

RESEARCH

Open Access



Digital addiction in children with end-stage kidney disease on regular hemodialysis: a cross-sectional study

Doaa Riad Ayoub¹, Yasmin Ramadan^{2*} , Dina Youssri Afifi¹ and Reham Mohamed Kamel¹

Abstract

Background Chronic kidney disease has a detrimental impact on the overall quality of life (QoL) in children. The regular visits to doctors, prolonged reliance on medication, frequent hospital stays, and changes in their physical appearance increase their vulnerability to developing psychiatric problems and hinder their daily activities and social interactions, resulting in isolation, poor peer relations, and low self-esteem. These factors may compel these children to depend on digital media to find connections, regulate emotions, and cope with their illnesses. The study aims to determine the prevalence of electronic addiction among minors undergoing regular hemodialysis for end-stage kidney disease (ESKD) while simultaneously assessing their parental styles and psychological adaptation.

A total of 60 subjects were enrolled in the study and divided into two groups. Group A: Thirty patients undergoing regular hemodialysis for ESKD. Group B: Thirty healthy subjects of matching age and sex. All the recruited participants were subjected to semi-structured clinical interviews according to our institute's sheets, Child Behavior Checklist (CBCL), Digital Addiction Scale for Children (DASC), Parent Authority Questionnaire (PAQ), and Psychological Adaptation Scale.

Results Patients had a significantly higher prevalence of digital addiction compared to healthy subjects, with an average score of (87.00 ± 21.23) in dialysis patients against (53.00 ± 25.20) in normal participants, demonstrating significant differences ($p < 0.001$). There was a significant correlation between the duration of dialysis treatment and the prevalence of digital addiction ($r = -0.415$, p -value = 0.023). A significant inverse correlation was found between digital addiction and the emotional subtype of the psychological adaptation rating ($r = -0.375$, $p = 0.041$).

Conclusion The findings revealed that dialysis patients have a higher incidence of digital addiction. Prolonged dialysis duration was significantly associated with increased digital addiction among patients.

Keywords Chronic kidney disease, Psychiatric Disorders, Digital Addiction, Internet Addiction, Parenting

Background

Chronic Kidney Disease (CKD) is considered a significant public health concern, impacting around 12% of the global population [1, 2]. The diagnosis of CKD in children frequently occurs unexpectedly, making it difficult to accurately estimate the global incidence of CKD in children, particularly in low-income countries such as Egypt [3]. The average incidence of CKD among children is estimated to be 15–75 cases/million children [4].

*Correspondence:

Yasmin Ramadan
yasminramadan@kasralainy.edu.eg

¹ Department of Psychiatry, Faculty of Medicine-Cairo University, Cairo, Egypt

² Department of Pediatrics, Faculty of Medicine-Cairo University, Cairo, Egypt



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

CKD has a long-lasting impact on the QoL of the affected children and significantly affects both the child and the entire family [5, 6]. Prolonged medication intake, frequent hospitalizations, frequent absence from school, changes in their body image, and difficulty socializing with peers lead to isolation, which may contribute to the exacerbation of psychiatric issues [7–9].

The research extensively discusses how increasing internet activities can serve as a coping mechanism for children with emotional difficulties, particularly those with high avoidance coping types [8]. These activities often reduce stress and anxiety or alleviate their feelings of depression [10, 11]. Digital addiction, a type of behavioral addiction, is characterized by excessive or poorly regulated concerns and urges associated with computer and internet usage, which can lead to impairment or distress [12].

Contemporary research indicates a significant connection between various parenting styles and their effect on the usage of the Internet by their children, affecting their guidance on usage and the shared content and supervision [13, 14].

Conversely, there has been significant interest in the parenting practices of children with chronic illnesses. Parents have a substantial influence on their child's current and future emotional and psychological health, well-being, and educational performance [15, 16]. Indeed, parenting style significantly impacts children's coping skills, and a child's conduct towards adults can vary significantly depending on the parenting style [17].

We hypothesized that children with ESKD on maintenance hemodialysis have a higher frequency of psychiatric problems and digital addiction. Furthermore, it is essential to note that the diverse parenting techniques of parents do not impact children's internet usage habits. This is because children's emotional distress and the mutual reliance of parents and children on the Internet for coping purposes override any potential influence from parenting styles.

Methods

The present study adopted a cross-sectional design using a non-random sample. Thirty patients, aged 6 to 11 years of both genders, with ESKD on regular hemodialysis, were recruited from the dialysis unit of our University Children's Hospital. All recruited patients finished the required questionnaires with their parents. The data was collected over six months.

Exclusion criteria included patients with no internet access, patients in a current delirium state, and patients diagnosed with major psychiatric disorders or intellectual disabilities (A psychiatrist conducted the clinical assessment, and past psychiatric history was confirmed

through history taking from the patient and his/her parent).

The second category consisted of 30 control participants matched in age and sex. The control subjects had no chronic diseases or other behavioral or neurological abnormalities that could impact the results. The control group underwent clinical assessment by a psychiatrist to exclude subjects with past or current psychiatric disorders. Furthermore, all recruited participants underwent semi-structured clinical interviews using our institute's standardized assessment tools, including CBCL, DASC, PAQ, and Psychological Adaptation Scale.

The CBCL is utilized to identify behavioral and emotional problems in children and adolescents. Parents complete CBCL, the CBCL/6-18 (used with children 6 to 18). It comprises internalizing and externalizing problems scored on a three-point Likert scale (0=absent, 1=occurs-sometimes, 2=occurs often). The CBCL consists of 113 questions [18].

The DASC is a questionnaire consisting of 25 items. This tool has been developed and evaluated to measure children's behavior related to digital devices (DD), including internet usage, online gaming, engagement in online social networking, and texting. The DASC test uses emerging criteria for diagnosing behavioral addiction based on DSM 5 criteria for addiction. The assessment evaluates various factors, including preoccupation, tolerance, withdrawal, deception (lying to parents or caregivers about the duration and activities on their digital devices), and displacement, which refers to parents feeling alienated from their children, compromising the family unit. The DASC utilizes a Likert scale ranging from "never" to "always" with a numerical range of 25 to 125. Higher scores on the scale indicate a greater level of digital dependency [19].

The Psychological Adaptation Scale, developed by Jabriel (1996), was used. The final version of this scale comprises forty elements divided into four dimensions, each containing ten items. The total score on the scale is the patient's overall score, which indicates their general psychological adjustment. The scores on the scale vary from 40, which represents the lowest possible score and indicates a low level of psychological adaptation, to 200, which is the highest score possible and indicates a high level of psychological adaptation in individuals.

The average score for a child is 120. The scale was selected based on its appropriateness for the Egyptian environment, which closely resembles the Jordanian environment (the Egyptian and Jordanian cultures share the same values, beliefs, religion, and traditions which aren't similar to the western and European culture) [20]. The current relevance and widespread utilization of this scale in research involving children from this specific

demographic region were considered. It was also utilized due to the simple design specifically tailored for children [21].

The objective of the PAQ is to evaluate the extent of parental authority or disciplinary measures as seen by children of all ages. The assessment examines how parents demonstrate permissive, controlling, or authoritative/flexible behaviors. The PAQ questionnaire consists of 30 questions, and the child is required to express their response by encircling the corresponding number on a 5-point scale. On this scale, a rating of one represents “strongly disagree,” while a rating of five represents “strongly agree.” The range of each subscale is from 10 to 50 [22].

Two researchers translated the DASC and PAQ questionnaires into Arabic, following the WHO criteria for questionnaire translation. Other researchers performed a back translation of the initial translation. A committee of three professors, who are experts in the field, conducted a thorough review of both the forward and backward translations in order to reach a prefinal version of the translated questionnaire. Subsequently, the questionnaire was pilot tested on twenty healthy children who were included in the control group. Children were asked what they understood from each item to make sure that the translated items retained the same meaning as the original items. The committee reassessed the questionnaire to reach the final version of the DASC and PAQ questionnaire.

Statistical methods

The data was analyzed utilizing Statistical Package for the Social Sciences (S.P.S.S) version 20 (IBM, 2011). The normality of the data was assessed using the Kolmogorov–Smirnov test. Subsequently, the results were defined employing frequency (percent) and mean \pm SD. Group comparisons were conducted through the unpaired t-test. The Chi-square (χ^2) test was utilized to compare categorical data. The precise test was employed when the predicted frequency was <5 . The Pearson correlation coefficient was utilized to analyze the relationships between quantitative variables. *P*-values < 0.05 were considered statistically significant. Based on a previous study by Wu et al. (2016) [23] to detect the actual difference between groups with a power of 80% and a significance level of 5%. In addition, they utilized a total sample size of 48 participants, with 24 participants in each group. Therefore, we increased the sample size by 20% to accommodate probable dropouts, which produced a total of 60 individuals (30 people in each group). The sample size was determined using G*Power (version 3.1.9.2; Germany) software [23].

Results

In the dialysis group, there was a higher prevalence of the female gender (63.3%, $n= 19$) with remarkable variations ($p= 0.039$), and there was no significant disparity in the educational attainment between cases and controls ($p = 0.091$).

The mean age of the patients studied was 9.57 ± 2.5 years, and the controls' mean age was 8.3 ± 1.7 years, with a statistically significant difference $p = 0.027$ (Table 1). The mean duration of dialysis was 3.89 ± 3.6 years (range: 4 months- 12 years).

Table 1 depicts a comparison between dialysis patients and healthy participants regarding psychiatric problems. There were no significant differences in the average values on the overall problem, internalizing, or externalizing CBCL levels between the dialysis children and the healthy individuals.

The prevalence of digital addiction was higher in dialysis patients than in normal participants, with a mean of (87 ± 21.23) compared to (53 ± 25.2) in normal participants, with a statistically significant difference of $p < 0.001$ (Table 1).

There was no significant correlation between parenting style and the outcomes of DASC (Table 2) and CBCL (Table 3).

The prevalence of digital addiction was significantly higher in individuals with dialysis for a more extended period ($r = -0.415, p = 0.023$) (Fig. 1).

An inverse correlation was found between digital addiction and the emotional subtype of the psychological adaptation scale. In addition, there was a significant negative correlation between the authoritarian and authoritative subtypes of the Psychological Adaptability Questionnaire (PAQ) and the personal subtypes of the psychological adaptability scale. In contrast, a highly significant positive connection was observed between the permissive (PAQ) and personal subtypes of the psychological adaptability scale, as indicated in Tables 4 and 5.

Discussion

The current study results revealed no substantial in the average values of the overall difficulty, internalizing, or externalizing CBCL values among the dialysis and healthy children. However, the results on symptom internalization contradict the results of a study performed by Amr et al. (2009) [24] in Egypt. In their study, they used four semi-structured clinical interviews for children and adolescents (SCICA) to evaluate the behavioral adjustment of those children. The dialysis cohort had a significantly higher mean score on the internalizing measure compared to both the control and pre-dialysis categories in SCICA. The key factor contributing to internalizing problems in the dialysis group was mainly associated

Table 1 Comparison between socio-demographic, clinical, and psychometric assessment Tools of the studied groups

		Cases		Controls		P value				
		Count	%	Count	%					
Gender	Male	11	36.7%	19	63.3%	0.039				
	Female	19	63.3%	11	36.7%					
Level of Education	no school	1	3.3%	0	0.0%	0.091				
	Kg2	0	0.0%	2	6.7%					
	1P	4	13.3%	6	20.0%					
	2P	4	13.3%	5	16.7%					
	3P	5	16.7%	7	23.3%					
	4P	3	10.0%	7	23.3%					
	5P	3	10.0%	1	3.3%					
	6P	10	33.3%	2	6.7%					
		Cases				Controls				P value
		Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum	
Age		9.57	2.51	6.00	13.00	8.30	1.70	6.00	12.00	0.027
Internal CBCL		64.60	7.33	55.00	86.00	64.13	4.76	59.00	72.00	0.771
External CBCL		60.97	4.85	54.00	75.00	63.87	6.33	47.00	74.00	0.051
Total CBCL		62.10	6.53	51.00	86.00	63.60	5.28	54.00	72.00	0.332
DASC		78.00	21.23	28.00	104.00	53.00	25.20	25.00	98.00	< 0.001
Authoritarian (PAQ)		32.63	6.58	22.00	42.00	30.23	5.57	20.00	39.00	0.133
Authoritative (PAQ)		30.57	6.73	19.00	40.00	28.37	6.19	18.00	40.00	0.193
Permissive (PAQ)		29.23	7.18	18.00	40.00	30.03	7.18	21.00	40.00	0.668
Psychological Adaptation Scale		95.47	10.36	75.00	119.00	99.87	13.06	72.00	122.00	0.154

CBCL Child Behavior Checklist, PAQ Parent Authority Questionnaire, DASC Digital Addiction Scale for Children, The P-value is significant if less than 0.05

Table 2 Correlation between parenting styles and digital addiction (n =30)

		DASC
Authoritarian (PAQ)	R	0.096
	P value	0.612
Authoritative (PAQ)	R	0.178
	P value	0.347
Permissive (PAQ)	r	-0.112-
	P value	0.555

PAQ Parent Authority Questionnaire, DASC Digital Addiction Scale for Children, The P-value is significant if less than 0.05

Table 3 Correlation between different parenting styles and results of CBCL (n =30)

		Internal CBCL	External CBCL	Total CBCL
Authoritarian (PAQ)	r	-0.134-	0.261	-0.120-
	P value	0.481	0.163	0.527
Authoritative (PAQ)	r	0.238	0.324	0.131
	P value	0.205	0.081	0.490
Permissive (PAQ)	r	-0.097-	-0.354-	-0.041-
	P value	0.610	0.055	0.830

CBCL Child Behavior Checklist, PAQ Parent Authority Questionnaire

with high scores in the categories of anxious/depressive attitude and physical manifestations.

A child's capacity to adapt to challenges is influenced by individual factors, including gender, utilization of different coping strategies, exposure to external stressors, socioeconomic status, and parental and peer support [7, 25]. Various factors can contribute to the development of depressive disorders in young children.

Age-specific psychological adaptation processes contribute to the development of externalizing [26] and internalizing difficulties [27]. Adolescence is a critical period for a child's mental health, as over 50% of mental illnesses manifest by the age of 14 [28]. The disparity in results regarding presence can be attributed to the significantly lower age of children, with a mean age of (9.57 ± 2.51) years.

Furthermore, our study revealed that the majority of patients had been coping with their renal failure for over a year, with an average duration of dialysis of (3.89 ± 3.60) years. Consequently, it is logical that families and children have adjusted to their illness and reached a steady state of functioning, possibly reverting to the levels of health and medical attention they had before the diagnosis [9]. Furthermore, research demonstrated that children who experienced the condition for a more extended

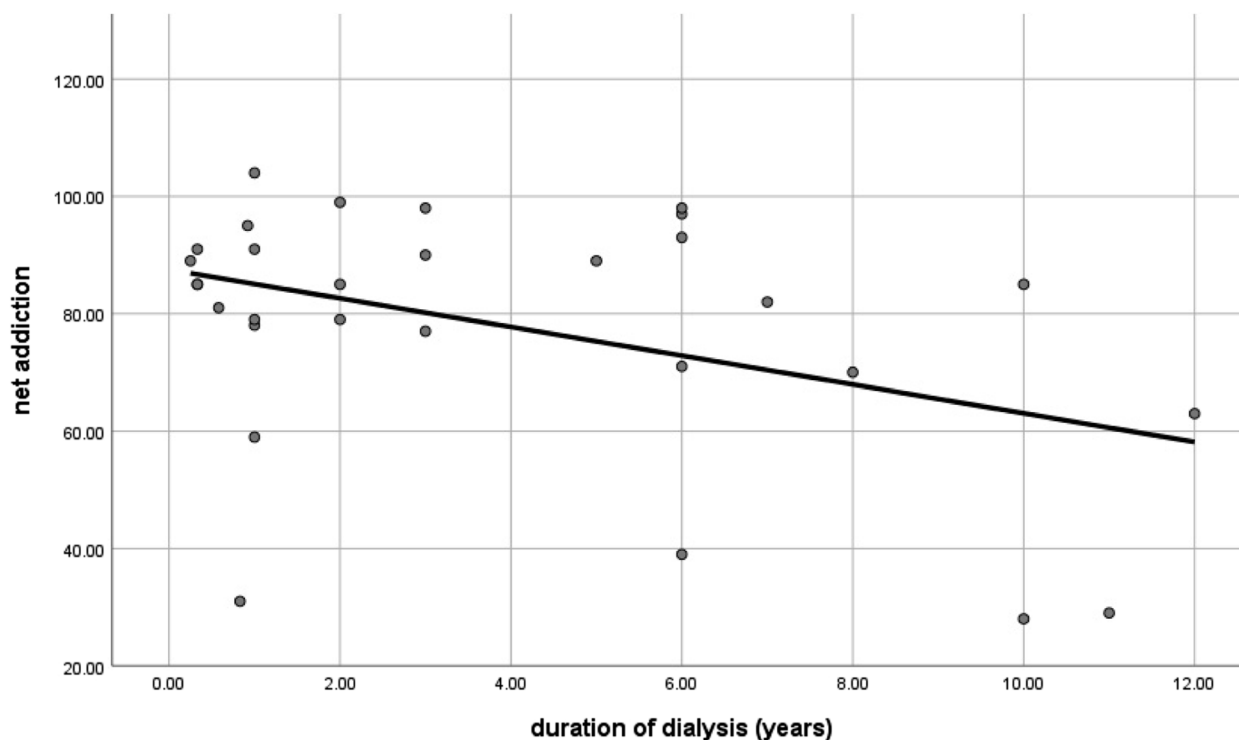


Fig. 1 Correlation between digital addiction and duration of dialysis

Table 4 Correlation between psychological adaptation scale subtypes, total, duration of dialysis, and digital addiction (n = 30)

		Personal	Emotional	Family	Social	Total
Age	R	-0.086-	0.108	-0.166-	-0.011-	-0.021-
	Pvalue	0.651	0.571	0.381	0.955	0.912
Duration of dialysis (years)	R	-0.158-	0.298	0.112	-0.114-	0.100
	P value	0.405	0.110	0.555	0.549	0.599
Digital Addiction	R	-0.070-	-0.375-	-0.235-	-0.113-	-0.327-
	P value	0.714	0.041	0.210	0.551	0.078

period had a greater quality of life, maybe because they had more time to adapt to the illness [7].

The findings are inconsistent with Amr et al.’s (2008) [23] findings on the externalizing symptoms of CBCL. According to their study, 26.3% of the samples taken during dialysis and 5.3% of the samples taken before dialysis showed values within the clinical range on the externalizing scale. Soliday et al. observed similar findings, indicating that around 15% of children with CKD obtained scores over the clinical threshold values on the CBCL externalizing scale [29]. Nevertheless, the disparity in outcomes can be attributed to the predominance of female participants in our investigation, who are less likely to display externalizing rule-breaking behaviors [30]. The high levels of DASC observed indicate a

significant issue with screen addiction. This raises the question of whether these children rely on their screens as a way to distract themselves from emotional and physical pain, using them as a coping mechanism, as evidenced by low internalizing and externalizing problems. However, these children are becoming deeply engrossed, and this exacerbates their isolation and cognitive and behavioral issues, as indicated by higher externalizing than internalizing behaviors. It is important to recognize that these children require targeted interventions and special support in order to cope effectively with their illness.

Furthermore, the children’s perspective, particularly their emotional state, was not investigated. The sole instrument employed was CBCL, a tool administered

Table 5 Correlation of CBCL, PAQ, and subtypes of Psychological Adaptation Scale ($n = 30$)

		Personal	Emotional	Family	Social	Total
Child Behavior Checklist (CBCL)						
Internal CBCL	R	-0.020-	-0.117-	0.038	0.143	-0.009-
	P value	0.917	0.538	0.842	0.451	0.963
External CBCL	R	-0.218-	-0.202-	-0.166-	-0.298-	-0.324-
	P value	0.248	0.284	0.382	0.110	0.081
Total CBCL	R	0.242	-0.093-	-0.050-	0.035	0.018
	P value	0.198	0.627	0.792	0.855	0.926
Parent Authority Questionnaire (PAQ)						
Authoritarian	R	-0.511-	-0.048-	-0.120-	-0.031-	-0.217-
	P value	<u>0.004</u>	0.802	0.529	0.870	0.250
Authoritative	R	-0.481-	-0.028-	-0.106-	-0.116-	-0.227-
	P value	<u>0.007</u>	0.883	0.577	0.542	0.228
Permissive	R	0.429	0.232	0.123	0.129	0.332
	P value	<u>0.018</u>	0.218	0.517	0.496	0.073

to parents or teachers only. This provides a single view. Moreover, relying solely on one examination does not yield a precise depiction of children's psychological adjustment. This highlights the significance of employing diverse measuring methodologies to comprehend the challenges encountered by adolescents with chronic renal disease.

Stressful circumstances within families can influence parenting style, leading to harmful parental reactions and increased maladaptive parenting behaviors [31]. Parents of children suffering from CKD face the challenges of managing complex medical treatments, scheduling many clinic appointments, and navigating the emotional strain and relational difficulties that arise. Additionally, they encounter disturbed societal expectations around family dynamics and experience strain in their marital relationships. Parents exhibit resolute dedication to performing their obligations as parents and caregivers to their ailing children, especially when confronted with challenges [32].

In our study, the average score of the authoritarian subscale of the PAQ was relatively higher in dialysis patients compared to the control cases [16]. Nevertheless, this difference did not meet the required statistical variation ($p=0.133$).

This phenomenon can be explained by the inclination of parents with chronically unwell children to display elevated levels of control and excessive engagement in their children's lives. As a result, their children often depend on them without exercising autonomy [15]. Moreover, the current results are consistent with the findings of a study conducted by Qiu et al. (2021) [16], which demonstrated a positive association between parental authority of children with chronic disease and family interaction

and problem-solving. Additionally, children with chronic illness had poorer ratings in authoritative parenting compared to their contemporaries. Kirk et al.'s (2005) [33] research supports the conclusions of our examination, which indicated that the role of parental caregiving tended to dominate the overall parenting experience. Instead of offering comfort and safety, parents were compelled to act as agents of suffering. Tsai et al. (2006) [34] have also acknowledged mothers' assumption of health-care professional duties. The present study found no statistically significant differences in the mean grades of the authoritative or permissive categories of PAQ between the dialysis patients and the healthy control groups ($p=193$, $p=0.668$, respectively). In their study, Qiu et al. (2021) found that parental authority completely mediates the association between resilience in the family and a child's psychological equalization [16]. Evidence suggests that the act of parenting could be influenced while taking care of a child with a chronic medical condition. Moreover, the perceived ability of the family to cope with the difficulties of chronic disease is associated with authoritative parenting practices, which have a favorable effect on the child's emotional and behavioral welfare [35].

Based on the aforementioned findings, it is recommended that physicians use family-based questionnaires and interviews in future research to ensure direct engagement with parents and gather significant data on family characteristics that may impact children's mental health. Parents should familiarize themselves with the benefits and guidelines of authoritative parenting approaches and be motivated to implement them in order to promote resilience within their families. Additionally, supplemental support systems and information are essential to assist

parents in managing challenges that arise at each stage of their child's sickness.

The data reflected unremarkable variation between the Psychological Adaptation scale scores of cases and controls. Total Psychological Adaptation scale scores in cases was 95.47 ± 10.36 . In controls, it was 99.87 ± 13.06 , with no statistically significant difference ($p = 0.154$). We attribute this finding to the presence of strong coping mechanisms or elements among the entire cohort, such as a robust religious or spiritual belief system. Research has suggested that Arab Muslim patients tend to have a positive interpretation of disease and improved coping mechanisms due to their belief system [36]. Meanwhile, individuals with renal sickness did not exhibit higher scores on the CBCL compared to the control group. This implies that alternative methods of coping with their emotional distress helped these children.

The prevalence of digital addiction was higher in patients undergoing dialysis than in normal participants, with a mean of (87 ± 21.23) compared to (53 ± 25.2) in normal participants, with a statistically significant difference ($p < 0.001$).

This phenomenon can be attributed to the fact that children afflicted with ESKD undergoing regular hemodialysis (as observed in our investigation) often endure social seclusion and feelings of solitude. The main reason for this is that children who require frequent dialysis face hospitalizations and the need for transportation (specifically, to a hemodialysis center), which poses challenges in terms of socializing and engaging in activities with their peers. Their profound grief over a previous life and lack of access to education and social interactions make them more prone to encountering social challenges. Furthermore, individuals may encounter difficulties in forming positive relationships with their peers and experience low self-esteem due to concerns about their physical appearance, such as being shorter or having scars from surgeries, as well as the existence of medical equipment like dialysis catheters [37].

Several studies revealed a negative correlation between social support and internet addiction [38]. Wu et al. (2016) demonstrated that adolescents who are addicted to the Internet have diminished levels of companionship in comparison to those who are not addicted [23]. According to research, social support from friends and family can help decrease an individual's psychological stress levels and improve their ability to handle stressful situations [39]. The findings are consistent with previous meta-analytic assessments that have demonstrated a negative association between the prevalence of online addiction and individuals' overall QOL experiences [11]. The outcomes of our study are consistent with the results of two previous research studies [40, 41], which indicated a

relatively substantial incidence of digital addiction among those facing economic or social problems. In addition, the results align with a meta-analytic analysis conducted by Meng et al. (2022), which revealed a significant incidence of digital addiction in low-income countries worldwide [11]. There is a significant relationship between parenting styles and behavioral problems in children, including internet addiction [42]. Nevertheless, our study did not find a statistically significant association between parenting habits and digital addiction.

The findings did not provide evidence to support the hypothesis that children who were subjected to repressive, overcontrolling, and humiliating parenting would have a higher likelihood of developing digital dependency [13]. Permissive parenting, characterized by the lack of expectations and supervision, may increase the probability of children developing internet addiction [14]. Conversely, Hsieh (2018) found that children who were raised with authoritative parenting and had a positive relationship with their parents were less likely to acquire internet addiction [13]. Nevertheless, it is essential to acknowledge that these findings may only be applicable to children who are in good health and may not be applicable to the children in our study, as there may be other factors that could impact the results.

The prevalence of digital addiction was significantly higher in individuals who underwent dialysis for a more extended period ($r = -0.415$, $p = 0.023$). Moreover, the conclusions of our study support the fundamental assumption of the self-medication theories of Internet addiction, which suggests that children who experience intense negative emotions are more likely to develop a pattern of hazardous online behavior as a means of alleviating feelings of sadness and coping with their condition. In addition, our study sample was recruited from the dialysis unit of our University Children's Hospital, where parents spend a long time with their children in the hospital. Typically, these parents experience adverse emotions such as uncertainty, frustration, guilt, and weariness [43]. In such situations, parents often give their children cell phones to keep them entertained and alleviate their anguish caused by the unpleasant hospital environment, assuming that there are no alternative sources of entertainment or comfort available for the children. This allows children to have additional opportunities to use cell phones, thus increasing risks for the development of addictive behaviors.

Conclusions

Digital addiction was found to be more prevalent among dialysis patients. Prolonged dialysis duration was significantly associated with increased digital addiction among patients.

Strengths and limitations

The present study has some limitations. First, the limited size of the sample prevents reliable estimations. The cross-sectional approach utilized in this study cannot establish a causal relationship between the variables. To comprehensively examine the development of parenting practices, psychiatric symptoms, and internet addiction as children transition into adolescence, it is essential to utilize a longitudinal approach in future research investigations.

Additionally, the data was obtained from a sole source, either the child or the parent. Therefore, it is recommended to collect data from both children and parents in order to reduce measurement bias and improve the validity of the findings in future research.

This study is the first in Arab nations to assess the prevalence of Internet addiction among adolescents with end-stage renal diseases undergoing hemodialysis despite several limitations. The study also investigated the potential impact of parenting methods on emotional and behavioral outcomes.

Abbreviations

CBCL	Child Behavior Checklist
CKD	chronic kidney disease
ESKD	End-stage kidney disease
DASC	Digital Addiction Scale for Children
DD	digital devices
GFR	Glomerular filtration rate
PAQ	Parent Authority Questionnaire
QoL	Quality of life

Acknowledgments

We acknowledged the role of the participants' parents in contributing to this study.

Authors' contributions

The study was designed by DR and RK. YM and DY collected the data. DR and DY analyzed the data. YM and RK wrote the manuscript. All the authors revised the manuscript before submission.

Funding

It was self-funded research.

Availability of data and materials

The data supporting this study's findings are available from the corresponding author (YM) upon a reasonable request.

Declarations

Ethics approval and consent to participate

All parents or caregivers agreed to sign the written informed assent. The current study protocol was approved by our University Research Ethics Committee (REC) with the reference number (N- 54-2023). It was performed following the principles outlined in the Declaration of Helsinki.

Consent for publication

Consent for publishing was obtained from the parents or guardians of all participants.

Competing interests

There is no conflict of interest to be disclosed.

Received: 9 January 2024 Accepted: 14 April 2024

Published online: 20 May 2024

References

- Kume Y, Kawasaki Y, Suyama K, Maeda R, Takahashi Y, Hoshino M, Suzuki S, Mitomo M, Nozawa R, Namai Y (2021) Incidence and Relapse Triggers of Childhood Idiopathic Nephrotic Syndrome between 2006 and 2016: A Population-Based Study in Fukushima, Japan. *Tohoku J Exp Med* 253:125–134
- Masalskienė J, Rudaitis Š, Vitkevič R, Čerkauskienė R, Dobilienė D, Jankauskienė A (2021) Epidemiology of Chronic Kidney Disease in Children: A Report from Lithuania. *Medicina (Kaunas)*. <https://doi.org/10.3390/medicina57020112>
- Amanullah F, Malik AA, Zaidi Z (2022) Chronic kidney disease causes and outcomes in children: Perspective from a LMIC setting. *PLoS One* 17:e0269632–e0269632
- Warady BA, Chadha V (2007) Chronic kidney disease in children: the global perspective. *Pediatr Nephrol* 22:1999–2009
- Aoto H, Nakatani H, Kanayama S, Okada S, Fukada M, Hanaki K (2018) Qualitative analysis of the psychosocial adaptation process in children with chronic kidney disease: toward effective support during transition from childhood to adulthood. *Yonago Acta Med* 61:166–174
- Watson AR (2013) Psychosocial support for children and families requiring renal replacement therapy. *Pediatr Nephrol* 29:1169–1174
- Abrão RO, Lopes M, Silva GJS, Ferraro AA, Koch VH (2021) Study of the association between generic and disease-specific quality of life and behavior problems in pediatric patients with chronic kidney disease stage 3 or higher and the quality of life and mental health of their primary caregivers. *Pediatr Nephrol* 36:3201–3210
- Aier A, Pais P, Raman V (2022) Psychological aspects in children and parents of children with chronic kidney disease and their families. *Clin Exp Pediatr* 65:222–229
- Clavé S, Tsimaratos M, Boucekine M et al (2019) Quality of life in adolescents with chronic kidney disease who initiate haemodialysis treatment. *BMC Nephrol* 20:163
- Gupta T, Swami MK, Nebhinani N (2020) Risk of digital addiction among children and adolescents during COVID-19 pandemic: Concerns, caution, and way out. *J Indian Assoc Child Adolesc Ment Heal* 16:199–208
- Meng S-Q, Cheng J-L, Li Y-Y et al (2022) Global prevalence of digital addiction in general population: A systematic review and meta-analysis. *Clin Psychol Rev* 92:102128
- Ferrara P, Corsello G, Ianniello F, Sbordone A, Ehrlich J, Giardino I, Pettoello-Mantovani M (2017) Internet Addiction: Starting the Debate on Health and Well-Being of Children Overexposed to Digital Media. *J Pediatr* 191:280–281.e1
- Hsieh Y-P, Shen AC-T, Wei H-S, Feng J-Y, Huang SC-Y, Hwa H-L (2018) Internet Addiction: A Closer Look at Multidimensional Parenting Practices and Child Mental Health. *Cyberpsychology, Behav Soc Netw* 21:768–773
- Shek DTL, Zhu X, Ma CMS (2018) The Influence of Parental Control and Parent-Child Relational Qualities on Adolescent Internet Addiction: A 3-Year Longitudinal Study in Hong Kong. *Front Psychol* 9:642
- Ahn J-A, Lee S (2016) Peer Attachment, Perceived Parenting Style, Self-concept, and School Adjustments in Adolescents with Chronic Illness. *Asian Nurs Res (Korean Soc Nurs Sci)* 10:300–304
- Qiu Y, Xu L, Pan Y, He C, Huang Y, Xu H, Lu Z, Dong C (2021) Family Resilience, Parenting Styles and Psychosocial Adjustment of Children With Chronic Illness: A Cross-Sectional Study. *Front psychiatry* 12:646421
- Sanvictores T, Mendez MD (2024) Types of Parenting Styles and Effects On Children. [Updated 2022 Sep 18]. In: *StatPearls [Internet]*. StatPearls Publishing, Treasure Island (FL), p. 1–4. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK568743/>
- Achenbach TM, Edelbrock C (1991) Child behavior checklist. *Burlingot* 7:371–392
- Hawi NS, Samaha M, Griffiths MD (2019) The Digital Addiction Scale for Children: Development and Validation. *Cyberpsychology, Behav Soc Netw* 22:771–778
- Abu-Ali MZ, Asaad B, Qattam M (2016) Educational system in Egypt and Jordan: a comparative study. *Int Interdiscip J Educ* 5:6–19

21. Biesecker BB, Erby LH, Woolford S, Adcock JY, Cohen JS, Lamb A, Lewis KV, Truitt M, Turriff A, Reeve BB (2013) Development and validation of the Psychological Adaptation Scale (PAS): use in six studies of adaptation to health condition or risk. *Patient Educ Couns* 93:248–254
22. Buri JR (1991) Parental authority questionnaire. *J Pers Assess* 57:110–119
23. Wu X-S, Zhang Z-H, Zhao F et al (2016) Prevalence of Internet addiction and its association with social support and other related factors among adolescents in China. *J Adolesc* 52:103–111
24. Amr M, Bakr A, El Gilany AH, Hammad A, El-Refaei A, El-Mougy A (2009) Multi-method assessment of behavior adjustment in children with chronic kidney disease. *Pediatr Nephrol* 24:341–347
25. Martinsen KD, Rasmussen L-MP, Wentzel-Larsen T, Holen S, Sund AM, Pedersen ML, Løvaas MES, Patras J, Adolfsen F, Neumer S-P (2021) Change in quality of life and self-esteem in a randomized controlled CBT study for anxious and sad children: can targeting anxious and depressive symptoms improve functional domains in schoolchildren? *BMC Psychol* 9:8
26. Cramer P (2009) An Increase in Early Adolescent Undercontrol Is Associated With the Use of Denial. *J Pers Assess* 91:331–339
27. Sandstrom MJ, Cramer P (2003) Defense Mechanisms and Psychological Adjustment in Childhood. *J Nerv Ment Dis* 191:487–495
28. Organization WH (2020) Improving the mental and brain health of children and adolescents. <https://www.who.int/activities/improving-the-mental-and-brain-health-of-children-and-adolescents>. Accessed date 15:2020
29. Soliday E (2000) Psychosocial Adjustment in Children With Kidney Disease. *J Pediatr Psychol* 25:93–103
30. Odaci H (2011) Are Adolescent Girls More Depressive than Adolescent Boys in Turkey? *Depression* 8:9–13
31. Uddin J, Alharbi N, Uddin H, Hossain MB, Hatipoğlu SS, Long DL, Carson AP (2020) Parenting stress and family resilience affect the association of adverse childhood experiences with children's mental health and attention-deficit/hyperactivity disorder. *J Affect Disord* 272:104–109
32. Tong A, Lowe A, Sainsbury P, Craig JC (2010) Parental perspectives on caring for a child with chronic kidney disease: an in-depth interview study. *Child Care Health Dev* 36:549–557
33. Kirk S, Glendinning C, Callery P (2005) Parent or nurse? The experience of being the parent of a technology-dependent child. *J Adv Nurs* 51:456–464
34. Tsai T-C, Liu S-I, Tsai J-D, Chou L-H (2006) Psychosocial effects on caregivers for children on chronic peritoneal dialysis. *Kidney Int* 70:1983–1987
35. Taraban L, Shaw DS (2018) Parenting in context: Revisiting Belsky's classic process of parenting model in early childhood. *Dev Rev* 48:55–81
36. Cruz JP, Colet PC, Alquwez N, Inocian EP, Al-Otaibi RS, Islam SMS (2017) Influence of religiosity and spiritual coping on health-related quality of life in Saudi haemodialysis patients. *Hemodial Int* 21:125–132
37. Dryjańska N, Kiliś-Pstrusińska K (2023) Depression in Children and Adolescents with Chronic Kidney Disease—Review of Available Literature. *J Clin Med* 12:3554
38. Chen Y, Hu J (2012) Relationship between teenagers' internet addiction disorder, parent rearing styles and social support. *China J Heal Psychol* 20:767–768
39. Naseri L, Mohamadi J, Sayehmiri K, Azizpoor Y (2015) Perceived Social Support, Self-Esteem, and Internet Addiction Among Students of Al-Zahra University, Tehran. *Iran J psychiatry Behav Sci* 9:e421–e421
40. Jang MH, Ji ES (2012) Gender differences in associations between parental problem drinking and early adolescents' internet addiction. *J Spec Pediatr Nurs* 17:288–300
41. Lopez-Fernandez O (2018) Generalised Versus Specific Internet Use-Related Addiction Problems: A Mixed Methods Study on Internet, Gaming, and Social Networking Behaviours. *Int J Environ Res Public Health* 15:2913
42. Cheung C, Yue XD, Wong DS (2014) Addictive Internet Use and Parenting Patterns Among Secondary School Students in Guangzhou and Hong Kong. *J Child Fam Stud* 24:2301–2309
43. Pinquart M (2017) Parenting stress in caregivers of children with chronic physical condition—A meta-analysis. *Stress Heal* 34:197–207

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.