

Digital Addiction and Its Association with Nutrition-Related Health Behaviors Among Female Secondary School Students

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ABSTRACT

Background: Digital addiction is an emerging global concern, particularly among adolescents, due to its detrimental impact on physical, psychological, and nutritional health behaviors. This study aims to examine the relationship between digital addiction and healthy behaviors related to nutrition among female high school students.

Methods: A cross-sectional descriptive study was conducted in Karbala, Iraq, including 368 female students randomly selected from 13 secondary schools. Data were collected using a structured questionnaire to assess digital addiction, diet patterns, and sociodemographic factors. Statistical analyzes included descriptive statistics, Pearson correlation, and regression analysis.

Results: The results revealed that 53.5% of students showed moderate levels of digital addiction (average score: 29.04 ± 5.857), while 73.6% showed moderate nutrition-related health behaviors (average score: 38.44 ± 5.470). A significant negative association was observed between digital addiction and healthy eating behaviors ($r = -0.118$, $p = 0.023$). Regression analysis indicated that increased digital addictive behaviors predicted decreased healthy behaviors-related nutrition. Owning digital devices and the time spend on devices were significantly associated with higher levels of digital addiction and poor nutritional practices.

Conclusions: The study highlights the harmful impact of digital addiction on adolescents' dietary behaviors, emphasizing the need for targeted interventions. Schools and communities must implement educational programs that address digital overuse and promote balanced nutrition.

Key-words: Digital Addiction, Health-behaviors-related Nutrition, Adolescents, Secondary School

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INTRODUCTION

The emergence of digital technologies has revolutionized the way human beings interact, study, and spend their enjoyment time, especially among youngsters. However, with the vast accessibility of digital gadgets, concerns about digital dependency have received prominence in recent years. Digital dependency, described as an immoderate dependency on electronic gadgets and the net, has been identified as a developing situation, specifically among secondary school female students.¹ Research shows that extended and unregulated use of digital media can lead to numerous detrimental consequences, which include behavioral, psychological, and physical health issues.²

One important location of issue is the affiliation between digital dependency and health behaviors, especially those associated with nutrition. Studies have highlighted that immoderate display time is linked to dangerous nutritional habits, including extended consumption of rapid meals and sugary beverages, reduced consumption of culmination and veggies, and erratic consumption patterns.^{3,4} This connection is regularly mediated by way of factors consisting of decreased bodily hobbies, disrupted sleep styles, and publicity of unhealthy meals classified ads.⁵ Secondary faculty students, in particular ladies, are in particular at risk of those outcomes due to their particular developmental and psychosocial characteristics, making them a key demographic for focused interventions.⁶

Adolescence is a pivotal duration of increase and development, marked through huge bodily, cognitive, and hormonal modifications that establish the foundation for lifelong health. Adequate vitamins at some stage in this level is critical to fulfill expanded energy demands, guide skeletal growth, optimize mind improvement, and regulate hormonal procedures.⁷ Key vitamins, inclusive of calcium and nutrition D, are essential for bone fitness, while iron is vital to prevent anemia and assist cognitive performance, especially in female youngsters. Conversely, negative vitamins at some stage in youth can cause stunted boom, weakened immunity, and delayed pubertal development.⁸ Long-time period effects consist of a multiplied threat of chronic diseases inclusive of weight problems, kind 2 diabetes, cardiovascular ailment, and osteoporosis, which are frequently rooted in nutritional conduct hooked up all through formative years. Addressing nutritional demanding situations all through this formative duration is important, as habits evolved throughout adolescence are likely to persist into adulthood, influencing future fitness effects and great of existence.⁹

The effect of digital dependency on nutrition-associated health behaviors is likewise influenced by way of psychosocial and environmental factors. For instance, digital dependency can negatively af-

fect time control competencies, leading to abnormal meal timings and reliance on convenience foods.¹⁰ Moreover, the pervasive effect of social media systems often perpetuates unrealistic frame photo ideals, that can further complicate ingesting behaviors amongst adolescent female.¹¹ Addressing these factors is essential for promoting healthful nutritional behaviors and stopping long-term health headaches in this populace.¹²

This study seeks to investigate the association between digital addiction and nutrition-related health behaviors among female high school students. By identifying patterns and associations, the study seeks to provide valuable insights that can help identify targeted interventions, health coaching programs, and policy initiatives aimed at promoting healthy living and mitigating the negative impacts of digital dependency on this vulnerable population group.

METHODOLOGY

Study Design and Sitting: This study used a descriptive cross-sectional design to explore the relationship between digital addiction and nutrition-related health behaviors among female high school students in Karbala, Iraq. The cross-sectional approach allowed for data to be collected at a single point in time to explore patterns, relationships, and incidence of the phenomena studied. The study was conducted in Karbala, Iraq, and included 71 high schools in the city. These schools represented diverse socioeconomic backgrounds, providing a wealth of insights into the relationship between digital addiction and nutritional health behaviors.

Study Population and Sampling: A sample of study undergo two-stage sampling process was employed:

School Selection: Out of the 71 secondary schools, 13 schools have been decided on using a systematic random sampling method. This worried listing all faculties, calculating a sampling c language, and systematically selecting schools from the listing to make certain representativeness.

Student Selection: Within the chosen faculties, all female students (totaling 8281) fashioned the sampling body. A lottery technique was implemented to randomly choose contributors, making sure every scholar had the same chance of being blanketed. The final pattern consisted of 368 female students, decided to use an easy random sampling technique to reduce selection bias and decorate the generalizability of the findings.

The sample size was calculated using Cochran's formula for estimating a proportion in a population:

$$n = \frac{Z^2 P(1 - P)}{E^2}$$

Where, n is required sample size; Z -value for a 95% confidence level (1.96); P is estimated prevalence of the primary outcome (digital addiction) in the target population, assumed to be 50% due to the lack of prior specific prevalence data, maximizing the sample size, and E is margin of error (precision) set at $\pm 5\%$.

Substituting these values: the calculated sample size was 384.

Study Instruments: The study used a questionnaire based on a review of the established literature to collect data on digital addiction and nutrient-related health behaviors. The questionnaire consisted of 3 sections: (1) demographic and socioeconomic characteristics, (2) a digital addiction scale¹³, this scale was designed to measure the level of digital addiction among students. It was scored based on the frequency and intensity of digital device use, such as smartphone, tablet, and laptop usage. The scoring classified digital addiction into three categories: low, moderate, and high. And (3) questions to assess nutrient-related health behaviors¹⁴, this scale assessed the students' dietary patterns, meal frequency, and snacking behaviors. Scores were classified as poor, moderate, or good. A group of specialists prepared the questionnaire to verify its content and validity. Reliability was ensured by conducting a pilot study with 30 female students not covered in the baseline observation, yielding a Cronbach's alpha coefficient of 0.85, indicating high internal consistency.

The mean score is computed as follows:

$$\frac{\text{Total mean of scores}}{\text{Maximum total scores} - \text{Minimum total scores}} = \text{Levels}$$

For Digital addiction, the total mean of scores was 10.66. A score 16 to 26.66 was considered low, a score 26.67 to 37.33 was considered Moderate and score 37.34 to 48 considered as High.

For Nitration-related behaviors, the total mean of scores was 13.33. A score 20 to 33.33 was considered as poor, score 33.34 to 46.66 was considered as Moderate and a score 46.67 to 60 considered as High.

Data Collection Methods: The data series was conducted over one month. The researchers visited the selected schools and administered the questionnaire to students after obtaining important permissions from the school government and informed consent from the 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 non-response.

During each visit, the purpose of the test was explained to the students, emphasizing the voluntary nature of participation and ensuring confidentiality. Consent sheets were distributed and signed by the individuals before completing the questionnaire.

Students were given 20-30 minutes to complete the questionnaire under the supervision of the researchers to address any queries and ensure accuracy. Completed questionnaires were collected on the same day to avoid loss or alterations.

Approval was obtained from the relevant institutional oversight board, 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.

Statistical Methods: Data were analyzed using SPSS version 25. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to summarize the demographic characteristics and scores for digital addiction and nutrition-related health behaviors. Inferential statistics, including Pearson's correlation and Simple Linear Regression, were used to examine the relationship between digital addiction and health behaviors. Non-parametric analysis was performed to determine statistical differences based on sociodemographic variables. A p -value of less than 0.05 was considered statistically significant.

RESULTS

In terms of frequencies and statistical proportions, this table shows the socio-demographic characteristics of the 368 participants who participated in this study. We found that their ages ranged from 12 to 20 years, with a mean age of 15.43 ± 1.597 years.

Table 1: Socio-Demographic Characteristics

Variables	Participant (%)
Age /years	
Min-Max	12-20
M \pm SD	15.43 \pm 1.597
Living Arrangement	
Live with parents	347 (94.3)
Live with mother	12 (3.3)
Live with father	7 (1.9)
Live with relative	2 (0.5)
Socio-economic Status (SRS)	
Upper lower class	45 (12.2)
Lower middle class	174 (47.3)
Upper middle class	149 (40.5)
Having their Own Digital Device	
No	21 (5.7)
Smartphone	283 (76.9)
Tablet (iPad)	49 (13.3)
Laptop	15 (4.1)
Time spent on device use in week days/ h	
Min-Max	0-52
M \pm SD	12.26 \pm 12.04
Time spent on device use in weekend days/ h	
Min-Max	0-19
M \pm SD	9.13 \pm 6.152

No. Number; %= Percentage; Min= Minimum; Max= Maximum; M= Mean; SD= standard deviation

Table 2: Evaluation of Study Parameters

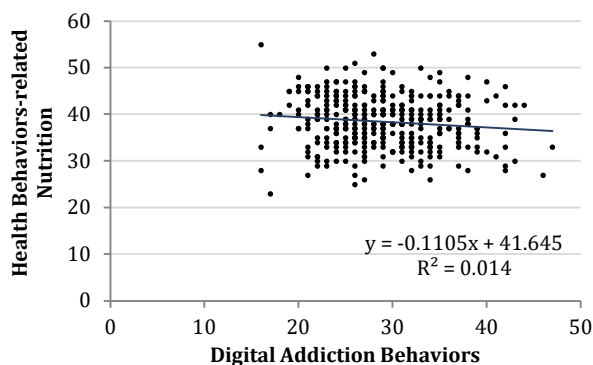
Score	Participant (%)	M ± SD
Digital Addiction		
Low	138 (37.5)	29.04±5.857
Moderate	197 (53.5)	
High	33 (9.0)	
Health Behaviors-related Nutrition		
Poor	75 (20.4)	38.44±5.470
Moderate	271 (73.6)	
Good	22 (6.0)	

M: Mean for total score, SD=Standard Deviation for total score

Table 3: Statistical Differences in Study Variables between Groups of Having their Own Digital Device

Ranks			Sig. ^b
Own Digital Device	No.	Mean Rank	
Digital Addiction Behaviors			
No	21	112.79	.004
Smartphone	283	209.42	
Tablet (iPad)	49	213.70	
Laptop	15	183.96	
Health Behaviors-related Nutrition			
No	21	219.17	.016
Smartphone	283	190.95	
Tablet (iPad)	49	144.17	
Laptop	15	166.88	

^b= Kruskal Wallis Test; n= number, sig.= significant level at ≤ 0.05 .

**Figure 1: Association Between Digital Addiction and Health Behaviors-related Nutrition ($r = -0.118$; $p = 0.023$)**

The majority (94.3%) lived with their parents, (47.3%) were from the lower middle class of socioeconomic status, (76.9%) had smartphones. The duration of device usage on weekdays/hour ranged from 0 to 52 hours with a mean of 12.26 ± 12.04 hours. The duration of device usage on weekends/hour ranged from 0 to 19 hours with a mean of 9.13 ± 6.152 hours.

The results in Table (2) showed that the 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).

Results indicate that there were negative correlation digital addiction behaviors and health behaviors-related nutrition among secondary school students ($r = -0.118$; $p = 0.023$). The results shown in Figure (1) indicate that for every increase of 41.645 in digital addictive behaviors, there is a corresponding decrease of 0.1105 in healthy behaviors related to nutrition among high school students ($R^2 = 0.014$).

The Kruskal-Wallis analysis reveals statistically significant differences in digital addiction ($p = 0.004$), and health behaviors-related nutrition ($p = 0.016$) with regard secondary school female students their own digital device.

The results indicate that the positive correlation between digital addiction behaviors among secondary school female students and time spent on digital device use in week days/ hours ($r = 0.238$; $p < 0.01$). Conversely, there were negative correlation between health behaviors-related nutrition among secondary school female students and time spent on digital device use in week days/ hours ($r = -0.118$; $p < 0.05$).

The results indicate that the positive correlation between digital addiction behaviors among secondary school female students and time spent on digital device use in weekend days/ hours ($r = 0.355$; $p < 0.01$). Conversely, there were negative correlation between health behaviors-related nutrition among secondary school female students and time spent on digital device use in weekend days/ hours ($r = -0.155$; $p < 0.05$).

Table 4: Relationship between Time Spent on Digital Device Use in Week Days of Secondary School Students and Study Variables

Correlations	1	2	3
1. Time spent in week days/ h	1		
2. Digital Addiction	.238**	1	
3. Nutrition Behaviors	-.118*	-.118*	1

*Correlation is significant at the 0.05 level (2-tailed);

**Correlation is significant at the 0.01 level (2-tailed).

Table 5: Relationship between Time Spent on Digital Device Use in Weekend Days of Secondary School Students and Study Variables

Correlations	1	2	3
1. Time spent in weekend days/ h	1		
2. Digital Addiction	.355**	1	
3. Nutrition Behaviors	-.155*	-.118*	1

*Correlation is significant at the 0.05 level (2-tailed);

**Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

The results revealed that 53.5% of female high school students showed moderate levels of digital dependence behaviors, with a mean score of 29.04 ± 5.857 . These results are higher than those suggested in China and Brazil, where the prevalence

of moderate digital dependence behaviors among similar populations was 45% and 48%, respectively.^{15,16} This discrepancy could be attributed to cultural differences, technology availability, and different social norms regarding viewing time. In addition, the format of the education system and the possibilities for extracurricular engagement in our context may also contribute to the higher prevalence of mild digital dependence behaviors. Conversely, our results are lower than those in Singapore, where moderate levels of digital addiction behaviors were reported by 60%.¹⁷ The differences may stem from more advanced technological integration in those countries or higher levels of societal dependence on digital structures. Furthermore, parental monitoring, awareness apps that address digital addiction, and access to mental health resources should play a role in mitigating or exacerbating digital addiction behaviors among high school students.

Regarding health behaviors related to nutrition, 73.6% of secondary school female showed a moderate score, with a mean score of 38.44 ± 5.470 . This percentage is better than those found in Morocco and Nigeria, where moderate levels were found at 65% and 67%, respectively.^{18,19} These differences may be due to a greater emphasis on nutritional training and focus campaigns in our context. However, our results are lower than those found in Germany, which reported rates of 78%.²⁰ These differences may be driven by socioeconomic factors, availability of the diet, and cultural attitudes towards nutrition and healthy eating practices.

The results of this study show a significant negative association between digital addiction behaviors and nutrient-related health behaviors among high school students ($r = -0.118$; $p = 0.023$). This finding is consistent with the growing body of literature emphasizing the detrimental impact of excessive digital use on many aspects of adolescent physical health. Digital addiction, characterized by compulsive use of smartphones, social media, and online gaming, has previously been associated with poor eating patterns, including meal skipping, rushing to snack on energy-dense ingredients, and lower intake of nutrient-rich foods. It also highlights similar patterns, where increased screen time was associated with a higher prevalence of poor dietary behaviors among adolescents, along with lower intake of fruits and vegetables.²¹ Regression analysis further supports this relationship by showing that for every unit of growth of 41.645 in digital addiction behaviors, there was a corresponding decrease of 0.1105 in nutrient-related health behaviors ($R^2 = 0.014$). Although the effect size is small, it shows that digital engagement behaviors explain a modest but significant portion of the variance in nutrition-related health behaviors. This is consistent with previous research findings that digital over-engagement reduces the time and attention teens devote to important health-promoting activities, including meal planning and mindful eating.^{22,23}

Furthermore, the identified dire association can be understood within the framework of the behavioral displacement principle, which posits that excessive engagement in one hobby (e.g., digital use) reduces the supply of time and motivation for other important activities, besides maintaining healthy eating behavior. In support of this idea, it has been found that digital addiction not only contributes to sedentary lifestyles but also interferes with meal routines, leading to irregular eating patterns and less nutritional satisfaction.²⁴⁻³⁰

The results of this study, as noted by Kruskal-Wallis, show significant statistical differences in digital addiction ($p = 0.004$) and nutritional health behaviors ($p = 0.016$) among high school female students with regard to their ownership of digital devices. These findings underscore the profound impact that personal digital device ownership can have on students' behavior and lifestyle choices. Digital addiction, characterized by excessive and compulsive use of digital devices, is widely generated through personal ownership of these devices. Students who own their digital devices often have unrestricted access, which can lead to increased screen time and addictive behaviors. This is consistent with previous research highlighting that personal device ownership is a predictor of higher levels of digital addiction, especially among young people.³¹ Access to social media, online gaming, and streaming platforms can intensify usage, reinforcing addictive patterns that disrupt daily activities, educational performance, and social interactions.

The results of this study showed a significant association between digital dependency behaviors and time spent using digital devices on weekdays and weekends among female high school students. Specifically, correlation coefficients of $r = 0.238$ on weekdays and $r = 0.355$ on weekends (both $p < 0.01$) indicate that as time spent on digital devices increases, the likelihood of engaging in digital addictive behaviors increases. This is consistent with previous research showing that prolonged use of digital devices is associated with addictive behaviors, including excessive screen time leading to behavioral dependence.¹⁰

On the other hand, the effects also show a negative association between nutrition-related health behaviors and children's time spent on digital devices. Correlation coefficients $r = -0.118$ on weekdays and $r = -0.115$ on weekends (both $p < 0.05$) indicate that as digital device uses increases, there is a corresponding decline in health-conscious nutrition behaviors. This finding is supported by research suggesting that increased screen time can lead to poor dietary behaviors, including negative meal choices, snacking, and decreased physical activity.⁴ Additionally, research has shown that sedentary behaviors associated with excessive screen time are linked to poor nutrition, with children more likely to consume high-calorie, low-nutrient ingredients even while engaging in digital activities.⁵ This under-

scores the importance of promoting balanced health behaviors, including adequate nutrients, especially in the context of increased digital device use among youth.

LIMITATIONS

This study includes its fragmented design, which captures statistics at a single point in time, limiting the possibility of establishing causal relationships between hypothetical addiction and nutrition-related fitness behaviors. Additionally, reliance on self-reported statistics may introduce biases including social desirability or recall bias, which may affect the accuracy of responses. The study sample is also limited to female students in Karbala, Iraq, which may not be generalizable to other populations or regions. Furthermore, elements such as parental influence and peer behaviors were not tested, which may provide a more complete understanding of the influences on students' hypothetical addiction and nutrition-related fitness behaviors.

CONCLUSION

The study highlights a moderate level of digital addiction and unhealthy eating behaviors among female high school students, with a negative association between digital addiction and healthy behaviors related to nutrition. The results suggest that excessive use of digital devices, especially among students who own personal devices, may contribute to poor dietary patterns. Further research is recommended to explore the factors contributing to adolescents' addiction to electronic devices and their impact on fitness behaviors, and investigate the effectiveness of interventions that aim to promote balanced nutrition and physical attention while reducing excessive screen time.

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Author contribution: **YFA:** Involved in Study conception, study design, data collection, data analysis, manuscript preparation; **MMR:** Involved in Study conception, study design, data analysis, manuscript preparation

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