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Health Responsibility as Mediators between Digital Addiction and Health Behaviors-related Nutrition among Secondary School Female Students in Karbala, Iraq

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ABSTRACT

Background: Digital addiction, characterized by excessive interaction with digital devices, poses risks to adolescents' health behaviors, especially nutrition-related habits. This study aimed to investigate the mediating role of health responsibility in relation to digital addiction and nutrition-related health behaviors among secondary school female students in Karbala, Iraq.

Methods: A descriptive correlational study was conducted in Karbala, Iraq, including 368 female students from 13 schools who were selected through simple and systematic random sampling methods. Data collection used a structured questionnaire consisted of sections on demographic characteristics, digital addiction, health behaviors related to nutrition, and health responsibility. Reliability and analysis were confirmed by a pilot study (Cronbach's alpha=0.85).

Results: Moderate level of digital addiction (53.5%), health responsibility (55.2%), and healthy behaviors related to nutrition (73.6%) were observed. Regression analysis revealed that health responsibility could negatively predict digital addictive behaviors (β=-0.143, p=0.006) and positively influenced nutrition-related health behaviors (β=0.585, p=0.000).

Conclusion: This study provided empirical evidences to support the promotion of health responsibility as a preventive measure for digital addiction and the promotion of healthy eating behaviors. There is a need to promote health responsibility through targeted educational programs, parent engagement, and awareness campaigns that address digital addiction and nutrition.

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Introduction

The widespread use of digital technology among adolescents has raised increasing concerns about its impact on health behaviors, especially nutrition-related behaviors. Digital addiction that is characterized by excessive and compulsive interaction with digital devices has been associated with numerous negative outcomes, including poor dietary

habits, sedentary lifestyles, and sleep disturbances (1-3). For female high school students, who represent a critical developmental stage, the interaction between digital addiction and health behaviors requires special attention, because it can have long-term effects on their overall well-being (4, 5).

Healthy nutrition-related behaviors are key determinants of adolescent health, including dietary intake, eating patterns, and dietary choices (6, 7). It was shown that excessive screen time, often driven by digital addiction, contributes to unhealthy dietary behaviors such as skipping meals, increased consumption of fast foods, and reduced intake of fruits and vegetables (8, 9). These behaviors can lead to nutritional deficiencies and increase the risk of obesity and metabolic disorders (10, 11).

In addressing the harmful effects of digital addiction, health responsibility as a key construct within the health-promoting lifestyle framework can emerge as an important mediator. Health responsibility involves an individual's active participation in maintaining and promoting his or her health by making informed decisions and being accountable for health-related actions (12, 13). Several studies demonstrated that higher levels of health responsibility are associated with better health behaviors, including improved dietary habits and regular physical activity (14-16).

Existing research supports the mediating role of health accountability in the relationship between digital addiction and various health outcomes. For example, reports indicate that adolescents with greater health responsibility demonstrated healthier eating behaviors despite high levels of digital engagement (17). Likewise, it was highlighted that promoting health responsibility in adolescents mitigates the negative effects of screen time on physical health. These findings suggest that interventions targeting health accountability may serve as an effective strategy to address the nutritional challenges posed by digital addiction (18, 19).

Despite a growing body of literature, there is limited research specifically examining the mediating role of health responsibility in the context of adolescent girls, who may exhibit unique patterns of digital use and health behaviors (8). Understanding this relationship is crucial, as female students often face distinct social and cultural pressures that influence their dietary choices and lifestyle behaviors (20). Therefore, this study aimed to explore the mediating role of health responsibility between digital addiction and health behaviors related to nutrition among female secondary school students. By addressing this gap, the research searched to provide evidence-based insights for the development of tailored interventions to promote healthy lifestyles and mitigate the risks associated with digital addiction.

Material and Methods

This study adopted a descriptive correlational design to investigate the mediating role of health responsibility in the relationship between digital addiction and health behaviors related to nutritional status among female high school students. The design was suitable for exploring associations between variables and assessing mediation effects in the context of the natural environment. The study was conducted in the city of Karbala, Iraq, and included 71 secondary schools in the city. These schools represented diverse socioeconomic backgrounds and provided a wealth of insights into the relationship between hypothetical addiction and nutritional health behaviors.

The study sample underwent a two-stage sampling process of (i) school selection:; while out of 71 secondary schools, 13 schools were selected using a systematic random sampling method including all colleges, calculating a language sample, and systematical selection of schools from a list to ensure their representation. (ii) Student selection; while within the selected colleges, all female students (a total of 8281 students) formed the sampling panel. A lottery method was applied to randomly select the participants, ensuring that each researcher had an equal chance of coverage. The final sample consisted of 368 female university students, and they decided to use a simple random sampling method to reduce selection bias and enhance the generalizability of the results.

The study used a questionnaire based on a review of established literature to collect data on digital addiction and nutrient-related health behaviors. The health responsibility structured questionnaire was consisted of 3 sections of (i) demographic and socioeconomic characteristics, (ii) the digital addiction scale (20), and (iii) questions to assess nutrient-related health behaviors (21), as well as dietary patterns, meal frequency, and snacking behavior (6). A group of specialists prepared the survey to ensure its content and validity. Reliability was ensured by conducting a pilot study with 30 university students who were not included in the baseline observation, resulting in a Cronbach's alpha of 0.85, indicating high internal consistency.

The data collection was conducted over a period of one month. The researchers visited the selected colleges and administered the questionnaire to students after obtaining important permissions from the school government and informed consent from

stakeholders. Instructions were provided to ensure that students understood the questions and provided honest responses. Completed questionnaires were collected on the same day to reduce the risk of a non-response. During each visit, the purpose of the test was explained to students, emphasizing the voluntary nature of participation and ensuring confidentiality. Consent sheets were distributed and signed by individuals prior to completing the questionnaire. Students were given 20-30 minutes to complete the questionnaire under the supervision of the researchers to answer any queries and ensure accuracy. Completed questionnaires were collected on the same day to avoid loss or alteration. Approval was obtained from the relevant institutional oversight board, and permissions were obtained from the Karbala Education Directorate and individual school administrations. Participation was completely voluntary, with informed consent obtained from all participants, and student confidentiality and anonymity were strictly maintained.

Data were analyzed using SPSS software (version 25, Chicago, IL, USA). Descriptive statistics, such as frequencies, percentages, means, and standard deviations were used to summarize demographic characteristics, scores for digital addiction, and nutrition-related health behaviors. Inferential statistics, including Pearson correlation and simple linear regression, were used to study the relationship between the studied variables. A *p* value of less than 0.05 was considered statistically significant.

Results

In terms of frequencies and statistical proportions, Table 1 shows the socio-demographic characteristics of the 368 participants in this study. The age ranged from 12 to 20 years, with a mean age of 15.43±1.597 years. Most of them (94.3%) lived with their parents, and 47.3% were from the lower middle-class socioeconomic status. The duration of device use on weekdays/hour ranged from 0 to 52 hours with a mean of 12.26±12.04 hours. The duration of device use on weekends/hour ranged from 0 to 19 hours with a mean of 9.13±6.152 hours. As Table 2 and Figure 1 demonstrate, 53.5% of secondary school female students expressed a moderate level of digital addiction behaviors (29.04±5.857). Regarding health behaviors-related nutrition, 73.6% of secondary school female students expressed a moderate level (38.44±5.470). Concerning health responsibility, 55.2% of secondary school female students expressed a moderate level (19.44±3.456). As Table 3 illustrates, health responsibility among secondary school female students could predict the digital addiction behaviors (β=-0.143; *p*=0.006) and health behaviors-related nutrition (β=0.585; *p*=0.000). Figure 2A reveals that an increase of 33.75 in health responsibility corresponded to a probability decrease of 0.2423 in digital addiction behaviors (R2=0.0205). Conversely Figure 2B reveals that an increase of 20.44 in health responsibility was associated with a probability increase of 0.9264 in health behaviors-related nutrition (R2=0.3427).

Table 1: Socio-demographic characteristics of participants.

SDVs	Classification	No.	%
Age/years	Min-Max	12-20	
	Mean±SD	15.43±1.597	
Living arrangement	Living with parents	347	94.3
	Living with mother	12	3.3
	Living with father	7	1.9
	Living with relatives	2	.5
Socio-economic status (SRS)	Upper lower class	45	12.2
	Lower middle class	174	47.3
	Upper middle class	149	40.5
Time spent on device use in week days/h	Min-Max	0-52	
	Mean±SD	12.26±12.04	
Time spent on device use in weekend days/h	Min-Max	0-19	
	Mean±SD	9.13±6.152	

No: Number; %=Percentage; Min=Minimum; Max=Maximum; SD=Standard deviation.

Table 2: Evaluation of study variables.

Variable	Mean±SD
Digital addiction	29.04±5.857
Health behaviors-related nutrition	38.44±5.470
Health responsibility	19.44±3.456

SD=Standard deviation for total score.

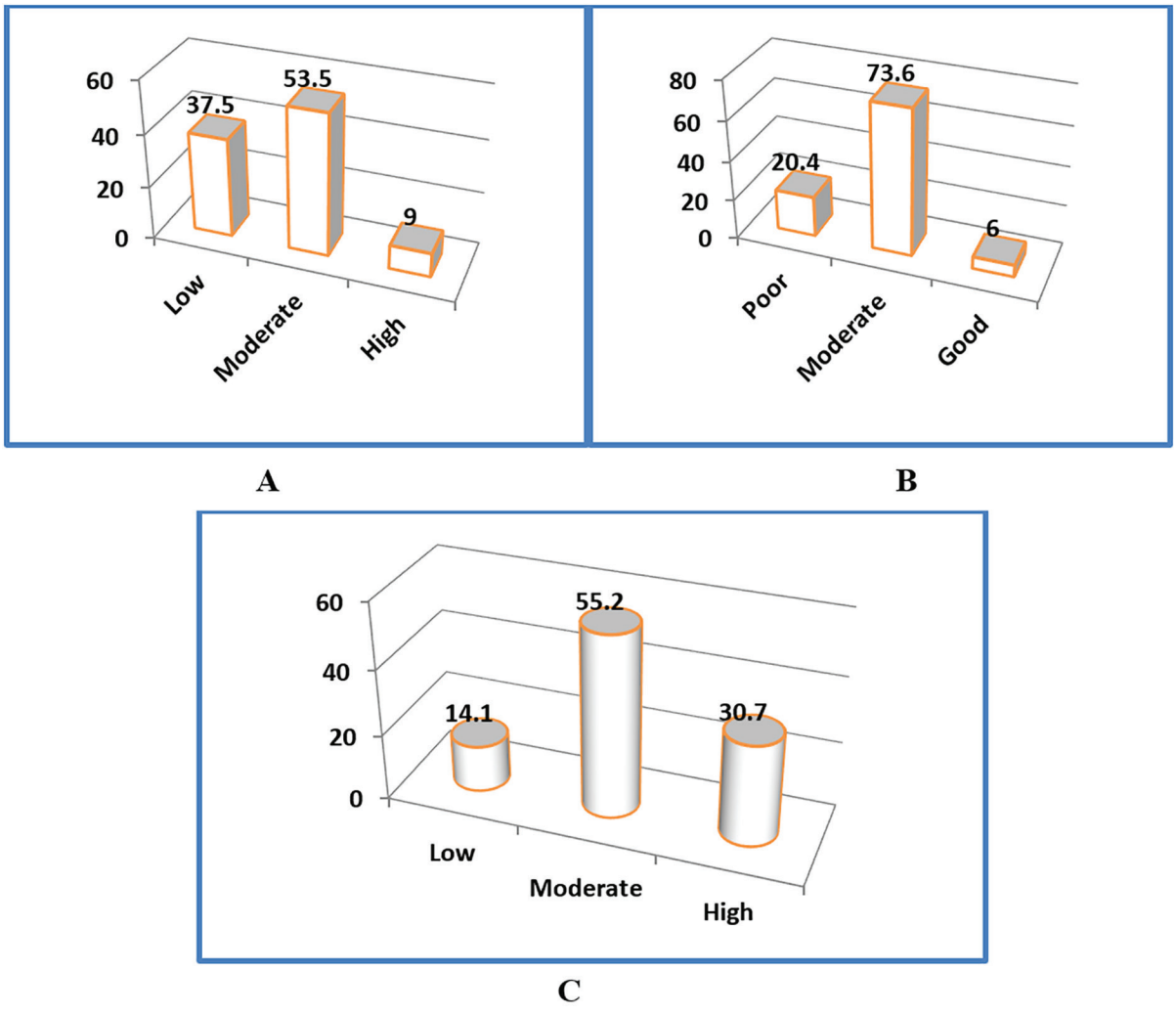

Figure 1: A: Digital addiction. B: Nutrition behaviors. C: Health responsibility.

Table 3: Predicted relationship of health responsibility between digital addiction and health behaviors-related nutrition.

Variable	Unstandardized coefficients		Standardized coefficients	T	*P* value
	B	SD Error	Beta		
Digital Addiction Behaviors	-0.242	0.088	-0.143	-2.766	0.006
Health Behaviors-related Nutrition	0.926	0.067	0.585	13.815	0.000

Dependent variables: Digital addiction, Health behaviors-related nutrition. Independent variables: Health responsibility.

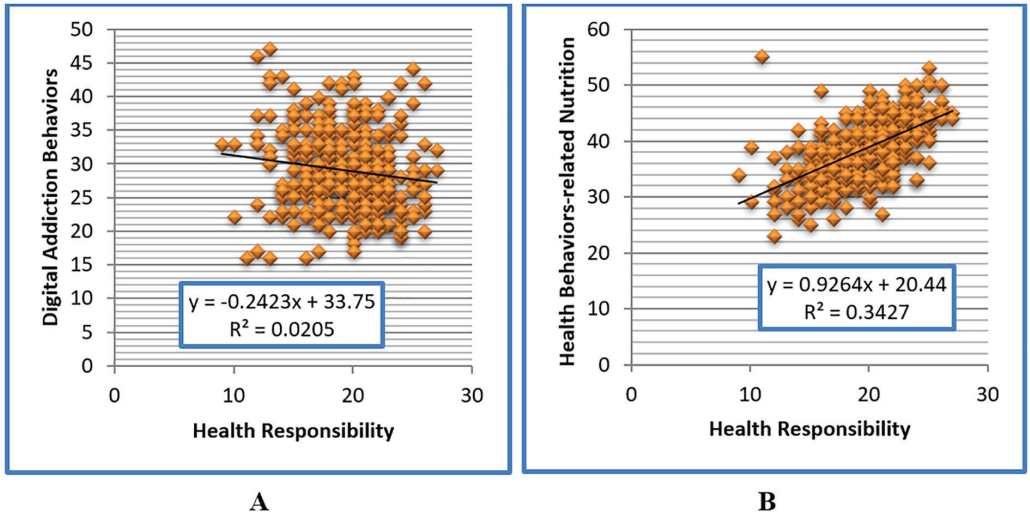

Figure 2: A: Digital addiction. B: Health behaviors-related nutrition.

Discussion

Health behaviors-related nutrition among different populations is of great importance (22, 23). Our socio-demographic data revealed that the majority of the participants were 12-20 years, lived with their parents and were from the lower socioeconomic middle class. Notably, their device use varied considerably too highlighting the high level of interaction with devices during weekdays. This underscores the need to explore the potential effects of these patterns on their well-being and lifestyle. Totally, 53.5% of female high school students showed moderate digital dependence behaviors. Our findings are higher than those reported in China and Brazil, where the prevalence of moderate digital dependence behaviors among similar populations was 45% and 48%, respectively (24, 25).

This discrepancy can be attributed to cultural differences, availability of technology, and different social norms regarding viewing time. In addition, the shape of the education system and the possibilities for extracurricular participation in our context may also contribute to the high prevalence of moderate digital dependence behaviors. Conversely, our results are lower than those in Singapore, where moderate levels of digital addictive behaviors were reported at 60% (26).

The differences may stem from more advanced technological integration in those countries or higher levels of societal dependence on digital structures. Furthermore, parental monitoring, outreach apps that address virtual addiction, and access to mental health resources should play a role in mitigating or exacerbating virtual addictive behaviors among high school students. Regarding nutrition-related health behaviors, 73.6% of our high school girls showed a moderate score. This percentage is better than that found in Morocco and Nigeria, where moderate levels of 65% and 67% were found, respectively (27, 28).

These differences may be a result of the increased emphasis on nutritional training and focus campaigns in our context. However, our findings are lower than those in Germany, which reported rates of 78% (29). These differences may be driven by socioeconomic factors, diet availability, cultural attitudes toward nutrition, and healthy eating practices.

Regarding health responsibility, 55.2% of our students expressed a moderate level. This percentage is higher than that reported in Konya (30) and Kut, Iraq (2), perhaps due to the greater emphasis in our educational system on promoting personal responsibility and awareness of health-related practices. However, our results are lower than those in Spain, where a greater emphasis on family involvement in health education or access to health promotion programs may have contributed to higher levels of health responsibility among students (31).

The results of our study highlighted the important role of health accountability in predicting both digital addiction behaviors and nutrition-related health behaviors among female high school students. Regression coefficients indicated an inverse relationship between health responsibility and digital addictive behaviors, indicating that higher levels of health responsibility were associated with lower tendencies toward digital addiction. These findings are consistent with a previous research that found digital addiction often thrived in environments characterized by low self-regulation and inadequate health-conscious behaviors (32).

On the contrary, our findings exhibited a positive relationship between health responsibility and nutrition-related health behaviors. This finding underscores the role of health responsibility as a critical determinant of proactive health behaviors, especially in relation to nutritional status. Similar conclusions have been drawn previously, reporting that individuals with higher levels of health responsibility tended to adopt healthier dietary practices (33). The differential predictive power of health liability about health-related digital addiction and nutritional behaviors deserve further discussion. While the negative association with digital addictive behaviors is statistically significant, the relatively small R^2 value suggests that other psychosocial or contextual factors may contribute more to digital addiction. The former emphasized the influence of factors such as stress, social environment, and access to technology on digital addiction, which may weaken the predictive power of health liability (34).

In contrast, the strong positive association with nutrition associated with healthy behaviors highlights the essential role of health responsibility in promoting positive health behaviors. This is likely due to the straightforward nature of the formulation, as individuals who consider themselves responsible for their health are more likely to make informed nutritional choices. A previous research supported this idea, focusing on the mediating role of self-regulation and health awareness in bridging health responsibility and behavioral outcomes (35). These findings underscore the subtle impact of health responsibility on different behavioral domains. This study provided empirical evidences supporting the promotion of health responsibility as a preventative measure for digital addiction and an enhancer of nutritional health behaviors. Future research should consider exploring mediating and moderating variables, such as self-efficacy and peer influence,

which may further explain these relationships.

Conclusion

Our study revealed that moderate level of digital addiction behaviors and nutrition-related health behaviors are prevalent among secondary school female students, with health responsibility playing a critical role in influencing both areas in Iraq. While greater health responsibility reduces tendencies toward digital addiction, its impact on promoting healthy eating behaviors is even more important. These findings highlight the need to promote health responsibility through targeted educational programs, parent involvement, and awareness campaigns that address digital addiction and nutrition in Iraq. Future researches in our region should explore mediating factors such as self-confidence and peer influence to deepen understanding and develop comprehensive interventions.

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Authors' Contribution

YFAA: Introduction, Writer/Methodologist/Main researcher (50%); MMR: Assistant Researcher/ Discussion Writer/Statistical analyst (50%).

Conflict of Interest

The authors declared no conflicts of interests.

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