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ORIGINAL RESEARCH

The Relationship Between E-Health Literacy, Health Anxiety, Cyberchondria, and Death Anxiety in University Students That Study in Health Related Department

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Introduction: While the Internet can be a valuable resource for learning about health issues, for those without adequate e-health literacy skills, it can have adverse effects on unwanted anxiety and cyberchondria risk. Improving e-health literacy is essential to manage health and death anxiety and help reduce the risk of cyberchondria. The aim of this study is to determine the e-health literacy, health anxiety, cyberchondria and death anxiety levels of university students, evaluate them in terms of independent variables and examine the relationship between the scales.

Methods: The study was completed with 568 students receiving education in the health department of a university. Data were obtained using the e-Health Literacy Scale, Health Anxiety Inventory, Cyberchondria Severity Scale, and Death Anxiety Scale. The chi-square, Mann–Whitney U, Kruskal–Wallis, Tamhane's T2 post hoc tests, and Spearman correlation were used to analyze the data.

Results: The mean score of e-health literacy was 28.63±4.65; health anxiety was 19.11±8.37, cyberchondria was 86.30±18.28 and death anxiety was 7.34±2.14. Cyberchondria is low in women and those who do not conduct online research on health. E-health literacy was higher in those earning above the minimum wage. Health and death anxiety was low in men and in those who did not conduct online health-related research. Health anxiety was positively correlated with cyberchondria and death anxiety and negatively correlated with e-health literacy. There was a positive relationship between cyberchondria and E-health literacy and death anxiety. This study highlights the complex relationship between eHealth literacy, health anxiety, cyberchondria and death anxiety. It shows that low e-health literacy can increase health anxiety, which in turn can worsen cyberchondria and death anxiety. By emphasising the importance of e-health literacy in health education, the findings may help students manage their anxiety, make informed health decisions, and increase their professional competence.

Keywords: E-health literacy, death anxiety, cyberchondria, health anxiety, university students

Introduction

Today, much health information can be easily accessed in the digital environment thanks to the rapid development in information and communication technology. Studies have shown that a significant portion of internet users search for information on the internet about their physical or mental health.[1–5] A study stated that most university students (67.7%) used the Internet to seek health support online for easy access to information, privacy, and confidentiality.[6] Another study found that more than 80% of medical students used social media platforms and online search engines as the primary source of information about COVID-19.[7] A significant portion of university students studying in the health department see the internet as a valuable and fundamental tool in accessing health resources, evaluating it and making health-related decisions.[6,8–10] However, studies highlight that a significant portion of students have problems finding accurate information on a health-related issue, evaluating it, and using it to make decisions.[10–16] As can be seen, access to health information alone is not

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enough. Students need e-health literacy skills to search for and find health information from electronic sources and to understand, interpret, and solve a health problem.[17] Norman and Skinner define eHealth literacy as

> the ability to search, locate, understand, and evaluate health information from electronic sources and to apply the information to address or solve a health problem.[17]

In studies conducted in Turkey, e-health literacy of students studying in health sciences was found to be at a medium level.[18,19] These results show that although students, who are future healthcare personnel, receive education in the field of health, they do not have high-level e-health literacy skills to search, understand, evaluate and use health information on the internet. For this reason, it is recommended that studies be carried out to improve students' e-health literacy levels. Low e-health literacy level may cause health anxiety, cyberchondria and death anxiety by making it difficult for individuals to evaluate health-related information accurately and consciously.[20–22] In this case, it may cause individuals to misinterpret health problems, self-diagnose, turn to incorrect treatment methods and unlicensed health services, or apply to emergency services unnecessarily, causing an additional burden on the health system.[23–25] In addition, it may increase the frequency of use of health services or, on the contrary, may cause individuals to avoid seeking medical help due to unnecessary fear.[24,26] It may also negatively affect the mental health of individuals and cause a decrease in quality of life.[27,28] Therefore, it is essential to examine the relationship between e-health literacy and health anxiety, cyberchondria and death anxiety.

As a result of a systematic cross-sectional study in which health literacy levels of university students were evaluated using various health literacy and e-health literacy scales (eHEALS), the health literacy levels of students were found to be low.[29] According to this information, university students are not prepared enough to use too many health-related details available in the digital environment and critically analyse and evaluate or make decisions about their health.[30] Low health literacy levels may cause health anxiety in students.[31–35] In the literature, it has been stated that a significant portion of students experienced health anxiety.[36–38] A study conducted in Turkey found that about half of the participants had moderate[3] levels of health anxiety. Health anxiety is the interpretation of perceived bodily sensations and changes as symptoms of severe disease and excessive worry about having a disease.[39,40] Most people experience health anxiety at some point in their lives, and this can be permanent in some cases.[39] Mild health anxiety is bearable, and it can disappear on its own, but severe health anxiety can cause psychiatric disorders such as hypochondriasis and health phobia.[41] It can even cause significant impairment by adversely affecting individuals' personal, familial, social, educational, occupational, or other critical functional areas.[37,42]

People with health anxiety search for information about their feared disease in the digital environment and for reassurance that their probability of having the disease is low.[42,43] However, individuals with low levels of e-health literacy may experience difficulties accessing accurate information, critically analysing and evaluating information, or drawing conclusions about their health.[44,45] In this case, it may cause more attention to the feared disease, increases the frequency and duration of searches, and consequently increases health anxiety.[42,46,47] Thus, a vicious cycle is formed between searching and health anxiety. The disproportionate and repetitive use of the internet to obtain health information brings cyberchondria over.[48] Previous studies have shown that health anxiety is associated with cyberchondria[31,42] and positively predicts cyberchondria.[42]

In the literature, the word "cyberchondria", which is a combination of the words "cyber" and "hypochondria", is defined as a behavioural pattern characterised by excessive and/or repetitive online health research, which is generally associated with an increase in health anxiety.[20,49,50] At the same time, cyberchondria is a concept that results in spending too much time on the internet for health-related research, resulting in worsened health anxiety.[5,47] In addition, it has been revealed in the literature that the prevalence of cyberchondria is increasing in university students.[51–53] As can be seen, it has been revealed in the literature that a significant rate of students experience health anxiety and cyberchondria. Studies conducted in Turkey underline that cyberchondria is an essential issue that university students must address.[54,55] Studies show moderate to strong correlations between cyberchondria and health anxiety.[47,50,56,57] Therefore, interventions that will reduce anxiety and cyberchondria in students are critical. Strengthening university students' eHealth literacy skills can reduce the risk of health anxiety and cyberchondria.[58,59] Recent studies have also shown that health literacy can help reduce anxiety and cyberchondria levels.[20,60,61]

Moreover, health anxiety can lead to an increase in online health searches, more misinterpretations, and death anxiety by creating symptomatologic loops. Death anxiety is defined as the conscious or unconscious fear of death resulting from situations that lead to the thought of dying, expectation of death, or awareness.[62–64] Death anxiety can lead to complications such as anxiety, stress, depression, and suicidal ideation.[63,65–70] Besides health anxiety and cyberchondria, it is known that

health literacy is also associated with death anxiety, and people with limited health literacy have higher levels of anxiety and death anxiety.[71]

The literature mainly focuses on general health literacy. It addresses the relationship between e-health literacy and psychological variables such as health anxiety, cyberchondria and death anxiety at a limited level. In particular, there is no research in the literature on how e-health literacy affects health anxiety and cyberchondria and how these two factors are related to death anxiety. While the existing studies generally focus on the relationship between health anxiety and cyberchondria, the role of e-health literacy in this process has been largely neglected. There is a gap in the literature on how these issues interact, especially in young adults such as university students. However, studies on death anxiety focus more on older individuals or groups with chronic diseases. However, it is thought that university students also have death anxiety and that this anxiety may increase, especially in the face of health-related uncertainties. In this context, this study aims to fill a significant knowledge gap by examining the role of e-health literacy on health anxiety, cyberchondria and death anxiety and their relationship with each other, especially among university students who constitute a large group of society.

Methods and Materials

This descriptive research was conducted at a university in Turkey. The data were collected between December 2021 and January 2022. The universe of the study consists of a total of 1674 students who are actively continuing their courses in the Faculty of Health Sciences (Nursing), Vocational School of Health Services (Anesthesia, Emergency and First Aid, Elderly Care, Medical Laboratory, and Physiotherapy Departments), and Vocational School of Physical Therapy and Rehabilitation of a university. All students at the faculties and colleges where the study would be conducted were invited to participate in the research. Before starting the online survey, participants were presented with an explanatory text regarding informed consent at the beginning. In light of this information, those who gave consent were asked to continue the survey.

In previous studies, 42.6% and 47.7% of students were found to have limited (problematic or inadequate) health literacy.[72,73] In another study, ~50% of students showed high health literacy behaviour. In addition, students reported that it was difficult for them to decide whether the information was reliable (64.5%) or not (53.9%) or whether the information was linked to commercial interests (53.9%) and to verify information from different websites (55.9%).[30] Considering the study's findings and taking the incidence of the event as 50% to obtain the maximum sample size for sample selection, the sample size was calculated as 313 for p:0.50, t:5, d:0.05. The calculation was performed using the Raosoft Sample Size Calculator Program. The study was completed with 568 students who agreed to participate voluntarily.

Inclusion criteria: Being over 18, answering all questions, volunteering to participate in the study. The exclusion criterion does not respond to more than one question in the survey.

Data Collection

Data were collected through an online questionnaire created on a platform (Google Form) that can be accessed from any device. The link to the survey was sent to all students in the study via WhatsApp and e-mail, which were used by the staff in the relevant departments to communicate with the students. At the beginning of the survey, participants were presented with an explanatory text about informed consent and asked to participate in the study voluntarily. Those who gave consent were asked to continue with the survey.

The questionnaire had 84 questions, including 8 in the descriptive form used to collect data, 10 in the e-health literacy scale, 18 in the health anxiety scale, 33 in the cyberchondria severity scale, and 15 in the death anxiety scale. It took an average of 40–45 minutes to complete.

Data Collection Tools

An "Introductory Form" the "e-Health Literacy Scale (eHEALS)" the "Health Anxiety Inventory (HAI)" the "Cyberchondria Severity Scale (CSS)" and the "Death Anxiety Scale (DAS)" were used for data collection.

The data were collected through an online survey created on an online platform (Google Forms), accessible from any device. The survey link was sent to the students via WhatsApp through the student representatives of the relevant

faculties and vocational schools where the study was conducted. Participation in the survey was voluntary and anonymous. When participants completed the survey on Google Forms, each was sent to a database that can be downloaded as a Microsoft Excel file.

Introductory Form

The form was prepared by the researchers and consists of 8 questions regarding age, gender, employment status, income, family structure, presence of chronic disease, frequency of internet use, and health-related online research.

E-Health Literacy Scale (eHEALS)

The scale was developed by Norman and Skinner in 2006 to measure individuals' skills in using health information technology and the fit between e-health programs and individuals.[17] This scale consists of 2 items measuring internet use and eight items measuring internet attitude. The scale items are ranked on a 5-point Likert-type scale ranging from "1= strongly disagree" to '5= strongly agree'. The minimum score from the scale is 8, and the maximum score is 40. A high score on the scale indicates a high level of e-health literacy. Gencer established the Turkish validity and reliability of the scale, and the Cronbach Alpha value of the scale was calculated as 0.91.[74]

Templer Death Anxiety Scale (DAS)

The scale was developed by Templer in 1970 to determine the level of death anxiety. It consists of a total of 15 items and a single dimension. Scale items are scored on a 2-point Likert-type scale as "0=no (no anxiety)" and '1=yes (anxiety)'. A minimum of 0 points and a maximum of 15 points can be taken from the scale. A score of 0 indicates no death anxiety, and a score of 15 indicates high death anxiety.[75] The Turkish validity and reliability of the scale were established by Akça and Köse (2008), and the Cronbach Alpha value of the scale was calculated as 0.72.[76]

Cyberchondria Severity Scale (CSS)

The scale was developed by McElroy and Shevlin.[77] It includes questions about how people do health research on the internet and how this health research affects their other activities on the Internet and their daily lives. The scale consists of 33 items and five subscales: compulsion (8 items), distress (8 items), excessiveness (8 items), reassurance seeking (6 items), and mistrust of medical professionals (3 items). The first sub-dimension is a compulsion, the interruption of daily life associated with repeated online search behaviour; the second sub-dimension is excessive anxiety, the negative emotional state experienced while searching for information about diseases on the Internet; the third sub-dimension is excessiveness, the repetitive nature of online behaviour; the fourth sub-dimension relief, the need to seek professional medical advice; the last sub-dimension distrust of the doctor, distrust of the medical professional.[77–79] Scale items are scored on a 5-point Likert-type scale ranging from "1= never" and "5= always". The minimum score from the scale is 33, and the maximum score is 165. Higher scores indicate higher levels of cyberchondria. The Turkish validity and reliability of the scale were established by Uzun and Zencir (2021), and the Cronbach Alpha value of the scale was calculated as 0.89.[80]

Health Anxiety Scale (HAI)

The inventory was developed by Salkovskis et al (2002) to evaluate individuals' health anxiety.[81] It consists of 18 items and two subscales: hypersensitivity (14 items) and body anxiety (4 items). The items are scored on a 3-point Likert-type scale ranging from "0= never" and "3= always". The minimum score obtainable from the inventory is 0, and the maximum score is 54. Higher scores indicate higher levels of health anxiety. The Turkish validity and reliability of the inventory were established by Aydemir et al (2013), and the Cronbach Alpha value was calculated as 0.91.[82]

Data Analysis

SPSS 22 package program was used for the statistical analysis of the data. Descriptive data were given as percentage, mean, and standard deviation. The chi-square test was performed to analyse categorical data. Normal distribution was checked by the Shapiro–Wilk test ($p<0.001$). Mann Whitney *U*-test and Kruskal Wallis analysis were used in the statistical analysis of quantitative data. Tamhane's T2 post hoc test and Spearman correlation were used to evaluate the relationship between variables. In the correlation analysis, 0–0.19 was considered as no correlation, 0.20–0.39 as

a weak correlation, 0.40–0.69 as a moderate correlation, 0.70–0.89 as a strong correlation, and 0.90–1.00 as a robust correlation. The significance value was $p<0.05$.[83]

Ethical Considerations

Recep Tayyip Erdoğan University's Social and Human Sciences Ethics Committee granted permission numbered 2021\259 for the research. This study was conducted in accordance with the Declaration of Helsinki.

Results

The mean age of the students participating in the study was 20.19±1.48. Of the students, 80.1% were female; 25.5% had an income below the minimum wage; 38.4% had an income of the minimum wage; 36.1% had an income above the minimum wage; 77.5% had a nuclear family; 18.7% had an extended family; 3.9% had a fragmented family; 3% were employed; 3% had a chronic disease; 38.9% had a family member with a chronic illness. Of the students, 87% used the internet more than an hour a day; 9.2% used an hour a day; 3.9% used it once a week or less; and 28.5% did online health research.

The mean scale scores are shown in Table 1. Participants' scores on e-HEALS, total CSS, distress, excessiveness, and reassurance-seeking subscales of CSS, HAI, and DAS were moderate. The score on the compulsion subscale of CSS was low, and the score on the mistrust of medical professional subscale of CSS was high (Table 1).

The score on the compulsion subscale was significantly lower in women and those who did not do online health research ($p=0.000$, $p=0.024$). The score on the distress subscale was substantially lower in women, those who did not do online health research, and those with fragmented families ($p=0.041$, $p=0.011$, $p=0.050$). The score on the excessiveness subscale was significantly lower in those who did not do online health research ($p<0.001$). The score on the reassurance-seeking subscale was substantially lower in women and those who did not do online health research ($p=0.002$, $p=0.001$). The total CSS score was significantly lower in women and those who did not do online health research ($p=0.002$, $p<0.001$). There was no significant difference in the score on the mistrust of medical professional subscale. The analysis of the scores on CSS and its subscales is shown in Table 2.

The e-health literacy score was significantly higher in those with an income above the minimum wage ($p=0.001$). The total score on HAI was considerably lower in men and in those who did not do online health research ($p=0.007$, $p<0.001$). The score on DAS was significantly lower in men and in those who did not do online health research ($p<0.001$, $p=0.028$). The analysis of e-HEALS, HAI, and DAS according to independent variables is shown in Table 3.

Table 1 Participants' Mean Scores on e-HEALS, DAS, CSS, and HAI

	N	Minimum	Maximum	Mean	Std. Deviation
e-HEALS	568	9	40	28.63	4.65
DAS	568	0	13	7.34	2.14
Compulsion	568	8	40	14.41	6.85
Distress	568	8	38	20.11	5.50
Excessiveness	568	8	40	24.53	5.73
Reassurance Seeking	568	6	30	15.89	4.89
Mistrust of Medical Professional	568	3	15	11.37	2.79
Total CSS	568	38	161	86.30	18.28
Total HAI	568	0	52	19.11	8.37

Abbreviations: e-HEALS, e-Health literacy scale; DAS, Templer death anxiety scale; CSS, Cyberchondria severity scale; HAI, Health anxiety scale.

Table 2 Analysis of CSS and Its Subscales According to Some Independent Variables

		n	Compulsion	Distress	Excessiveness	Reassurance Seeking	Mistrust of Medical Professional	CSS Total
Gender	Women	455	271.87	277.48	282.34	273.89	289.31	273.84
	Men	113	335.35	312.76	293.19	327.2	265.13	327.43
	MWU		19962	22,514.5	24,726	20,882	23,518.5	20,856
	Z		−3.726	−2.048	−0.63	−3.098	−1.412	−3.108
	p		0.000	0.041	0.529	0.002	0.158	0.002
Employment status	Yes	17	285.35	306.12	257.21	286.85	277.97	277.15
	No	551	284.47	283.83	285.34	284.43	284.7	284.73
	MWU		4669.0	4316.0	4219.5	4643.5	4572.5	4558.5
	Z		−0.022	−0.552	−0.697	−0.06	−0.168	−0.188
	p		0.982	0.581	0.486	0.952	0.867	0.851
Online health research	Yes	162	308.79	312.04	327.13	320.96	282.16	327.21
	No	406	274.81	273.51	267.49	269.95	285.43	267.46
	MWU		28951.5	28,424.5	25,980.5	26,979	32,506.5	25,967.5
	Z		−2.256	−2.531	−3.917	−3.353	−0.216	−3.918
	p		0.024	0.011	0.000	0.001	0.829	0.000
Income	Below minimum wage	145	303.16	291.33	282.91	293.2	283.89	295.28
	Minimum wage	218	289.27	289.21	284.93	281.86	273.89	285.6
	Above minimum wage	205	266.23	274.66	285.16	281.15	296.22	275.71
	KW X^2		4.718	1.172	0.018	0.552	1.987	1.224
	p		0.095	0.557	0.991	0.759	0.370	0.542
Family structure	Nuclear family	440	277.2	282.01	286.99	286.03	282.5	283.47
	Extended family	106	313.59	308.61	271.89	282.11	292.75	294.25
	Fragmented family	22	290.27	218.16	295.45	265.39	284.73	258.07
	KW X^2		4.337	6.004	0.828	0.361	0.338	0.962
	p		0.114	0.050	0.661	0.835	0.845	0.618
Chronic disease	Yes, I have	17	253.76	246.35	264.82	277.85	285.15	253.56
	Yes, a family member has	221	283.35	282.44	281.06	290.61	292.94	282.91
	No	330	286.85	287.85	287.82	280.75	278.82	287.16
	KW X^2		0.692	1.094	0.478	0.51	0.995	0.712
	p		0.707	0.579	0.787	0.775	0.608	0.701
Internet use	More than an hour a day	494	287.76	289.21	287.37	286.37	284.05	288.34
	An hour a day	52	271.55	261.14	273.24	273.24	304.20	272.37
	An hour a day or less	22	241.84	233.98	246.57	246.57	247.98	226.93
	KW X^2		2.057	3.557	1.577	0.685	1.869	3.263
	p		0.358	0.169	0.455	0.720	0.393	0.196

Abbreviations: CSS, Cyberchondria severity scale; MWU, Mann–Whitney *U*-test; KW, Kruskal Wallis test.

Table 3 Analysis of Mean Scores on e-HEALS, HAI, and DAS According to Some Independent Variables

		n	e-HEALS	HAI Total	DAS
Gender	Women	455	282.22	293.77	298.02
	Men	113	293.66	247.18	230.08
	MWU		24672.0	21,490.5	19,557.5
	Z		−0.667	−2.704	−3.979
	p		0.505	0.007	0.000
Employment status	Yes	17	279.35	289.82	336.29
	No	551	284.66	284.34	282.90
	MWU		4596.0	4593.0	3803.0
	Z		−0.132	−0.136	−1.335
	p		0.895	0.892	0.182
Online health research	Yes	162	302.85	329.81	308.27
	No	406	277.18	266.42	275.01
	MWU		29912.5	25,546.0	29,034.5
	Z		−1.693	−4.161	−2.203
	p		0.090	0.000	0.028
Income	Below minimum wage	145	262.51	292.31	291.10
	Minimum wage	218	265.84	290.61	298.79
	Above minimum wage	205	319.90	272.48	264.63
	KW X^2		15.122	1.735	4.991
	p		0.001	0.420	0.082
Family structure	Nuclear family	440	284.70	280.50	278.17
	Extended family	106	284.90	309.44	312.35
	Fragmented family	22	278.64	244.27	276.84
	KW X^2		0.030	4.040	3.831
	p		0.985	0.133	0.147
Chronic disease	Yes, I have	17	264.12	300.44	315.41
	Yes, a family member has	221	296.10	281.69	285.00
	No	330	277.78	285.56	282.57
	KW X^2		1.940	0.239	0.664
	p		0.379	0.887	0.718

(*Continued*)

Table 3 (Continued).

		n	e-HEALS	HAI Total	DAS
Internet use	More than an hour a day	494	282.46	289.46	282.96
	An hour a day	52	280.78	247.75	290.59
	An hour a day or less	22	339.14	259.89	304.75
	KW X^2		2.569	3.562	0.459
	p		0.277	0.168	0.795

Abbreviations: eHEALS, e-Health literacy scale; HAI, Health anxiety scale; DAS, Templer death anxiety scale.

Table 4 Correlation Analysis Between HAI, CSS, e-HEALS and DAS

		Cyberchondria Severity Scale	E-Health Literacy Scale	Death Anxiety Scale
Health Anxiety Inventory	r	0.407	−0.098	0.261
	p	0.000	0.019	0.000
Cyberchondria Severity Scale	r	1.000	0.147	0.157
	p		0.000	0.000
E-Health Literacy Scale	r		1.000	−0.042
	p			0.312

Abbreviations: HAI, Health anxiety scale; CSS, Cyberchondria severity scale; eHEALS, e-Health literacy scale; DAS, Templer death anxiety scale.

The correlation analysis between HAI, CSS, e-HEALS and DAS is shown in Table 4. In the correlation analysis, health anxiety was moderately and positively correlated with cyberchondria, weakly and positively correlated with death anxiety, and weakly and negatively correlated with e-health literacy ($p<0.001$, $p=0.019$, $p<0.001$, $p<0.001$). A positive, weak, and significant correlation existed between CSS and e-health literacy and death anxiety ($p<0.001$, $p<0.001$). There was no significant correlation between e-health literacy and death anxiety ($p=0.312$).

Discussion

This study aimed to examine the relationship between e-health literacy, health anxiety, cyberchondria and death anxiety. Students' mean e-health literacy score (28.63) being consistent with the current literature.[8–10,16,84–87] In previous studies, it has been shown that students were not sure where to find health sources, that they could not evaluate health sources, that they could not distinguish the quality of information, and that relevant knowledge and skills were not taught.[16,88] Studies conducted in Germany and England found that although digital health literacy among university students is well-developed, a significant portion of students have problems finding accurate information on a particular health-related subject and evaluating the information.[11,12] At the same time, in Portuguese and Slovenian studies, it was determined that students had difficulties in making decisions about the reliability of health information, finding information, and choosing among all the information.[13,14] Similarly, another study conducted in South Korea found that most students could not distinguish between high and low-quality health resources on the internet.[10] A study conducted in Canada found that students lack awareness of online health information and the ability to use this information to make decisions.[15] The literature generally shows that even if students have good e-health literacy levels, they struggle to find the correct information, evaluate, and make decisions. It also emphasises that e-health literacy levels should be improved. Health students should have strong e-health literacy to manage their health and make decisions based on accurate and reliable

information in their professional practice. Therefore, curricular adjustments and elective courses to increase health literacy in universities are critical for students to develop the skills to use digital health information effectively.

The findings show that e-health literacy increases significantly with income, consistent with the existing literature.[18] Other studies have shown that individuals with lower income levels are significantly more likely to have insufficient health literacy.[89,90] Students with lower incomes may have difficulty accessing digital health resources and may not use health technologies and digital health platforms more effectively, limiting their health literacy.

Similar to the literature, a negative correlation was determined between health anxiety and e-health literacy in this study. At the same time, it was found that a significant portion of the students experienced health anxiety, similar to the results of the study.[36–38] Research reveals that the pandemic has played an essential role in increasing health anxiety among university students.[91,92] Especially for students studying in health departments, this anxiety has been reported to be exacerbated by the risk of exposure to the virus during their clinical training and the fear of transmitting the infection to their families or loved ones.[93–96] In this process, it has been emphasised that students turn to online medical information to relieve their health-related concerns, but the risk of not being able to access reliable sources or encountering misinformation further reinforces anxiety.[97–99] The literature agrees that a high level of e-health literacy is a critical factor in managing health anxiety.[32–35,45] Having access to accurate and reliable information to cope with health anxiety can help students make informed health decisions. E-health literacy can reduce anxiety and make healthier decisions by enabling students to find, understand, evaluate and apply health information accurately. Accordingly, providing training and programs to strengthen students' e-health literacy can contribute to both reducing health anxiety and increasing students' professional competencies.

Consistent with previous studies, our findings showed that female students had significantly higher health anxiety than male students.[37,97] Biological, psychosocial and cultural factors may have influenced this result. From a biological perspective, the literature suggests that periodic fluctuations in women's reproductive hormones, especially estrogen and progesterone levels (eg menarche and menstrual cycle periods), have an essential role in anxiety. In men, testosterone has an anxiety-relieving effect.[100,101] At the same time, the literature suggests that in terms of psychosocial and cultural factors, women are encouraged to express emotions such as anxiety and fear and are more often directed towards dependency, cowardice and passivity.

On the other hand, men are encouraged to keep their feelings of fear and insecurity under control, suppress their emotions, and solve problems. These different psychosocial and cultural factors may cause women to express emotions such as anxiety and fear more openly, while men may develop different strategies to cope with these emotions.[102] In conclusion, it can be said that biological, psychosocial and cultural factors are effective in making women more vulnerable to experiencing health anxiety. It is recommended that these factors should be taken into consideration in studies to reduce women's health anxiety.

In addition, in this study, the level of health anxiety of the students who did online health research was found to be significantly higher than that of the students who did not. According to the literature, searching for health information online is a potential risk factor for developing health anxiety.[35,103] In a study, it was determined that the health anxiety scores of students who frequently searched for online health information were higher than the scores of students who did not seek health information online.[97] At the same time, in another study, it was found that health anxiety is one of the most critical factors leading to excessive online health-related searches.[104] The literature has reported that people with high health anxiety can often spend much of their time searching for health information online in hopes of information and relief and that these online searches can cause even more anxiety.[42,105] Additionally, studies have shown that repetitive searches on the internet to alleviate anxiety further increase anxiety and can cause cyberchondria, a severe form of anxiety.[106] In this study, the level of cyberchondria was found to be significantly higher among those who conducted online health-related research and a positive and significant relationship was found between cyberchondria and health anxiety. Similarly, previous studies have shown that online health information-seeking behaviour is an essential factor that increases cyberchondria[107] and that health anxiety and cyberchondria are related.[42,46,47,51,105,107,108] At the same time, previous studies have shown that the prevalence of cyberchondria is increasing among university students.[51–53] As a result, health anxiety may trigger cyberchondria, and continuous online health searches may cause a vicious cycle by increasing anxiety instead of alleviating it. Therefore, students' e-health literacy skills should be increased, and online health searches should be encouraged to be made more conscious and moderate.

Gender is one of the factors affecting the level of cyberchondria. In this study, male students' levels of cyberchondria were found to be significantly higher than that of female students. Although some findings in the literature are similar to our findings,[107,109] some have shown that women have higher levels of cyberchondria than men.[52,110] Accordingly, it is thought that women visit a doctor earlier than men in case of health anxiety, reducing their search on the internet and eventually causing their cyberchondria levels to be lower than men. The literature supports this idea, emphasising that men may see taking care of their health or seeking support as a weakness or vulnerability, and therefore, they have access to health care.[111,112] Based on these current findings, it is thought that men do more online research about their health rather than going to the doctor to cope with their health concerns. In addition, due to the higher cyberchondria scores of men compared to women, it was expected that the compulsion, distress, and reassurance (reassurance seeking) scores would be high.

Surprisingly, this study determined a weak positive correlation between cyberchondria and e-health literacy. There are similar study results in the literature. It was also stated in the studies that this finding may be associated with the duration and frequency of internet use.[107,109,113–115] At the same time, this weak relationship may be because health anxiety partially mediates the relationship between health literacy and cyberchondria. In a study, it was found that health literacy directly reduced cyberchondria. Still, the indirect effect of health literacy on cyberchondria, mediated by health anxiety, was significant and accounted for 77.45% of the total effect.[59] As a result, it can be said that health literacy may negatively affect health anxiety, which in turn may affect cyberchondria.

In this study, students' death anxiety was found to be at moderate levels (7.34). These findings are consistent with previous study findings.[92,116–118] In general, the fact that students studying in the health department have encountered the phenomenon of death in theoretical courses and clinical practices may have increased death awareness and caused death anxiety.[119–121] Educational interventions are needed to help students develop coping strategies to manage death anxiety.

Death anxiety may differ between genders. In this study, the death anxiety of women was found to be significantly higher than that of men. In studies on s Gender and death, it was concluded that women had higher death anxiety than men, similar to this finding.[122–126] This finding can be explained by the fact that women focus on their emotions more than men, are more prone to emotional reactions such as fear and anxiety, and do not hide their feelings, while men tend to express their fears and concerns nonverbally and hide them. Therefore, gender-specific approaches should be developed by taking into account the effect of gender in interventions to reduce death anxiety.

In this study, a positive correlation was found between health anxiety and cyberchondria and death anxiety. The frequent repetitive online searches by students with health anxiety may have led them to reach conflicting, exaggerated, incorrect, and even harmful scenarios such as the disease will result in death, reminding them of death and consequently causing death anxiety. Moreover, in this study, it was expected that death anxiety was significantly higher in students who did online research about their health compared to those who did not. There is no study in the literature in which the relationship between health anxiety and cyberchondria and death anxiety is examined among university students receiving education in the health department. These findings shed light on the interaction between health anxiety, cyberchondria, and death anxiety and the necessity of interventions to prevent health anxiety and cyberchondria to reduce death anxiety.

Another surprising finding was that there was no correlation between e-health literacy and death anxiety. Considering the effect of e-health literacy on health anxiety and cyberchondria, it was thought that e-health literacy might have an indirect impact on death anxiety.

Limitations and Strengths

Although our study provides beneficial information on e-health literacy, health anxiety, cyberchondria, and death anxiety, it has some limitations that should be considered for the planning of future studies in this area. Our primary limitation in this study is that the rate of male participants is lower than that of female participants.

Since the participants were students in the health department, the findings cannot be generalised to all university students. Additionally, college students are more educated and have more access to health information than other segments of society, so the results may not be transferable to the general population. For this reason, we recommend conducting additional studies with young people studying in a non-health department at universities and who do not go to university at the same age.

The data was collected online only from people with internet access and using an online platform. However, since most university courses are held online, this is not expected to reflect a severe limitation.

The COVID-19 pandemic may have affected students' e-health literacy, cyberchondria, and health and death concerns. However, this cross-sectional study did not investigate the epidemic's impact, and more studies are needed to assess it.

Considering its strengths, this study is the first to examine the relationship between e-health literacy, cyberchondria, and health and death anxiety among university students. It also provides information about other factors affecting students' e-health literacy, cyberchondria, and health and death anxiety. It also highlights the need for interventional research to increase students' e-health literacy and reduce cyberchondria and health and death anxiety.

Perspectives and Recommendations

When the study data are evaluated, first of all, the fact that students' health literacy skills are not at a high level suggests that there may be a deficiency in their ability to find, understand, evaluate, and use the desired information about health. In this case, interventions are essential to increase students' e-health literacy skills, such as accessing the right source, distinguishing between high and low-quality sources, understanding the message correctly, and synthesising it. It would be beneficial to interpret that e-health literacy can reduce health anxiety and indirectly reduce death anxiety. It is recommended that studies be conducted in this direction.

In addition, students must have high eHealth literacy as future healthcare personnel to provide high-quality patient care and protect and improve the community's health. For this reason, it is recommended that eHealth literacy be integrated into the curriculum to increase the awareness, knowledge, and skills of students studying it in health-related departments.

It would be helpful to repeat the study with a different student population and compare them with those in health-related departments. It will contribute to revealing the effect of the pandemic process on health anxiety, cyberchondria, and death anxiety.

Conclusions

The results of this study show that e-health literacy, health anxiety, cyberchondria, and death anxiety of students studying in the field of health are at a moderate level. Health and death anxiety were found to be high in females and cyberchondria in males. Health anxiety, cyberchondria, and fear of death were found to be higher in those who conducted health-related research. E-health literacy is higher among those earning above the minimum wage. In addition, this study's data show a relationship between e-health literacy level, health anxiety, and cyberchondria.

Disclosure

The authors report no conflicts of interest in this work.

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