Original Article

Cyberchondria and its Association with Smartphone Addiction and Electronic Health Literacy among a Saudi Population

Ayat El-Zayat, Sundus Amin Namnkani, Nouf Abdullah Alshareef, Mashaer Mohammed Mustfa, Nuran Shukri Eminaga, Ghadah Ahmed Algarni

Clinical Sciences Department, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia

Abstract

Background: Cyberchondria is a recent phenomenon characterized by the excessive/frequent searching of the internet for health-related information (HRI) that results in concerns/anxiety over health and wellness. Studies have shown an increase in the prevalence of cyberchondria and that it is associated with smartphone addiction and eHealth literacy, but few such studies are available from Saudi Arabia.

Methods: This cross-sectional study included adult Saudis living in Jeddah, Saudi Arabia, and was conducted between May 1 and June 30, 2022. A four-section questionnaire was distributed using Google Forms, and included the Cyberchondria Severity Scale (CSS), Smartphone Addiction Scale-Short Version (SAS), and Electronic Health Literacy scale (eHEALS). The scales were translated into Arabic using the forward–backward technique, and then evaluated for content validity, face validity, and reliability.

Results: The reliability of the translated versions was satisfactory: CSS Cronbach's alpha = 0.882; SAS = 0.887; eHEALS = 0.903. A total of 518 participants were inlcuded, of which the majority were female (64.1%). The prevalence of cyberchondria was 2.1% (95% CI: 1.1–3.8), 83.4% (79.9–86.5), and 14.5% (11.6–17.8) for low, moderate, and high grades, respectively. Two-thirds of the participants (66.6%) had smartphone addiction, while three-fourths (72.6%) had a high level of eHealth literacy. There were significant correlations between cyberchondria and smartphone addiction (r = 0.395, CI = 0.316/0.475, P = 0.0001) and high eHealth literacy (r = 0.265, CI = 0.182/0.349, P = 0.0001).

Conclusion: The study revealed a high prevalence of cyberchondria in a Saudi population, and this was associated with smartphone addiction and high eHealth literacy.

Keywords: Compulsive behavior, cyberchondria, health literacy, health-related information, internet addiction, mental health, Saudi Arabia, smartphone addiction

Address for correspondence: Dr. Ayat El-Zayat, Clinical Sciences Department, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia.
E-mail: ayattawfik@hotmail.com

Submitted: 27-Sep-2022 **Revised:** 28-Nov-2022 **Accepted:** 27-Feb-2023 **Published:** 12-Apr-2023

INTRODUCTION

Cyberchondria is a recent phenomenon that is an unhealthy behavioral pattern and an emotional condition. It is more than just a behavior of searching health-related information (HRI) on the internet; rather, it is the

Access this article online	
Quick Response Code:	Website: www.sjmms.net
	DOI: 10.4103/sjmms.sjmms_491_22

How to cite this article: El-Zayat A, Namnkani SA, Alshareef NA, Mustfa MM, Eminaga NS, Algarni GA. Cyberchondria and its association with smartphone addiction and electronic health literacy among a Saudi population. Saudi J Med Med Sci 2023;11:162-8.

excessive/frequent searching of the internet for HRI that results in concerns/anxiety over health and wellness.[1] Studies have shown that in the recent past, there is an increase in the prevalence of cyberchondria.[2-5]

Compulsive use of the internet, which interferes with daily life activities, is the main feature of this disorder.[2] People with cyberchondria usually have poor health awareness, driving them to seek information about their condition and/or confirm their illness.[6] The excessive browsing for HRI, and the resultant overwhelming information obtained adds to the psychological distress of a person with cyberchondria.[7] Alternatively, some people over-search online until they subconsciously become symptomatic and/or feel ill.[8]

Cyberchondria has been linked to many factors such as age and gender.[9] In addition, addiction to smartphones, which are now widely available and provide easy access to information, is increasing; smartphone addiction is also a key contributing factor of cyberchondria.[9-12] Although the use of information and communications technology to support health and health-related fields, defined as electronic health (eHealth), can be beneficial,[13] it is dependent on an individual's eHealth literacy, which is "the ability to seek, find, understand, and appraise health information from electronic sources."[14] In fact, having high eHealth literacy may reduce the unwanted effects of cyberchondria.[15]

Few studies from the Middle East, including Saudi Arabia, have determined the prevalence of cyberchondria. The current study was conducted to fill this gap and aimed to assess the prevalence of cyberchondria and its association with smartphone addiction and eHealth literacy in a population from Saudi Arabia.

METHODS

Study design, setting, and participants

This cross-sectional study included adult Saudis living in Jeddah, Saudi Arabia, and was conducted between May 1 and June 30, 2022. The study was approved by the Institutional Review Board of Fakeeh College of Medical Sciences, Jeddah.

Volunteer sampling was used for recruiting participants. A four-section questionnaire was distributed using Google Forms. The link to the questionnaire was shared to individual accounts and on groups of social interest in different social networks, including Facebook, Twitter, and WhatsApp.

Inclusion criteria were being aged ≥18 years, Saudi national, and literate (i.e. able to read and write in Arabic). Exclusion criteria were all healthcare providers, students of medical sciences, and those with applications for contacting healthcare providers to gain knowledge, as their situations allow them to handle the HRI on the internet in a different way. A brief section at the beginning of the questionnaire determined the inclusion/exclusion of the respondent.

All participants were required to provide a consent for inclusion. An introduction section in the questionnaire informed the participants about the aim of the study, that participation was voluntary, and that the obtained data would be confidential and only used for current research purposes. In addition, all responses were collected anonymously, and the data of the participants were coded and managed using these codes. No incentives were offered for participation.

Only responses without any missing data were included in the final analysis. The usability and technical functionality of the electronic questionnaire was tested by the authors and their colleagues before it was distributed. To avoid duplicate submissions, by selecting an option in Google Forms, participants were informed that their response had already been submitted in case they attempted resubmission.

Sample size calculation

The sample size was calculated by the Epi-info software (version 3.01; Centers for Disease Control and Prevention, USA) using the prevalence of cyberchondria among employees working in information technology in Chennai, India (55.6%), in which the population were of diverse education levels (diploma, bachelors, masters, and doctorate), similar to the population that was being targeted for the present study.[3] A recent systematic review and meta-analysis on response rates of online surveys found that the non-response rate is about 11%–12%.[16] Accordingly, we assumed a non-response rate of 10%, and the sample size was calculated to be 418 participants. However, the above-stated meta-analysis also revealed that the estimates of the data remained reliable with a sample size of at least 500, and thus the authors targeted a larger population to achieve the same.

Data collection tools

The questionnaire included the following four sections:

1. General characteristics of the studied population: age, gender, education, marital status, occupation, and any chronic diseases.
2. The 12-item Cyberchondria Severity Scale (CSS) was used to determine cyberchondria and its severity.[17]

CSS includes four constructs, namely, compulsion, distress, excessiveness, and reassurance. Each construct is represented by three questions with a 5-point Likert response format. Scores on each item range from 1 (Never) to 5 (Always), with total scores ranging from 12 to 60, and higher scores representing higher severity. The scores were categorized as follows: scores ≤25th percentile were considered as low, between >25th and <75th percentile as moderate, and ≥75th percentile as high cyberchondria.[18] The CSS scale has been validated in a different population and found to have good reliability (Cronbach's alpha = 0.9).[17]

3. The 10-item Smartphone Addiction Scale-Short Version (SAS) was used to determine smartphone addiction. Each question had a 6-point Likert response format, and scoring on each item ranged from 1 (Strongly Disagree) to 6 (Strongly Agree) (total score range: 10–60). The cut-off score for defining smartphone addiction differs according to gender: ≥31 for males and ≥33 for females. The SAS scale has been validated in a different population and found to have excellent reliability (Cronbach's alpha = 0.967).[19]
4. The 8-item Electronic Health Literacy scale (eHEALS) was used to estimate individual's perception of own eHealth-literacy. The scale comprises 8 questions, each question had five options in a 5-point Likert response format. Scores on an item range from 1 (Strongly Disagree) to 5 (Strongly Agree). The total scores of the eHEALS range from 8 to 40, with higher scores representing higher self-perceived eHealth literacy. The cutoff score for defining high eHealth literacy is ≥26.[20] The eHEALS scale has been validated in a different population and found to have excellent reliability (Cronbach's alpha = 0.94).[21]

The forward–backward technique was used for translating CSS, SAS, and eHEALS to Arabic. First, the authors did a forward translation (i.e. from English to Arabic). An independent, proficient English and Arabic speaker (who conducts lectures in Arabic and English languages in Fakeeh College for Medical Sciences) first did a back translation (from Arabic to English), and then did a second forward translation (from English to Arabic). A certified Arabic–English translator compared the original and back translated versions of the English questionnaire, while a professor of medicine compared the two translated Arabic versions. All discrepancies were resolved, and both the final Arabic translated versions were matched for cohesiveness.

The final Arabic version was evaluated for content validity by panel comprising experts in the field of psychiatry, pharmacology, and public health, and their opinion was that the tool accurately covered the concept it purported to measure. To ensure the clarity and simplicity of the questions and answer choices, the questionnaire was then evaluated for face validity through a pilot study. In total, 30 participants were interviewed, and based on their feedback, it was concluded that the translated questionnaire was clear, simple, and well understandable. The reliability of the Arabic version among the Saudi population was measured using Cronbach's alpha.

Data management and analysis

Data were coded, entered, and managed using Microsoft Excel (2019 version). Data analyses were performed using IBM SPSS software (version 25). Cronbach's alpha was assessed for each translated scale and a value of >0.7 was considered acceptable. Descriptive statistics were presented by frequencies and percentages and mean ± SD (range). Pearson correlation was used to assess the association between quantitative variables. Student's *t* test was used to compare means between two groups, and one-way ANOVA test for comparing means between more than two groups. Multivariable linear regression analysis was used to assess predictors of cyberchondria. A sensitivity analysis was separately conducted for male and female participants to compare any variation in results using the corresponding statistical tests and *P* value. *P* value <0.05 was considered statistically significant based on the level of confidence of 95%.

RESULTS

The reliability of the Arabic versions of the questionnaire was considered satisfactory, as the Cronbach's alpha was >0.7 (CSS = 0.882; SAS = 0.887; eHEALS = 0.903).

A total of 518 participants completed the questionnaire, with a mean (±SD) age of 33 (±14) years. Most of the participants were females (64.1%), had completed or were pursuing university-level education (77.4%), and single (54.6%). About one-third of the participants were students (34.7) and had at least one chronic illness (36%); 7.7% had multiple chronic diseases. Diabetes mellitus was the most commonly reported chronic illness (5.8%) [Table 1].

The mean of the total CSS score was 34.6 ± 10, while its domain-wise scores were as follows: excessiveness, 11 ± 3; distress, 9.4 ± 3; reassurance, 8.2 ± 3; and compulsion 5.9 ± 3. The prevalence of cyberchondria was 2.1% (CI = 1.1–3.8) for low, 83.4% (CI = 79.9–86.5) for moderate, and 14.5% (CI = 11.6–17.8) for high grades.

Two-thirds of the participants (66.6%) had smartphone addiction, while three-fourths (72.6%) had a high level of eHealth literacy [Table 2].

Correlation and predictors of cyberchondria

The relation between CSS score and the general characteristics showed that females, widows and divorcees, and students had higher scores of CSS ($P < 0.05$) [Table 3].

Table 1: General characteristics of the study participants (*N*=518)

Variables	Frequency (%)
Age (years), mean±SD (range)	33±14 (18–70)
Gender	
Male	186 (35.9)
Female	332 (64.1)
Education	
Preparatory	8 (1.5)
High school	77 (14.9)
University	401 (77.4)
Postgraduate (Masters or Ph.D.)	32 (6.2)
Marital status	
Single	283 (54.6)
Married	224 (43.2)
Divorced	9 (1.7)
Widow	2 (0.4)
Occupation	
Student	180 (34.7)
Office employee	85 (16.4)
Field employee	40 (7.7)
Not working	109 (21)
Retiree	72 (13.9)
Other	32 (6.2)
Chronic illness	
Present	188 (36.3)
Absent	330 (63.7)
Which chronic illness, if present	
Diabetes mellitus	30 (5.8)
Hypertension	15 (2.9)
Cardiac	4 (0.8)
Renal	5 (1)
Autoimmune	5 (1)
Multiple	40 (7.7)
Others	89 (17.2)

Table 2: Cyberchondria, smartphone addiction and electronic health literacy of the participants

Scale	Frequency (%)
Cyberchondria Severity Scale, mean±SD	34.6±10
Excessiveness	11±3
Distress	9.4±3
Reassurance	8.2±3
Compulsion	5.9±3
Cyberchondria categories*	
Low	11 (2.1)
Moderate	432 (83.4)
High	75 (14.5)
Smartphone Addiction Scale† (mean±SD)	36.6±11
Addicted	345 (66.6)
Not addicted	173 (33.4)
Electronic Health Literacy Scale‡, mean±SD	29±6
Low	142 (27.4)
High	376 (72.6)

*Cyberchondria categories range scale: low (≤25), moderate (>25–<75), high (≥75); †If male, addiction = ≥31, if female, addiction = ≥33; ‡Low, <26; high, ≥26

There were positive significant correlations between the CSS score and both SAS ($r = 0.395$, CI = 0.316/0.475, $P = 0.0001$) and eHEALS ($r = 0.265$, CI = 0.182/0.349, $P = 0.0001$) scores.

In the multivariable linear regression model, older age was a significant predictor of lower cyberchondria scores ($\beta = -0.279$, CI = −0.279–−0.103), while being divorced and widow ($\beta = 0.14$, CI = 0.612 − 4.271), having a smartphone addiction ($\beta = 0.329$, CI = 0.224–0.363), and eHealth literacy ($\beta = 0.163$, CI = 0.133 − 0.381) were significant predictors of higher cyberchondria scores [Table 4].

In the multivariate stepwise linear regression model, interaction between the significant predictors accounted for a small variance: between age and marital status ($R^2 = 8.9\%$); age, marital status, and smartphone addiction score ($R^2 = 21.5\%$); and age, marital status, smartphone addiction score, and eHealth literacy score ($R^2 = 24.1\%$) [Table 5]. A variance inflation factor (VIF) was conducted to assess the correlation among independent variables that were statistically affecting cyberchondria in the regression analysis. Both the VIF and tolerance statistics met the recommended cut-off points of <10 and >0.1, respectively.

In a sensitivity analysis for male and female participants [Suppl. Table 1], females were found to have significantly higher eHealth literacy and a non-significantly higher smartphone addiction than males. No significant difference relation was noted between cyberchondria and education level for both genders [Suppl. Table 2]. Cyberchondria scores were higher among males who were divorced [Suppl. Table 3], among male students and retired females [Suppl. Table 4], and among females with chronic illness [Suppl. Table 5]. Similar to the total sample, in both genders, significant correlations were found between cyberchondria score and smartphone addiction and electronic health literacy [Suppl. Table 6]. In the regression model, only marital status for males, and age and marital status for females, were not significant predictors of cyberchondria score, which was in contrast to the findings in the total population. [Suppl. Table 7].

DISCUSSION

The current study revealed a high prevalence of cyberchondria and a significant association between smartphone addiction and cyberchondria severity. These findings were consistent with those of previous studies.[12,22-24] The interaction between these three domains

could possibly result in significant mental burden: being addicted to smartphones can aid cyberchondria, while having a high eHealth literacy can result in believing the self-diagnosis.

Smartphones are, in many developing countries, affordable and widely used, including by children.[25] The relative affordability of getting HRI online causes the repeated behavior of searching the internet to feel comfortable, sometimes for the same health concerns. The recent and huge digital transformation in Saudi Arabia depends on having a communication device, usually a smartphone with an internet connection.[26] The prevalence of internet addiction was reported in previous research to be up to 41.1% among school/university students and adults in Saudi Arabia.[27]

Another possible explanation is "physician shopping," which is the intense desire of visiting multiple doctors for the same concern. To avoid the additional costs associated with such behavior, searching the internet tends to be an alternative.[28] Moreover, the current COVID-19 pandemic increased the rate of searching the internet for health concerns.[23] People with high eHealth literacy can comprehend the HRI they find on the internet.[29] However, the current study reported that there is a statistically significant association between high eHealth literacy and cyberchondria, which is in agreement with the findings of previous studies.[15,30] This may be explained by the fact that eHealth literacy is directly proportional to the time spent on, and the frequency of searching, the internet.[31]

In terms of the domains of cyberchondria domains, compulsion had the lowest mean score, while excessiveness had the highest. The high level of eHealth literacy among the studied participants is a possible explanation, as it reduces compulsiveness. Excessiveness, the leading sign of cyberchondria, is the domain that drives the existence and magnitude of distress and anxiety that creates and interacts with the other domains to negatively affect mental health.[32] Its highest score could be also explained by the high prevalence of smartphone addiction among the studied participants.

Table 3: Relation between cyberchondria and general characteristics of the studied participants

Variables	Cyberchondria score (mean±SD)	*P*
Gender		
Male	32.5±10	0.0001*,†
Female	35.7±9	
Education		
Preparatory	29.5±8	0.084‡
High school	32.5±10	
College	35±10	
Postgraduate	35.4±10	
Marital status		
Single	36.1±10	0.0001*,‡
Married	32.1±9	
Divorced	41.8±9	
Widow	45.5±2	
Occupation		
Student	37.4±9	0.0001*,‡
Office employee	33.8±10	
Field employee	34.7±10	
Not working	34.3±9	
Retiree	29.1±8	
Other	33.8±11	
Chronic illness		
Present	34.4±10	0.856†
Absent	34.6±10	

*Statistically significant; †Student's *t*-test; ‡One-way ANOVA test

Table 4: Multivariable linear regression analysis of predictors to cyberchondria among the studied participants

Independent variables	Unstandardized coefficients		Standardized coefficients (beta)	*t*	*P*	95% CI for *B*	
	B	SE				Lower bound	Upper bound
Age	−0.191	0.045	−0.279	−4.259	0.0001*	−0.279	−0.103
Gender	−0.402	1.042	−0.02	−0.385	0.7	−2.45	1.646
Education	0.885	0.744	0.046	1.19	0.235	−0.576	2.347
Marital status	2.441	0.931	0.14	2.621	0.009*	0.612	4.271
Occupation	−0.271	0.242	−0.049	−1.12	0.263	−0.747	0.205
Chronic illness	−0.121	0.238	−0.02	−0.51	0.61	−0.59	0.347
Smartphone addiction	0.293	0.035	0.329	8.298	0.0001*	0.224	0.363
Electronic health literacy	0.257	0.063	0.163	4.066	0.0001*	0.133	0.381

*Statistically significant. SE – Standard error; CI – Confidence interval

Table 5: Stepwise multivariate linear regression model of predictors to cyberchondria among the studied participants

Model	*R*	R^2	Adjusted R^2	SE of the estimate	Change statistics				
					R^2 change	*F* change	df1	df2	Significance *F* change
Age	0.285[a]	0.081	0.08	9.30420	0.081	45.709	1	516	0.0001
Marital status	0.299[b]	0.089	0.086	15.45510	0.089	25.244	2	515	0.0001
Smartphone addiction	0.464[c]	0.215	0.21	14.36232	0.215	46.938	3	514	0.0001
eHEALS	0.491[d]	0.241	0.235	14.13898	0.241	40.666	4	513	0.0001

[a]Predictors: Age; [b]Predictors: Marital status, age; [c]Predictors: SAS, marital, age; [d]Predictors: eHEALS, SAS, marital, age. eHEALS – Electronic Health Literacy Scale; SE – Standard error; SAS – Smartphone Addiction Scale

The female and student participants in the current study had a higher severity of cyberchondria, which is consistent with the findings of previous studies.[33,34] Females search the internet for any unexplained bodily sensation significantly more commonly and frequently than males.[34] Again, those with a higher level of education, or being a student at the university, are likely to believe that the frequent searching of the internet for HRI may prepare them well for the clinic's visit in case of illness, or in promoting health and leading a healthy lifestyle, and that they may be able to assist the clinician in diagnosis and management.[35]

The current study also revealed that the CSS scores were almost the same between non-working and currently working participants, which were higher than that of retired respondents. In contrast, Ciułkowicz *et al*.[36] reported that occupational inactivity results in limited access to healthcare, which in turn creates an economic burden on these individuals. A possible explanation for this difference is that in Saudi Arabia, citizens are provided healthcare for free, and thus it has a fair coverage for those non-working, while the pension for retirees adequately covers any additional healthcare needs.[37]

The sensitivity analysis for male and female participants to compare any variation in results showed that females had significantly higher eHealth literacy and a non-significantly higher smartphone addiction than males. Similarly, Perry and Lee[38] also did not find any significant gender-related differences in smartphone addiction, while Tennant *et al*.[39] found that females had a higher level of eHealth literacy than males. Kurcer *et al*.[40] found that health anxiety scores were significantly higher among those who lived alone and with a chronic disease. Health anxiety is also the main driver for cyberchondria. Similarly, the current study found that females with chronic illness and males who were divorced had higher scores of cyberchondria.

Limitations

The primary limitation of the current study is the cross-sectional design, which, despite its suitability for the objective of the study, limits elucidating the temporal relationship between influencing factors and cyberchondria. In addition, a single point data collection cannot assess changes in the population over a period of time or detect trends. The volunteering bias and the lack of random sampling may have resulted in the sample not being adequately representative of the population. In addition, the study did not determine if the respondents had any pre-existing psychiatric or psychosomatic conditions, which could result in differing patterns of cyberchondria.

CONCLUSION

The study revealed a high prevalence of cyberchondria in a Saudi population, and this was associated with smartphone addiction and high eHealth literacy. Cyberchondria severity was also influenced by age and marital status. Therefore, future studies on cyberchondria are required in Saudi Arabia to better characterize the condition and accordingly take preventive measures. These studies could also focus on potential influencing factors on cyberchondria such as years of work/employment, income, and other socioeconomic variables.

Ethical considerations

The study was approved by the Institutional Review Board of Fakeeh College of Medical Sciences, Jeddah, Saudi Arabia (approval No.: 295/IRB/2022; date: February 3, 2022). All participants provided informed consent before participation. The study adhered to the principles of Declaration of Helsinki, 2013.

Data availability statement

The datasets generated and/or analyzed during the current study are not publicly available but can be obtained from the corresponding author on reasonable request.

Peer review

This article was peer-reviewed by two independent and anonymous reviewers.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Starcevic V. Cyberchondria: Challenges of problematic online searches for health-related information. Psychother Psychosom 2017;86:129-33.
2. Al Dameery K, Quteshat M, Al Harthy I, Khalaf A. Cyberchondria, uncertainty, and psychological distress among Omanis during COVID-19: An online cross-sectional survey. J Hunan Univ Nat Sci 2020;48:140-6.
3. Makarla S, Gopichandran V, Tondare D. Prevalence and correlates of cyberchondria among professionals working in the information technology sector in Chennai, India: A cross-sectional study. J Postgrad Med 2019;65:87-92.
4. Roble DB, Lomibao LS, Maglipong MV. Ubiquity of cyberchondria among teachers: The case of basic and higher education institution (HEI) teachers in Southern Philippines. Rev Tempos Espaços Educ 2021;14:7.
5. Wijesinghe CA, Liyanage U, Kapugama K, Warsapperuma W, Williams SS, Kuruppuarachchi K, *et al*. "Muddling by googling" – Cyberchondria among outpatient attendees of two hospitals in Sri Lanka. Sri Lanka J Psychiatry 2019;10:11-5.
6. Bati AH, Mandiracioglu A, Govsa F, Çam O. Health anxiety and cyberchondria among Ege University health science students. Nurse

Educ Today 2018;71:169-73.
7. Kalantari A, Valizadeh-Haghi S, Shahbodaghi A, Zayeri F. Opportunities and challenges of consumer health information on the internet: Is cyberchondria an emerging challenge? Libr Philos Pract 2021;1-16.
8. Gibler RC, Jastrowski Mano KE, O'Bryan EM, Beadel JR, McLeish AC. The role of pain catastrophizing in cyberchondria among emerging adults. Psychol Health Med 2019;24:1267-76.
9. Zheng H, Sin SC, Kim HK, Theng YL. Cyberchondria: A systematic review. Internet Res 2020;31:677-98.
10. Montag C, Wegmann E, Sariyska R, Demetrovics Z, Brand M. How to overcome taxonomical problems in the study of Internet use disorders and what to do with "smartphone addiction?" J Behav Addict 2021;9:908-14.
11. Panova T, Carbonell X. Is smartphone addiction really an addiction? J Behav Addict 2018;7:252-9.
12. Köse S, Murat M. Examination of the relationship between smartphone addiction and cyberchondria in adolescents. Arch Psychiatr Nurs 2021;35:563-70.
13. Cheng C, Beauchamp A, Elsworth GR, Osborne RH. Applying the electronic health literacy lens: Systematic review of electronic health interventions targeted at socially disadvantaged groups. J Med Internet Res 2020;22:e18476.
14. Austin R. EHealth literacy for older adults-Part I. Ania-Caring Newsl 2012;27:7-9.
15. Özer Ö, Özmen S, Özkan O. Investigation of the effect of cyberchondria behavior on e-health literacy in healthcare workers. Hosp Top 2021;1-9. doi: 10.1080/00185868.2021.1969873 [Online ahead of print].
16. Wu MJ, Zhao K, Fils-Aime F. Response rates of online surveys in published research: A meta-analysis. Comput Hum Behav Rep 2022;7:100206.
17. McElroy E, Kearney M, Touhey J, Evans J, Cooke Y, Shevlin M. The CSS-12: Development and validation of a short-form version of the cyberchondria severity scale. Cyberpsychol Behav Soc Netw 2019;22:330-5.
18. Akhtar M, Fatima T. Exploring cyberchondria and worry about health among individuals with no diagnosed medical condition. J Pak Med Assoc 2020;70:90-5.
19. Kwon M, Kim DJ, Cho H, Yang S. The smartphone addiction scale: Development and validation of a short version for adolescents. PLoS One 2013;8:e83558.
20. Richtering SS, Hyun K, Neubeck L, Coorey G, Chalmers J, Usherwood T, *et al*. eHealth literacy: Predictors in a population with moderate-to-high cardiovascular risk. JMIR Hum Factors 2017;4:e4.
21. Chung SY, Nahm ES. Testing reliability and validity of the eHealth Literacy Scale (eHEALS) for older adults recruited online. Comput Inform Nurs 2015;33:150-6.
22. Yam FC, Korkmaz O, Griffiths MD. The association between fear of Covid-19 and smartphone addiction among individuals: The mediating and moderating role of cyberchondria severity. Curr Psychol 2021;1-14 [Epub ahead of print].
23. Vismara M, Varinelli A, Pellegrini L, Enara A, Fineberg NA. New challenges in facing cyberchondria during the coronavirus disease pandemic. Curr Opin Behav Sci 2022;46:101156.
24. Baggio S, Starcevic V, Billieux J, King DL, Gainsbury SM, Eslick GD, *et al*. Testing the spectrum hypothesis of problematic online behaviors: A network analysis approach. Addict Behav 2022;135:107451.
25. Fuster H, Carbonell X, Chamarro A, Oberst U. Interaction with the game and motivation among players of massively multiplayer online role-playing games. Span J Psychol 2013;16:E43.
26. Alharbi AS. Challenges in digital transformation in Saudi Arabia obstacles in paradigm shift in Saudi Arabia. In: 2019 6th International Conference on Computing for Sustainable Global Development (INDIACom). IEEE; 2019. p. 1287-91.
27. Al-Khani AM, Saquib J, Rajab AM, Khalifa MA, Almazrou A, Saquib N. Internet addiction in Gulf countries: A systematic review and meta-analysis. J Behav Addict 2021;10:601-10.
28. McElroy E, Shevlin M. The development and initial validation of the cyberchondria severity scale (CSS). J Anxiety Disord 2014;28:259-65.
29. Huang CL, Yang SC, Chiang CH. The associations between individual factors, ehealth literacy, and health behaviors among college students. Int J Environ Res Public Health 2020;17:2108.
30. Peng XQ, Chen Y, Zhang YC, Liu F, He HY, Luo T, *et al*. The status and influencing factors of cyberchondria during the COVID-19 epidemic. A cross-sectional study in Nanyang city of China. Front Psychol 2021;12:712703.
31. Wong DK, Cheung MK. Online health information seeking and ehealth literacy among patients attending a primary care clinic in Hong Kong: A cross-sectional survey. J Med Internet Res 2019;21:e10831.
32. Starcevic V, Berle D. Cyberchondria: Towards a better understanding of excessive health-related Internet use. Expert Rev Neurother 2013;13:205-13.
33. Aulia A, Marchira CR, Supriyanto I, Pratiti B. Cyberchondria in first year medical students of Yogyakarta. J Consum Health Internet 2020;24:1-9.
34. Turkistani A, Mashaikhi A, Bajaber A, Alghamdi W, Althobaity B, Alharthi N, *et al*. The prevalence of cyberchondria and the impact of social media among the students in Taif University. Int J Med Dev Ctries 2020;4:1759-65.
35. Tanis M, Hartmann T, Te Poel F. Online health anxiety and consultation satisfaction: A quantitative exploratory study on their relations. Patient Educ Couns 2016;99:1227-32.
36. Ciułkowicz M, Misiak B, Szcześniak D, Grzebieluch J, Maciaszek J, Rymaszewska J. The portrait of cyberchondria-a cross-sectional online study on factors related to health anxiety and cyberchondria in polish population during SARS-CoV-2 pandemic. Int J Environ Res Public Health 2022;19:4347.
37. Alharbi MF. National health insurance system for universal health coverage: Prospects and challenges in Saudi Arabia. 2019;6:5006-12.
38. Perry SD, Lee KC. Mobile phone text messaging overuse among developing world university students. Communicatio 2007;33:63-79.
39. Tennant B, Stellefson M, Dodd V, Chaney B, Chaney D, Paige S, *et al*. eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults. J Med Internet Res 2015;17:e70.
40. Kurcer MA, Erdogan Z, Cakir Kardes V. The effect of the COVID-19 pandemic on health anxiety and cyberchondria levels of university students. Perspect Psychiatr Care 2022;58:132-40.

SUPPLEMENTARY MATERIALS

Table 1: Comparison of smartphone addiction and electronic health literacy based on gender

Variables	Gender	*n*	Mean±SD	*P*
Smartphone addiction score	Male	186	35.6344±10.63933	0.126
	Female	332	37.1596±10.99114	
eHEALS	Male	186	27.6183±6.08849	0.0001*
	Female	332	29.9247±6.03843	

SD – Standard deviation; eHEALS – Electronic Health Literacy Scale

Table 2: Relation between cyberchondria and education level of males and females

		Cyberchondria score			*P*
Gender	Education	Mean	*n*	SD	
Male	Preparatory	49.5238	7	14.16550	0.593
	High school	50.3448	29	15.96362	
	College	54.8855	131	16.17372	
	Postgraduate	57.0175	19	19.72480	
	Total	54.1935	186	16.46383	
Female	Preparatory	46.6667	1		0.644
	High school	56.5625	48	17.02594	
	College	60.0309	270	15.53165	
	Postgraduate	61.9231	13	13.67354	
	Total	59.5633	332	15.69050	

SD – Standard deviation

Table 3: Relation between cyberchondria and marital status

		Cyberchondria score			*P*
Gender	Marital status	Mean	*n*	SD	
Male	Single	62.4000	50	16.66721	0.0001*
	Married	50.6767	133	15.17718	
	Divorced	73.3333	3	2.88675	
	Total	54.1935	186	16.46383	
Female	Single	59.8569	233	15.99445	0.181
	Married	57.9121	91	14.59028	
	Divorced	67.7778	6	18.78731	
	Widow	75.8333	2	3.53553	
	Total	59.5633	332	15.69050	

SD – Standard deviation

Table 4: Relation between cyberchondria and occupation

		Cyberchondria score			*P*
Gender	Occupation	Mean	*n*	SD	
Male	Student	63.5333	25	16.61325	0.0001*
	Office-employee	57.9938	54	17.77857	
	Field-employee	56.0000	25	15.47848	
	Retiree	47.7381	70	13.09889	
	Not-working	53.6667	5	14.78550	
	Other	50.0000	7	19.24501	
	Total	54.1935	186	16.46383	
Female	Student	62.2043	155	15.26809	0.016*
	Office-employee	53.3333	31	12.42757	
	Field-employee	60.8889	15	17.03016	
	Retiree	75.8333	2	17.67767	
	Not-working	57.3397	104	15.52657	
	Other	58.0667	25	18.64433	
	Total	59.5633	332	15.69050	

SD – Standard deviation

Table 5: Relation between cyberchondria and presence of chronic illness

Gender	Chronic illness	*n*	Mean±SD	*P*
Male (cyberchondria score)	Yes	67	31.3284±10.52470	0.219
	No	119	33.1849±9.47518	
Female (cyberchondria score)	Yes	32	39.6875±9.75982	0.021*
	No	300	35.3167±9.29468	

SD – Standard deviation

Table 6: Correlations between cyberchondria and smartphone addiction and electronic health literacy

	Correlations	
Gender	**Smartphone**	**eHEALS**
Male (cyberchondria)		
Pearson correlation	0.442**	0.333**
Significance (two-tailed)	0.0001	0.0001
n	186	186
Female (cyberchondria)		
Pearson correlation	0.362**	0.190**
Significance (two-tailed)	0.0001	0.0001
n	332	332

**Correlation is significant. eHEALS – Electronic Health Literacy Scale

Table 7: Multivariable linear logistic regression analysis of factors affecting cyberchondria

Gender	Model	Unstandardized coefficients		Standardized coefficients (beta)	*t*	Significance	95.0% CI for *B*	
		B	SE				Lower bound	Upper bound
Male	Constant	34.122	9.833		3.470	0.001	14.718	53.525
	Age	−0.284	0.105	−0.273	−2.690	0.008	−0.492	−0.076
	Education	0.721	1.614	0.028	0.447	0.655	−2.464	3.907
	Marital	2.245	3.079	0.064	0.729	0.467	−3.832	8.321
	Occupation	−1.327	0.974	−0.104	−1.363	0.175	−3.248	0.595
	Chronic illness	−0.976	0.634	−0.093	−1.539	0.126	−2.227	0.275
	Smartphone	0.547	0.097	0.353	5.647	0.000	0.356	0.738
	eHEALS	0.589	0.167	0.218	3.535	0.001	0.260	0.919
Female	Constant	21.891	9.827		2.228	0.027	2.558	41.225
	Age	−0.116	0.152	−0.052	−0.765	0.445	−0.414	0.182
	Education	2.164	1.875	0.059	1.154	0.249	−1.525	5.852
	Marital	3.507	1.927	0.121	1.820	0.070	−0.283	7.297
	Occupation	−0.520	0.463	−0.065	−1.122	0.263	−1.431	0.392
	Chronic illness	0.208	0.510	0.021	0.408	0.684	−0.795	1.210
	Smartphone	0.474	0.074	0.332	6.368	0.000	0.328	0.621
	eHEALS	0.343	0.136	0.132	2.531	0.012	0.077	0.610

eHEALS – Electronic Health Literacy Scale; SE – Standard error; CI – Confidence interval