HEALTH SCIENCES QUARTERLY

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International Peer-Reviewed
and Open Access Electronic Journal

VOLUME : 2
ISSUE: 3

E-ISSN: 2791-6022
DOI: 10.26900/HSQ
2022

HOLISTENCE publications

FORMERLY NAME: JOURNAL OF SCIENTIFIC PERSPECTIVES E-ISSN:2587-3008

HEALTH SCIENCES QUARTERLY

E-ISSN: 2791-6022
DOI: 10.26900/hsq

Formerly Name: Journal of Scientific Perspectives
E-ISSN: 2587-3008

International Peer-Reviewed and Open Access Electronic Journal

Volume: 2
Issue: 3
July 2022

https://journals.gen.tr/jsp
hsq.editorial@holistence.com
Address: Sarıcaeli Köyü ÇOMÜ Sarıcaeli Yerleşkesi, Teknopark, No: 29, D.119
Çanakkale / Türkiye

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Aims and Scope

Health Sciences Quarterly (Health Sci. Q.) is an open-access journal that publishes original research papers, case reports, and reviews, clinical studies covering a wide range of subjects in life sciences and medicine as well as clinical and experimental investigations only in English.

Researchers in health sciences will find much of great use and interest in the Health Sci. Q.

HSQ aims to supply scientists of health with resources in order to provide the scientific knowledge through the publication of peer-reviewed, high quality, scientific papers and other material on all topics related to Medicine, Pharmacy and pharmaceutical sciences, Dentistry, Nursing, Bioethics, History of medicine, Health economics, Pharmacoeconomics, Medical education, Public health, and Epidemiology.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2021-10-07
Accepted: 2022-05-17

ORIGINAL ARTICLE

Nursing students' innovation and creativity approaches: A descriptive study

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Abstract

The aim of this study is to reveal the creativity and innovativeness attitudes of nursing students who receive vocational education, to determine the influencing factors and to increase their awareness of innovation and creativity in nursing. The research was conducted as a descriptive study. The sample consisted of 399 nursing students. To collect data "Personal Information Form", "Individual Innovativeness Scale Adapted for Nursing", "Individual Creativity Scale" were used. Descriptive values, Shapiro-Wilk, Chi-square, Student's-t, ANOVA, Tukey, Pearson Correlation test were used in the evaluation of the data. Ethics committee and institutional permission were obtained for the study. The average age of the participants is 20.82 ±1.69. The total score average of the participants is 59.19 for the Individual Innovativeness Scale and 55.58 for the Individual Creativity Scale. A significant relationship was found between genders, the place lived in the longest, the need for innovative thinking and individual innovativeness total score average. Also, a significant relationship was found between gender, place lived in the longest, participation in scientific activities related to creativity and innovativeness and innovative thinking status and creativity scale average score. The participants were skeptical about individual innovativeness and their creativity score average was at a medium level. The creativity and innovation scale scores of the participants were affected by some sociodemographic characteristics. It is recommended to plan trainings to raise awareness about innovation and creativity.

Keywords: Innovation, creativity, nursing, student

Citation: Can Özdemir R, Işık MT. Nursing students' innovation and creativity approaches: A descriptive study. Health Sci Q. 2022;2(3):117-26. https://doi.org/10.26900/hsq.2.3.01

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Introduction

Developments in technology and medicine have led to an increase in expectations and possibilities in health services. In this context, nurses are expected to be more open to innovations and develop their creativity in the care and treatment process.

Innovative practices are important in reducing costs, improving the quality of care and evidence-based nursing practices, and increasing scientific knowledge [1,2]. The main factor in spreading innovation is nurses thinking with an innovative point of view and putting those ideas into practice [1].

Therefore, an innovation culture must be established in order to increase and develop innovative practices in nursing. Despite the unit they work in, nurses should take on important roles in innovation and be a pioneer in developing new technologies, procedures and policies [3]. In their study, Zhong et al. (2018) emphasized that supporting nursing students in developing innovative awareness and skills is very important for the quality of patient care [4].

Creativity is essential in the advancement of nursing practices and assessing the quality and outcomes of care. The creativity of nurses plays an important role in the development of the health institutions, increasing productivity and ensuring sustainability. Being creative in nursing practices includes being open to change, being able to evaluate opportunities and accepting flexibility in perspective [5,6]. Liu et al. (2020) defined creative teaching behaviors as actions that improve student creativity [7]. Four elements to improve student creativity are; (1) autonomous learning promoting independence; (2) creative thinking that encourages creative approaches to problem solving, decision making, and flexibility; (3) traits / motivation that encourage students to learn basic needs and to approach conflict in a positive manner; and (4) to create environments / opportunities that encourage student collaboration and interpersonal interaction.

The reflection of the developments in science and technology on medicine, the increase in competition in the health system and the increase in the quality of care have made innovation in the field of nursing necessary [4,8,9]. In the International Council of Nurses (ICN) 2014-2015 Biennial report, "innovativeness" is explained with the concepts of transformation, progressiveness, being evidence and solution-oriented [10]. According to the ICN 2020 nursing practice guideline, in order to improve health care, the specialist clinical nurse should lead innovations and changes in practices and produce innovative alternative solutions with a multidisciplinary approach to the problems experienced in the care process [11]. Therefore, in the modern nursing profession, it is important to follow and apply innovations and be creative in limited resources to give the best care. Yang et al. (2018) emphasized the importance of creating open environments that encourage learning and teaching creative thinking skills by discovering new teaching methods in nursing education, and preparing nursing students with problem-solving skills who can think creatively and innovatively [12].

Nursing students are the professionals of the future. It is important to increase sensitivity and awareness about innovation and creativity in clinics during vocational training. The aim of this study is to reveal the creativity and innovativeness attitudes of nursing students who receive vocational education, to determine the influencing factors.

Research Question

What are the factors affecting nursing students' approaches to individual innovativeness and creativity?

Does the nursing students' individual innovativeness approach affect their creativity attitude?

Materials and Methods

Study Design

The research was conducted as a descriptive study.

Place and characteristics of the study

This study was conducted with nursing students of a university located in southern Türkiyeduring the spring semester of the 2018-2019 academic year.

Study sample

The population consists of 815 nursing students of a university. No sampling method was used; after the information session, the students who accepted to participate in the study were included in the sample. All of the volunteer nursing students who accepted to participate in the study and filled the questionnaire completely were included in the study. 49% of the universe has been reached.

Instruments

Data collection form consists of three parts: "Personal Information Form" created by researchers after scanning the literature, "Individual Innovativeness Scale Adapted for Nursing" and "Individual Creativity Scale". Personal Information Form: This form consists of 17 questions about innovativeness, creativity and demographic characteristics of the participants [13-16]. Individual Innovativeness Scale (IIS) Adapted for Nursing: The scale was developed in 1977 by H. Thomas Hurt, Katherine Joseph and Chester D. Cook. The validity and reliability of the adaptation of the scale for nursing was conducted by Sarıoğlu Kemer and Altuntaş in 2017 [13] .This Likert-type scale (strongly disagree: 1, strongly agree: 5) includes 18 items and 3 sub-scales (opinion leadership, resistance to change, risk taking). 82 and above are classified as innovators, 75-81 pioneers, 66-74 interrogators, 58-65 skeptics, 57 and less traditionalists [15]. Cronbach's alpha reliability coefficient is 0.82. [13].

Individual Creativity Scale (ICS): This scale was developed by Balay in 2010. It consists of one dimension and 16 questions. The lowest score that can be obtained is 16 and the highest score is 80. There are no reverse questions. Scoring was done according to a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) [17]. As a result of the reliability analysis, the coefficient of alpha internal consistency of the individual sub-division has been found as 92, that of the administrative sub-division found as 93, and of the social sub-division as 95 [17].

Application of data collection form

After being informed about the study, students who met the inclusion criteria and agreed to participate in the study completed the data collection forms. It took approximately 10-15 minutes to complete the form. The data collection form was distributed face to face by the researchers during the students' recess and the data were collected.

Data analysis

STATISTICA 13.3 program was used for data entry and analysis. Descriptive statistics of categorical data were given as numbers and percentages, and descriptive statistics of continuous variables were given with mean, standard deviation and minimum-maximum values. Chi-square test was used to determine the relationship between categorical data. Student's-t test was used to control the difference between the two group averages, while the ANOVA test was used for the difference between the means of more than two groups. Pearson Correlation test was used to control the relationship between two continuous variables.

Ethical considerations

Permission was obtained from the non-invasive clinical research ethics committee of the university (No: 05, Date: 23.05.2019). Also, written permission from the nursing department dean and written consent from the participants were obtained. Before data was collected, verbal consent was obtained from the participants after the purpose of the research in accordance with the Helsinki Declaration was explained. Also, participants were informed about the fact that their participation is voluntary, and their answers will be kept confidential and evaluated only as scientific data.

Results

Characteristics of the participants

The average age of the participants is 20.82 ± 1.69 (18-29) and academic grade point average is 73.11 ± 8.64 (50-100). 64.9% of the participants were female; 36.1% first, 26.8% second, 17.3% third, 19.8% were fourth year students. Half the participants' income, 52.4%, is equal to expenses, 39.4% income less than expenses and 8.1% income more than expenses. 74.1% are anatolian/ science high school, 14.4% medical vocational/

vocational high school and 11.6% are regular high school graduates.

Half of the participants' mothers, 50.6%, are primary school graduates and 24.2% are illiterate. Half of the participants' fathers, 50.9%, are primary school and 22.2% are high school graduates. 48.3% of the participants lived in the province, 36% in the city, 15.6% in the village / town the longest. When asked about internet use, 55.4% stated 1-3 hours, 19.4% 4-7 hours, 15.1% 10 hours and morre, 10.1% 7-10 hours weekly. Reason for the use of the Internet were; 11.1% access to information sources, 10.5% watching TV / music / videos,9.5% doing homework, 8.6% social networking and 7% Internet surfing. 61.9% of the participants did not attend conferences / courses / training on innovation and creativity. 33.7% of the participants defined innovation as innovation, 35.5% as creativity and 24.7% did not know, 5.6% as entrepreneurship, 0.5% gave other statements. 74.6% stated that nurses should think innovatively.

Comparison of participants' demographic characteristics and individual creativity scale Scores and individual innovativeness scale mean scores

A statistically significant difference was found between the Individual Creativity Scale and Individual Innovativeness Scale scores ($p < 0.001$). There is a statistically significant, linear, moderate positive correlation ($p < 0.001$; $r = 0.679$) between the ICS total score and the opinion leadership sub-scale. Also, a statistically significant, linear, moderate positive relationship was found between the ICS total score and the risk taking sub-scale. ($p < 0.001$; $r = 0.585$). In addition, a statistically significant, linear, moderate positive correlation was found between ICS total score and IIS total score ($p < 0.001$; $r = 0.555$) (Table 1).

IIS total score average is 59.19 and median is 59. For this study, Cronbach's α reliability coefficient was determined as 0.82. ICS total score average is 55.58 and median is 56. Cronbach's α reliability coefficient for this study was determined as 0.94. A statistically significant, linear, and positive low correlation was found between the ICS total score and the IIS total score ($p < 0.001$; $r = 0.555$) (Table 1).

There was a statistically significant relationship between gender and the IIS total score ($p = 0.001$) and the IIS total score average and the need for innovative thinking ($p = 0.013$). This difference is due to the difference between the group which stated that innovative thinking is not necessary and the groups that states "yes" and "I don't know" ($p = 0.018$; 0.009). A statistically significant difference was found between the IIS total score and the place lived the longest. This difference is due to the fact that those living in the province are different from those living in the city and in villages / towns ($p = 0.024$; $p = 0.017$). When looking at the relationship between IIS sub-scales and individual demographic characteristics, a statistically significant difference was found between the resistance to change sub-scale and gender ($p < 0.001$). The average of resistance to change score of the male participants was higher (Table 2). No significant difference was found in the comparison of the participants' other demographic characteristics and the IIS sub-scales ($p > 0.05$).

Table 1. Individual innovativeness scale sub-subscales versus individual creativity scale total score comparison

	Individual Innovativeness Scale							
	Opinion Leadership Sub-scale		Risk Taking Sub-scale		Resistance to Change Sub-scale		Individual Innovativeness Scale Total Score	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Individual Creativity Scale Total Score	0.679	**<0.001**	0.585	**<0.001**	-0.018	0.723	0.555	**<0.001**

r:Pearson Correlation

A statistically significant difference was found between the risk taking sub-scale and the year of study (p = 0.031). This was due to the difference between the second year, first year and the fourth year students (p = 0.011; 0.014). A statistically significant difference was found between the year of study and resistance to change sub-scale scores (p = 0.003). This was due to the difference between the scores of the second year and the first year students (p = 0.001) (Table 2).

A statistically significant difference was found between the resilience to change sub-scale and the type of high school graduated (p = 0.026). The average score of medical vocational high school graduates is lower than those graduated from other high schools (p = 0.013; p = 0.041). A statistically significant difference was found between the opinion leadership sub-scale and the status of participation in conferences / courses / training related to innovation (p = 0.004).The sub-scale mean score of those who attended an activity on innovation was found to be higher. A statistically significant difference was found between the opinion leadership sub-scale average and the status of participation in conferences / courses / training related to creativity (p = 0.008). A statistically significant difference was found between the resilience to change sub-scale mean score and the definition of innovation (p = 0.009).

Table 2. Comparison of participants' demographic characteristics and individual innovativeness scale mean scores

		INDIVIDUAL INNOVATIVENESS SCALE			
		Opinion Leadership Sub-scale	**Risk Taking Sub-scale**	**Resistance to Change Sub-scale**	**Individual Innovativeness Total Scale**
		M±SD	M±SD	M±SD	M±SD
Gender	Female	24.95±4.01	15.90±2.30	17.41±4.39	58.27±6.64
	Male	25.46±4.01	15.82±2.56	19.61±5.21	60.96±8.07
	Student's t Test: *p*	0.230	0.772	**<0.001**	**0.001**
Year of Study	1st Year	25.13±3.81	16.15±2.39	17.21±4.13	58.51±6.30
	2nd Year	24.51±4.43	15.37±2.51	19.53±5.30	59.41±8.91
	3rd Year	24.94±4.07	15.68±2.48	18.23±4.78	58.95±7.66
	4th Year	26.14±3.58	16.24±1.99	17.93±4.86	60.32±5.85
	ANOVA Test: *p*	0.058	**0.031**	**0.003**	0.358
Type of High School	Regular High School	25.17±4.00	15.47±2.23	19.34±4.59	60.00±6.89
	Anatolia/Science High School	25.12±4.00	15.88±2.45	18.16±4.79	59.19±7.09
	Medical Vocational High School	24.90±4.19	16.11±2.22	16.94±4.80	57.96±8.29
	Vocational High School	29.50±3.53	17.00±2.82	24.00±4.24	70.50±2.12
	ANOVA Test: *p*	0.472	0.529	**0.026**	0.074
Place lived the longest	Province	24.70±3.83	15.70±2.46	17.74±4.25	58.14±6.61
	City	25.65±4.16	16,09±2.24	18.20±5.46	59.99±7.76
	Town/village	25.28±4.09	16.08±2.16	19.32±4.72	60.71±7.59
	ANOVA Test: *p*	0.105	0.282	0.083	**0.017**
Attended conference/course/training on innovation	Yes	25.87±3.58	16.15±2.08	17.86±5.10	59.86±6.45
	No	24.65±4.21	15.73±2.56	18.30±4.6	58.75±7.7
	Student's t Test: *p*	**0.004**	0.088	0.388	0.149
Attended conference/course/training on creativity	Yes	25.83±3.70	16.06±2.04	17.70±4.9	59.62±6.47
	No	24.69±4.16	15.78±2.59	18.37±4.7	58.88±7.7
	Student's t Test: *p*	**0.008**	0.258	0.194	0.341
Definition of innovation	I don't know	24.43±4.26	15.38±2.6	18.70±4.7	58.55±7.6
	Innovation	25.32±3.6	16.14±2.36	17.37±4.5	58.83±6.49
	Creativity	25.08±4.10	15.94±2.19	18.37±4.8	59.39±7.5
	Entrepreneurship	26.00±3.71	15.63±2.38	21.00±4.9	62.95±8.5
	Other	30.00±4.24	19.00±1.41	14.50±7.7	63.50±2.12
	ANOVA Test: *p*	0.131	0.055	**0.009**	0.118
Need for innovative thinking	Yes	25.46±3.9	16.12±2.25	17.57±4.7	59.18±7.09
	No	26.83±4.06	15.41±2.10	22.83±3.8	65.08±6.81
	Undecided	23.83±4.10	15.09±2.7	19.51±4.6	58.46±7.67
	ANOVA Test: *p*	**0.001**	**0.002**	**<0.001**	**0.013**

This is due to the difference between the group that defines innovation as entrepreneurship and the group that doesn't know the definition of innovation. Also there was a differene between the group that defines innovation as innovation and the group that defines innovation as creativity. (p = 0.045; p = 0.001; p = 0.018; p = 0.037) (Table 2).

A statistically significant difference was found between the opinion leadership sub-scale of the IIS and the need for innovative thinking (p = 0.001). This was due to the differences between the groups that stated "Undecided about the necessity of innovative thinking", "Innovative thinking is necessary" and "Innovative thinking is not necessary" (p = 0.003; p = 0.044). A statistically significant difference was found between the risk taking sub-scale score and the group who declared that "Innovative thinking is necessary" (p = 0.002). The group that stated "Innovative thinking was necessary" had a higher mean score than the other groups (p = 0.001). Also, a statistically significant difference was found between the resistance to change sub-scale and the need for innovative thinking (p <0.001). This difference was caused by the difference between the group saying "Yes" to the necessity of innovative thinking and the groups saying "No" and "I don't know" (p <0.001; p = 0.002) (Table 2).

A statistically significant difference was found between gender and Individual Creativity Scale (p = 0.043). Also, a statistically significant difference was found between the place lived longest and ICS (p = 0.005). This difference is due to the difference between the groups that live in the province and city (p = 0.005). In terms of the ICS, a statistically significant difference was found between the participants' participation in a course / training related to innovation (p = 0.012) and the status of participating in a course / training about creativity (p = 0.003). Also, a statistically significant difference was found between the groups that think nurses need to think innovatively (p = 0.011). This difference arises between those that answered "Yes" and "I do not know" (p = 0.010) (Table 3).

Discussion

The participants with high ICS total score also had high IIS total score. The participants were skeptical about individual innovativeness. The creativity score average was at a medium level. Studies have found that the level of individual innovativeness of nursing students is low [18,19]. In this study, the participants with high individual creativity scores had higher opinion leadership and risk-taking sub-scale mean scores. Also the participants of our study were not directly open to innovative approaches, attitudes and practices in the field of nursing; they evaluated these innovations with suspicion. Although the participants' creativity scale scores were high, it can be said that they had difficulty in transferring their creativity to their innovative approach.

Table 3. Comparison of participants' demographic characteristics and individual creativity scale scores

		Individual Creativity Scale	
		M±SD	*p*
Gender	Female	54.83±10.26	**0.043***
	Male	57.05±10.12	
Place lived the longest	Province	53.8±9.6	**0.005****
	City	57.50±11.17	
	Town/Village	56.7±9.26	
Attended conference/course/training on innovation	Yes	57.26±9.38	**0.012***
	No	54.5±10.68	
Attended conference/course/training on creativity	Yes	57.26±9.38	**0.012***
	No	54.5±10.6	
The need for innovative thinking	Yes	56.35±10.02	**0.011****
	No	57.6±7.8	
	Undecided	52.6±10.9	

M±SD: The mean and standard deviation,*: *Student's t Test*, **: ANOVA Test.

A significant relationship was found between gender and the IIS total score. Both genders showed a skeptical approach to innovativeness. Male students had higher IIS total scores than females. Similar results were found in a study conducted with nurses working in intensive care units [20]. In studies found a statistically significant difference between gender and IIS and ICS score where female's scores were higher [21,22]. These differences may arise from personal characteristics. These differences may originate from the patriarchal culture in Türkiyeand male gender receiving more support.

In this study, a significant relationship was found between the longest place of residence and the IIS total score. The IIS scores of those living in villages / towns was found to be higher than others. In other studies, no significant difference was found between the IIS scores and where students live [19, 23]. In the literature, different results were shared about effects of the environment on the innovative approach. We can conclude that the environment the participants in this study live in supports innovative approach. The participants that live in villages and towns interact with their environments more and different stimuli leads young individuals to think innovatively.

A significant relationship was found between the place of residence and the ICS score where the creativity approach of the people living in the district was higher. In a study conducted with nursing students, a significant relationship was found between the place of residence and the average score of creativity ($p < 0.005$), while the scale scores of the people living in the province were high [18]. The environments where creativity is supported are an important source of inspiration and support for the creativity of the individual.

A significant relationship was found between year of study and IIS risk taking and resistance to change sub-scales. The mean scores of the second year students in the risk-taking sub-scale and the first-year students' in the resistance to change sub-scale were found to be lower. In one study were found to be at a good level, and the innovative behavioral attitudes were more positive in graduate students than undergraduate students [4]. Literature review and results of this study reveal that the education level is a factor in the individual innovativeness approach.

In this study, a significant relationship was found between the high school graduated from and the IIS resistance sub-scale. The average score of medical vocational high school graduates is lower than others, while the average score of other vocational high school graduates is the highest. The knowledge and skills acquired during vocational education have a positive effect on the tendency to be innovative and creative. In studies conducted with nursing students [24] and medical students [22], the average of innovation and creativity scores of students with higher education levels were found to be higher. These differences may be due to the students' having different personal characteristics and experiences.

In this study, a significant relationship was found between participating in an activity related to innovativeness and creativity and the opinion leadership sub-scale of the IIS and the ICS score. The mean scores of those that participated in an activity related to innovation and creativity were higher. According to Saeed et al., education about creativity affected nurses' attitudes towards creativity positively and that there were insufficiencies in developing creativity in nursing education [5]. Studies concluded that education contributes to the development of nursing students' creativity and innovativeness [15,25,26]. In line with this, it can be concluded that planning curriculum to develop innovative approach and creative thinking in the nursing education can increase awareness on this issue.

In this study the group that defines innovation as entrepreneurship has the highest score. In a study, 45.7% define innovation as "innovation", and they are aware of the necessity of innovation in the field of nursing [19]. Liu et al. (2020) defines the creative capacity for health research as the ability to produce something new and useful that could be a concrete product, an abstract idea, or a theory [7]. Noles et al. (2019) stated that innovative lead nurses have an important role in obtaining better patient care, being cost effective and coping with chronic conditions

[27]. While entrepreneurship means building a business by taking risks, innovation is the introduction of new methods in social, cultural and administrative environments in order to adapt to changing conditions.

In this study, a significant relationship was found between the necessity of innovative thinking and the total IIS score. The average score of the group who thinks innovative thinking is not necessary is higher than the indecisive group. Nurses need the support of entrepreneurial leaders to exhibit Innovation Work Behavior in the process of discovering, producing, and implementing a new idea [28]. Studies have emphasized the importance of encouraging lead nurses and nurses to use new technologies in their workplaces, and innovation ability being a part of the profession [3,29,30]. Researchers concluded that adopting innovative thinking is an element that will contribute to being open to creative and innovative in the areas served.

In this study, a significant relationship was found between the necessity of innovative thinking and the ICS score. The average score of the group who thinks innovative thinking is not necessary is higher. In a study evaluating the effectiveness of creativity courses in nursing students, the importance of developing creative thinking skills and integrating creative teaching techniques into nursing education was emphasized [31]. While creativity requires an idea, interpretation or solution that solves a problem, innovations involve the application of that idea [32,33]. It is possible to say that creativity and innovativeness will have positive effects on people's daily lives and professional development, as well as providing new perspectives. Innovative thinking will also contribute to an increasing in the quality of health care services.

Conclusion

The participants were skeptical in terms of individual innovativeness. The creativity score average was at a medium level. The IIS and ICS scores were affected by some socio-demographic characteristics. Participating in various scientific activities related to innovation and creativity positively affected the creativity and innovativeness approach. Creating course content and seminars and encouraging students to participate in activities aimed at developing creativity and innovativeness skills are recommended during nursing education.

In order for nurses to be open to innovations in clinics, their knowledge on the subject should be developed during their education. Innovative and creative nurses will provide better quality service in patient care. Being open to the innovation contributes to improving care and increasing patient satisfaction.

Limitations: The location and sample of this study is a limitation. The study was conducted with nursing students of a university in southern Türkiye.

Funding

No support of grants was used for the purpose of this research.

Conflict of interest

No potential conflict of interest was reported by the authors.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2022-05-05
Accepted: 2022-07-20

ORIGINAL ARTICLE

Investigation of *CYP1B1*3* and *CYP1B1*4* polymorphisms in a Turkish population

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Abstract

CYP1B1 is a P450 enzyme involved in activating pro-carcinogens to carcinogens as well as estrogen metabolism. In order to examine the effect of CYP1B1 on cancer metabolism, it should be compared with healthy individuals and whether the polymorphism between healthy individuals and sick individuals is significant. This study aims to screen the CYP1B1*3 and CYP1B1*4 polymorphisms of a group of individuals who have not been diagnosed with cancer to examine the genetic differences of metabolic enzymes in the Turkish population.This study is a cross-sectional type descriptive study.The study included 295 patients without a cancer diagnosis. The research sample includes patients who applied to Ankara University Medical Faculty Hospital and Afyonkarahisar Health Sciences University Research and Application Hospital. The individuals signed voluntary consent forms before participation, and 3 ml blood samples were taken from each. DNA samples were obtained using a DNA isolation kit, and then polymorphism was determined by real-time PCR. The distribution of CYP1B1*3 and CYP1B1*4 polymorphism in healthy individuals was determined. The frequency of CYP1B1*1/*1 (wild type), CYP1B1*1/*3 (heterozygous) and, CYP1B1*3/*3 (mutant) genotypes were found 39.33%, 50.67% and 10.0% respectively. The frequency of CYP1B1*1/*1 (wild type), CYP1B1*1/*4 (heterozygous) and, CYP1B1*4/*4 (mutant) genotypes were found 39.31%, 60.69% and 0% respectively. No individuals with mutant genotype were detected in this genotype (CYP1B1*4).The results show that the genotype frequencies of the CYP1B1*3 gene polymorphism in a Turkish population are similar to other Caucasian populations. However, it was determined that the Turkish population did not show similarity with other races in terms of CYP1B1*4 polymorphism.

Keywords: CYP1B1, polymorphism, rs1056836, rs1800440, Turkish population

Citation: Kargın Solmaz FÖ, Akgöl J, Becit Kızılkaya M, Ada AO. Investigation of *CYP1B1*3* and *CYP1B1*4* polymorphisms in a Turkish population. Health Sci Q. 2022;2(3):127-38.. Health Sci Q. 2022;2(3):127-138. https://doi.org/10.26900/hsq.2.3.02

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Introduction

Cytochrome P450 (CYP) enzymes are membrane-bound hemoproteins that play a crucial role in xenobiotic detoxification, cellular metabolism, and homeostasis [1]. CYP1B1, an important isozyme of this enzyme family, is a crucial enzyme involved in the formation of drugs and reactive estrogen metabolites and the metabolism of environmental carcinogens such as polycyclic aromatic hydrocarbons [2].

The CYP1B1 enzyme system was first identified as a new enzyme when it was transcriptionally induced by 2,3,7,8-tetrachlorodibenzo-p-dioxin in the keratinocyte cell line [3]. CYP1B1 is transcriptionally induced by 2,3,7,8-tetrachloro-hydro benzo-p-dioxin or dioxin and is regulated by specific transcriptional switches, including the estrogen receptor and aryl hydrocarbon receptor (AhR) [4]. Transcriptional regulation is important in treating CYP1B1-positive tumor cases [5]. In normal tissues, CYP1B1 binds to 2,3,7,8-tetrachlorobenzo-p-dioxin by cytoplasmic AhR and is activated by AhR, heat shock protein -90, XAP2, and p23 proteins. The elongation region (-5298 to -5110) of CYP1B1 contains several steroidogenetic factors-1 that interact with two cAMP-sensitive elements (CRE1 and CRE2). The cAMP signal transduction pathway is critical in the adrenal glands, testes, and ovaries [6].

CYP450 enzymes are primarily found in the liver, while CYP1B1 enzymes are also found in extrahepatic tissues and cells. CYP1B1 must be found in the ovaries, testicles, adrenal glands, prostate, uterus, and breast tissue. Immunohistochemical studies have shown that the protein-synthesizing this enzyme can be isolated from these tissues in esophageal, brain, lung, and breast cancer [7]. Polymorphisms in the *CYP1B1* gene cause changes in enzyme activity. There are many studies regarding the relationship of these polymorphisms with glaucoma, obesity, cardiovascular diseases, and hormone-mediated cancers [8, 9]. In previous studies on the Turkish population, Ada et al.[10] investigated the *CYP1B1*4* polymorphism in coke oven workers with 49 people. In their study, Güler et al. [11] examined *CYP1B1*2* and *CYP1B1*3* polymorphisms in lung cancer patients. An insufficient number of patients in the first study and polymorphism in only lung cancer patients in the second study made it necessary to carry out studies with a more significant number of patients and control groups and to conduct these studies with other cancer types. Ozbek et al. [12], on the other hand, investigated the *CYP1B1*3* polymorphism in breast cancer with a case-control study. As a result of this study, polymorphism frequencies were 9,56.2 and 34.8% for wild-type, heterozygous and mutant, respectively. In this study, the classical PCR method was used for genotype determination.

Increased expression in certain diseases makes CYP1B1 a therapeutic target, especially for cancer diseases. Polymorphisms in this gene may also affect pharmacokinetic parameters and lead to differences in drug responses [13].

Molecular epidemiological studies have become increasingly important in determining countries' health policies, revealing social differences and similarities, and guiding treatment protocols. This study aims to screen the *CYP1B1*3* and *CYP1B1*4* polymorphisms of a group of individuals who have not been diagnosed with cancer to examine the genetic differences of metabolic enzymes in the Turkish population. It is crucial to perform the *CYP1B1*3* and *CYP1B1*4* polymorphism with a more significant number of healthy individuals since the above studies are conducted with a limited number of people, performed with classical PCR, and used only in studies of determining drug resistance in lung cancer patients in Turkish society. This study gains importance as it is the first study to determine the *CYP1B1*4* polymorphism in the Turkish population. It is also an important study in determining the polymorphic distribution of breast, prostate, over, endometrıum, and many other cancer types, which are determined to be effective, especially with CYP1B1, and providing the possibility of comparison with cancer patients in further studies.

Materials and Methods

This study is a cross-sectional type descriptive study. The design of the study was created by following The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Study population

While determining the study sample, these two articles were taken as reference, and the sample size was determined to be a minimum of 145 for both groups [14-15](Figure 1). The study sample consists of patients who applied to Ankara University Medical Faculty Hospital and Afyonkarahisar Health Sciences University Research and Application Hospital. The study, which was started after the relevant permissions from the Ethics Committee of Ankara University (Approval no: 12-222) and Afyonkarahisar Health Sciences University Clinical Research Ethics Committee (2011-KAEK-2-2021/385) were included in the study, which consisted of volunteer women (111) and men (184), aged 25-71, without a history of cancer and who applied to the hospital for different reasons other than cancer screening and treatment. While the *CYP1B1*3* polymorphism studies of the research were carried out with samples taken from Ankara University Medical Faculty Hospital, the determination of *CYP1B1*4* polymorphism was carried out with samples taken from Afyonkarahisar Health Sciences University Research and Application Hospital. *CYP1B1*3* polymorphism was investigated in 150 individuals; *CYP1B1*4* polymorphism was investigated in 145 individuals. Two polymorphisms could not be studied in the same group, as samples were taken at different places from the control groups included in the study at different times.

DNA isolation

The patients who accepted the study and gave consent were asked to donate 3 ccs of blood to the hemogram tube. The samples were anonymized by adding age information to the initials of the person's names and surnames to be blinded. Samples are stored at 20 °C For genotyping of the samples, DNA isolation was performed using the kit prepared according to the method applied by Miller et al. (1988) [16].

Genotype analyzes

A real-time polymerase chain reaction (Real-time PCR method) was used to determine the relevant gene polymorphisms. The researchers disposed of the remaining samples as medical waste without storage.

The *CYP1B1*3* Leu432Val polymorphism was determined according to the Real-time PCR method of Brünning et al. [17]. Accordingly, 25 µl of the reaction mix, 1µl of each hybridization probe, 1 µl of each primer, 20 µl of water, and 1 µl of DNA. PCR conditions are 15 minutes of initial denaturation at 95°C followed by 40 PCR cycles of melting (95°C for 15 seconds), adhesion (55°C for 30 seconds), and synthesis (72°C for 30 seconds). Genotype differentiation was made by using the fact that the probe-DNA hybrid of the wild-type allele gave a higher melting temperature (Tm) than the probe-DNA hybrid of the mutant allele. In Figure 2, the PCR results of some samples determined depending on the melting temperature are given.

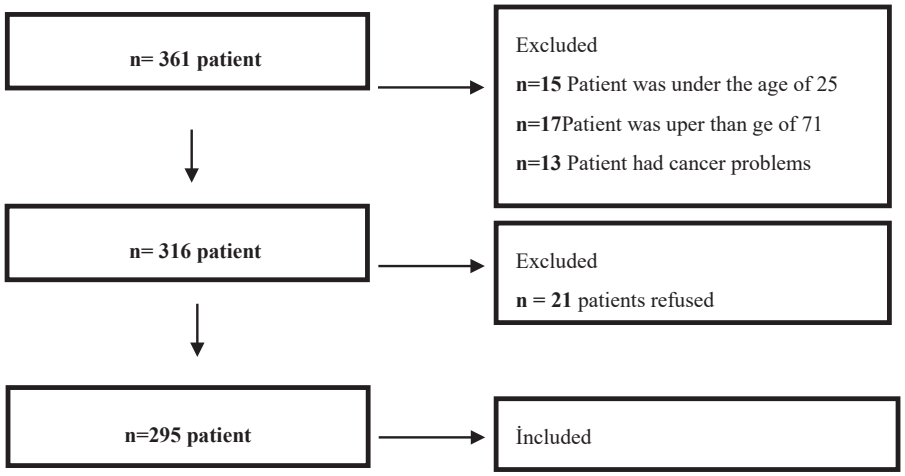

Figure 1. Included and excluded participants

The probes and primers used and their sequences are given in Table 1.

The *CYP1B1*4* Asn453Ser polymorphism was determined according to the Taqman Real-time PCR method. Accordingly, 10 µl of the reaction mixture contains 0,4 µl of each hybridization probe, 0,8 µl of each primer, 2 µl of DNA, and 5,6 µl of water. PCR conditions are 5 minutes of initial denaturation at 95°C followed by 40 PCR cycles of melting (95°C for 15 seconds), adhesion (58°C for 30 seconds), and synthesis (72°C for 15 seconds). PCR results of some samples are given in Figure 3.

Table 1. Probes and primers and their sequences used in the detection of *CYP1B1*3* polymorphism

Primer/Prob	**Primer/Probsequencing 5'-3'**
Prob A	LCR-AACTTTGATCCAGCTCGATTCTTGGACAA-
Prob B	ATGACCCACTGAAGTGACCTAACCC-FL
Primer F	GAAATAAGAATTTTGCTCACTTGC
Primer R	CTTAGAAAGTTCTTCGCCAATG

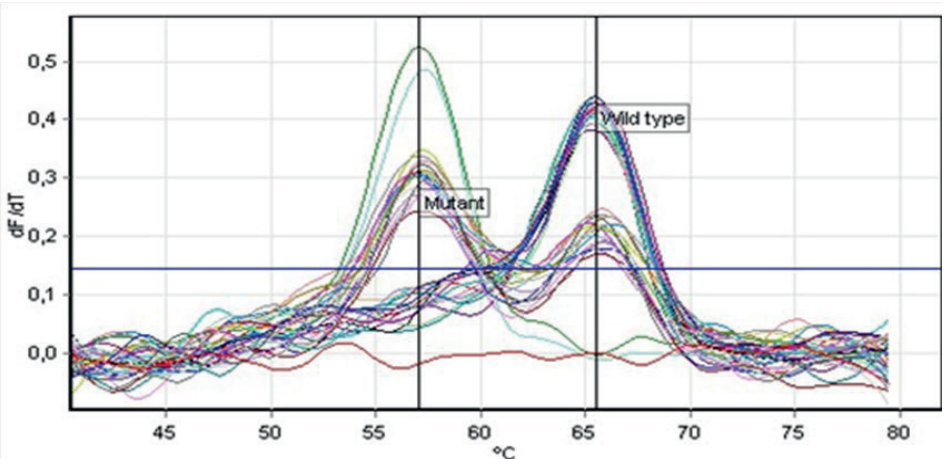

Figure 2. The results of some individuals belonging to the *CYP1B1*3* polymorphism with the melting temperature graph used for genotype discrimination by real-time PCR

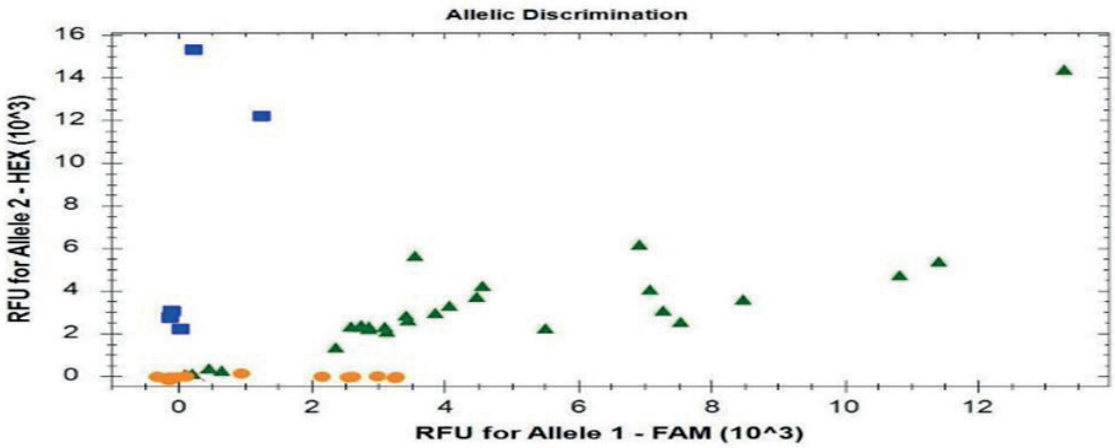

Figure 3. The plot of allelic discrimination from the qPCR reaction of *CYP1B1*4*

The probes and primers used and their sequences are given in Table 2.

In the *CYP1B1*3* polymorphism, the hybridization probe was used with the Brünning method, while the Taqman probe was used in the determination of the *CYP1B1*4* polymorphism. Different graphics were obtained by using different probes.

Statistical Package for the Social Sciences, SPSS 26.0 (IBM Corp. 2019 IBM SPSS Statistics for Windows, version 26.0.) was used to analyze the data on alleles whose numbers and frequencies were specified according to the Hardy-Weinberg equation. Categorical variables were presented as percentages and frequencies.

Results

90% of the individuals participating in the determination of *CYP1B1*3* polymorphism were male, and 10% were female. The mean age of the participants in this polymorphism was 46 (min-max; 21-71). On the other hand, 66.21% of the individuals who determined *CYP1B1*4* polymorphism were female, and 33.79% were male. The mean age of the individuals participating in this polymorphism was 45.08 (min-max 23-63 years) (Table 3).

In *CYP1B1*3* polymorphism, out of 150 individuals, 59 (39.33%) had wild type (*CYP1B1*1/*1)* genotype, 76 (50.67%) had heterozygous (*CYP1B1*1/*3*) genotype, 15 (10%) were found to have homozygous mutant (*CYP1B1*3/*3*) genotype. The genotype frequencies we determined were compatible with the expected genotype frequency according to the Hardy-Weinberg equation ($\chi 2$ = 1.794). When the genotypes are analyzed by gender, in males, 52 individuals (38.52%) have wild type (*CYP1B1*1/*1*) genotype, 70 individuals (51.85%) have heterozygous (*CYP1B1*1/*3*) genotype, and 13 individuals (9.63%) have genotypes. Homozygous mutant (*CYP1B1*3/*3*) genotype was determined. In females, 7 individuals (46.66%) had wild type (*CYP1B1*1/*1*) genotype, 6 individuals (40%) had heterozygous (*CYP1B1*1/*3*) genotype and 2 subjects (13.34%) had homozygous mutant (*CYP1B1*3 /*3)* genotype was determined (Table 4).

Table 4 shows genotype frequencies and expected frequency values of *CYP1B1*3* Leu423Val polymorphism.

In *CYP1B1*4* polymorphism, out of 145 individuals, 57 (39.31%) had wild-type (*CYP1B1*1/*1*) genotype, and 88 (60.69) had heterozygous (*CYP1B1*1/*4*) genotype determined. No individuals with mutant genotype were detected in this genotype. According to the Hardy-Weinberg equation, we determined that the genotype frequencies were incompatible with the expected genotype frequency ($\chi 2$ = 27,58).

Table 2. Probes and primers and their sequences used in the detection of *CYP1B1*4* polymorphism

Primer/Probe	**Primer/Prob sequencing 5'-3'**
Prob A	5FAM/ ATC AAC AAG GAC CTG ACC AGC A /BHQ-1/
Prob B	5HEX/ ATC AAC AAG GGC CTG ACC AGC A /BHQ-1/
Primer F	GGA TGG AGA TGA AGA GAA
Primer R	GAT TCT TGG ACA AGG ATG

Table 3. Gender and age averages of the individuals participating in the study

Genotype	**Sample (n)**	**Female (n-%)**	**Male (n-%)**	**Mean Age (Standard Deviation)**
*CYP1B1*3*	150	15 -10%	135-90%	46(13,13)
*CYP1B1*4*	145	96- 66.2%	49-33.8%	45,08(10,81)

Considering the genotypes by gender, it was determined that 17 individuals (34.69%) had wild type (*CYP1B1*1/*1*) genotype and 32 individuals (65.39%) had heterozygous (*CYP1B1*1/*4*) genotype in males. It was determined that 40 individuals (41.67%) had wild type (*CYP1B1*1/*1*) genotype and 56 individuals (58.33%) had heterozygous (*CYP1B1*1/*4*) genotype in female individuals.

Discussion

No study looks at both polymorphisms in the Turkish population. Ada et al. [10], while looking at only *CYP1B1*4* in people working in a coke oven, Bilgin et al. [18] looked at NSCLC (Non-Small Cell Lung Cancer) patients and *CYP1B1*4.* Güler et al. [11] examined *CYP1B1*2* and *CYP1B1*3* polymorphisms in NSCLC patients.

A study examining the relationship between material or breast cancer treatment and CYP1B1 4326 C> G polymorphism showed that TNBC (Triple Negative Breast Cancer) patients (37.0%) who were carriers of the CYP1B1 4326 GG variant genotypes had significantly lower disease-free rates than TNBC patients who were carriers of the CYP1B1 4326 CC/CG genotypes (71.0%) [1]. In several gene polymorphisms addressed with breast cancer, including the CYP1B1 Leu432Val polymorphism in Mexican women, no significant association was found between the Leu432Val gene polymorphism and breast cancer [19].

In a case-control study performed on 1000 control groups and 911 individuals diagnosed with breast cancer, 11 single-nucleotide polymorphisms were examined. As a result of the examination, it was determined that the rate of developing breast cancer was higher in heterogeneous and homozygous mutant individuals with CYP1B1 Leu432Val and Asn453Ser polymorphisms [20]. It was studied in 200 lung cancer patients and an equal number of controls. A significant difference was observed in the distribution of variant genotypes of CYP1B1Arg48Gly and Ala119Ser polymorphisms (*CYP1B1*2)* in cases compared to controls. No significant difference was observed in the distribution of variant genotypes of the CYP1B1Leu432Val (*CYP1B1*3*) and CYP1B1Asn453Ser (*CYP1B1*4*) polymorphisms [21].

As it can be understood from the examples above, although both polymorphisms were examined in limited numbers in other societies, no study in the Turkish population looked at both at the same time.

Table 4. Distribution of *CYP1B1*3* genotypes

Genotype	n (150)	Observed frequency (%)	Expected frequency (%) (Hardy-Weinberg)
*CYP1B1*1/*1*	59	39,33	41,8
*CYP1B1*1/*3*	76	50,67	45,7
*CYP1B1*3/*3*	15	10	12,5

Table 5. Distribution of *CYP1B1*4* genotypes

Genotype	n (150)	Observed frequency (%)	Expected frequency (%) (Hardy Weinberg)
*CYP1B1*1/*1*	57	39,31	70.4
*CYP1B1*1/*4*	88	60,69	61.3
*CYP1B1*4/*4*	-	-	13.4

When the *CYP1B1*3* polymorphism is compared with some countries, and the results of the *CYP1B1*3* polymorphism in this study and in other countries are examined; *CYP1B1*3* allele frequency was found 40.07% in the Czech Republic, 17.27% in China, 40.67% in Germans, 21.67 in Indians, 54.45% in Americans and 35.34% in our study (Table 6). As can be seen from the table, the *CYP1B1*3* allele frequency is similar to the populations of Germany and the Czech Republic. However, it differs from studies conducted with Chinese, Indian, and American societies. This shows that the incidence of *CYP1B1*3* polymorphism in the Turkish population is similar to that of European Caucasian populations. We can explain the differences in these findings with racial diversity, including Chinese, Indian-Asian race, and American - African American race.

When *CYP1B1*4* polymorphism is compared with other countries, In studies conducted in Spain, England, and America, the frequency of alleles was found to be 21, 18, and 15%, respectively. In Türkiye, the allele frequency of *CYP1B1*4* polymorphism was 30% (Table 7). Therefore, it can be said that the Turkish population does not show similarities with European white races and America in terms of this allele. Apart from this, we also do not show similarity with Japanese, that is, with Asian races, because no heterozygous and homozygous mutant individuals were found in studies conducted with Japanese.

The CYP1B1 polymorphism is significant in understanding the mechanism of many hormone-mediated cancer types and disease types such as glaucoma.

Table 6. Comparison of *CYP1B1*3* polymorphism results with other countries

Country	**n**	**Leu432Val (*CYP1B1*1/1*) (%)**	**Leu432Val (*CYP1B1*1/3*) (%)**	**Leu432Val (*CYP1B1*3/3*) (%)**	**Reference**
Czech	122	30,83	58,20	10,97	[22]
Chinese	278	69,78	25,90	4,32	[23]
German	300	36,33	46	17,67	[24]
India	150	60,67	35,33	4	[25]
USA	1226	20,88	49,34	29,78	[26]
Turkey	150	39,33	50,67	10	This study

Table 7. Comparison of *CYP1B1*4* polymorphism results with other countries

Country	n	**Asn453Ser (CYP1B1*1/1) (%)**	**Asn453Ser (CY1B1*1/4) (%)**	**Asn453Ser (CYP1B1*4/4)(%)**	**Reference**
Spain	297	63,97	30,30	5,73	[27]
England	2694	66,44	30,73	2,83	[28]
England	296	64,19	32,77	3,04	[29]
USA	182	72,52	25,27	2,21	[30]
Japan	200	100	-	-	[31]
Turkey	145	39,31	60,69	-	This study

4326C>G TNP leads to the amino acid substitution Leu432Val (L432V).

This change results in the *CYP1B1*3* allele. This polymorphism is important in the catalytic activity of CYP1B1. This activity causes the formation of 4-OHE2(4-Hydroxyestradiol) and thus increases estrogen carcinogenicity. It is also responsible for the AhR-mediated CYP1B1 gene expression increase. 4390A>G TNP leads to amino acid substitution Asn453Ser (N453S). This change results in the *CYP1B1*4* allele. The amino acid change caused by the 4390 A> G Asn453Ser (N453S) polymorphism does not affect the catalytic properties that play a role in protein production [32]. This polymorphism causes an increase in protein degradation. Therefore it is associated with a decrease in protein expression. In particular, a significant relationship was found between MI (myocardial infarction) and *CYP1B1*4* and smoking. Polymorphisms in the CYP1B1 gene, particularly the *CYP1B1*3* allele, are considered essential determinants of estrogen-mediated cancers [33]. While investigating the estrogen activity of CYP1B1 in women, they should be differentiated according to whether they are in the premenopausal or postmenopausal period. These periods are important because the level of estrogen in both circulation and tissues varies. Since the CYP1B1 enzyme is known to have polymorphic properties, its relationship with various diseases has been investigated. The effect of CYP1B1 on breast cancer is thought to be through the conversion of estradiol to 4-OHE2 [34]. Among the theories, the carcinogenic intermediate metabolites that occur with excessive expression of CYP are oxidized, react with DNA and tubulin, and cause toxicity. Overexpression in cancer types makes CYP1B1 valuable for its potential as a biomarker and a new therapeutic target [35].

It is not fully known whether CYP1B1 polymorphisms act alone or in combination with other polymorphisms. Many studies have been conducted on the effect of CYP1B1 polymorphism on breast cancer. There are many studies on the effect of CYP1B1_L432V polymorphism in particular. In this polymorphism, Leu-Val amino acid change occurs with the C-G change occurring in both linker regions at codon 432 of CYP1B1. This change has been determined to increase the catalytic efficiency in 4-hydroxylation [36].

According to the results of a meta-analysis study in which 52 articles were analyzed, the association between CYP1B1 and breast and prostate cancer was significantly increased in the Asian population [37]. Studies have shown that it is also associated with colorectal and ovarian cancer [8].

Polymorphisms in CYP1B1 enzymes may lead to different results in oncology practices regarding drug safety profile and efficacy [38]. In a study of 95 breast cancers, the presence of the *CYP1B1*3* allele was significantly associated with groups with less hypersensitivity reaction to Taxane treatment [39]. This situation can be an example of genetic factors' effect on drug safety. Studies also show that paclitaxel resistance is more common in breast cancer patients with the *CYP1B1*3* allele [40]. In the study of Sissung et al., it is stated that the presence of the *CYP1B1*3* allele can be considered an important marker to predict the efficacy of docetaxel used in the treatment of 52 prostate cancer patients [41]. Anticancer drugs such as flutamide and mitoxantrone are valuable in terms of the effect of pharmacokinetic differences on the therapeutic process, leading to drug resistance by inhibiting Cyp1b1 metabolism [42]. In the study of Xie et al. involving 64 lung cancer patients, CYP1B1 expression was significantly higher in the group with resistance to cisplatin used in the treatment [43].

CYP1B1 rs1056836 was associated with increased CYP1B1 catalytic activity, while CYP1B1 rs1800440 was associated with a decrease in protein expression due to degradation [44]. *CYP1B1*4* (rs1800440) determined that women with the GG genotype were 3 times more likely to experience hot flashes for ≥1 year compared to the AA genotype [45].

In addition to many studies in the literature on the CYP-cancer relationship, some studies do not support this. It appears that having the *CYP1B1*4* (Asn453Ser) allele does not affect survival in patients with NSCLC [46]. It was also

concluded that the presence of the *CYP1B1*4* (Asn453Ser) mutant allele reduces enzyme activity and has a protective role for endometrial cancer carrying the *CYP1B1*4* (Asn453Ser) allele. Findings from case-control studies in lung and endometrial cancers, including breast cancer, do not confirm this information [47]. Therefore, there is no definitive judgment on this issue. Therefore, there is no definitive judgment on this issue. In the Copenhagen City Heart Study, which lasted 30 years and included more than 10 thousand people, no significant relationship was found between *CYP1B1*3* and *CYP1B1*4* genotypes and oncological and cardiovascular diseases [48].

Despite known dose-limiting side effects, many cancer drugs are used in treatment. Cardiotoxicity is an important problem in cancer diseases. Cardioprotection-based therapies can reduce anticancer drug effects and block chemotherapy [49]. The association between cardiovascular diseases and CYP1B1 has made CYP inhibitors a therapeutic target [50]. In vitro studies have also shown in various animal models that cyp1 inhibitors inhibit the cardiomyopathy-producing effect of doxorubicin [51]. Natural flavonoids such as Quercetin, chrysin, alpha-naphthoflavone, and 7,8-dehydrorutecarpy that inhibit Cyp1b1 and quinazoline derivatives are under investigation for their therapeutic value [52]. We think that research on this enzyme will contribute to drug development processes.

Conclusion

This study reveals the frequency of *CYP1B1*3* and *CYP1B1*4* alleles in a Turkish population in comparison with other populations and studies on the determination of individual susceptibility to various diseases and cancer that may be associated with CYP1B1 polymorphisms, as well as explains the metabolic differences between individuals of endogenous substances and therapeutics metabolized by CYP1B1 contributes to the literature for future studies on.

CYP1B1 needs to be investigated in larger populations to determine the effects of diagnosis, treatment process, and survival in many diseases, especially cancer diseases, and to provide primary data in determining the effect size in the Turkish population.

Acknowledgment

Authors thank to the Scientific Research Projects Units of Afyonkarahisar Health Sciences University and Ankara University for their financial support.

Funding

This research was supported by the grants of Research Fund of Ankara University (Grant no: 10B3336003) and Afyonkarahisar Health Sciences University- Scientific Research Projects Unit as Project 21. (21.GENEL.011)

Conflict of interest

No conflict of interest was declared by the authors.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2022-02-03
Accepted: 2022-06-02

ORIGINAL ARTICLE

An evaluation of the environmental literacy levels of nursing students in Türkiye

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Abstract

The study was aimed to investigate the environmental literacy levels of the nursing students, including the dimensions of environmental knowledge, attitudes, behaviour, and perceptions. It was a descriptive and cross-sectional study, including 292 nursing students who had accepted participation in the study. Data were collected in the fall term of the 2019-2020 academic year using the Sociodemographic Characteristics Form and the Environmental Literacy Scale. According to the results, nursing students' sub-dimension scores were 12.23±2.96 for environmental knowledge, 66.11±12.25 for environmental attitude, 41.22±6.38 for environmental behaviour, and 10.26±2.08 for environmental perception. The environmental literacy levels of nursing students are at a moderate level. The study found a statistically significant difference between class level, age, gender, father educational status, talking about environmental issues in the family, environmental education status, being involved in the environmental project, source of environmental information, membership of the environmental organizations, and the mean score of the scale ($p < 0.05$). As a result, it is suggested to plan interventional studies with larger samples to improve the environmental literacy levels of nursing students and to make necessary regulations in the course contents.

Keywords: Nursing students, environmental literacy, environmental knowledge, environmental attitude, environmental behaviour, environmental perception

Citation: Kapan R, Yardımcı Gürel T. An evaluation of the environmental literacy levels of nursing students in Türkiye. Health Sci Q. 2022;2(3):139-48. https://doi.org/10.26900/hsq.2.3.03

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Introduction

The environment plays an essential role in supporting life on earth. However, there are some problems that harm living conditions and the world ecosystem. These problems do not only interest the environment, but all living things on earth. The primary sources of these problems are pollution, global warming, greenhouse gas, and other environmental problems. People daily activities persistently reduce the quality of the environment and consequently, it causes survival conditions to disappear day by day [1]. The term environmental education has emerged as a response to increasing environmental problems such as global warming, climate change, destruction of rain forests, threats to biodiversity, increasing rates of land degradation and desertification, population-resource imbalances, nuclear accidents, destruction of toxic waste, ozone depletion, pollutions, affecting the quality of life and the sustainability of the ecosystem [2]. Ramsey et al. (1992) stated that environmental education should help individuals gain the necessary skills to be sensitive to a rapidly changing technological world, understand the problems of the contemporary world, and play an active role in the improvement and sustainability of the environment [3]. Environmental education aims to gather information, develop knowledge, take into account different views and make judgments, understand the mutual relationship in nature, evaluate information, solve problems, adopt a relevant attitude towards the environment, develop responsible behaviour pattern, take positive actions and increase the willingness to participate in decision-making processes [4]. Environmental education aims to make people behave responsibly towards the environment.

The environmental education objectives mentioned above can help increase awareness, knowledge, sensitivity, values, attitudes, behaviour patterns, skills and motivation to identify and solve environmental problems. These are crucial for environmental education. Hence, environmental education trains people who can analyse environmental problems, adopt a critical attitude toward the person's environment, and cause changes in their actions and behaviours. For the effective implementation of environmental education at all educational levels, environmental education objectives need to be transformed into goals [5]. The concept of environmental literacy emerged after the concepts of environmental ignorance. The concept is called the skills that encourage understanding the environmental, social, and economic dimensions of human-environment interactions and developing sustainably various human societies and the ecological systems in which they are placed [6]. Roth (1992) defines environmental literacy as the ability to perceive and interpret the health of environmental systems and take appropriate measures to protect or improve the health of these systems. Environmental education is of great importance in raising environmentally literate individuals. This process, which starts in childhood especially in the family and continues throughout life, should be taken seriously and followed. For this reason, it is significant for a sustainable future to know the level of environmental literacy of young people studying in higher education institutions before graduation and to improve their deficiencies. Several papers in the literature investigate the environmental literacy levels of students and the factors affecting them. Studies have found that out-of-school factors and demographic characteristics can also affect students' level of environmental knowledge and their attitude towards the environment [7-15]. Accordingly, it is remarkable to know the factors affecting these levels in determining the environmental literacy levels of students.

Since Florence Nightingale, the relationship between environment and health has been emphasized as one of the basic concepts of nursing science. She emphasized that an unfavourable environment consists of a combination of factors and conditions that cause disease and death or harm the development and survival of an organism [16]. Environmental awareness for nurses begins with the promotion of sustainable practices. Especially during higher education, which has an essential place in preparing nursing students for life and professional life, it is important to raise conscious students who are sensitive to the environment and contribute to protecting natural resources. Since nurses

are the largest group in the healthcare industry, they play an important role in both individual and social areas for environmental awareness, protection, and long-term development of the healthcare sector [17,18,19]. For this reason, it is essential to encourage environmentally sensitive attitudes and behaviours of healthcare professionals, including nursing students. In this context, it is important to conduct more research on the attitudes and behaviours of nursing students towards the environment.

This study aimed to investigate the environmental literacy levels of nursing students from the point of various variables. The study is essential to determine the deficiencies by identifying the current environmental literacy levels of the nursing students and to plan the necessary interventions to eliminate these deficiencies.

Materials and Methods

Study design

This study was conducted at the Sinop University Faculty of Health Sciences Nursing Department. Data were collected in the fall term of the 2019-2020 academic year. The universe of the study was 400. Since it was aimed to reach the whole universe, no sample selection was made. During the data collection process, all students in the classroom who agreed to participate in the research were included in the study. The study was completed with 292 students. The participation rate was 73%.Inclusion criteria were: studying at the nursing department and agreeing to take part in the study. The data were collected by the master's student, by face-to-face interview method during or after classes. It took about five minutes to fill out the data collection forms.

Instruments

Socio-demographic Characteristics Form and the Environmental Literacy Scale was used for data collection.

Socio-demographic characteristics form

This form consisted of 15 items and two parts. In the first part; year of study, gender, age, the high school which they graduated from, place of residence for a long time, family income level, educational level of mother, educational level of father, working status of mother and working status of father were included. In the second part, there are questions about the environment such as getting education about the environment, the sources from which information about the environment was obtained, the membership status of the environmental non-governmental organization, having a project related to the environment in or out of school and talking about environmental issues within the family.

Environmental literacy scale

The scale was developed by Kışoğlu (2009) comprises four sub-dimensions: environmental information, environmental attitude, environmental behaviour and environmental perception. *Environmental knowledge*: This sub-dimension, which is created to measure the level of knowledge about the environment, consists of 20 multiple-choice questions. Multiple choice questions have four choices and each correct question is worth one point. In this section, points are calculated by considering the correct answers, and a total score is obtained by giving one point for each correct answer and zero for incorrect answers. The reliability coefficient (alpha) of the environmental information sub-dimension is 0.64. *Environmental attitude*: This sub-dimension, in which environmental attitudes are evaluated, consists of 18 multiple-choice questions. This sub-dimension of the environmental literacy scale is in the 5-point Likert scale. Items are scored over five points (Strongly agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly disagree = 1). Negative items are scored in reverse. A minimum of 18 and a maximum of 90 points can be obtained for this sub-dimension. The reliability coefficient (alpha) of the environmental attitude sub-dimension is 0.77. *Environmental behaviour*: This sub-dimension consists of 20 behaviour sentences on a 3-points Likert scale to determine the frequency of students' environmentally sensitive behaviour.Scaled scoring is done as always = 3 points, occasionally = 2 points, never = 1 point. Accordingly, a minimum of 20 and a maximum of 60 points can be obtained from the sub-dimension. The reliability coefficient (alpha) of the behaviour sub-dimension is 0.79.

Environmental perception: In this sub-dimension there are three multiple-choice questions. Students are asked to give scores from one to five for their interest in the environment and environmental problems. Each sentence is evaluated on 5 points (1 to 5). Accordingly, a minimum of three and a maximum of 15 points can be obtained from the scale. The reliability coefficient (alpha) of perception sub-dimension is 0.78. As the scale scores increase, the environmental literacy level also increases [20].

Ethical considerations

Before starting the data collection process, written permission was obtained from the author who developed the Environmental Literacy Scale. Ethics committee approval was received from the Human Research Ethics Committee of Sinop University where the authors were affiliated (Date: 18.10.2019, Meeting No: 04, Decree No: 2019/40), and institutional permission was obtained from the Faculty of Health Sciences. In addition, written approval was received from the students who wanted to participate in the study. Participants were determined based on volunteering, and required time was given to the participants to answer the questions in a comfortably. The study was conducted by the principles of the Declaration of Helsinki.

Data analysis

Statistical analysis of the data was performed using Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL) 22.0 package program. Kolmogorov-Smirnov test was applied to determine whether the data were normally distributed. The student t test, Mann Whitney U, ANOVA and Kruskal Wallis H tests were used for data analysis. Frequency, mean and standard deviation were used as descriptive statistics.

Results

Sample characteristics

The study consisted of 292 people and 69.9% were female, 28.4% were at first year of study, 57.9% were between the ages of 20-22, 51.7% were Anatolian High School graduates, 46.2% were residing in the city, 79.5% had middle income, 59.2% of mothers and 46.2% of fathers had primary school graduates, 82.2% of mothers were not working, 72.6% of fathers were working. The results indicate that 65.4% of the participants had not received any environmental training before. The internet was the first source that 77.7% of them applied to get information about the environment, and 81.2% of them were not involved in an environmental project. It is found that 60.3% of the students sometimes talk about environmental issues in the family, while 16.8% have not talked about environmental issues in the family (Table 1).

The mean scores of the students from the environmental literacy scale were found to be 12.23 ± 2.96 in the knowledge, 66.11 ± 12.25 in the attitude, 41.22 ± 6.38 in the behaviour, and 10.26 ± 2.08 in the perception sub-dimension, respectively (Table 2).

Environmental literacy levels by socio-demographic features

The analysis results for the knowledge sub-dimension of the Environmental Literacy Scale are presented in Table 1. A statistically significant difference was found for the environmental knowledge sub-dimension in terms of year of study and father's education level ($p < 0.05$). Based on the pairwise comparison results, it was understood that the knowledge level of 1stgrade students was lower than in other grades ($p < 0.05$). On the other hand, it was determined that the mean scores of students whose fathers are university graduates are significantly higher mean scores ($p < 0.05$).

The results shown that there was a statistically significant difference between the mean scores of the environmental attitude sub-dimension regarding gender, age group and talking about environmental issues in the family. Additionally, it was seen that female students' mean scores were higher than male students. According to the paired comparison results, it was found that the attitude levels of students aged 19 and under were lower than those of 20-22 years old ($p < 0.05$). Finally, it was concluded that students' attitude levels about environmental issues in the family are significantly higher than other students ($p < 0.05$) (Table 1).

Table 1. Distribution of students' socio-demographic characteristics according to environmental literacy scale sub-dimension scores (N = 292).

Features	n	Environmental knowledge	Environmental attitude	Environmental behaviour	Environmental perception
		Mean±SD	Mean±SD	Mean±SD	Mean±SD
Grade					
1st grade[a*]	83	11.29 ± 2.72	62.49 ±15.53	39.30 ± 6.65	10.18 ±2.46
2nd grade[b*]	73	13.16 ± 2.69	68.88 ±7.24	42.82 ± 7.19	10.49 ±2.03
3rd grade[b*]	69	12.22 ± 3.18	68.04 ±8.68	41.25 ± 4.44	10.23 ±1.51
4th grade[b*]	67	12.39 ± 2.99	65.58 ±14.08	41.81 ± 6.31	10.13 ±2.13
		χ^2=15.958 p=0.001**	χ^2=4.950 p=0.175	F=3.661 p=0.014**	χ^2=2.180 p=0.536
Father educational status					
Not literate[ab*]	5	11.80 ± 1.92	71.80 ± 8.49	48.40 ± 5.59	11.80 ± 1.92
Literate[a*]	27	12.74 ± 2.99	67.59 ±11.84	41.59 ± 5.91	10.15 ± 1.99
Primary education[a*]	135	12.28 ± 2.77	64.77 ± 13.43	40.84 ± 6.70	10.24 ± 2.06
High school[b*]	79	11.48 ± 3.15	66.42 ± 10.92	40.99 ± 5.46	10.25 ± 2.12
University[a*]	46	13.11 ± 3.02	68.02 ± 11.19	41.72 ± 6.91	10.22 ± 2.14
		χ^2=11.477 p=0.022**	χ^2=4.290 p=0.368	F= 2.133 p=0.104	χ^2=3.482 p=0.481
Gender					
Female	204	12.24 ± 2.79	67.02 ± 11.87	41.33 ± 6.04	10.34 ± 2.03
Male	88	12.20 ± 3.32	64.00 ± 12.91	40.95 ± 7.12	10.07 ± 2.18
		U=8436.00 p=0.412	U=7517.50 p=0.028**	T=0.459 p=0.647	U=8132.50 p=0.195
Age					
19 years and under [a*]	85	11.72 ± 2.63	63.38 ± 13.58	39.59 ± 6.43	10.24 ± 2.36
Between 20 and 22 [b*]	169	12.46 ± 3.04	67.60 ± 11.30	41.89 ± 6.07	10.30 ± 1.92
23 years and older [ab*]	38	12.34 ± 3.19	65.58 ± 12.44	41.84 ± 7.06	10.16 ± 2.13
		χ^2=5.553 p=0.062	χ^2=7.039 p=0.030**	F=3.982 p=0.020**	χ^2=0.808 p=0.668
Talking about environmental issues in the family					
Yes[a*]	67	12.70 ± 2.60	69.61 ± 11.73	42.25 ± 6.41	10.72 ± 1.76
Sometimes[b*]	176	12.36 ± 2.84	66.01 ± 11.77	41.43 ± 5.99	10.15 ± 2.07
No[c*]	49	11.12 ± 3.56	61.67 ± 13.35	39.04 ± 7.26	10.04 ± 2.43
		χ^2=5.038 p=0.081	χ^2=17.443 p=0.000**	F=3.906 p=0.021**	χ^2=5.682 p=0.058
Environmental education status					
Yes	101	12.09 ± 3.21	67.06 ± 11.99	43.29 ± 6.43	10.52 ± 1.96
No	191	12.30 ± 2.82	65.61 ± 12.39	40.12 ± 6.09	10.12 ± 2.13
		U=9268.00 p=0.580	U=8858.50 p=0.251	U=6730.50 p=0.000**	U=8572.00 p=0.111
Being involved in the environmental project					
Yes	55	11.89 ± 3.21	67.95 ± 9.35	43.00 ± 7.35	10.73 ± 2.12
No	237	12.31 ± 2.90	65.68 ± 12.81	40.80 ± 6.07	10.15 ± 2.06
		U=5970.50 p=0.329	U=6164.50 p= 0.531	t=2.319 p=0.021**	U=5518.50 p=0.071
Source of environmental information					
Course book [a*]	16	11.13 ± 3.79	59.50 ± 15.57	40.63 ± 5.62	9.00 ± 2.03
Instructor [b*]	12	10.67 ± 4.37	61.58 ± 13.42	46.33 ± 7.19	11.17 ± 2.51
Internet[b]	227	12.34 ± 2.91	66.86 ± 11.51	40.93 ± 6.13	10.28 ± 1.98
Newspaper-Magazine[b]	13	13.00 ± 1.73	69.62 ± 9.43	42.08 ± 5.39	10.54 ± 2.06
TV Radio[b]	24	12.25 ± 2.27	63.79 ± 15.75	41.29 ± 8.31	10.33 ± 2.58
		χ^2=2.772 p= 0.597	χ^2=9.313 p= 0.054	F=2.173 p=0.072	χ^2=10.806 p=0.029**
Membership status to environmental organization					
Member	16	12.00 ± 4.08	68.69 ± 11.32	43.81 ± 5.36	11.13 ± 2.21
Not a member	276	12.24 ± 2.89	65.96 ± 12.31	41.07 ± 6.41	10.21 ± 2.06
		U=2161.50 p=0.887	U=1904.00 p=0.354	U=1638.00 p=0.082	U=1565.00 p=0.046**

*Groups that are not represented with the same letter are different from each other.** $p < 0.05$.

According to the results, it was found that the mean scores of the environmental behaviour sub-dimension were significantly different depending on the class, age, environmental education status, being involved in the environmental project and talking about environmental issues in the family. Based on the pairwise comparison results, environmental behaviour levels of 1st grade students are lower than 2nd grade students, and this difference was statistically significant ($p < 0.05$). However, it was determined that the environmental behaviour levels of students aged 19 and under were significantly lower than the environmental behaviour levels of students aged 20-22 ($p < 0.05$).No significant difference was found in the other pairwise comparisons (Table 1).

Moreover, it was specified that students who received environmental education had higher scores than those who did not. Those who worked on an environmental project than those who did not work, and these differences were statistically significant ($p < 0.05$). Lastly, the pairwise comparison results presented that the students who talked about environmental issues in the family had a significantly higher environmental behaviour level than the students who did not talk at all ($p < 0.05$).

The results revealed a statistically significant difference between the mean scores of the environmental perception in terms of the source of environmental information and the status of being a member of an environmental organization ($p < 0.05$). Based on the results of paired comparison, the environmental perception levels of the students who obtained information from the course-book were lower than the environmental perception levels of the students who obtained information from the instructors, internet, newspaper-magazine, and TV-radio sources, and this difference was statistically significant ($p < 0.05$). Finally, it was concluded that the environmental perception levels of the students who are members of an environmental non-governmental organization are statistically significantly higher than the students who are not members ($p < 0.05$) (Table 1).

Discussion

This study aimed to investigate the environmental literacy levels of nursing students in terms of several variables. According to the results, it was concluded that the environmental literacy levels of nursing students were moderate and some of their socio-demographic characteristics effected their environmental literacy levels.

In the light of the analysis, it was determined that the mean scale scores of the students were significantly different in terms of gender, grade level, age, father's education level and some environmental features. Studies in the literature investigate the relationship between similar variables and environmental literacy level. Similar to our results, Kayalı (2018) found that environmental literacy levels of female students are higher than male students in their study on teacher candidates [21]. Demirtaş Akbulut and Özşen (2018) determined in their study on vocational high school students that their environmental literacy levels were high. In addition, they concluded that the environmental literacy levels of the students differ based on their gender, environmental education, foreign experience and the programs they studied [7].

Similarly, Teksöz, Şahin and Ertepınar (2010) found out that female students had higher scores in attitudes towards the environment, uses related to the environment, and concern for environmental problems, while male students had higher scores in the environmental knowledge sub-dimension [22].

Table 2. Descriptive statistics of the environmental literacy scale (N = 292)

Sub-dimension	Highest possible score	Min.	Max.	Mean ± SD
Environmental Knowledge	20	3	19	12.23 ± 2.96
Environmental Attitude	90	22	85	66.11 ± 12.25
Environmental Behaviour	60	20	60	41.22 ± 6.38
Environmental Perception	15	3	15	10.26 ± 2.08

Kocalar and Balcı (2013) concluded that the environmental literacy levels of students are relatively high, and as the grade level increases, the environmental literacy level also increases [23]. Altınöz (2010) found that the environmental knowledge level of female students was significantly high in his study on science teacher candidates [24]. Şahin, Ünlü and Ünlü (2016) determined that there is a significant difference between the environmental literacy scores of 4th-grade students according to their department [8]. Artun, Uzunöz and Akbaş (2013) found that environmental literacy levels of students were not affected by factors such as gender, the school they graduated from, the education level of the mother and the father [25]. Studies show that generally female students have higher scores. It is thought that this may be due to women's nature. Since women are more sensitive and responsible than men, they may act more consciously towards the environment.

Yavetz et al. (2009) investigated the student's environmental attitude, environmental knowledge, environmental behaviour and the relationship between these variables and demographic characteristics in their study with three colleges that train teachers in Israel. They concluded that although the students environmental knowledge was limited, their general attitudes towards the environment were positive. In addition, a positive relationship was found between students' environmental knowledge and environmental attitudes and mother's education level. It was determined that students who receive education on environmental issues are more knowledgeable and have more positive attitudes towards the environment than other students [9]. Liu et al. (2015) found out that teachers in Taiwan have a good environmental knowledge and attitude levels, but low environmental action. In addition, they concluded that primary school teachers performed better than high school teachers [26]. Shamuganathan and Karpudewan (2015) investigated the variables of environmental knowledge, environmental attitude, belief, conservation awareness, and responsible environmental behaviour to model the environmental literacy of high school seniors in Malaysia. It was found that students responsible environmental behaviour level and their level of knowledge about environmental problems were high. However, it was specified that individuals with a confident attitude, belief and awareness of protection are more prone to exhibit responsible environmental behaviour [27].

Our study found that the students whose father's educational level was university were higher environmental knowledge. Similarly, Güler (2013) found that students whose fathers are university graduates have higher levels of environmental knowledge [28]. On the other hand, Bilim (2012) concluded that there was no significant difference between the education levels of the parents of the students and their environmental knowledge levels [29]. In addition, it was found that students whose parents graduated from high school have higher levels of environmental knowledge, but this difference is not statistically significant [24]. It is thought that parents with a high level of education have a high sensitivity to the environment and bring it to their children, therefore, children who grow up in educated families have higher environmental literacy levels.

Our study, determined that receiving environmental education, being involved in the environmental project, talking about environmental issues in the family, obtaining information from an instructor, and being a member of a non-governmental organization related to the environment provide the students to increase their average score. This result indicates that being sensitive to environmental issues and taking action on these issues positively affect the level of literacy. Therefore, it is believed that activities such as membership in environmental non-governmental organizations and participation in environmental responsibility projects will effectively in raise the environmental literacy level of students. Similar to our results, it was determined that students interested in the environment and environmental problems, participate more in environmental activities, spend more time in nature, and have higher levels of environmental literacy [30, 31]. It is obvious that the participation of university students in environmental activities has positive

effects on environmental literacy. For this reason, it is recommended that environmental organizations work actively in universities and organize environmental campaigns.

Conclusion

Nursing students, who will be included in health care professionals in the future, are expected to have a high level of environmental knowledge, attitude, behaviour and perception towards the environment, in other words, to be environmentally literate individuals. In this study, it was found that the environmental literacy level of nursing students was moderate. Therefore, it is crucial to carry out studies that will improve the environmental literacy levels of students. For this purpose, it is recommended that students take environmental literacy courses during their university education or make regulations on the quality and content of the existing courses. Interventional studies can be conducted to increase students' environmental knowledge and transform their existing environmental attitudes into behaviour. The study determined that participating in an environmental project, being a member of environmental non-governmental organizations, and talking about environmental issues within the family had a positive effect on environmental attitude, behaviour, and perception. However, it was seen that only 18.8% of the students were involved in project work, 5.5% were members of a non-governmental organization and 22.9% talked about environmental issues in the family (Table 1). In other words, despite the positive effects of these three variables, it is understood that very few students have these features. In line with these results, it can be ensured that students are directed to environmental project studies or their participation in current projects on this subject can be increased. The literature has observed that the studies on the environmental literacy level of nursing students are very limited, and the studies are generally carried out for teacher candidates. In line with these results, our recommendations are as follows; 1) Interventional studies should be carried out with larger samples on the environmental literacy levels of nursing students, 2) Universities should initiate programs to increase environmental awareness and sensitivity of students, especially with the participation of non-governmental organizations, 3) Students should be included in social responsibility projects related to environmental problems, 4) Environmental courses can be included in the nursing curriculum.

Limitations: This study was conducted in a single university and the sample was relatively small. Hence the results cannot be generalized.

Acknowledgement

We would like to thank to all of the participants.

Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Funding

This study was not funded by any organisation.

Conflict of interest

There are no conflicts of interest with respect to the authorship and/or publication of this article.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2022-04-14
Accepted: 2022-06-20

ORIGINAL ARTICLE

Efficacy of TBNA needles for EBUS during fiberoptic bronchoscopy?

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Abstract

Conventional transbronchial needle aspiration (cTBNA) biopsy is a diagnostic minimally invasive technique applied using fibreoptic bronchoscopy (FOB) in the evaluation of mediastinal/hilar lymph nodes. With the development of endobronchial ultrasound (EBUS) devices, transbronchial aspiration needles have been revised for use according to the EBUS guidelines. The main aim of this research was to evaluate the diagnostic success of transbronchial aspiration needles that was produced for EBUS when it was applied with FOB instead of conventional TBNA. A retrospective examination was made with the data of 35 patients applied with FOB TBNA, using needles specifically designed for EBUS and 36 patients with conventional TBNA (cTBNA group), for lung cancer staging or the diagnosis of mediastinal lymphadenopathy between November 2018 and November 2019. Seventy-two and sixty procedures performed on 71 patients were included in the study. Diagnostic efficiency for TBNA and cTBNA groups were 91.4% and 83.3%, respectively. Conventional TBNA is still acceptable when the low cost and ease of application are taken into consideration. In conclusion, improvement of current conventional TBNA needles similar to EBUS-TBNA needles for more efficient aspiration capacity could be the first stepto increasing the TBNA diagnostic yield. Nevertheless, further studies are needed to confirm our results.

Keywords: Conventional transbronchial needle aspiration, endobronchial ultrasound, fiberoptic bronchoscopy

Abbreviations: Transbronchial needle aspiration (TBNA), fibreoptic bronchoscopy (FOB), lymph nodes(LN), conventional TBNA (cTBNA)

Citation: Çoşğun İG, Günay E, Çilekar Ş, Günay S. Efficacy of TBNA needles for EBUS during fiberoptic bronchoscopy? Health Sci Q. 2022;2(3):149-55. https://doi.org/10.26900/hsq.2.3.04

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Introduction

Conventional transbronchial needle aspiration (TBNA) biopsy is a diagnostic minimally invasive technique applied using fibreoptic bronchoscopy (FOB) [1]. Transbronchial needle aspiration was applied for the first time in 1949 by Eduardo Schieppati with a rigid bronchoscope [2]. With the development of the fibreoptic bronchoscope in 1967, Shigeto Ikeda, achieved success in the field of bronchoscopy. TBNA biopsy applied with a fibreoptic bronchoscope was first described by Ko-Pen Wang in 1981[3]. Then, in 2004, EBUS TBNA was introduced, which provided a sampling of mediastinal and hilar lymph nodes with real-time ultrasonographic imaging [4]. Until the EBUS, conventional TBNA was considered the standard bronchoscopic modality for lymph node (LN) sampling to investigate etiologies of mediastinal and hilar lesions [5]. Conventional TBNA was used primarily by sampling mediastinal/hilar lymph node tissue for diagnosis and staging of lung carcinoma [6,7]. With the introduction of the use of EBUS devices, transbronchial aspiration needles were revised for use according to the EBUS guidelines. The increasing use of revised TBNA in the EBUS guidelines created a need for comparison with conventional TBNA. The Lung Cancer Guidelines (American College of Chest Physicians) stated that the diagnostic success rates were reported as 78% for cTBNA and 89% for EBUS-TBNA in a meta-analysis [8]. In randomized, controlled studies, the diagnostic success of EBUS-TBNA has been determined to be higher in lung cancer and sarcoidosis disease [9-13]. Despite the better results of EBUS-TBNA, it has the disadvantage of requiring a specially developed device with a higher price and experienced staff for the specific procedure [14]. Therefore, there is wider availability of TBNA applied with FOB and this continues to be important in clinical practice. Although there are many studies in the literature that have evaluated the diagnostic success of EBUS-TBNA and cTBNA, to our knowledge, there are no studies that were investigating the use of transbronchial aspiration needles produced only for the use of EBUS, applied with FOB with tomographic anatomy guidance without ultrasonography. The main aim of this research was to present the diagnostic success of transbronchial aspiration needles produced for EBUS-TBNA application when applied with FOB compared with standard cTBNA.

Materials and Methods

Ethical committee approval and informed consent

This study was approved by the Ethics committee of Afyonkarahisar Health Sciences University (2011-KAEK-2;2020/6).

Patient and procedures

A retrospective examination was made with the data of 35 patients applied with FOB TBNA, using needles specifically designed for EBUS and 36 patients with conventional TBNA (cTBNA group), for lung cancer staging or the diagnosis of mediastinal lymphadenopathy between November 2018 and November 2019. All the procedures were performed under conscious sedation and local anesthesia. The procedures were applied by a bronchoscopist with 8 years of EBUS-TBNA experience (about 200 EBUS-TBNA procedures per year), using a 22-gauge cytology needle of EBUS-TBNA (model OmniTip-Ultra Pentax) via fiberoptic bronchoscopy (Pentax). In the cTBNA group, a 19-gauge WANG cTBNA needle (Cook Medical Inc., Bloomington, IN, USA) was used. The EBUS needle was fixed to the fiberoptic bronchoscopy device. The length of the sheath was adjusted tomographic image. Lymph node stations were classified according to the American Thoracic Society mapping system [15]. Before taking all the samples, the tomographic anatomy was evaluated carefully by the bronchoscopist.

All possible lymph-node stations were sampled starting from N3 to N1 localization in cases of multiple station involvement in the presence of suspicious malignant lesions. Rapid on-site cytology examination (ROSE) was not available in our bronchoscopy setting. After stabilization of the TBNA catheter in the scope, the sheath of the needle was removed from the tip of the scope and screwed for a safe procedure in the same way as for EBUS applications. The “hub against wall” method was used for all penetrations to the targeted lymph nodes or masses.

After adjustment of the needle size according to the caliber of the lesion, the needle was pushed through the intercartilaginous space with a quick thrust maneuver. The stylet was removed and aspiration and preparation of samples (cell block and smears) were applied in the same way as for the EBUS procedure.

Statistical analysis

All statistical analyses were performed using the Statistical Package for Social Sciences software (SPSS, version 25). Data were presented using descriptive statistics. Continuous variables were expressed as mean ± standard deviation (SD) values and categorical variables as number (n) and percentage (%).

Results

The characteristics of the participants involved in the study are outlined in Table 1. Seventy-two and sixty procedures performed on a total of 71 patients in TBNA and cTBNA groups, were included in the study, respectively. The mean age was 54 years [58 in the TBNA group (Using needles specifically designed for EBUS) and 50 in the cTBNA group]. Both in the TBNA and cTBNA groups, patients were predominantly male (71% and 66%, respectively).

Most frequent sampling was taken from the lymph nodes station 7 in 26 subjects (36.1%) in the TBNA group and 36 subjects (36.1%) in the cTBNA group.

Table 1. Clinical characteristics of the patients in both groups

	TBNA (Using needles specifically designed for EBUS)	**cTBNA**
Age, Years (range)	58 (20-84)	50 (18-80)
Gender; Male/Female	25/10	24/12
Number of patients	35	36
Number of procedures	72	60
Symptoms, N(%)		
Cough	15 (42.8)	18 (30.0)
Dyspnea	14(40.0)	15 (25.0)
Chest pain	9 (25.7)	11 (18.3)
Weight loss	7 (20)	5 (8.3)
Hemoptysis	5 (14.2)	4 (6.7)
Dysphagia	1 (2.8)	0

Table 2. Sampled lymph nodes during fiberoptic bronchoscopy procedure

Nodal Station	**TBNA(n (%)) (Using needles specifically designed for EBUS)**	**cTBNA(n(%)) (WANG needle)**
2R	1 (1.4)	0
4R	25 (34.7)	15 (25)
4L	4 (5.5)	2 (3.3)
7	36 (50.0)	37 (61.6)
10R	2 (2.7)	2 (3.3)
11R	1 (1.4)	1(1.7)
11L	3 (4.2)	3 (5.0)
Total	72	60

Distribution of lymph node stations sampled during both groups were outlined in Table 2.

Diagnoses in the TBNA group were 31.4% for non-small cell lung cancer and 14.2% for small-cell lung cancer. Other benign diagnoses were outlined in Table 3. Additionally, diagnoses during cTBNA procedures also were also shown in Table 3. Diagnostic efficacy for TBNA and cTBNA groups were 91.4% and 83.3%, respectively. No complications were observed in any case during or after both procedures. All the patients were discharged on the same day of sampling.

Discussion

The application of cTBNA provides a tissue sample for cytological or histological evaluation. TBNA is indicated in the diagnosis of mediastinal lymph node growth. Generally, lymph node growths emerge in diseases such as sarcoidosis, tuberculosis, lymphoma, and bronchogenic carcinoma metastases. The determination of mediastinal spread is important for staging and appropriate treatment in bronchogenic carcinoma. The success rate of conventional TBNA in lung carcinoma mediastinal staging has been reported as 78% (confidence interval 71%-84%) [16]. In the subcarinal lymph gland, factors such as lymph gland size >1.5cm and diagnosis of small-cell lung carcinoma, increase the diagnostic success of conventional TBNA [17].

With the start of the EBUS-TBNA application in the 2000s, the biopsy needles used in conventional TBNA were revised for use with the EBUS device. The revised needles had the features of being able to be fixed to the bronchoscopy device and the margin could be determined with the advancement of the biopsy needle. Also, the most important advantage of this needle is its longer length than the conventional needle. EBUS needle is stiffer and longer than conventional needles. A longer EBUS needle resulted in better target reach and better sampling. Additionally, the stiffer needles of EBUS better for puncturing the bronchial wall. Other technological advantages are the echogenicity of the needle, which is not a useful feature in the conventional method. However, needle stiffness and a lack of flexibility of the EBUS bronchoscope resulted in less angulation for penetrating the endobronchial Wall [18]. In a study by Hert et al, EBUS-TBNA used via EBUS probe was compared with conventional TBNA, and other than the subcarinal station, better results were determined in all other stations [9]. ACCP Lung Cancer Guidelines 3rd edition reported a sensitivity of 89% and a negative predictive value of 91% for EBUS-TBNA in lung cancer mediastinal lymph node staging [8]. Based on these results, the guidelines recommended EBUS-TBNA as the first step in lung cancer mediastinal staging rather than surgical staging.

Table 3. Distribution of pathological diagnosis among both study groups

Nodal Station	TBNA n=35		cTBNA n=36	
	N	%	N	%
Small cell lung carcinoma	5	14.2	1	2.8
Non-small celllung carcinoma	11	31.4	9	25
Adenocarcinoma*	7	63.6	3	33.3
Squamous cell carcinoma*	3	27.2	2	22.2
Malignant epithelial tumour*	1	9.1	4	44.4
Sarcoidosis	6	17.1	12	33.3
Tuberculosis	2	5.6	1	2.8
Anthracosis	5	14.2	4	11.1
Benign lymph node	3	8.6	3	8.3
Non-diagnostic	3	8.6	6	16,7

*Percentage represents the percentage within the diagnosis of non-small cell lung carcinoma

EBUS-TBNA and conventional TBNA have also been compared in diseases other than bronchogenic carcinoma which results in mediastinal lymphadenopathy. In sarcoidosis disease, EBUS-TBNA has been determined to have higher diagnostic success, and when combined with transbronchial biopsy, the diagnostic rates were increased. In the same study, it was reported that when conventional TBNA was combined with endobronchial and transbronchial biopsy, the diagnostic success was similar to that of EBUS-TBNA & transbronchial biopsy [19]. In the diagnosis of lymphoma, the diagnostic success of conventional TBNA is limited, and there are diagnostic difficulties in EBUS-TBNA in the diagnosis of the same disease [20]. In many studies, diagnosis of lymphoma with EBUS-TBNA is challenging, it ranging from 57%-90% in various studies with an average of about 60% [21-24]. In the present study, there was no diagnosis of lymphoma.

Conventional TBNA has been reported to be efficient in the diagnosis of intrathoracic tuberculous lymphadenitis [25]. In both groups we also get diagnosis of tuberculosis in 3 patients (2 in the TBNA group and 1 in the cTBNA group).

Considering its simplicity, the availability of conventional TBNA continues to contribute to the diagnosis of patients worldwide [26]. In addition, the initial capital cost of the equipment and the maintenance of repair costs are significantly lower versus EBUS [27].

In the literature, studies have shown that EBUS-TBNA and cTBNA have close diagnostic performance when evaluating 4R, 7, and 11R lymph node stations [28]. It is relatively easy to locate these lymph nodes of stations. This facilitates localization of the needle-related point and relatively simplifies sampling with cTBNA [29]. The limitation to the use of cTBNA for diagnosis is the lack of skills and insufficient experience. In the present study, lymph node sampling was performed by an experienced bronchoscopist using transbronchial aspiration needles manufactured for EBUS application in the TBNA group. Lung malignancy was diagnosed the most frequently, followed by sarcoidosis. In the cTBNA group, sarcoidosis was determined most frequently, followed by lung malignancy.

TBNA procedure does not require special equipment such as ultrasonography, is low-cost and easily accessible, it seems to be more useful than EBUS-TBNA. In addition, there are still difficulties in acquiring the necessary training for EBUS. It has been determined in studies that more than 100 EBUS-TBNA procedures are necessary to acquire sufficient skill [30-32]. Therefore, despite the advantages, this procedure remains underutilized [33-34]. Küpeli et al. reported that TBNA can be easily learned and sufficient skill could be gained [35]. It has also been shown that the applications can be successfully learned without training presented by an interventional pulmonologist [36].

In our study, there were some limitations. Our study was conducted in only one institution. Therefore, bronchoscopy technique, node sample processing, and selection criteria may differ between different centers. Second, our study did not attempt to examine the cost-effectiveness of the proposed approach. However, we believe that the improvement of new conventional transbronchial aspiration needles could be potentially cost-effective.

Conclusion

As a result, there are still difficulties in accessing EBUS devices due to high costs and gaining the required training facilities for EBUS. Conventional TBNA is still acceptable when the low cost and ease of application are taken into consideration. By using EBUS-TBNA needles as conventional TBNA procedures during fiberoptic bronchoscopy, we achieved a high diagnostic rate without any complication. Improvement of new aspiration needles similar to needles produced for EBUS procedurewith lower costs could be the first step on improving cTBNA diagnostic efficacy. Consequently, further studies designed as multicenter involvement with larger populations are warranted to confirm our findings.

Funding

No financial support has been received from any person or organization for this study.

Conflict of interest

We have no conflicts of interest to disclose.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2022-03-11
Accepted: 2022-06-27

ORIGINAL ARTICLE

Health literacy and health behaviors in the Covid-19 Pandemic

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Abstract

COVID-19 pandemic has placed a heavy burden on healthcare systems and governments. Health literacy and health behaviors are recognized as strategic public health elements, but they have not received due attention during the pandemic. Health literacy and health behaviors are vital in slowing and controlling the COVID-19 outbreak. The purpose of this research is to examine the health literacy level and health behaviors of individuals in the COVID 19 epidemic. The sample of the study consists of individuals between the ages of 18-65 living in Ankara. An online questionnaire was applied to 384 people who agreed to participate in the research. TürkiyeHealth Literacy Scenario Scale was used to determine the health literacy level of individuals, and the Healthy Lifestyle Behaviors Scale was used to evaluate healthy lifestyle behaviors. As a result, a significant difference was found in the total health literacy scores of the individuals according to their healthy lifestyle, and the health literacy total scores of the individuals with a healthy lifestyle were found to be higher. It has been suggested to raise awareness about health literacy and healthy lifestyle and to raise awareness of the society.

Keywords: Covid-19, health literacy, healthy lifestyle

Citation: Yılmaz F, Hekimoğlu Tunç D, İbişoğlu Ş. Health literacy and health behaviors in the Covid-19 Pandemic. Health Sci Q. 2022;2(3):157-66. https://doi.org/10.26900/hsq.2.3.05

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Introduction

The new type of coronavirus (SARS-CoV-2), which started in Wuhan, China in December 2019 and affected the all world, with its high rate of transmission and mortality negatively affects not only our health, but also our all life in political, economic, psychological and social terms [1,2]. WHO officially declared COVID-19 as a pandemic in March 2020 and since then, apart from the great efforts of scientists to overcome the pandemic, many countries have adopted isolation and protection measures to contain the rapid spread of the pandemic [1]. Precautions include behavioral patterns that individuals are not accustomed to. Preventing the rapid spread of the virus, rather than the deterrent punishment practices of the rule makers, is through learning the way of transmission and spreading of each individual and breaking the chain of transmission of their own will [3]. As vaccination is still progressing at a slow pace and there is no specific treatment, it has become really important to adopt non-pharmacological public health interventions to slow virus transmission in the fight against COVID-19 [4-6]. At this point, health literacy become prominent. It is expressed that "health literacy" concept as the cognitive-social abilities and motivation levels to reach, understand and use the necessary information in order to protect and improve the health of the society [7]. At a time such as the COVID-19 pandemic, with full of uncertainties, information constantly changing and the world population needing rapid behavioral change to reduce the risks of disease transmission and spread, having an adequate level of health literacy has become more important than ever before [1,8,9].

Looking at the studies carried out in Türkiye, it is possible to say that the level of health literacy is insufficient and it has become a very important public health problem affecting many individuals in the country [10-13]. With the emergence of the COVID 19 pandemic, in addition to reflecting the correct information around the world, unfortunately, incomplete, incorrect and unscientific information has spread rapidly, causing the society to be more concerned. Health literacy requires individuals' knowledge and skills in acquiring, understanding and evaluating health information and services in order to make the right health decisions [14]. However, it is not enough to just read and understand health information in this period. Critical health literacy is needed. In times of crisis such as the COVID-19 pandemic, individuals should be ensured to conduct a risk analysis properly and then develop appropriate behaviors instead of being excessively panicked or ignoring the problem [15]. During the COVID-19 pandemic, it has been observed that societies with low health literacy levels are much more affected by infectious diseases due to lack of information. Many studies have proven that low health literacy causes difficulties in understanding the health disease process, increases hospitalization rates and the cost of health services, prevents medication adherence, affects quality of life, and creates an obstacle to self-care [16,17].

What people do is as important as what they know. This pandemic has shown us the importance of the concept of health behavior as well as health literacy. Health behavior has been defined as the whole of the behaviors that an individual believes and does in order to protect, develop, maintain and protect his/her health [18]. Health behavior is a person's existing health-related actions and is shaped by the person's past experiences, social factors, cultural characteristics, and interactions with the environment. If the individual describes herself as healthy, she will tend to protect this situation or if she feels any health problem, she will take various activities to solve it. Being healthy for the individual is an indispensable element for increasing the quality of life. The individual can increase this quality with his own behavior. The individual, who turns to behavior for the state of being healthy, will adopt the above-mentioned factors in his mental process and will reveal the most appropriate behavior for himself.

Health literacy and healthy behaviors are an important key to preventive medicine and a way to achieve greater justice and equity in society as a long-term measure [19]. In the studies it was found that health literacy is an important predictor of awareness of the disease and the adoption of protective behaviors during the Covid-19 pandemic [20].

The aim of this study is to examine the relationship between health literacy and health behaviors of individuals during the pandemic. Thus, it is aimed to provide guidance on how to design effective health education interventions.

Materials and Methods

This study was planned as a cross-sectional field study in order to evaluate the relationship between health literacy levels and health behaviors of adults living in Ankara during the pandemic. The population of the study consists of a total of 4,381,435 individuals between the ages of 18-65 living in the central districts of Ankara, based on the TSI 2021 data. The sample of the study was determined as 384 individuals with a 5% deviation at the 95% confidence level. 384 individuals included in the sampling were selected by convenience sampling method, one of the non-probability sampling methods [21,22].

In the study, a questionnaire consisting of 3 parts was applied to the participants. In the first part of the questionnaire, there are 5 questions about demographic information and socio-economic status, 2 questions about general health status and use of health services, and 8 questions about the diagnosis and precautions of Covid-19. In the second part, "TürkiyeHealth Literacy Scenario Scale" was used to determine the health literacy level of individuals, and in the last part, "Healthy Lifestyle Composite Scale" was used to evaluate healthy behaviors.

The Health Literacy Scenario Scale, which was created and validated by the Ministry of Health, consists of four scenarios with sixteen questions. The scenarios evaluate the process of accessing, understanding, evaluating and using/ application of health-related information in the dimensions of treatment-service, protection from diseases, and health promotion. Five statements are included for each question. One of these statements is correct and is rated "5". Two statements are partially true; that is, it contains incomplete information. These statements were scored as "+2" and "+3". Two statements are completely wrong and score "-5". The highest score that can be obtained from each question is "+10"; the lowest score can be "-10". In this case, the highest score that can be obtained from each scenario is "+30"; the lowest score is "-30". The total score that can be obtained from the four scenarios can be "+120" and the lowest score can be "-120". The first questions of each scenario were knowledge questions and were evaluated separately. In this case, the total score of the knowledge questions can be "+40" at the highest and "-40" at the lowest [23].

Healthy Lifestyle Composite Scale consists of 5 indicators selected by Adams, Katz, and Shenson (2016) from the Behavioral Risk Factors Surveillance System by considering the "Healthy People 2020" targets [24]. These indicators are smoking, fruit and vegetable consumption, physical activity, excessive alcohol consumption and adequate sleep. The "ideal" behaviors were scored as 1 and summed to obtain a composite measure total from the 5 selected indicators. Accordingly, the total scale score can vary between 0 and 5, and the participants whose scale scores are calculated as 4 and 5 are considered to have healthy behaviors [25].

The data of the research was collected by the online survey method created through Google forms between April-May 2021. Inclusion criteria for the study were determined by being between the ages of 18-65, living in the central districts of Ankara and being literate were determined. Questionnaires were sent to 384 individuals through the researchers' social networks, it was stated that the participation was voluntary and they were informed about the purpose of the study. The surveys take between 20-25 minutes to complete.

Statistical analysis of the data was carried out in SPSS 22 package program. While the dependent variable of the study was determined as the score obtained from the health literacy scenario scale, the independent variables were accepted as demographic characteristics, socio-economic status, health status indicators, attitudes related to the diagnosis and precautions of Covid-19, and healthy behaviors. The health literacy scenario scale score was calculated and evaluated with mean and standard deviation. The normality of scale score was evaluated with the Kolmogorov-Smirnov Test. Since scale scores do not provide parametric assumptions, in order to determine the relationships between health literacy score

averages and independent variables, Mann Whitney U Test and Kruskal Wallis Analysis were performed. The statistical significance level in the evaluations was accepted as $p<0.05$.

This study was evaluated by Başkent University Social and Human Sciences and Art Research Board with the letter dated March 31, 2021 and numbered 17162298.600-99 and it was determined that there was no harm in doing it.

Results

The distribution of 348 individuals participating in the study according to some descriptive characteristics is shown in Table 1. The mean age of the participants was 28.02±8.50 years; 75.5% are women. When the socio-economic status of the participants is examined; It was determined that 75.7% had at least a bachelor's degree and 55.6% had a monthly household income of more than 5,441 Turkish Liras (poverty line according to TSI March 2021 data).

While 84.5% of the participants rated their general health as good, 30.8% stated that they first applied to a state hospital when they needed health care. 65.5% of the individuals participating in the study were not diagnosed with Covid-19 as of April-May 2021. 68.3% of the participants declared that they lived in an urban area during the pandemic. 84.8% of the participants stated that they paid attention to the social distance rules, 90.5% of the hygiene rules and 82.7% of the participants stated that they used properly masks.

Table 1. Distribution of participants according to some descriptive characteristics

	Frequency	Percentage
Gender		
Female	290	75,5
Male	94	23,8
Education		
High school and below	94	24,3
Bachelor's degree and above	290	75,7
Household income		
< 5.440 Turkish Liras	170	44,3
> 5.441 Turkish Liras	214	55,6
Self-rated health		
Good	325	84,5
Not good	60	15,5
First health care provider		
Family health center	114	29,7
State hospital	118	30,8
University hospital	35	9,1
Private hospital	114	29,7
Diagnosis of Covid-19		
Yes	132	34,5
No	252	65,5
Living place in the pandemic		
Urban	262	68,3
Rural	122	31,7
Compliance with social isolation rules		
Yes	326	84,8
No	58	15,2
Compliance with hygiene rules		
Yes	348	90,5
No	36	9,5
Wearing mask properly		
Yes	318	82,7
No	66	17,3

The healthy behaviors of the participants according to the Healthy Lifestyle Composite Scale are shown in Table 2. As can be seen in Table 2, the participants have ideal behaviors related to healthy behaviors in terms of not drinking excessively with 93.7% and sleeping at least 7 hours a day with 85.6%. When evaluated in total, it can be said that 40.8% of the participants have healthy behaviors with a score of 4 and above.

Table 3 shows the descriptive statistics of the participants' Health Literacy Scenario Scale sub-dimensions and total scores. As seen in the table, the total health literacy scores range from -28 to 80, with an average of 37.7±27.2.

Table 4 shows the mean scores obtained from the Health Literacy Scenario Scale according to some characteristics of the participants. As seen in the table, the average score of the Health Literacy Scenario Scale is higher for women, those who have at least a bachelor's degree, those who are not diagnosed with Covid-19, those who live in urban areas during the pandemic, those who pay attention to social isolation, those who follow hygiene rules, those who use masks and those who have a healthy lifestyle ($p<0.05$).

Table 2. Distribution of participants by healthy behaviors

	Frequency	**Percentage**
Non-smokers	205	53,5
Those who do not drink excessively	360	93,7
Those who exercise regularly	93	24,3
Those who consume 5 servings of fruit and vegetables a day	226	58,8
Those who sleep at least 7 hours a day	329	85,6
Those with a healthy lifestyle (≥4 points)	157	40,8

Table 3. Descriptive statistics of the Health Literacy Scenario Scale (N=384)

	Minimum	Maximum	Mean	Standard deviation
Knowledge	-13	20	10,25	7,30
Access	-20	20	11,30	9,16
Understanding	-20	20	9,53	9,33
Evaluation	-13	20	8,64	7,64
Use	-20	20	8,27	9,59
Total	-28	80	37,76	27,20

Discussion

This study was conducted to determine the healthy behaviors of individuals and their effects on health literacy during the pandemic period. In the study, healthy behaviors and health literacy levels of individuals between the ages of 18-65 living in the central districts of Ankara and selected by convenience sampling method were examined.

40.8% of 384 participants have healthy behaviors according to the Healthy Lifestyle Composite Scale. Among the five basic indicators in the scale, it was determined that the most common habits of the participants were adequate sleep (85.6%) and not consuming excessive alcohol (93.7%). It has also been demonstrated in previous large-scale studies that individuals living in Türkiyedo not have sleep and alcohol problems in terms of healthy behaviors. According to TSI 2019 data, 74.4% of Türkiye's population has never used alcohol in their lifetime. WHO statistics on healthy lifestyle habits also show that alcohol consumption in Türkiyeis at a very low level. On the other hand, it was determined that only 24% of the participants exercised regularly. According to WHO and EUROSTAT, 88.2% of Türkiye's population does not exercise at all. According to the Chronic Diseases Risk Factors Survey in Türkiye, 87% of women and 77% of men do not do enough physical activity.

Table 4. Mean scores of Health Literacy Scenario Scale according to some characteristics of the participants

		Mean ± SD	p
Gender	Female	41,98±24,49	0,000*
	Male	24,33±30,98	
Education	High school and below	24,59±26,79	0,000*
	Bachelor's degree and above	42,61±25,26	
Living place in the pandemic	Urban	40,51±26,66	0,008*
	Rural	31,82±27,91	
Diagnosis of Covid-19	Yes	27,08±26,20	0,000*
	No	43,38±26,07	
Compliance with social isolation rules	Yes	39,98±26,44	0,003*
	No	25,30±28,36	
Compliance with hygiene rules	Yes	39,94±26,23	0,000*
	No	16,92±27,91	
Wearing mask properly	Yes	39,96±26,63	0,004*
	No	27,18±27,71	
Healthy behaviors	Non-healthy lifestyle	31,50±27,86	0,000*
	Healthy lifestyle	46,81±23,52	

*p<0,05

Studies showing that the limitations brought by the pandemic period also increase physical inactivity in the community should not be ignored [26-28].

Average Health Literacy Scenario Scale score of 384 individuals was determined as 37.7±27.2. Compared to the study in which the scale was developed [23] and other studies using this scale in Türkiye[29-31], this average score is quite low. The lower level of health literacy in the study may be related to the fact that the samples of other studies were predominantly composed of students. On the other hand, the only common point in studies in Türkiyein which the level of health literacy is determined with different scales in the general population [10,32-35] is that our level of health literacy is generally insufficient.

The results of the research showed that women, those who have at least a bachelor's degree, those who are not diagnosed with Covid-19, those who live in urban areas during the pandemic period, those who pay attention to social isolation, those who follow hygiene rules, those who use masks and those who have a healthy lifestyle, have obtained higher score from Health Literacy Scenario Scale. There are many cross-sectional studies supporting the finding that women have a higher level of health literacy [36-38]. The positive relationship between general literacy and health literacy has also been proven by many studies in the literature [38,39]. The relationship between compliance with Covid-19 measures and health literacy is as expected, and it is similar to the results of some international studies [19,20,40]. Although the cross-sectional design of the study does not allow to solve the cause-effect relationships, the high level of health literacy of those who have healthy lifestyle habits is enough to think that the relationship between the two concepts is a bidirectional paradox. The high health literacy scores of individuals with healthy behaviors are also compatible with previous studies [35,41-43].

It would be correct to evaluate the results of the research with some limitations. The cross-sectional design of the study only reveals the relationships between the variables, not the cause-effect relationship. Since the data collection tool used in the study is based on personal statement, it should not be ignored that the answers may be biased. Since convenience sampling method was used in the study, generalization of the results may lead to wrong evaluations. In addition, the "Healthy Lifestyle Composite Scale", which was used as a data collection tool in the research, also has limitations. The sleep duration indicator in the scale does not take into account individual differences in sleep needs. There is no doubt that the pandemic period has also changed healthy lifestyle habits.

Conclusion

The most important results of this study, which was carried out between April and May 2021 in order to determine the relationship between health literacy and health behaviors of individuals during the Covid-19 pandemic period, can be evaluated as follows. First of all, the health literacy levels of the individuals participating in the study are very low. Inadequate health literacy of the population during an epidemic may lead to irrational use of health services by preventing the correct perception of risks and reducing judgment. In efforts to prevent the spread of epidemics, the importance of individuals' health behaviors and health literacy should be taken into account, and multidisciplinary teams, including health communication and public health professionals, should be established in this direction. The second important result of the study is that individuals who comply with the preventive measures related to the pandemic have higher health literacy levels. In this process, it can be suggested that health professionals consider health literacy as a part of pandemic management. Finally, individuals with more healthy lifestyle habits were found to have higher health literacy levels. Considering that the most successful countries in the management of the pandemic are those that attach the necessary importance to preventive medicine [44,45], it is once again remarkable how essential it is to raise the health literacy level of the society and to improve health behaviors. Taking into account that the Covid-19 pandemic is not the only one we have experienced, urgent health education interventions for health literacy and health behaviors are needed.

Funding

No support of grants was used for the purpose of this research.

Conflict of interest

The authors have no conflicts of interest to disclose.

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HEALTH SCIENCES QUARTERLY

Volume: 2
Issue: 3
2022

E-ISSN: 2791-6022
https://journals.gen.tr/jsp

Received: 2022-05-20
Accepted: 2022-06-21

ORIGINAL ARTICLE

Evaluation of patients admitted to our hospital with a possible diagnosis of COVID-19

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Abstract

We aimed to evaluate the clinical characteristics, laboratory and imaging findings, and outcomes associated with the severity of illness of patients admitted to our hospital with possible COVID-19 diagnosis. The patients admitted to our hospital with a possible diagnosis of COVID-19 between March 25 and December 3, 2020, were evaluated retrospectively. In terms of their clinical, laboratory, imaging findings, and mortality were compared between patients discharged and hospitalized with died and survivors. 12470 patients admitted to our hospital with a possible diagnosis of COVID-19 tested by SARS-CoV-2 RT-PCR. Of those tested, 3116 (24.9%) were positive. Of the patients, 2529 (81.2%) were discharged, 587 (18.8%) hospitalized, and 92 (3%) were died. In the comparison of discharged, and hospitalized groups, a significant difference was found in age, symptoms, comorbid diseases, chest CT, laboratory findings, and mortality ($p< 0.05$). In the comparison of survivor, and dead, the risk of mortality analysis showed similar characteristics. Older age, male gender, comorbidities, lymphopenia, thrombocytopenia, increased levels of CRP, NLR, D-dimer, ferritin, and chest CT findings were significant risk factors. Of the patients who died, 23 (25%) were female and 69 (75%) were male. The outbreak of COVID-19 is a significantly health problem. We were experienced with high numbers of COVID-19 cases and found that age, symptoms, comorbid diseases, chest CT, laboratory findings of inflammation are significant predictors for admission to hospital. Therefore, these risk factors should consider routinely for patients with a high risk of developing severe and critical diseases by clinicians.

Keywords: COVID-19, prognosis, diagnosis.

Citation: Tünay H, Şarlak Konya P, Korkmaz D, Demirtürk, Çolak G. Evaluation of patients admitted to our hospital with a possible diagnosis of COVID-19. Health Sci Q. 2022;2(3):167-74. https://doi.org/10.26900/hsq.2.3.06

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Introduction

COVID-19 pandemic has affected millions of people around the world in recent years. Firstly, in December 2019, the pneumonia cases occurred in Wuhan, a city of China. The disease quickly spread to the other parts of the world. In February 2020, it was named COVID-19 by the World Health Organization (WHO) [1].

COVID-19 has a different clinical presentation ranging from asymptomatic infection to severe pneumonia. The symptoms initially present with mild but later may develop severe clinical manifestations. Therefore, identifying risk factors that estimate the prognosis of COVID-19 can reduce the mortality rates. Most of the studies have been published on hospitalised patients, but the acute symptoms of the disease in outpatients was restricted [2]. This study aimed to evaluate the clinical features, laboratory and imaging findings and results of associated with severity of illness patients admitted to our hospital with possible COVID-19 diagnosis.

Materials and Methods

The patients admitted to our hospital with a possible COVID-19 diagnosis between March 25 and December 3, 2020, were evaluated, retrospectively. The patients over18 years and older were included in our study. Testing was conducted on patients admitted to the pandemic department who were any symptom or sign consistent with COVID-19, including fever, cough, and shortness of breath, fatigue, gastrointestinal problems, syncope, and exposure to a positive patient for COVID-19.

Table 1. The characteristic data of overall 3116 patients

Characteristics	%	(n)
Male	45.8	1427
Female	54.2	1689
Exposure history	28.3	881
Symptoms at admission		
Fatigue	47	1464
Cough	44.2	1377
Sore Throat	25.6	799
Muscle Pain	25.4	792
Headache	21.2	660
Fever	17.7	550
Dyspnea	11.7	366
Loss of Taste	8.9	276
Loss of Smell	8.5	266
Diarrhea	6.5	204
Nausea and Vomiting	5.3	165
Abdominal Pain	2.6	82
Anorexia	2.1	66
Conjunctivitis	0.2	5
Comorbid Diseases		
Hypertension	12.1	377
Diabetes	8.7	270
Cardiovascular Disease	5.1	159
Chronic Obstructive Pulmonary Disease	4.3	133
Malignancy	2	63
Chronic Nephropathy	1.2	38
Pregnancy	1.2	38
Others	1.3	37
Chest CT		
COVID-19	19.4	606
Mortalite	3	92
Outcomes		
Discharge	81.2	2529
Hospitalization	18.8	587
Death	3	92

Case definitions were made according to the COVID-19 guidelines of the Republic of TürkiyeMinistry of Health. Cases among the patients admitted to our hospital with a possible COVID-19 diagnosis that were found to have SARS-CoV-2 by molecular methods were included in the study. A definitive diagnosis was made detecting the SARS-CoV-2 virus in oropharyngeal and nasopharyngeal swabs by SARS-CoV-2 virus real-time polymerase chain reaction (RT-PCR). Demographic, clinical, laboratory, chest CT findings and clinical outcomes of these patients were obtained from the hospital database and patient records. The data of patients, including age, gender, underlying disease (comorbidities), duration of days with symptoms on admission and exposure to a positive patient for COVID-19 were recorded. Hemogram, neutrophil-to-lymphocyte ratio [NLR], kidney and liver function tests, lactate dehydrogenase [LDH], troponin, D-dimer, ferritin, C-reactive protein (CRP) were examined on the first day of hospitalization in the patients. Age, symptoms, comorbid diseases, chest CT and laboratory findings were compared between patients discharged, and hospitalized. Approval for the study was provided from the Clinical Research Ethics Committee of Afyonkarahisar Health Sciences University, Türkiye(2021/199).

Statistical analysis

All of the patient data were recorded with Statistical Package for Social Sciences (SPSS) 20.0 (SPSS Inc., Chicago, IL, USA) Descriptive data were given as mean, standard deviation, numbers and percentages. Chi-square and Fisher's exact tests were used for group comparisons, and Student's t-test was used for comparisons of normally distributed continuous variables. The Mann-Whitney U test, one of the nonparametric tests, was used to compare continuous variables that did not conform to the normal distribution. Results with a p-value of less than 0.05 were considered statistically significant.

Table2 . The comparison data of the patients between hospitalized and discharged group

	Discharged (*n*= 2527)	**Hospitalized(*n*=589)**	***p***
Age			
Median (minimum-maximum)	42.1 (18-93)	60.3 (19-92)	<0.005
Symptoms			
Fever	16.9% (426)	%21.1 (104)	0.016
Cough	40.8% (1032)	%58.6 (345)	<0.005
Dyspnea	5.2% (131)	%39.9 (235)	<0.005
Nausea and Vomiting	4.2% (106)	%10 (59)	<0.005
Anorexia	1.5% (37)	%4.9 (29)	<0.005
Comorbid Diseases			
Hypertension	7.3% (184)	%32.8 (193)	<0.005
Diabetes	5.2% (132)	%23.4 (138)	<0.005
Cardiovascular Disease	2.9% (74)	%14.4 (85)	<0.005
Chronic Obstructive Pulmonary Disease	2.4% (61)	%12.2 (72)	<0.005
Malignancy	1.1% (29)	%5.8 (34)	<0.005
Chronic Nephropathy	0.6% (15)	%3.9 (23)	<0.005
Pregnancy	0.7% (19)	%3 (18)	<0.005
Chest CT			
Compatible with COVID-19	56.1% (169)	%85.9 (437)	<0.005
Mortality	0.2% (5)	%14.8 (87)	<0.005
Laboratory			
Lymphopenia	29.6% (55)	%70.4 (131)	<0.005
PNL/Lymphocyte	29.9% (19)	%70.1 (289)	<0.005
Thrombocytopenia	29.2% (15)	%70.8 (46)	<0.005
CRP	15.5% (18)	%84.5 (98)	<0.005
D-Dimer	26.2% (37)	%83.6 (104)	<0.005
Ferritin	16.4% (26)	%49.4 (133)	<0.005

Results

During the study period, 12470 patients admitted to our hospital with a possible COVID-19 diagnosis tested by SARS-CoV-2 RT-PCR. Of those tested, 3116 (24.9%) were positive and included in the study. The mean age of the patients was 45.5±16.9 years. Of the patients, 168 (54.2%) were female. Among patients admitted to hospital, the median duration of days with symptoms on admission was 3.15±2.45 days. The number of patients who known exposure was 881(%28.3). The most common complaints were fatigue (47%), cough (44.2%), and headache (21.2%). The most common chronic diseases were hypertension (12.1%), diabetes mellitus (8.7%), cardiovascular disease (5.1%) and chronic obstructive pulmonary disease (4.3%). Of the patients, 92 (3%) were died. The characteristic data of patients are given in Table 1. Of the patients, 2529 (81.2%) were discharged, and 587 (18.8%) hospitalized. Among the 587 patients 523 (16.8) were treated in the clinic and 66 (2.1) were treated in the intensive care unit. Age, symptoms, comorbid diseases, chest CT, laboratory findings and mortality were compared patients discharged, and hospitalized. In the comparison of discharged, and hospitalized groups, a significant difference was found age, symptoms, comorbid diseases, chest CT, laboratory findings and mortality ($p<0.05$). The mean age of group hospitalized were significantly higher than discharged group. The symptoms such as cough, dyspnea, nausea and vomiting were significantly higher in patients hospitalized than discharged group ($p<0.05$). The comorbidities in patients hospitalized were significantly higher than discharged group. A significant correlation was found between hospitalized and diabetes mellitus (DM), coronary artery disease (CAD), hypertension (HT), chronic obstructive pulmonary (COPD), chronic renal failure (CRF), malignancy ($p<0.05$). Lymphopenia, thrombocytopenia, elevated NLR levels, elevated D-dimer levels, elevated Ferritin levels, and elevated C-reactive protein (CRP) levels were significantly higher in the patients with hospitalized groups than discharged group ($p<0.05$). Of the hospitalized patients 437 (85.9%)

Table3. The comparison data of the groups between the survivor, and died

	Survivor (*n*=3024)	**Died (*n*=92)**	***p***
Age			
Median (minimum-maximum)	44.7 (20-87)	72.1 (18-93)	<0.005
Symptoms			
Dyspnea	10.2% (309)	%62 (57)	<0.005
Nausea and Vomiting	5.1% (155)	%10.9 (10)	<0.005
Anorexia	5.4% (5)	%2 (61)	<0.005
Hospitalization	16.6% (502)	%92.4 (85)	<0.005
Comorbid Diseases			
Hypertension	11.3% (340)	%40.2 (37)	<0.005
Diabetes	8% (243)	%29.3 (27)	<0.005
Cardiovascular Disease	4.3%(131)	%30.4 (28)	<0.005
Chronic Obstructive Pulmonary Disease	4% (120)	%14.1 (13)	<0.005
Malignancy	1.7% (52)	%12 (11)	<0.005
Chronic Nephropathy	0.9% (29)	%9.8 (9)	<0.005
Pregnancy	1% (32)	%4 (5)	<0.005
Chest-CT			
Compatible with COVID-19	73% (533)	%91.2 (73)	<0.005
Laboratory			
Lymphopenia	16.1% (140)	%51.7 (46)	<0.005
PNL/Lymphocyte	39.2% (341)	%79.8 (71)	<0.005
Thrombocytopenia	5.7% (50)	%16.9 (15)	<0.005
CRP	8.8% (76)	%44.9 (40)	<0.005
D-Dimer	15.6% (111)	%39 (30)	<0.005
Ferritin	13.8% (116)	%49.4 (43)	<0.005

had thorax CT findings of COVID-19 infection and mortality rate 87 (14.8%) was founded higher than discharge group ($p<0.05$). The comparison data of the patients between the hospitalized and discharged group are given in Table 2.

Of the patients who died, 23 (25%) were female, and 69 (75%) male. In the comparison of survivor, and died, a significant difference was found age, symptoms, comorbid diseases, chest CT, and laboratory findings ($p<0.05$). The mean age of group died were significantly higher than survivors. The symptoms such as dyspnea, nausea-vomiting were notably higher in patients died than survivor ($p<0.05$). The comorbidities such as diabetes mellitus (DM), coronary artery disease (CAD), hypertension (HT), chronic obstructive pulmonary (COPD), chronic renal failure (CRF), malignancy in patients died were significantly higher than survivor ($p<0.05$). Lymphopenia, thrombocytopenia, elevated NLR levels, elevated D-dimer levels, elevated Ferritin levels, and elevated C-reactive protein (CRP) levels were significantly higher in the patients with died groups than survivor ($p<0.05$). 73 (91.2%) of died had thorax CT findings consistent with COVID-19 infection. The comparison data of the groups between died and survivor are given in Table 3.

Discussion

In the COVID-19 pandemic, our study investigated the factors associated with severity of COVID-19. Identifying the risk factors can indicate the prognosis of the disease, and help to hospitalize patients in the high-risk group earlier. According to our study, demographic, clinical, laboratory, chest CT findings and clinical outcomes of COVID-19 patients were similar to previous studies [3-5].

Compared with younger age, the patients an older age (>65 years) are more likely mortality. In our study, the mean age of group died were over 65 years old. Elderly patients have reduced in immune function. The anti-inflammatory mechanisms after infection are not adequately controlled in elderly persons, potentially causing to mortality [6]. In the studies, it was found that male patients are the more susceptible to the COVID-19 infection [7,8]. In our study, 54.2% of the patients admitted to our hospital with a possible COVID-19 diagnosis were female and 45.8% were male.

In the studies, the incubation period of SARS-CoV-2 ranges from 2.1 to 11.1 days [9]. The median incubation period was found 3.15±2.45 days in our study. The studies have reported that the COVID-19 infections may be impacted by geographical climatic factors such as temperature and seasonality. Nineteen studies in China reported peak time of infections varied from late January to late March [10]. Findings from our study showed that peak time of infections from late June to late November.

SARS-CoV-2 can be transmitted effectively human-to-human by droplets or direct contact. [11]. In a study, the rate of SARS-CoV-2 transmission was founded 41% in the hospital [12]. In our study, the transmission rate of SARS-CoV-2 was founded 28.3%. The development and facility of global travel could also increase its worldwide spread transmission of SARS-CoV-2 [13].

The most common symptoms of COVID-19 infection are fever, cough, dyspnea, fatigue, which were reported in the previous literature [13,14]. In our study, the signs and symptoms of COVID-19 were similar with these previous publications. On admission, fatigue (47%), cough (44.2%), and headache (21.2%) were the most common symptoms. The clinical course in COVID-19 may vary according to the comorbidities. Comorbidities increase the risk of hospitalization and mortality in COVID-19 pandemic [16,17]. Huang et al. reported that 32% of 41 patients had an underlying disease; reported that they found diabetes mellitus in 20%, hypertension in 15%, and cardiovascular disease in 15% of these patients [2]. In another study by Lai et al., it was found the common underlying diseases in patients were hypertension, cardiovascular disease and diabetes mellitus [15]. In our study, hypertension (12.1%) we found to be the most common comorbidity, followed by diabetes (8.7%), and cardiovascular disease (5.1%).

The most widely used test method all over the world in the diagnosis of COVID-19 is RT-PCR. The positivity rate of the RT-PCR test was reported as 39.5% by Li et al., and as 36.6% by Sümer et al. [18,19]. In our study, the RT-PCR test positivity rate was found to be 24.9% at the time of admission. Thorax CT is used as an important diagnostic method in cases of COVID-19 pneumonia [20]. Guan et al reported that CT no abnormality was found in 1099 patients (17.9%) [7]. In our study, thoracic CT was requested in 805 (25.8%) of the patients. Among 805 patients characteristic thoracic CT findings were detected in 606 (75.2%) patients. The mortality rates reported in the literature ranged from 1% to 32.5% [1]. In this study, the mortality rate of patients included was 3%.

COVID-19 may progress more severely in hospitalized patients; therefore, it should be identified the risk factors for mortality [21,22]. In a study, it is reported that advanced age cause severe COVID-19 disease [23]. In general, comorbidities such as DM, CAD, HT, COPD, CRF and malignancy have leading to worse outcomes in COVID-19 patients [24-26]. The most common laboratory findings in COVID-19 patients that include lymphopenia, thrombocytopenia, and increased levels of CRP, NLR, D-dimer, and ferritin reported in several studies. These laboratory findings are significantly higher in hospitalized patients and can be used to predict COVID-19 severity [27,28]. When the outcomes of patients who were hospitalized was compared with the discharged group, we found particularly association of among age, symptoms, comorbid diseases, chest CT, laboratory findings and mortality as in previous studies. In the comparison of survivor, and died, the risk mortality analysis showed similar characteristics with previous studies. The mean age of group died were over 65 years old. Of the patients who died, 23 (25%) were female, and 69 (75%) male. The mortality was found higher in the males. Other significant factors included symptoms, comorbid diseases, and chest CT, and laboratory findings.

Conclusion

Finally, the outbreak of COVID-19 is a significantly health problem. We were experienced with high numbers of COVID-19 cases and found that age, symptoms, comorbid diseases, chest CT, laboratory findings of inflammation are significant predictors for admission to hospital. Determining risk factors for COVID-19 severity and mortality are critical for prognosis too. Therefore, these risk factors should consider routinely for patients with a high risk of developing severe and critical diseases by clinicians.

Our study has some notable limitations. It was designed as a retrospective study. Some cases had incomplete documentation for exposure history and laboratory testing in the electronic databases.

Funding

There is no funding for the study.

Conflict of interest

The authors of this manuscript report no conflict of interest. All co-authors have seen and agreed with the contents of the manuscript.

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Volume: 2
Issue: 3
2022
E-ISSN: 2791-6022
DOI: 10.26900/hsq

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