

From Perceived Health Threat to Cyberchondria: The Mediating Role of Health Anxiety, Perceived Information Insufficiency, and Online Health Information Seeking

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Abstract

Present study re-tested the antecedents and mediating factors of cyberchondria explored by Zheng et al. (2021) in Pakistani youth. In first phase, only the pathway from health threat to cyberchondria mediated by health anxiety, sufficiency of information and health information seeking online was evaluated using serial mediation analysis. The study was conducted on 555 young adults, including both genders. Perceived health threat positively predicted health anxiety which further positively predicted insufficiency of information, OHIS and cyberchondria. Information insufficiency also positively predicted OHIS which further positively predicted cyberchondria. Consistent with Zheng et al. (2021), the serial mediation analysis using model 6 of process macro indicated evidence of significant mediation. The direct effect of health threat on cyberchondria was not significant. Among the single mediator paths, only health anxiety showed significant mediation. Significant sequential mediations were found through health anxiety with OHIS, information insufficiency with OHIS and the combined three-mediator pathway. The findings underscore the need to address the key antecedent and mediating factors in the advancement and escalation of cyberchondria.

Keywords: Health Anxiety, Cyberchondria, Health Threat, Online Health Information Seeking, Information Insufficiency, Young Adults

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1. Introduction

The rapid expansion of digital health information has fundamentally transformed how people access and process medical knowledge. The internet offers immediate and convenient access to content about symptoms, diseases, and treatments, allowing users to make informed health decisions. However, for some individuals, this continuous access can enhance maladaptive patterns of information-seeking that escalate distress rather than provide reassurance. One such pattern is cyberchondria which is characterized by undue and repetitive searches regarding health, heightened health anxiety, and distress when confronted with vague information (Starcevic & Berle, 2013). Although online health resources provide valuable knowledge to individuals, the overwhelming amount and inconsistency of information often amplifies worry and encourage catastrophic interpretation of ordinary symptoms (Amini & Ahadzadeh, 2025).

Cyberchondria has emerged as a significant concern among younger adults, who are heavy users of digital platforms and often rely on online sources as primary source of knowledge related to health (Sansakorn et al., 2024). Their sensitivity to uncertainty about health risks and their tendency to engage in frequent symptom checking may intensify anxiety and lead to patterns of persistent, sometimes compulsive online searching (Peng et al., 2021). These behaviors can disrupt daily functioning, delay or replace professional consultation and perpetuate the cycle of distress. Understanding why routine symptom-checking escalates into maladaptive searching is therefore essential for designing interventions and guiding digital-health communication strategies. Earlier work has demonstrated that cyberchondria is not merely a behavioral phenomenon but is underpinned by specific cognitive-affective processes.

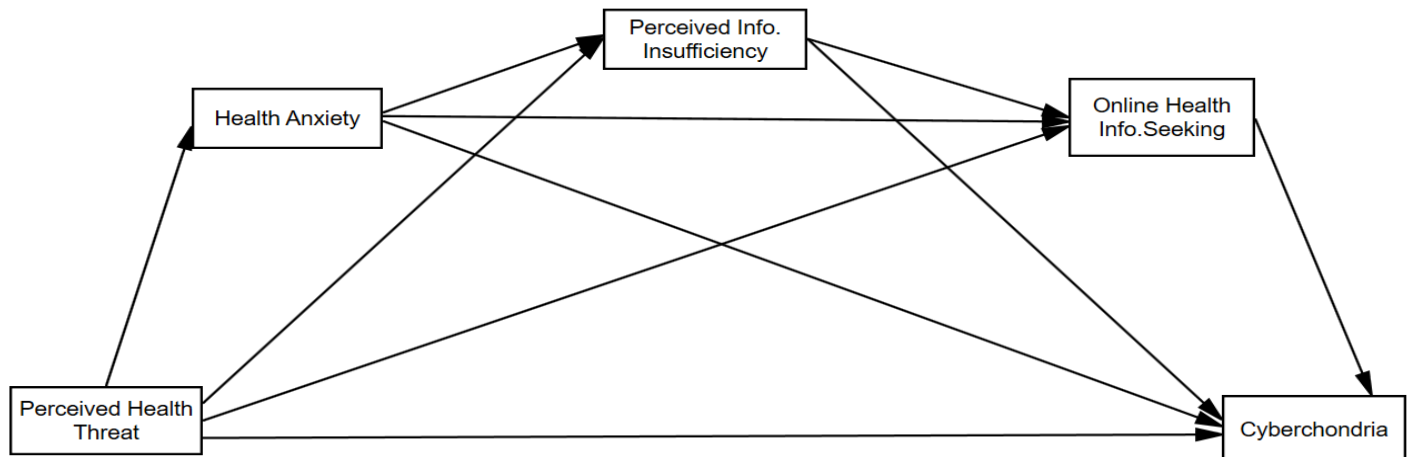
The present study is grounded in the Health Belief Model (HBM) and the cyberchondria development model (Zheng et al. 2021). HBM theorizes that health-related actions of individuals are driven by two primary appraisals: susceptibility to disease and anticipated severity of its consequences (Champion, 1999), representing perceived health threat (Karademas et al., 2008). While these perceptions can motivate beneficial preventive actions, they can also increase vigilance and worry. Advancing this work, Zheng et al. (2021) proposed that perceiving a health threat can trigger health anxiety, which in turn drives individuals to see health information online (OHIS) as they strive to gain sufficient knowledge. According to cognitive-behavioral model of health anxiety, when individuals feel inadequately equipped to manage a perceived health threat, they may experience elevated health anxiety and tend to magnify the seriousness of their symptoms or health issues (Warwick & Salkovskis, 1990). Health anxiety is essential early pathological psychological process that contributes to the cognitive and behavioral anxiety patterns of cyberchondria. Those with increased health anxiety might stumble across extreme, anecdotal, or deceptive knowledge at the top of their search results, acting to affirm their fears instead of dismissing those (Baumgartner & Hartmann, 2011). A key mediator in this dynamic is perceived information insufficiency which is the subjective belief of a person that his/her current health knowledge is inadequate leading to persistent online searching to fill the gap between his/her current and required knowledge (Griffin et al., 1999; Te Poel et al., 2016). This drive for certainty can manifest as compulsive OHIS, reinforcing maladaptive behavior patterns and escalating distress (Lin et al., 2016; Liu et al., 2024).

Despite growing attention to cyberchondria, much of the literature in Pakistan and internationally has examined these factors in isolation or has focused only on direct associations with cyberchondria. Few studies like Zheng et al. (2021) assessed the sequential process that transform health threat and ordinary symptom checking into excessive anxiety, maladaptive searching and distress. While the existing models of cyberchondria have advanced understanding about its psychological mechanisms, its generalizability across cultures remains unclear. Differences in health-information literacy, trust in online sources and cultural interpretations of symptoms could alter how these factors interact. The current study seeks to validate this pathway by examining the serial mediation of these variables in a sample of Pakistani young adults. Pakistan represents a relevant context for such an examination where internet and mobile-based health searching have risen sharply with associated concern of cyberchondria and self-diagnoses via internet (Ahmed et al., 2019; Arshad, 2019; Maryam et al., 2023; Sabir & Naqvi, 2023; Tariq et al., 2021; Usman et al., 2025). Considering these facts, evaluating the existing pathways in Pakistani youth will elucidate whether the model reflects a universal mechanism or is culturally contingent. This focus will address the gap in cross-cultural validation and specificity of mediation pathways. Hence, present study aims to (1) investigate the sequential relationship among the study variables, (2) examine whether health threat positively predicts cyberchondria, (3) assess the serial mediating roles of health anxiety, insufficiency of information, and OHIS between health threat and cyberchondria.

Drawing on recent literature and the theoretical framework, this study proposes several hypotheses to explain the relationships among perceived health threat, health anxiety, perceived information insufficiency, online health information seeking (OHIS), and cyberchondria (Figure 1). **Firstly**, it is hypothesized that perceived health threat is positively associated with cyberchondria. **Secondly**, it is proposed that the study variables will positively predict each other in a sequential pathway. **Thirdly**, health anxiety, perceived information insufficiency, and OHIS are expected to serially mediate the relationship between perceived health threat and cyberchondria.

To further specify the indirect pathways, several sub-hypotheses are proposed. **Firstly**, under the single mediator indirect effects, (H3a) health anxiety is expected to mediate the relationship between perceived health threat and cyberchondria; perceived information insufficiency will mediate the relationship between perceived health threat and cyberchondria; and OHIS will mediate the same association. **Secondly**, in the two-step sequential indirect effects (H3b), health anxiety and perceived information insufficiency will mediate the relationship between perceived health threat and cyberchondria; health anxiety and OHIS will act as mediators; and perceived information insufficiency and OHIS will mediate the association between perceived health threat and cyberchondria. **Finally**, the three-step sequential indirect effect (H3c) proposes that health anxiety, perceived information insufficiency, and OHIS will collectively mediate the relationship between perceived health threat and cyberchondria.

Figure 1
Proposed Serial Mediation Model



2. Method

2.1 Participants

Data was collected from young adults through non-probability purposive sampling technique to ensure that participants were at risk of cyberchondria. The inclusion criteria were to approach only those literate participants who were engaged in regular online health-related searching (spending at least 30 minutes per week) through different search engines and they were not undergoing any treatment. Other participants, who were not meeting these criteria, were excluded. Participants with any chronic physical or psychological problem and autoimmune diseases were not included. Size of research sample size was determined through G*power 3.1 for the final multiple-regression equation. Using the F-test for linear multiple regression: R^2 deviation from zero, with four predictors, a medium effect size ($f^2 = 0.15$), power ($1-\beta$) = .95 and $\alpha = .05$, a sample of 129 participants was required. However, to increase the generalizability of data, participants from different public and private sector universities of Lahore were approached and data was collected in classroom settings. Initial data was obtained from 705 participants but after excluding patterned responses and incomplete data, a final sample of 555 was retained for final study with overall response rate of 78.7% (AAPOR, 2016). Participants aged from 21 to 30 years ($M = 22.20$, $SD = 1.43$), including 254 men (45.8%) and 301 women (54.2%). Out of 555 participants, 86.7% were graduate level, 8.6% postgraduate and 7% were doctorate level students. They belong to both rural (17.7%) and urban areas (82.3%). Most participants reported living in nuclear family system (56.2%) while 43.8% were from joint family system.

2.2 Measures

2.2.1 Perceived Health Threat Scale (Zheng et al., 2021): The Perceived Health Threat Scale (PHTS) is a six-item instrument designed to assess individuals perceived threat to health. It has two sub-components: perceived susceptibility (three items deduced from Champion, 1999) and perceived severity (3-items adapted from Witte, 1996). Items were evaluated on a five-point scale (*strongly disagree*=1 to *strongly agree*=5). The two dimensions are combined into a single

latent construct representing overall perceived health threat. For the present research, Cronbach's alpha indicated good reliability ($\alpha = .88$).

2.2.2 Short Health Anxiety Inventory (Salkovskis et al., 2002): This is a self-administered measure consisting of 18 items, developed to evaluate health-related anxiety. Responses were given on a 4-point Likert scale ranging from (0–3), with extreme scores reflects extreme health anxiety. The measure comprises two parameters: Illness Likelihood (items 1–14) and Negative Consequences (items 15–18). In the current research, the total score was used. The reliability of the SHAI in the present research was good ($\alpha = 0.94$).

2.2.3 Information Insufficiency Scale (Zheng et al., 2021): The Information Insufficiency Scale is a three-indicator tool which measures the subjective gap between an individual's personal existing understanding of a health issue and the knowledge they believe is sufficient to manage the issue effectively (sufficiency threshold). Responses are given on a 10-point Likert scale (*not at all/know nothing*=1 to *extremely/know a lot*=10). In the present research, the scale had good reliability ($\alpha = 0.89$).

2.2.4 Online Health Information Seeking Scale (OHIS; Zheng et al., 2021): The Online Health Information Seeking (OHIS) Scale is a three-items tool which assesses the rate of symptom-related searching online. The participants rated on a 5-point Likert scale on this tool from 1 (*strongly disagree*) to 5 (*strongly agree*), and the scale showed a good reliability in this study ($\alpha = 0.89$).

2.2.5 Cyberchondria Severity Scale (McElroy et al., 2019): The Cyberchondria Severity Scale shorter version of 12-item was used to measure the severity of cyberchondria. The scale includes four sub-scales: distress (items 4, 8, 9), excessiveness (items 1, 3, 6), compulsion (items 2, 7, 10), and reassurance seeking (items 5, 11, 12). Responses are provided on a 5-point Likert scale from 1 (*never*) to 5 (*always*). In this study, the scale had a good reliability ($\alpha = 0.96$).

2.3 Procedure

The study protocol was granted by the Departmental Doctoral Program Committee and the Advanced Studies and Research Board (AS&RB), Institute of Applied Psychology, University of the Punjab. Formal

permission for data collection was also obtained from the regulated authorities. Reliability of the measures was initially assessed through pilot study. For the main study, participants were recruited from public and private sector universities. They were provided with information regarding the purpose of the study, informed of their voluntary participation, and assured of confidentiality. Participants completed a demographic form and questionnaire after giving informed consent. Data was collected in classroom settings under the supervision of the researcher. On average, participants took 25–30 minutes to complete the questionnaires. The researcher was present throughout the process to provide clarification if needed.

2.4 Ethical Considerations

This study complied with the APA's standards for research. All participants were briefed about their rights, their participation, their right to leave research at any time, and the privacy of their responses. Written informed consent was collected prior to participating in this study. The use of all scales was authorized by their respective authors. Upon completion, participants appreciated their time, and psychological support services were offered to anyone who experienced discomfort, although no participant reported distress.

2.5 Statistical Analysis and Results

Data processing was performed in SPSS 27. Initially, descriptive and correlation analyses were conducted. Subsequently, the serial mediation model was examined using the Model 6 of PROCESS macro in SPSS, to test the intermediating role of health anxiety, perceived information insufficiency, and OHIS in the relationship between perceived health threat and cyberchondria. For further confirmation of the mediating pathways and estimate the indirect effects, a bootstrapping procedure with 5000 samples was conducted using random sampling with replacement. This method provides confidence intervals (CI) for indirect effects without assuming normality of the sampling distribution (Hayes, 2022).

3. Results

Table 1
Correlations of the variables (N=555)

Variable	1	2	3	4	5
1. Perceived Health Threat	–				
2. Health Anxiety	.38***	–			
3. Perceived Info. Insufficiency	.21***	.23***	–		
4. Online Health Info Seeking	.20***	.33***	.32***	–	
5. Cyberchondria	.21***	.50***	.21***	.62***	–
M	2.74	22.11	4.17	3.19	2.85
SD	0.91	12.48	2.07	1.19	1.20

Note: *** $p < .001$.

The findings showed that perceived health threat was positively associated with health anxiety ($r = .38, p < .001$), perceived information insufficiency ($r = .21, p < .001$), online health information seeking ($r = .20, p < .001$), and cyberchondria ($r = .21, p < .001$). Health anxiety was positively linked with perceived information insufficiency ($r = .23, p < .001$), online health information seeking ($r = .33, p < .001$), and cyberchondria ($r = .50, p < .001$). Similarly, perceived information

insufficiency showed significant positive correlations with online health information seeking ($r = .32, p < .001$) and cyberchondria ($r = .21, p < .001$). Online health information seeking had a positive significant relationship with cyberchondria ($r = .62, p < .001$). These results indicated that greater perceived health threats are correlated with more health anxiety, increased perception of insufficient health-related information, more frequent online health information seeking, and ultimately higher cyberchondria.

Further, the serial mediation analysis was run to test the association between perceived health threat and cyberchondria, mediated by health anxiety, perceived information insufficiency, OHIS (see figure 2 and table 2).

In table 2, in Model 1, perceived health threat significantly predicted health anxiety ($\beta = .38, p < .001$), indicating that increased perceived health threat were linked with greater health anxiety. In Model 2, perceived health threat significantly predicted perceived information insufficiency ($\beta = .14, p < .01$), and perceived information insufficiency ($\beta = .17, p < .001$), suggesting that both perceived health threat and health anxiety contribute to stronger feelings of insufficient health-related information.

In Model 3, perceived health threat did not significantly predict online health information seeking ($\beta = .04, p > .05$). However, health anxiety ($\beta = .25, p < .001$) and information insufficiency ($\beta = .25, p < .001$) positively predicted OHIS, indicating that higher health anxiety and greater perceived insufficiency of information were linked to more frequent online health information searches. Finally, in Model 4, the direct effect of perceived health threat ($\beta = -.01, p > .05$) and perceived information insufficiency ($\beta = -.03, p > .05$) did not predict cyberchondria. Whereas health anxiety ($\beta = .34, p < .001$) and online health information seeking ($\beta = .52, p < .001$) were significant predictors of cyberchondria.

The serial mediation model tested multiple pathways (see table 3). The direct effect of perceived health threat on cyberchondria was nonsignificant ($\beta = -.0186, 95\% \text{ CI } [-.1051, .0679]$), whereas the total effect was significant ($\beta = .2797, SE = 0.0547, 95\% \text{ CI } [0.1722, 0.3872]$), indicating that the relationship was primarily explained by indirect effects. The serial mediation model tested multiple pathways from perceived health threat to cyberchondria (see Table 2). For the single-mediator pathways, only the indirect effect through health anxiety was significant (*Path 1*: $\beta = .1305, SE = .0223, 95\% \text{ CI } [.0891, .1768]$). The indirect effects through perceived information insufficiency (*Path 2*: $\beta = -.0053, SE = .0054, 95\% \text{ CI } [-.0173, .0043]$), online health information seeking (*Path 3*: $\beta = .0253, SE = .0254, 95\% \text{ CI } [-.0238, .0769]$) were nonsignificant.

Among the two sequential mediations, there were three significant indirect effects. The indirect effect through Health anxiety and perceived information seeking was non-significant (*Path 4*: $\beta = -.0025, SE = .0027, 95\% \text{ CI } [-.0085, 0.0020]$). Furthermore, the indirect effect through Health anxiety and online health information seeking was significant (*Path 5*: $\beta = .0508, SE = .0113, 95\% \text{ CI } [.0295, .0743]$). Furthermore, the indirect effect through perceived information insufficiency and online health information seeking was also significant (*Path 6*: $\beta = .0187, SE = .0070, 95\% \text{ CI } [.0061, .0333]$). Among the three sequential mediations. The indirect effect through health anxiety, perceived information insufficiency, and online health information

seeking was significant (*Path 7*: $\beta = .0090$, $SE = .0032$, 95% $CI [.0036, .0159]$).

Table 2

Testing the mediation effects of perceived health threat on cyberchondria through health anxiety, perceived information insufficiency, online and OHIS (N=555).

Independent variables	Model 1 (Health Anxiety)			Model 2 (Information Insufficiency)			Model 3 (Online Health Info Seek)			Model 4 (Cyberchondria)		
	B	SE (B)	B	B	SE (B)	B	B	SE (B)	β	B	SE (B)	β
Perceived Health Threat	5.24	.53	.38***	.32	.10	.14**	.06	.05	.04	-.01	.04	-.00
Health Anxiety	-	-	-	.02	.01	.17***	.02	.00	.25***	.03	.00	.34***
Information Insufficiency	-	-	-	-	-	-	.14	.02	.25***	-.02	.01	-.03
Online Health Info Seek	-	-	-	-	-	-	-	-	-	.53	.03	.52***
R ²	.14			.07			.17			.48		
F	95.25***			21.34***			38.35***			129.96***		

Note: ** $p < .01$. *** $p < .001$.

Table 3

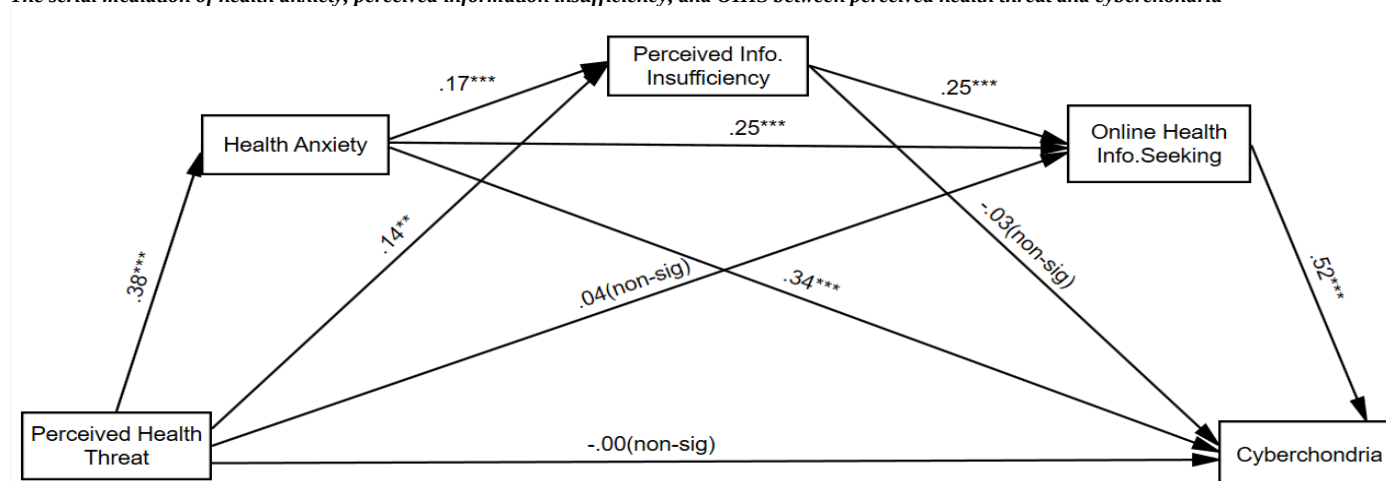
The direct, indirect, and total effect from Perceived Health Threat (PHT) to Cyberchondria (CC) through the following mediators and their sequential combinations: Health Anxiety (HAY), Perceived Information Insufficiency (PII), and OHIS (N=555)

Outcome	95% CI			
	B	BootSE	BootLLCI	BootULCI
Direct effect				
PHT → CC	-.0186	.0440	-.1051	.0679
Single Mediator Indirect effects				
1. PHT → HAY → CC	.1305	.0223	.0891	.1768
2. PHT → PII → CC	-.0053	.0054	-.0173	.0043
3. PHT → OHIS → CC	.0253	.0254	-.0238	.0769
Two-step sequential Indirect effects				
4. PHT → HAY → PII → CC	-.0025	.0027	-.0085	.0020
5. PHT → HAY → OHIS → CC	.0508	.0113	.0295	.0743
6. PHT → PII → OHIS → CC	.0187	.0070	.0061	.0333
Three-step sequential Indirect effects				
7. PHT → HAY → PII → OHIS → CC	.0090	.0032	.0036	.0159
Total Effect				
PHT → CC	.2797	0.0547	0.1722	0.3872

Note. PHT = Perceived Health Threat; HAY = Health Anxiety; PII = Perceived Information Insufficiency; OHIS = Online Health Information Seeking; CC = Cyberchondria.

Figure 2.

The serial mediation of health anxiety, perceived information insufficiency, and OHIS between perceived health threat and cyberchondria



Note. coefficients of standardized path are reported.

4. Discussion

The emerging threat of cyberchondria has elicited growing concern within public and mental health communities, especially in the context of heightened global anxieties during the COVID-19 pandemic (Jokic-Begic et al., 2020). Considering the severity of this phenomenon, present study aimed to explore the factors that directly or in relationship with other variables develop and elevate cyberchondria. Based on existing models of cyberchondria (i.e. Zheng et al., 2021), the present study examined a serial-mediation model linking health threat to cyberchondria through health anxiety, information insufficiency and OHIS among young adults. The findings largely supported the hypothesized model.

For preliminary analysis, a significant positive relationship was found among study variables. Results of serial mediation analysis showed that health threat positively predicted health anxiety which further positively predicted information insufficiency, OHIS and cyberchondria. Information insufficiency positively predicted OHIS which was further positive predictor of cyberchondria. Health threat and information insufficiency did not directly predict cyberchondria. The indirect effect of health threat on cyberchondria through three mediators was significant suggesting full mediation. The existing literature supports these findings.

The cognitive-behavioral perspective suggests that perceiving bodily sensations as threatening increases vigilance toward illness cues and triggers heightened concern about disease (Salkovskis & Warwick, 2001). Among Pakistani young adults, perception of susceptibility and severity were associated with higher health anxiety and more frequent symptom monitoring (Salman et al., 2020). In the context of COVID-19 pandemic, a study also concluded that higher perceived severity of illness is associated with increased stress, anxiety and depression (Han et al., 2021). According to Song and Min (2025), risk perception, and health anxiety fuel OHIS, which subsequently amplifies these concerns over time. Even when provided with credible sources, health-anxious individuals often feel lack of adequate information (Doherty-Torstrick et al., 2016).

Anxiety about health further directs a person to seeking online health information (Gupta et al., 2025). This strive to information seeking resulting from anxiety is often mediated by the perception of having insufficient information. The RISP model by Griffin et al. (1999) argued that individuals involve in excessive searching to fill the gap between their present and required knowledge and this insufficiency drives the repetitive searching (Starcevic & Berle, 2013). The uncertainty surrounding online health information, which is often incomplete, inaccurate, or misleading, is a key driver of cyberchondria (Eysenbach et al., 2002).

As people strive to confirm the accuracy of what they read online, they become trapped in a cycle of repeated searches that escalate worry and distress (Starcevic & Berle, 2013). A systematic literature review of twenty studies by McMullan et al. (2019) revealed a positive association between health anxiety and OHIS and between anxiety related to health and cyberchondria. The distressing nature of information also generates different responses among seekers as some stop further searching while some continued seeking which not only elevates anxiety but reinforces the cycle of cyberchondria (Mohammad et al., 2019). The distinctive information environment of the internet fosters a self-perpetuating cycle in which problematic health-related searching intensifies and sustains cyberchondria (Brown et al., 2019, Starcevic et al., 2020).

Hence, the study is guided by strong theoretical background as well as empirical findings enabling a focused testing of a well-defined cognitive and emotional mechanism underlying cyberchondria. Though full model is not tested here, still significance of the sequential pathway of cyberchondria validates the model in eastern context. By concentrating on at-risk group, the findings increase the need to design prevention and intervention efforts in its management. Despite these strengths, few limitations should be acknowledged. The cross-sectional nature of the study cannot prove cause and effect or the order in which these factors develop, therefore longitudinal or experimental design could be used for better understanding. Data was collected from young

adults limiting its generalizability to adolescents or older adults. Though there are no diagnostic criteria for cyberchondria, exploring these factors in clinically diagnosed group can provide rich insight. Only part of cyberchondria model is assessed here, future research should test the entire model and extend it by additional factors such as information overload and search related cognitive beliefs. In addition, qualitative research could provide deeper insights into people's experiences leading causes, searching patterns and consequences. Overall, the study underscores the need to view cyberchondria as a culturally relevant public health concern and calls for integrated strategies to minimize its growing impact.

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