	25 (23.1)	

The frequency of adequate HL levels was higher in those with higher education levels ($p = 0.001$). A comparison of HL levels in the study group according to socio-demographic characteristics is given in Table 1.

56.1% of the patients ($n = 60$) were newly diagnosed, and 11% had resistant TB. 43.5% of the participants have had COVID-19 ($n = 47$); 23.1% ($n = 25$) have thought that they had disruptions in their TB treatment due to the pandemic. The frequency of inadequate HL levels was higher in patients whose first-degree relatives had COVID-19 disease ($p = 0.034$). The HL level of only 23% was adequate. The frequency of adequate HL levels was higher in those with higher education levels. A comparison of the patients' HL

levels with their background characteristics is given in Table 2.

TV/Radio was the most common source for TB patients to follow information about COVID-19 infection. Eighty-six percent of the participants thought that quarantine/isolation practices were correct. The participants' opinions about information sources and practices related to COVID-19 infection are given in Table 3.

The scores of the participants from the propositions about the COVID-19 knowledge level ranged between 0.0-16.0, and the mean (SD) was 8.9 (4.6). The question with the highest percentage of correct answers was, “The symptoms of COVID-19 include fever, cough, myalgia, headache, sore throat, shortness of breath, loss

Table 3. Opinions of the study group about information sources and practices related to COVID-19 infection.

Questions	Answers	n (%)
Frequency of following information about COVID-19 Disease	Every day	47 (43.9)
	Sometimes	45 (42.1)
	Rarely	13 (12.1)
	Never	2 (1.9)
Source for tracking information about COVID-19 Disease*	Social media/Internet	63 (29.4)
	TV/Radio	86 (40.2)
	Newspaper/Magazine/Book	15 (7.0)
	Family/Friends/Environment	35 (16.4)
	Healthcare personnel	15 (7.0)
Thought on quarantine/isolation practices	A correct application	92 (86.0)
	Against human rights	15 (14.0)
Should people who do not comply with quarantine/isolation practices be punished?	Yes, with penalty fine	59 (55.1)
	Yes, with penalty of imprisonment	27 (25.2)
	No	21 (19.6)
Should infecting someone else with the COVID-19 virus be considered a crime?	Yes	76 (71.0)
	No	31 (29.0)

* Numbers and percentages are given over the number of answers.

Table 4. Responses to the COVID-19 knowledge level questions.

Knowledge level questions about the COVID-19 disease	True, n (%)	False, n (%)	Unknown, n (%)
1-The average incubation period of COVID-19 is 2-14 days.	52 (48.6)	15 (14.0)	40 (37.4)
2-The disease is mainly transmitted by droplets scattered by individuals.	60 (56.1)	24 (22.4)	23 (21.5)
3-The COVID-19 can also be transmitted as a result of contact with droplets released by sick individuals.	67 (62.6)	14 (13.1)	26 (24.3)
4-Individuals with chronic diseases such as Hypertension, Heart Disease, Diabetes are in the risk group for COVID-19.	73 (68.2)	16 (15.0)	18 (16.8)
5-People with COVID-19 always show symptoms.	41 (38.3)	36 (33.6)	30 (28.0)
6-The symptoms of COVID-19 include; fever, cough, myalgia, headache, sore throat, shortness of breath, loss of sense of taste, diarrhea etc.	75 (70.1)	20 (18.7)	12 (11.2)
7- People without symptoms of COVID-19 are not contagious.	56 (52.3)	24 (22.4)	27 (25.2)
8- Antibiotics are the most effective drugs in the treatment of COVID-19 disease.	52 (48.6)	22 (20.6)	33 (30.8)
9- Persons who are face-to-face with a COVID-19 patient at a distance of less than 2 meters for more than 10 minutes are considered close contact.	54 (50.5)	22 (20.6)	31 (29.0)
10-People who are in close contact with a COVID-19 patient do not need to be isolated at home.	55 (51.4)	20 (18.7)	32 (29.9)
11-Washing hands with soapy water at regular intervals for at least 20 seconds is one of the measures to prevent the transmission of the disease.	73 (68.2)	10 (9.3)	24 (22.4)
12-The proper use of the face mask to the nose, mouth and chin is one of the protective measures.	71 (66.4)	14 (13.1)	22 (20.6)
13- People who have been infected with COVID- 19 do not become infected again.	66 (61.7)	15 (14.0)	26 (24.3)
14- There are effective vaccines for COVID-19 disease.	56 (52.3)	24 (22.4)	27 (25.2)
15-There is no risk of getting sick for people who are vaccinated.	53 (49.5)	18 (16.8)	36 (33.6)
16-Children do not carry a life-threatening risk for COVID-19 infection.	45 (42.1)	30 (28.0)	32 (29.9)
17-COVID-19 virus is not transmitted to children.	57 (53.3)	17 (15.9)	33 (20.8)

of sense of taste, diarrhea, etc.”. The COVID-19 knowledge level scores of those who did not have a diploma and stated that their income level was low were lower ($p < 0.05$ for each). The answers given to the COVID-19 knowledge level questions are shown in Table 4, and the comparisons according to socio-demographic characteristics are given in Table 5.

No relationship was found between the background characteristics of the patients and the COVID-19 knowledge levels ($p > 0.05$ for each) (Table 6).

In the study group, the COVID-19 knowledge level score of those with adequate HL levels was higher ($p <$

0.001). There was a moderate positive correlation between the HL level score and the COVID-19 knowledge score ($r = 0.468; p < 0.001$). The distribution of the HL level score and COVID-19 knowledge score is given in Figure 1.

Discussion

TB is a communicable disease and has importance as a public health problem worldwide. The immune status that makes people vulnerable to TB may also make them susceptible to coronavirus infection. COVID-19 is already affecting control measures for TB,

Table 5. Comparison of COVID-19 knowledge level according to socio-demographic characteristics.

Properties	COVID-19 Knowledge Level		Statistical Analysis, z; p
	Mean (SD)	Median (Q1-Q3)	
Gender	Female	8.1 (5.1)	1.263; 0.206
	Male	9.4 (4.2)	
Age Group	< 50	9.2 (4.6)	0.711; 0.477
	≥ 50	8.5 (4.6)	
Marital Status	Married	9.0 (4.4)	0.417; 0.677
	Single	8.5 (5.1)	
Education Level	Uncertificated	3.8 (2.5)	34.940; 0.000
	Primary-Middle School	10.1 (3.8)	
	High school-University	10.5 (4.3)	
Family Type	Extended Family	9.0 (4.8)	0.210; 0.834
	Small Family	8.8 (4.6)	
Perceived Income Level	Good	9.4 (5.2)	7.209; 0.027
	Middle	9.6 (4.2)	
	Bad	6.8 (4.9)	
Working Status	Working	9.5 (4.5)	1.078; 0.281
	Not working	8.5 (4.7)	

Table 6. Comparison of the COVID-19 knowledge levels of the study group according to their background characteristics.

Properties		Covid 19 Knowledge Level		Statistical Analysis z; p
		Mean (SD)	Median (Q1-Q3)	
Smoking Status	Smokes	9.4 (4.3)	10.5 (6.5-13.0)	1.146; 0.564
	Left	9.4 (5.2)	9.0 (4.0-13.0)	
Body Mass Index	Never Smoked	8.4 (4.6)	8.5 (4.0-12.0)	0.492; 0.622
	Weak- Normal	9.1 (4.5)	9.5 (6.0-13.0)	
Physician-diagnosed chronic disease	Overweight-Obese	8.7 (4.8)	8.0 (4.0-13.0)	1.747; 0.081
	Present	9.4 (4.6)	10.0 (6.0-13.0)	
Tuberculosis Diagnosis Status	Absent	7.8 (4.6)	8.0 (3.0-12.0)	0.661; 0.508
	Newly diagnosed	9.1 (4.6)	9.0 (6.0-13.0)	
Hospitalization Because of Tuberculosis	Previously Diagnosed	8.5 (4.6)	9.0 (4.0-12.0)	0.972; 0.331
	Yes	8.3 (4.6)	8.0 (4.0-13.0)	
Have had COVID-19 Disease	No	9.2 (4.6)	10.0 (6.0-13.0)	1.238; 0.216
	Yes	8.2 (5.1)	8.0 (3.0-13.0)	
Thinking that there is a disruption in TB treatment due to the pandemic	No	9.4 (4.2)	10.0 (6.0-13.0)	0.879; 0.379
	Yes	9.1 (4.5)	9.0 (6.0-13.0)	
Status of having COVID-19 infection of relatives	No	8.0 (5.0)	9.0 (3.0-12.0)	1.651; 0.099
	Yes	8.1 (4.6)	8.0 (3.0-12.0)	
	No	9.6 (4.5)	10.0 (6.0-13.0)	

whereas the possibility of coinfection should be kept in mind.

It is extremely important that the rules determined in the fight against the pandemic are adopted by the public and put into practice. HL plays a key role in obtaining the correct information and exhibiting the desired behaviors of individuals in the early stages of the epidemic, like COVID-19, when there are many new and especially unknown ones.

In a systematic review conducted by Castro-Sanchez *et al.* between 1999 and 2015, in which HL and infection (tuberculosis, malaria, influenza, etc.) -related behaviors (hand washing, vaccination) were examined, a correlation was found between HL levels and immunization, antibiotic knowledge and use. It was reported that literacy has a key importance in controlling and managing TB and that low literacy level is associated with negative TB outcomes in the studies reviewed in the same article [14]. It has been reported in different studies that individuals with high HL levels are more likely to adopt preventive health measures such as adopting healthy lifestyle behaviors, screening and vaccination; on the other hand, individuals with low HL levels have difficulty understanding health-related information and applying to more expensive health services rather than preventive health practices. [10,15,16].

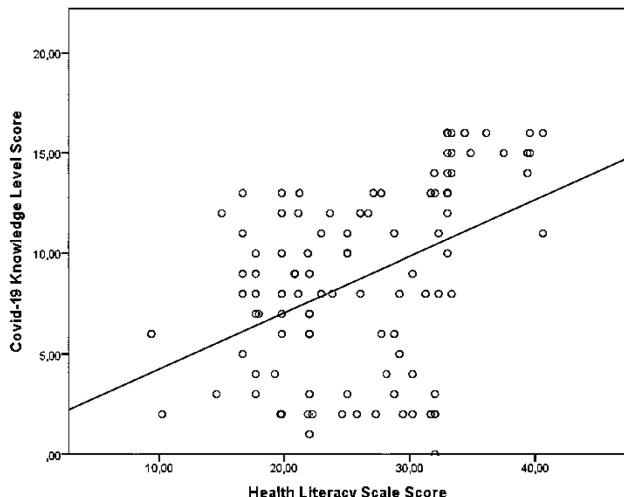
COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes. The measures to prevent the transmission of the virus are using masks, applying hygiene rules, and isolating patients or those with suspected disease. HL levels should be developed first so that individuals can carry

out these practices determined by health authorities and integrate them into their daily lives. While the adequate HL level was 31.1% in the Turkish Health Literacy study, it was found to be 23.1% in TB patients in this study (17). A study conducted on TB patients in China reported that only 33.3% had sufficient HL levels [18]. In order to successfully manage TB infection, which is a preventable, controllable, and treatable disease, patients must have access to medical information, understand recommendations, remember medication times and doses, and execute treatment plans. All these skills are affected by the HL level of individuals. Low HL level is one of the leading social determinants of TB management and control.

The WHO recommends using masks as a control measure to limit the spread of COVID-19. The use of masks is recommended for people who are confirmed or suspected to be infected with the virus, as well as for people who seem healthy [19]. The positive people may not always show symptoms of COVID-19 infection so they can be an asymptomatic source [20]. The majority of TB patients incorrectly answered the statements questioning that people infected with COVID-19 would not always show symptoms and that they could be contagious even if they were asymptomatic in our study. This situation may prevent pandemic control measures by creating the perception of "I am not sick, so I do not need to wear a mask".

For individuals' HL levels to be at the desired level, they must have acquired basic literacy skills such as accessing the correct health information from suitable sources, combining information obtained from different or complex texts, and making calculations. A high level

Figure 1. Distribution of HL level and COVID-19 knowledge level.



of education increases the probability of acquiring these skills, which are necessary for a high level of HL [21]. The frequency of inadequate HL levels was higher, and the level of COVID-19 knowledge was lower in people without a diploma in our study. In the study of Shrestha *et al.* in Nepal, it was reported that the frequency of insufficient HL levels and disease knowledge were lower in those with low education levels. It was shown that there is a strong relationship between the HL level and the level of disease knowledge in the same study [22]. In a web-based study conducted by Lawrence *et al.*, it was shown that there is a positive correlation between education level and COVID-19 HL; and as the HL level of individuals increased, their knowledge about the disease increased, and their attitudes to exhibit protective behaviors were higher [23]. Another study reported that the HL level and drug knowledge were related, and those with sufficient knowledge and HL levels had higher drug compliance [24]. Our study also found a positive correlation between the HL level and COVID-19 knowledge level, which is in line with the literature. This result reveals the importance of HL level for improving patient-provider communication and disease management. In addition, the relationship between education and HL levels shows that strategies to enhance HL at all education levels should be developed, implemented and evaluated.

COVID-19 disease started in China at the end of 2019, spread to the world quickly, and the first case was reported in our country in March 2020 [25]. Information about COVID-19 has increased on various platforms worldwide, both in traditional media, on the internet, and in digital media. This situation has made it inevitable to increase the information far from being scientific and will lead the public to panic and fear. An infodemic has also been experienced along with the

viral pandemic, and the current situation has become more complex. In such an uncertain sea of information, HL plays a critical role in understanding the information given by public health professionals [26].

In the study of Lawrence *et al.*, it was reported that as the COVID-19 HL of people increased, they believed less in conspiracy theories [23]. In a study conducted by Alicilar *et al.*, it was reported that the most common source of information about COVID-19 is the mass media [27]. Our study determined that approximately 80% of people follow the news about COVID-19 frequently/every day, and 70% of them follow this by using mass media.

Various studies have shown that the internet has become an important source of health information for the public [28,29]. These results reveal that the messages given to society in both traditional mass media, such as TV/RADIO and new mass media, such as social media, should be accessible, transparent, understandable and appealing to all levels. In addition, those findings highlight the need to assess and address eHealth literacy as part of pandemic control efforts.

The COVID-19 guideline was prepared by the Ministry of Health, General Directorate of Public Health, to combat the pandemic in Turkey at the beginning of the pandemic. This guideline has been constantly updated in line with the developments. The quarantine/isolation practices have come to the fore within the scope of the measures. Those who are sick within the range of quarantine/isolation practices or are suspected of being exposed (contacted) to the disease agent and those who come from abroad have stayed at their homes or places determined by the state for the specified periods in the guide [20]. Although many people have heard terms such as contact tracing, quarantine, and isolation during the COVID-19 pandemic we have had similar applications throughout history [30-32]. While 9 out of 10 people in the study group defended the correctness of the quarantine/isolation practices, 8 of them thought that those who did not comply with the isolation/quarantine rules should be punished, and 7 of them felt that infecting someone else with the COVID-19 infection should be considered a crime. Contact tracing and quarantine practices can prevent a person's freedom and autonomy from making their own decisions about future [30-32]. However, preventing the transmission of the infection at the individual level is extremely important to control the spread of the epidemic. In this situation, people may have to choose between their health and freedom. A point that should be remembered is that some practices that cannot be accepted under

normal conditions can be applied when public health is in an emergency.

Öztürk *et al.* conducted qualitative research about the experiences of patients diagnosed with TB during the COVID-19 pandemic in Turkey. They concluded that during the COVID-19 pandemic, TB patients show individual reactions emotionally, physiologically and behaviorally when diagnosed, and they cope with these reactions by turning to religion and accepting methods. To reduce the physiological, emotional, and behavioral reactions in TB patients and to teach effective coping techniques for these reactions, it is recommended that the patients be educated on the symptoms of TB, symptom management, treatment process, medications, and stress coping strategies [33].

In summary, HL includes the ability to make the right decision about an individual's health. Low HL levels in the COVID-19 pandemic threaten TB patients' health and public health. Improving HL might have positive effects on public health.

Conclusions

According to the study results, it was observed that the HL level was low (only 23% was adequate) among TB patients, and the rate of COVID-19 transmission was relatively high (43%), which could be related to inadequate HL levels in addition to some health reasons.

It was seen that the increase in the education level increases both the HL level and the COVID-19 knowledge level. TB patients frequently follow the news about COVID-19 on television. Therefore, using the media effectively in studies to improve HL is important.

The higher level of COVID-19 knowledge in TB patients with adequate HL levels suggests the importance of increasing the HL order in the effective fight against the pandemic.

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