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Parents' cyberchondria, digital literacy levels, and their relationship with attitudes toward traditional complementary medicine

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Abstract

This study aimed to determine the relationship between cyberchondria and digital literacy levels of parents of children aged 0–18 years and their attitudes toward traditional complementary medicine. This cross-sectional study was conducted. The dependent variable was the score on the Complementary, Alternative, and Conventional Medicine Attitude Scale (CACMAS). The independent variables were sociodemographic characteristics, Cyberchondria Severity Scale (CSS), and Digital Literacy Scale (DLS) scores. According to the linear regression analysis, CACMAS scores were significantly higher among those whose fathers were unemployed and whose mothers were primary school graduates ($p < 0.05$). Additionally, the CACMAS scores increased as the child's age decreased, DLS decreased, hospital visits occurred later in the day, and CSS increased ($p < 0.05$). Both a decrease in digital literacy and an increase in cyberchondria led to higher CAM attitudes.

Keywords

cyberchondria, digital literacy, traditional complementary medicine, attitude

Introduction

Complementary and alternative medicine (CAM) includes all methods used alongside or in place of conventional evidence-based medicine (National Center for Complementary and Integrative Health (NCCIH), 2024). The World Health Organization (WHO) defines CAM as culturally diverse, value-based knowledge, skills, beliefs, and practices that aim to protect health and prevent, improve, or alleviate physical and emotional problems (WHO, 2024). Over the years, CAM use has increased in adults (Park et al., 2016) and children (Dhankar, 2018; Italia et al., 2014; Stampini et al., 2019). The frequency of CAM use in children is 11.6% in the United States, 18% in India, 26.0% in Germany, 48.3% in Italy,

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Data Availability Statement included at the end of the article

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54.3% in Israel, 65.3% in Korea, 73.8% in Australia, and 93.3% in Bahrain (Black et al., 2015; Frawley et al., 2017; Italia et al., 2015; Kim et al., 2012; Oren-Amit et al., 2017; Shosha et al., 2017; Stampini et al., 2019). In a systematic review by Italia et al., which examined studies from 19 European countries, the frequency of CAM use was between 10.9% and 87.6% (Italia et al., 2014). Studies from various centers in Turkey have shown that CAM use by parents ranges from 57% to 100% (Akcay and Yıldırımlar, 2017; Araz and Bulbul, 2011; Cevik and Tari Selcuk, 2019; Ustuner Top et al., 2017).

As children cannot make their own decisions, CAM use depends on their parents' discretion. In pediatric populations, biologically based therapies are the most frequently reported CAM practices and include the use of herbal remedies (e.g. chamomile, ginger, echinacea), dietary supplements, probiotics, vitamins, and traditional medicinal products (Italia et al., 2014; Nimbalkar et al., 2019; Stampini et al., 2019). Mind–body interventions, such as prayer, meditation, yoga, relaxation techniques, breathing exercises, and guided imagery, are commonly employed to manage stress, anxiety, sleep disturbances, and chronic pain in children (James et al., 2018; Stampini et al., 2019). In addition, manipulative and body-based practices, including massage therapy, chiropractic care, osteopathy, and reflexology, are used particularly for musculoskeletal complaints, gastrointestinal problems, and general well-being (Nimbalkar et al., 2019; WHO, 2024). In culturally specific contexts, such as Turkey and other Middle Eastern countries, CAM practices also encompass religious or spiritual healing methods, including amulets, recitation of prayers, and traditional folk remedies, which are deeply embedded in family belief systems and cultural traditions (Ceyhan and Yiğit, 2016; Kusunoki et al., 2023). Factors such as the perception that CAM is safer and more natural, a sense of control through the patient's active role, the absence of invasive methods, the extended amount of time practitioners spend with patients, alignment with lifestyles and belief systems, a holistic approach to healthcare (Ceyhan and Yiğit, 2016; James et al., 2018), and higher accessibility of CAM (Kusunoki et al., 2023; Nimbalkar et al., 2019; Stampini et al., 2019) motivate parents to utilize these methods. Consistent with these findings, a systematic review examining beliefs underlying CAM use demonstrated that perceptions of naturalness, holistic healing, personal responsibility for health, and dissatisfaction with conventional medicine constitute core cognitive drivers of CAM preferences, thereby emphasizing that CAM use is strongly rooted in value-based and belief-oriented frameworks (Bishop et al., 2007).

Determining parents' attitudes toward CAM is important for planning health services and preventing potential risks to children. Moreover, the frequency of CAM use has grown in parallel with Internet searches (Kusunoki et al., 2023; Ng et al., 2023), prompting an awareness of possible risks. While the internet increases access to information, it may also pose a hazard. Therefore, ensuring safe and informed Internet usage and verifying the accuracy of information are crucial. Possessing digital literacy is important for this purpose, as practical skills are needed to ethically access, process, and manage information on digital platforms (Barke and Doering, 2020).

Another concept gaining prominence, as the Internet has become a primary source of health research, is cyberchondria. Individuals may turn to the Internet to learn about their health status or to relieve concerns or anxiety. However, these searches may provide information that amplifies anxiety and worry, leading to more frequent and extensive online health searches (Elciyar and Taşçı, 2017), eventually escalating to intensified health anxiety and cyberchondria (McMullan et al., 2019). That is, excessive or repeated online health information searches may trigger unnecessary concerns related to health, and this phenomenon is called cyberchondria (Zheng and Tandoc, 2022). Recent research also highlights that multidimensional health information overload may increase cyberchondria through the mediating role of rumination, suggesting that excessive exposure to complex, ambiguous, or contradictory online health information can

trigger repetitive negative thinking patterns and intensify health-related anxiety (Xiao et al., 2025). In addition to increasing the workload and healthcare costs in health institutions (Starcevic, 2017), cyberchondria can drive individuals toward inappropriate treatments. Parental anxiety has been shown to significantly influence health-related decision-making processes. Recent evidence indicates that higher levels of parental anxiety are associated with increased hesitancy toward childhood COVID-19 vaccination, and that anxiety may moderate how parents interpret health risks and medical information (Richard et al., 2025). These findings support the theoretical assumption that anxiety-driven processes, including cyberchondria, may similarly shape parents' attitudes toward complementary and alternative medicine.

Low digital literacy may shape parents' attitudes toward CAM through several interrelated mechanisms. Individuals with limited digital literacy often have difficulty evaluating the credibility, scientific validity, and commercial intent of online health information, making them more vulnerable to misinformation, anecdotal narratives, and non–evidence-based claims that frequently promote CAM as "natural," "safe," or superior to conventional treatments (Barke and Doering, 2020; Turavinina and Amornkitvikai, 2025). In digital environments where CAM-related content is highly visible and emotionally framed, low digital literacy may reduce parents' capacity to distinguish evidence-based medical recommendations from unverified or misleading sources, thereby increasing openness to CAM practices (Denny et al., 2024; Ng et al., 2023).

From a theoretical perspective, cyberchondria may influence attitudes toward complementary and alternative medicine (CAM) through an anxiety-driven cognitive–behavioral pathway. Although cyberchondria is commonly associated with increased reassurance-seeking and more frequent use of conventional healthcare services, repeated exposure to alarming, contradictory, or ambiguous online health information can simultaneously heighten uncertainty and erode confidence in biomedical explanations (McMullan et al., 2019; Starcevic, 2017). When individuals experience persistent uncertainty and emotional distress, conventional medicine—often perceived as technical, fragmented, or insufficiently attentive to psychosocial needs—may be evaluated as inadequate in addressing the full scope of health concerns (Zheng and Tandoc, 2022). In this context, CAM becomes attractive not primarily as a replacement for conventional care, but as a coping-oriented response that offers holistic explanations, greater perceived personal control, and emotional reassurance. Recent evidence further supports this mechanism by demonstrating that uncertainty about the credibility of online health information is associated with stronger beliefs in the superiority of traditional, complementary, and integrative medicine, highlighting how difficulties in evaluating digital information can shift health beliefs and treatment preferences under conditions of anxiety (Barke and Doering, 2020; Ng et al., 2023).

Accordingly, low digital literacy may amplify the maladaptive effects of cyberchondria by limiting individuals' capacity to critically appraise online health information and increasing susceptibility to CAM-promoting misinformation (Barke and Doering, 2020; Diviani et al., 2015). Individuals with lower digital health literacy are particularly vulnerable to emotionally framed, non–evidence-based content, which may blur the distinction between scientific medical evidence and misleading or commercially driven narratives prevalent in CAM-related online environments (Ng et al., 2023). Consequently, cyberchondria does not uniformly lead to greater reliance on conventional healthcare; rather, its behavioral consequences vary according to digital literacy levels, cultural health beliefs, and trust in healthcare systems, shaping whether reassurance-seeking results in increased medical consultation or greater openness to alternative health practices (Starcevic, 2017; Zheng and Tandoc, 2022).

In today's era, where digitalization permeates all areas of life, it is desirable for everyone to have a high level of digital literacy and a low level of cyberchondria. Otherwise, it may be

challenging to adapt to medical and technological advancements. Few cross-sectional studies have been conducted on cyberchondria and digital literacy levels in various population groups (Gür and Duman, 2024; Tuna et al., 2023; Ustuner et al., 2023). However, no study has been identified that evaluated the relationship between parents' digital literacy, cyberchondria levels, and attitudes toward complementary and alternative medicine.

This study aimed to determine the relationship between parents' cyberchondria, digital literacy levels, and attitudes toward CAM in children aged 0–18 years. By seeking a scientific response to how parents acquire health information, their ability to evaluate information, and their orientation toward alternative health practices in the digital age, this study will contribute new and original insights to the literature on health education, digital media use, and health sociology.

Research hypotheses

H_1: Parents' sociodemographic characteristics are associated with their attitudes toward traditional complementary medicine.

H_2: Parents' cyberchondria levels are associated with their attitudes toward traditional complementary medicine.

H_3: Parents' digital literacy levels are associated with their attitudes toward traditional complementary medicine.

Methods

Study design

This cross-sectional study was conducted from June 2023 to March 2024 at a Women's and Children's Health Training and Research Hospital in Northeastern Turkey. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies (von Elm et al., 2014), with detailed adherence outlined in the "Checklist of items that should be included in the cross-sectional studies."

Participants and recruitment

The study population consisted of individuals who presented to a Women's and Children's Health Training and Research Hospital for their 0–18-year-old children in pediatric clinics/polyclinics between June 2023 and March 2024. A non-probability convenience sampling method was used, and all eligible parents who attended the pediatric clinics during the study period and agreed to participate were consecutively recruited. An a priori power analysis was conducted using G*Power 3.1, assuming a small effect size ($f^2 = 0.04$), $\alpha = 0.05$, power = 0.85, and 20 predictors. This effect size was chosen based on Cohen's (1988) guidelines for multiple regression in social sciences and previous studies reporting similar associations. The analysis indicated that a minimum sample size of 596 participants (approximately 600) was required. Ultimately, data were collected from 647 participants who met the inclusion and exclusion criteria.

Inclusion criteria for the study:

Being 18 years of age or older,

Having a child under the age of 18,

Having visited the pediatrics clinic/outpatient clinic during the study period,

Not having cognitive impairment,

Volunteering to participate in the study.

Data collection

Data were collected by the researcher in a face-to-face format within the hospital. After children underwent routine health checks, parents who met the inclusion criteria were approached in the pediatric clinic waiting area. Participation was voluntary, and written informed consent was obtained at the start of the survey. No incentives or financial support was provided. A

set of instructions and a flow were followed to administer the questionnaire, which took approximately 10–15 minutes per participant.

The dependent variable of the study was parents' overall attitude toward CAM, measured using the Complementary, Alternative, and Conventional Medicine Attitude Scale (CACMAS). The independent variables included sociodemographic characteristics, Cyberchondrial Severity Scale (CSS), and Digital Literacy Scale (DLS).

The study data were gathered face-to-face by the researchers, as follows:

Sociodemographic Characteristics Form

The Digital Literacy Scale (DLS)

The Cyberchondria Severity Scale (CSS)

The Complementary, Alternative, and Conventional Medicine Attitude Scale (CACMAS)

Sociodemographic characteristics form

This form contains questions about personal characteristics (age, educational level, employment status, economic status, family structure, child's age and gender) and details about hospital visits (complaints, time of visit, reason for choosing the hospital, etc.) and health service use.

Complementary, Alternative, and Conventional Medicine Attitude Scale (CACMAS)

Developed by McFadden et al. (2010) and adapted to Turkish by Köse et al. (2018), this 27-item scale includes five reverse-scored items (1, 4, 8, 9, and 26). It is rated on a 7-point Likert scale from "strongly disagree" (1) to "strongly agree" (7) and covers three sub-dimensions: Cognitive View of Complementary Medicine (Items 18, 19, 21, 22, 24, 5, 7, 9), Dissatisfaction with Modern Medicine (Items 1, 4,16, 14, 11,17, 26, 27, 20, 8), and Holistic View of Health (Items 3, 10, 12, 13, 15, 23, 25, 2, 6). There is no cutoff point; higher scores indicate a more positive attitude toward CAM. In the adaptation study, Cronbach's alpha was 0.808; in this study, it was 0.771.

Cyberchondria Severity Scale (CSS)

Developed by McElroy and Shevlin (2014) and adapted to Turkish by Uzun et al. (2017), this 15-item scale includes three reverse-scored items (items 5, 12, and 15). Rated on a 5-point Likert scale (1 = never, 5 = always), the total scores range from 15 to 75, with higher scores indicating more severe cyberchondria. The Cronbach's alpha was 0.890 in the adaptation study and 0.807 in the present study.

The Digital Literacy Scale (DLS)

Developed by Ng (2012) and adapted to Turkish by Hamutoğlu et al. (2017), consists of 17 items rated on a 5-point Likert scale (5 = strongly agree, 1 = strongly disagree). The total scores range from 17 to 85, with higher scores indicating higher digital literacy. The Cronbach's alpha was 0.930 in the adaptation study and 0.931 in the present study.

Statistical analysis

Data were analyzed using IBM SPSS Statistics 26.0 and Stata software. Statistical significance was set at $p < 0.05$. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. Normality assumptions were evaluated using skewness and kurtosis values (± 1.5). When normality was satisfied, Student's *t*-test was used for comparisons between two groups, and one-way analysis of variance (ANOVA) with Tukey HSD post hoc test was applied for comparisons among three or more groups. When normality assumptions were not met, the Kruskal–Wallis H test was employed. Associations between continuous variables were assessed using Pearson's correlation analysis.

Variables found to be statistically significant in univariate analyses were entered into multivariate analyses. Hierarchical multiple linear regression analysis was conducted to identify

predictors of CACMAS scores. Sociodemographic and healthcare utilization variables were entered in the first block, CSS in the second block, and DLS in the third block.

Regression analyses were performed in Stata 15.0 using a bootstrap procedure with 5000 resamples, and bootstrap standard errors and 95% confidence intervals were reported. Multicollinearity was assessed using tolerance and variance inflation factor (VIF) values.

Ethics approval

Approval was granted by the Balıkesir University Health Sciences Non-Interventional Research Ethics Committee (Date: 11.04.2023, Number: 2023/40) and by the chief physician of the Women's and Children's Health Training and Research Hospital at Giresun University (Date: 24.05.2023/Number: E-41544352-799–21,621,942). This study complied with the principles of the Declaration of Helsinki. Participants were informed about the study's purpose and method, and under the "Autonomy" principle, they were told that they could withdraw at any time. Before data collection began, an "Informed Consent Form" was provided to ensure participants' rights.

Results

Among the participants ($n=647$), 51.3% had children aged 0–5 years and 52.6% were girls. While 36.5% of mothers were employed, 96.1% of fathers were employed; 61.7% of mothers and 71.9% of fathers were high school and above. Overall, 95.5% of the participants were married, 64.0% reported that their income was equal to their expenses, 82.4% lived in a nuclear family, 57.5% resided in the provincial center, and 57.5% were blue-collar workers.

Of the participants, 25.0% visited the hospital because their child had a fever, and 83.8% typically went to the state hospital when the child experienced health issues.

The mean age of the children was 6.15 ± 4.24 (Min-Max: 0.60–17.00), the mean age of the mothers was 33.58 ± 6.46 (Min-Max: 19–52), and the mean age of the fathers was 36.88 ± 6.85 (Min-Max: 22–59). The average time of hospital admission was 14.22 ± 5.15 (in hours; Min-Max: 1–24), the mean number of visits to a healthcare institution in the last year was 5.87 ± 4.07 (Min-Max: 1–21), and the mean number of hospital admissions in the last year was 3.95 ± 2.66 (Min-Max: 1–13). Participants' mean CSS score was 40.92 ± 7.82 (Min-Max: 16–62), mean DLS score was 55.45 ± 12.00 (Min-Max: 24–82), mean CACMAS score was 109.22 ± 15.70 (Min-Max: 59–162). Participants' mean score on the Holistic View of Health subscale of the CACMAS scale was the highest at 47.13 ± 7.45 (Min-Max: 15–63), the lowest was the Dissatisfaction with Modern Medicine subscale score, which was 28.01 ± 10.47 (Min-Max: 10–57), and the Cognitive View of Complementary Medicine subscale score was 34.07 ± 7.89 (Min-Max: 8–56; Table 1).

CACMAS scores were significantly higher among those with children aged 0–5 years ($t=2.109$, $p=0.035$), when the mother was unemployed ($t=-2.162$, $p=0.031$), when the father was unemployed ($t=10.296$, $p=0.001$), when the mother was a primary school graduate ($t=5.201$, $p=0.001$), when the father was a primary school graduate ($t=-2.837$, $p=0.001$), in those who came to the hospital because of the child's fever ($t=2.155$, $p=0.035$), and in parents who usually preferred the state hospital when their child had a health issue ($t=-3.157$, $p=0.002$). No significant differences were found based on parents' marital status, income level, family structure, place of residence, occupation, or child's gender ($p>0.05$; Table 2).

In the study group, there was a weak negative correlation between CACMAS scores and the child's age ($r=-0.085$, $p=0.031$), a weak positive correlation with the time of hospital admission ($r=0.096$, $p=0.015$) and the number of hospital admissions in the last year ($r=0.168$, $p<0.001$), a weak positive correlation with CSS ($r=0.210$, $p<0.001$), and a weak negative correlation with DLS ($r=-0.156$, $p=0.001$). No significant correlation was found with mother's age, father's age, or the number of healthcare visits in the last year ($p>0.05$; Table 3).

Table 1. Descriptive characteristics of continuous variables ($n = 647$).

Variables	Mean ± SD	Median (Min-Max)
Child's age (year)	6.15 ± 4.24	5.00 (0.60–17.00)
Mother's age (year)	33.58 ± 6.46	33.00 (19–52)
Father's age (year)	36.88 ± 6.85	36.00 (22–59)
Time of admission	14.22 ± 5.15	15.00 (1–24)
Number of health care institution visits in the last year	5.87 ± 4.07	5.00 (1–21)
Number of hospital visits in the last year	3.95 ± 2.66	3.00 (1–13)
CSS	40.92 ± 7.82	41.00 (16–62)
DLS	55.45 ± 12.00	57.00 (24–82)
CACMAS	109.22 ± 15.70	109.00 (59–162)
Cognitive View of Complementary Medicine	34.07 ± 7.89	34.00 (8–56)
Dissatisfaction with Modern Medicine	28.01 ± 10.47	26.00 (10–57)
Holistic View of Health	47.13 ± 7.45	48.00 (15–63)

SD: standard deviation.

Table 2. Sociodemographic characteristics and CACMAS scores ($n = 647$).

	CACMAS			
Variables	*n* (%)	Mean ± SD/Median (Min. Max.)	Test value	*p*
Child's age (year)				
0–5	332 (51.3)	110.48 ± 15.79	$t = 2.109$	**0.035***
6–17	315 (48.7)	107.88 ± 15.52		
Child's gender				
Girl	307 (47.4)	109.13 ± 16.55	$t = -0.139$	0.889
Boy	340 (52.6)	109.30 ± 14.92		
Mother's working status				
Yes	236 (36.5)	107.47 ± 15.02	$t = -2.162$	**0.031***
No	411 (63.5)	110.23 ± 16.01		
Father's working status				
Yes	622 (96.1)	108.04 ± 14.47	$t = 10.296$	**0.001***
No	25 (3.9)	138.64 ± 16.76		
Mother's educational level				
Primary school	248 (38.3)	113.33 ± 16.56	$t = -5.201$	**0.001***
High school and above	399 (61.7)	106.67 ± 14.60		
Father's educational level				
Primary school	182 (28.1)	112.23 ± 17.60	$t = -2.837$	**0.005***
High school and above	465 (71.9)	108.05 ± 14.75		
Marital status				
Married	618 (95.5)	109.24 ± 15.56	$t = 0.164$	0.870
Not married	29 (4.5)	108.75 ± 18.71		
Income level				
Income less than expenses	16 (2.5)	105 (73.00–140.00)	KW = 1.176	0.556
Income equal expenses	414 (64.0)	110.00 (59.00–162.00)		
Income more than expenses	217 (33.5)	107.00 (70.00–152.00)		

(continued)

Table 2. (continued)

Variables	CACMAS			
	n (%)	Mean ± SD/Median (Min. Max.)	Test value	*p*
Family type				
Nuclear	533 (82.4)	109.25 ± 15.17	$t = 0.098$	0.922
Extended/Broken	114 (17.6)	109.09 ± 18.04		
Place of residence				
City	372 (57.5)	108.25 ± 15.96	$F = 1.982$	0.139
District	209 (32.3)	110.95 ± 15.59		
Village	66 (10.2)	109.25 ± 14.28		
Occupation				
White-collar	185 (28.6)	110.09 ± 15.63	$F = 0.699$	0.553
Blue-collar	323 (49.9)	109.40 ± 15.31		
Unemployed	24 (3.7)	106.66 ± 15.75		
Other[a]	115 (17.8)	107.86 ± 16.91		
Reason for child's hospital admission				
Fever	162 (25.0)	111.48 ± 16.61	$t = 2.115$	**0.035***
Other[b]	485 (75.0)	108.47 ± 15.33		
Usual health care facility is chosen when child has a problem				
Hospital	542 (83.8)	110.07 ± 15.91	$t = -3.157$	**0.002***
Other[c]	105 (16.2)	104.82 ± 13.86		

SD: standard deviation
[a]Includes housewives and retirees.
[b]Upper respiratory tract infection, restlessness, allergy, injury.
[c]Family health center, University hospital, private hospital.
*$p < 0.05$.

Table 3. Relationship between continuous variables and CACMAS ($n = 647$).

Continuous variables	*r*	*p*
Child's age	−0.085	**0.031***
Mother's age	0.035	0.374
Father's age	−0.030	0.445
Time of admission	0.096	**0.015***
Number of health care institution visits in the last year	0.069	0.080
Number of hospital visits in the last year	0.168	**0.001***
CSS	0.210	**0.001***
DLS	−0.156	**0.001***

r: Pearson's correlation
*$p < 0.05$.

Before conducting the regression analysis, potential multicollinearity and common method bias were assessed. Multicollinearity was examined using Variance Inflation Factor (VIF) values, all of which were below the recommended threshold (VIF < 5), indicating that multicollinearity did not threaten the model. Common method bias was evaluated using Harman's single-factor test, which showed that a single factor accounted for 16.4% of the total variance, well below the commonly cited 50% threshold, suggesting that common method bias was unlikely to affect the findings.

Table 4 presents the hierarchical regression results predicting CACMAS scores.

Model 1 included sociodemographic and healthcare utilization variables related to the child and parents. The overall model was statistically significant ($p < 0.001$) and explained 18.3% of the variance in CACMAS scores ($R^2 = 0.183$, *Adjusted* $R^2 = 0.172$). Significant predictors were child's age ($\beta = -0.078$, $p = 0.033$), father's working status ($\beta = 0.309$, $p < 0.001$), mother's educational level ($\beta = 0.132$, $p = 0.002$), usual healthcare facility when the child is ill ($\beta = 0.093$, $p = 0.004$), and time of admission ($\beta = 0.094$, $p = 0.016$).

Model 2 added CSS to the regression model. The explained variance increased to 22.1% ($R^2 = 0.221$, *Adjusted* $R^2 = 0.208$, $p < 0.001$). CSS was a significant positive predictor of CACMAS scores ($\beta = 0.196$, $p < 0.001$). All previously significant variables remained statistically significant ($p < 0.05$).

Model 3 included DLS, which slightly increased the explained variance to 22.7% ($R^2 = 0.227$, *Adjusted* $R^2 = 0.214$, $p < 0.001$). CSS remained a significant positive predictor ($\beta = 0.188$, $p < 0.001$), while DLS emerged as a significant negative predictor ($\beta = -0.080$, $p = 0.037$). In the final model, child's age ($p = 0.010$), father's working status ($p < 0.001$), mother's educational level ($p = 0.006$), usual healthcare facility ($p = 0.029$), time of admission ($p = 0.029$), CSS ($p < 0.001$), and DLS ($p = 0.037$) were significant predictors of CACMAS scores.

Given the small proportion of unemployed fathers ($n = 25$, 3.9%), a bootstrap sensitivity analysis was conducted to assess the stability of the paternal employment coefficient. The effect remained statistically significant ($B = 26.74$, 95% CI [19.83–33.65], $p < 0.001$), and the confidence interval did not indicate instability. The magnitude of the coefficient was comparable to that observed in the original model ($B = 24.44$), suggesting that the coefficient was stable and robust to resampling procedures, thereby reducing concerns regarding overfitting due to group imbalance.

Discussion

CAM practices have continued from the past to the present and have shown a global increase in use (Jasamai et al., 2017; Romero-García et al., 2024). According to the WHO, parents' CAM use for their children ranges geographically between 10% and 80% (Mosavat et al., 2018). Sometimes regarded as an alternative or a first choice, and sometimes as the only option for specific health issues, CAM is a phenomenon that must be understood. Health professionals play a pivotal role in evaluating CAM methods used by families and explaining their objectives, effects, modes of application, and potential risks (Ozer et al., 2020). Consequently, health professionals need to understand the factors that influence individuals' attitudes toward CAM.

This study investigated parents' digital literacy and cyberchondria levels in relation to their CAM attitudes. The mean CSS score (40.92 ± 7.82) suggests that participants' perceived severity of cyberchondria was moderate. Cyberchondria research is generally cross-sectional and includes different sample groups (Ustuner et al., 2023; Zheng et al., 2021). Barke and Doering (2020) observed high cyberchondria levels in an online study conducted in Germany. Because children are dependent on their families, they are more vulnerable to the consequences of incorrect or incomplete information that parents may find online (Korkmaz and Esenay, 2022). In parallel to our study results, Sabandüzen and Kavaklı (2022) reported moderate cyberchondria levels among parents of newborns, and Ustuner et al. (2023) reported moderate levels among parents of children aged 0–18 years. Parenthood already involves an enduring increase in anxiety (Rathbone and Prescott, 2019), and frequent internet searches, misinformation, and emotional factors can further escalate anxiety, resulting in higher cyberchondria (Avçin and Can, 2022). Parents who use the internet to seek health information frequently find such websites confusing and report feeling more anxious afterward (Barke and Doering, 2020). This can lead to heightened

Table 4. Hierarchical regression analysis of CACMAS[a] by independent variables ($n = 647$).

Variables	Beta	Bootstrap SE	Std. Beta	z	p	95% C.I. Bootstrap (5000) Low	95% C.I. Bootstrap (5000) Upper	Collinearity Statistics Tolerance	Collinearity Statistics VIF
Model 1									
Constant	99.307	2.973		33.40	0.000*	93.48	105.13		
Child's age (year)	−0.272	0.128	−0.078	−2.13	**0.033***	−0.52	−0.02	0.90	1.10
Mother's employment status	0.892	1.233	0.026	0.72	0.469	−1.52	3.30	0.88	1.13
Father's employment status	26.741	3.525	0.309	7.59	**0.000***	19.83	33.64	0.85	1.16
Mother's educational level	4.379	1.444	0.132	3.03	**0.002***	1.54	7.21	0.75	1.32
Father's educational level	0.455	1.471	0.004	0.31	0.757	−2.42	3.33	0.79	1.26
Reason for hospital admission	−0.739	1.328	−0.024	−0.56	0.578	−3.34	1.86	0.92	1.08
Usual health care facility when child is ill	4.729	1.644	0.093	2.88	**0.004***	1.50	7.95	0.98	1.01
Time of admission	0.272	0.113	0.094	2.42	**0.016***	0.05	0.49	0.98	1.02
Number of hospital visits in the last year	0.120	0.134	0.062	0.89	0.371	−0.14	0.38	0.90	1.10
$R^2 = 0.183$, Adjusted $R^2 = 0.172$, $p = 0.000$									
Model 2									
Constant	85.203	4.032		21.13	0.000*	77.30	93.105		
Child's age (year)	−0.315	0.129	−0.088	−2.44	**0.015***	−0.56	−0.06	0.90	1.10
Mother's employment status	1.122	1.240	0.033	0.91	0.365	−1.30	3.55	0.88	1.13
Father's employment status	25.753	3.677	0.303	7.00	**0.000***	18.54	32.95	0.85	1.16
Mother's educational level	4.161	1.392	0.126	2.99	**0.003***	1.43	6.89	0.75	1.33
Father's educational level	0.762	1.436	0.015	0.53	0.596	−2.05	3.57	0.78	1.26
Reason for hospital admission	−1.774	1.297	−0.051	−1.37	0.171	−4.31	0.76	0.90	1.10
Usual health care facility when child is ill	3.987	1.656	0.080	2.41	**0.016***	0.74	7.23	0.97	1.02
Time of admission	0.242	0.108	0.084	2.25	**0.025***	0.03	0.45	0.97	1.02
Number of hospital visits in the last year	0.090	0.129	0.041	0.70	0.486	−0.16	0.34	0.89	1.11
CSS	0.398	0.077	0.196	5.15	**0.000***	0.24	0.54	**0.95**	**1.05**
$R^2 = 0.221$, Adjusted $R^2 = 0.208$, $p = 0.000$									
Model 3									
Constant	92.44	5.278		17.52	0.000*	82.10	102.79	0.90	1.11
Child's age (year)	−0.332	0.129	−0.093	−2.57	**0.010***	−0.58	−0.07	0.90	1.13
Mother's employment status	0.998	1.233	0.030	0.81	0.418	−1.41	3.41	0.88	1.13
Father's employment status[b]	25.466	3.764	0.300	6.77	**0.000***	18.08	32.84	0.85	1.16
Mother's educational level	3.840	1.394	0.116	2.75	**0.006***	1.10	6.57	0.74	1.34
Father's educational level	0.525	1.436	0.009	0.37	0.714	−2.28	3.33	0.78	1.27
Reason for hospital admission	−1.661	1.274	−0.049	−1.30	0.192	−4.15	0.83	0.90	1.10
Usual health care facility when child is ill	3.719	1.704	0.073	2.18	**0.029***	0.38	7.05	0.96	1.03

(continued)

Table 4. (continued)

Variables	Beta	Bootstrap SE	Std. Beta	z	p	95% C.I. Bootstrap (5000)		Collinearity Statistics	
						Low	Upper	Tolerance	VIF
Time of admission	0.239	0.110	0.082	2.18	**0.029***	0.02	0.45	0.97	1.02
Number of hospital visits in the last year	0.108	0.127	0.041	0.85	0.395	−0.14	0.35	0.89	1.11
CSS	0.380	0.077	0.188	4.95	**0.000***	0.23	0.53	0.94	1.06
DLS	−0.109	0.052	−0.080	−2.08	**0.037***	−0.21	−0.01	0.93	1.07
$R = 0.227$, Adjusted $R^2 = 0.214$, $p = 0.000$									

The variables included in the model were as follows: Child's age: continuous, Mother's working status: (Yes: 0, No: 1), Father's working status: (Yes: 0, No: 1), Mother's educational level: (High school and above: 0, Primary school: 1), Father's educational level: (High school and above:0, Primary school: 1), The reason for hospital admission: (Other: 0, Fever: 1), Usual healthcare facility when child is ill: (Family health center/University hospital/Private hospital: 0, State hospital: 1), Time of admission (hour): (Continuous), Number of healthcare institution visits in the last year: (Continuous), Number of hospital visits in the last year: (Continuous), CSS: (Continuous), DLS: (Continuous).
[a]As the CACMAS score increases, so does the positive attitude toward traditional complementary medicine.
[b]Sensitivity analyses excluding influential observations yielded comparable results (see Supplemental Table S1).
*$p < 0.05$.

anxiety, self-diagnosis, self-treatment, and distrust among medical professionals.

The mean DLS score of the participating parents (55.45 ± 12.00) suggests a moderate level of digital literacy when interpreted within the scales theoretical score range. Given the central role of digital technologies in accessing information and shaping health- and parenting-related decisions, digital literacy may serve as an important facilitator of informed family decision-making. Higher digital literacy is associated with greater capacity to critically evaluate online content and engage more positively with digital environments. Consistent with this interpretation, previous studies have reported moderate digital literacy levels among parents and adult populations (Ustuner et al., 2023; Yeşildal and Kaya, 2021), while also highlighting substantial variability associated with sociodemographic factors such as education, age, and access to digital resources (McDougall et al., 2018; Ozerbas and Ocal, 2019; Vandoninck et al., 2010; Zhao et al., 2023). Moreover, parental digital literacy has been shown to be closely linked to social-digital competencies, including digital parenting awareness and communication skills that shape family-level digital interactions (Kalkim et al., 2024). From this perspective, a moderate level of digital literacy may limit parents' capacity to recognize online risks and adopt safe digital practices, underscoring the importance of strengthening parental digital and digital health literacy to support child health and well-being in increasingly digitalized contexts.

In our study, the mean CACMAS score (109.22 ± 15.70) was above the midpoint of the scale, indicating a positive attitude toward CAM among participants. Similar findings were noted by Dursun et al. (2019), with a mean CACMAS score of 103.99 ± 22.03, and by Kahraman and Kırkan (2020), with a score of 112.01 ± 20.07. Various other studies have also reported generally positive attitudes toward CAM (Dursun et al., 2019; Kıskaç et al., 2024; Romero-García et al., 2024). The highest mean score on the Holistic View of Health subscale indicates that participants tend to perceive

health in a comprehensive and multidimensional manner. The lowest mean score on the Dissatisfaction with Modern Medicine subscale suggests that the inclination toward complementary and alternative medicine is not based on a rejection of modern medical practices but rather reflects a supportive approach. The Cognitive View of Complementary Medicine subscale scores at a moderate level indicate limited yet generally positive knowledge and beliefs regarding complementary medicine. In line with the interpretation of McFadden et al. (2010), complementary practices appear to be perceived as supportive or adjunctive approaches to modern medicine rather than as substitutes. According to the WHO, the prevalence of CAM use by parents for their children can reach 80% (Romero-García et al., 2024). Contributing factors include the belief that CAM is safer or more natural (Ding et al., 2017; Gad et al., 2013), the desire to fulfill a "good parent" role (Gad et al., 2013), cultural or religious traditions (Bishop and Lewith, 2010), dissatisfaction with medical treatments, and the desire to avoid side effects (Gad et al., 2013). Regardless of these reasons, a major concern is that reliance on CAM may delay diagnosis and medical treatment or lead to complications if administered by individuals lacking proper expertise or if the chosen methods have side effects (Vos et al., 2021; Zorzela et al., 2014). Thus, some researchers have emphasized the need to integrate CAM into evidence-based medicine, given that some CAM practices can interact with medical treatments (Leach et al., 2018). Parents' positive attitudes toward CAM can significantly influence the care and guidance they provide to their children.

In our findings, the CACMAS score was higher in families in which the father was unemployed, the mother had a lower education level, the child was younger, and the hospital visit was made at a later hour. However, the group of unemployed fathers was relatively small, which may render the large Beta coefficient for father's working status unstable; therefore, this finding should be interpreted with caution, and future studies with larger samples of unemployed fathers are recommended. Similarly, Gokce and Pasli Gurdogan (2019) found that individuals with low educational and income levels had more favorable attitudes toward CAM. Some studies also indicate that people with lower education and income levels have higher CAM attitudes (İçer and Daşlı, 2024; Kharroubi et al., 2018), whereas others suggest that those with higher education and income levels are more likely to use CAM (Kwon, 2024; Nölke et al., 2015). Although there is no overarching consensus on the influence of education and income on CAM frequency, increasing evidence suggests that these factors strongly shape the CAM methods that people choose (Romero-García et al., 2024). Our study also showed that CAM attitudes were stronger among parents of younger children, consistent with previous findings that CAM is more frequently used for preschool-aged children and less frequently used as they get older (Oren-Amit et al., 2017; Sathiyan et al., 2021; Shosha et al., 2017). Parents may perceive younger children as more vulnerable to pharmaceutical side effects, thus favoring CAM use. In our study, a later time of hospital admission was associated with higher CACMAS scores. In Turkey, tertiary hospitals are also widely used for routine outpatient services (Tosun, 2020). Moreover, the reason for admission was controlled for in the regression model and did not remain significant. This suggests that the observed association cannot be explained solely by acute clinical conditions. Previous research has reported that perceived limitations in healthcare access may be associated with a greater inclination toward CAM use (Cevik et al., 2018). Therefore, admission time may reflect healthcare-seeking behavior patterns rather than exclusively emergency-related circumstances.

We also determined that attitudes toward CAM increased as CSS increased and DLS decreased. Consistent with the findings of Jędrzejewska et al. (2024), our results suggest that heightened health-related anxiety driven by excessive online health information seeking may prompt individuals to seek greater control

over their health through CAM practices. Although no prior study has explicitly examined the combined roles of cyberchondria and digital literacy in shaping CAM attitudes, evidence suggesting that higher health literacy is associated with lower CAM use (Dursun et al., 2019) lends support to the plausibility of this explanatory framework. In a focus group with Australian mothers, participants reported liking immediate, easily accessible information (Lupton, 2016). Much online health information is complex and requires high literacy (McInnes and Haglund, 2011), and many parents struggle to comprehend pediatric health topics (Yin et al., 2012). Despite the Internet's broad potential, reliability can vary substantially, and misinformation is widespread (Jaks et al., 2019; Modave et al., 2014; Scullard et al., 2010). Our results, which show that parents who exhibit stronger CAM attitudes also have lower digital literacy and higher cyberchondria, align with the existing literature. Evaluating the safety of complementary or alternative methods requires strong digital literacy and a low tendency to repeat health searches obsessively. Although CAM can offer certain benefits, distinguishing safer from riskier methods is vital for safeguarding child health. Identifying parents' cyberchondria severity and implementing measures, particularly improving digital literacy, may prevent unsubstantiated complementary and alternative medicine use in children.

Limitations and strengths

This study has some limitations. First, the cross-sectional design inherently poses methodological constraints, and the results can only be generalized to populations with similar characteristics. Second, Likert-type questions might have steered participants to select predetermined answers rather than offering more in-depth responses to open-ended questions. However, the study's notable strength is its unique focus on parents of children aged 0–18 years, examining cyberchondria, digital literacy, and CAM attitudes.

Conclusion

Participants' perceived cyberchondria severity and digital literacy levels were moderate, while their attitudes toward complementary and alternative medicine (CAM) were generally positive. CAM attitudes were particularly stronger among parents whose fathers were unemployed, whose mothers had lower education levels, whose children were younger, and who presented to the hospital later in the day. Furthermore, CAM attitudes increased as digital literacy decreased and cyberchondria increased. Based on these findings, parents should be informed about CAM use, with particular attention to mothers with lower educational levels, families with unemployed fathers, and parents of younger children. Targeted educational programs providing evidence-based CAM information should be offered to these groups. Interventions to improve digital health literacy could be implemented; for example, parents could be provided with QR-code-based verified CAM resource lists and short educational videos during outpatient or emergency visits, brief interactive digital literacy workshops could be organized, and access to verified CAM information could be facilitated via mobile applications. In addition, strategies to reduce parents' cyberchondria could include providing reliable online guides, short informational SMS messages, or web-based content. Finally, ensuring that pediatric consultations are accessible during later hours may help reduce reliance on CAM due to limited healthcare availability, and providing verified information cards or QR-codes during late-hour visits can further enhance access to accurate information. These approaches aim both to ensure parents can access correct information regarding CAM and to reduce misguidance related to lower digital health literacy.

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Ethical considerations

Approval was granted by the Balıkesir University Health Sciences Non-Interventional Research Ethics Committee (Date: 11.04.2023, Number: 2023/40) and by the chief physician of the Women's and Children's Health Training and Research Hospital at Giresun University (Date: 27.05.20232, Number: E-58380337-044-155208).

Consent to participate

Written informed consent was obtained from all participants with a signed informed consent form.

Consent for publication

All participants and authors consent to the publication of this research.

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Declaration of conflicting interests

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Data availability statement

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

Supplemental material

Supplemental material for this article is available online.

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