Avicenna Perpective of Learning-Difficulties, Screen-Time, and Emotional-Behavioral Issues in Children with Tuberculosis

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Abstract

Pediatric tuberculosis has become a significant issue in Indonesia, affecting physical, mental, social, and educational aspects of the child. This correlational quantitative study aimed to analyze the correlation between learning-difficulties, screen-time, and emotional-behavioral issues of children with tuberculosis from the perspective of Avicenna. Data collection was performed on 68 children aged 5–12 years in Cirebon, Indonesia, during December 2024. Learning-difficulties were assessed using the Collorado Learning Difficulties Questionnaire in mathematics and language proficiency tests, while emotional-behavioral issues were measured using the Pediatric Symptom Checklist-17. Data analysis was then performed using the Spearman-Rank correlation test. Results showed that there was no significant relationship between learning-difficulties and children's emotional-behavioral issues in either language (r=0.56, p>0.05) or mathematics (r=0.212, p>0.05). However, excessive screen-time was significantly associated with emotional-behavioral issues (r=0.63, p<0.05). Avicenna's perspective shows the importance of balancing physical, mental, and spiritual health to support children's development. This study recommends reducing screen-time, providing family support, and integrating spiritual values into health interventions for children with tuberculosis to mitigate the psychosocial impacts of the disease. Thus, a holistic approach grounded in cultural and spiritual values for managing the condition is crucial.

Keywords: Avicenna, childhood tuberculosis, emotional-behavioral issues, learning-difficulties, screen-time

Introduction

Pediatric tuberculosis (TB) remains a critical global and national health issue, especially in low- and middle-income countries. The World Health Organization (WHO) estimates that more than one million children were infected with TB in 2022, with many lacking adequate access to diagnosis and treatment.[1] Globally, 10.8 million people are infected with TB, with children under 14 comprising approximately 1.25 million cases equating to 16% of total TB-related mortality.[1] In Indonesia, the second-highest TB burden globally, 969,000 cases were reported in 2022, of which 80,829 (11.8%) involved children under 15.[2] In West Java alone, 229,683 TB cases (22% of the national total) were recorded in 2024, including 52.192 pediatric case.[3] Locally, in Cirebon City, over 4,000 total TB cases were reported in 2023, including 1,559 pediatric cases, signaling an urgent need for integrated child-centered care.[4]

Beyond its physical manifestations, TB in children significantly affects emotional, social, and cognitive development. Prolonged treatment, hospitalization, and social stigma may contribute to anxiety, depression, and behavioral difficulties.[5] These emotional stressors can disrupt learning processes, leading to academic challenges, particularly in attention, reading, and numeracy.[6] However, the reverse can also be true: children who already struggle with learning

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may experience higher emotional vulnerability, suggesting a possible bidirectional relationship between learning difficulties and emotional-behavioral issues.[7]

The issue is further complicated by the increasing role of screen time in children's daily lives, especially after the COVID-19 pandemic. Digital device use, although sometimes beneficial for education, has been associated with emotional dysregulation, impulsivity, and social withdrawal.[8,9] Children with TB, who often experience physical restrictions and reduced social interaction, may rely heavily on screens for entertainment and coping, increasing the risk of psychological imbalance.[10] Excessive or unregulated exposure to screens may displace crucial developmental stimuli such as physical play, interpersonal bonding, and sleep, which are vital for emotional balance in growing children.

Avicenna's classical perspective on child development offers a useful conceptual lens for understanding these interactions. His holistic model emphasizes the inseparability of physical, emotional, and environmental factors in maintaining well-being, highlighting the importance of balanced routines, supportive environments, and family engagement.[11,12] His writings do not separate physical illness from emotional well-being, instead viewing them as mutually reinforcing domains. This study adopts Avicenna's perspective as a conceptual framework to understand the complex interplay between physical illness (TB), psychosocial exposures (screen time), and cognitive factors (learning difficulties) in shaping emotional and behavioral outcomes in children. The study does not aim to test Avicenna's theory directly but uses it to guide the interpretation of findings and propose culturally grounded interventions that integrate his holistic principles.

Despite the significant burden of TB and its potential psychosocial consequences, research examining the relationships among learning difficulties, screen time, and emotional-behavioral symptoms in children with TB remains limited, particularly in Indonesia. This study aims to investigate the associations among these three factors in pediatric TB patients, providing preliminary evidence to support more holistic and culturally grounded approaches to child health.

Methods

This study employed a quantitative correlational design to assess the relationship between learning difficulties, screen time, and emotional–behavioral outcomes in children diagnosed with tuberculosis (TB). The study was conducted at pediatric outpatient polyclinics in Cirebon, Indonesia, during December 2024. A total sampling approach was used, and all children aged 5–12 years with a confirmed TB diagnosis who attended outpatient follow-up during the study period were invited to participate. A total of 68 children were enrolled after written informed consent was obtained from parents or legal guardians, and verbal assent was sought from children when appropriate.

The final sample included 68 children, whose participation was based on informed written consent from parents or legal guardians. Verbal assent was obtained from children where appropriate, and ethical clearance for the study was granted by the relevant institutional ethics board.

This research received ethical approval from the Health Research Ethics Committee of Universitas Islam Bunga Bangsa Cirebon, Indonesia (Approval No. 001/EC/PPS. UIBBC/XI/2024, dated 30 November 2024). All procedures adhered to relevant ethical guidelines to ensure confidentiality, voluntary participation, and data protection.

Data were obtained through structured interviews and standardized questionnaires completed by parents or guardians. Trained research assistants with backgrounds in psychology or public health conducted the sessions and provided clarification when needed to minimize reporting bias. Parent-reported responses were cross-checked through brief follow-up questions, and direct behavioral observations were made while children waited for consultation. These observations were recorded using an observation checklist focusing on attention, emotional state, restlessness, and social engagement to support consistency with questionnaire data.

Learning difficulties were assessed using the Colorado Learning Difficulties Questionnaire (CLDQ), which measures language and mathematics performance based on standardized score ranges. Scores were categorized as shown Table 1. Emotional–behavioral problems were measured using the Pediatric Symptom Checklist-17 (PSC-17), a validated 17-item screening tool scored using a three-point Likert scale. PSC-17 scores were classified as normal (0–14) or indicated (>15).[15,16]

Screen time was assessed using a parental

Tabel 1 Criteria for Math and Language Learning Disorders

Learning Ability	Score Range	Category
Language	0–16	Light
	17–21	Moderate
	≥22	High
Math	0–15	Light
	16–19	Moderate
	≥20	High

Source: Koriakin et al., 2019[14]

report of average daily exposure to electronic media during the preceding seven days and categorized as ≤2 hours per day or >2 hours per day in accordance with WHO and AAP recommendations.

To enhance validity and reliability, a cross-checking process was implemented. Parent-reported answers were verified during the structured interviews through follow-up questions. Additionally, direct behavioral observations were made while the children waited for medical consultation. These observations were conducted by trained research assistants and recorded on a checklist that included attention span, social engagement, restlessness, and observable emotional states. The observation data were then cross-referenced with questionnaire responses (especially the PSC-17) for consistency.[15]

The instruments used were previously validated: (1) The CLDQ has demonstrated strong reliability and discriminative validity in identifying learning difficulties in children.[14] The

Tabel 2 Characteristics of Tuberculosis Child Respondents by Age

Age	Frequency (n=68)	%
5	16	23.5
6	14	20.6
7	15	22.1
8	12	17.6
9	2	2.9
10	2	2.9
11	2	2.9
12	5	7.4

PSC-17, in its Indonesian version, has shown good internal consistency (Cronbach's alpha >0.80) and construct validity.[16]

Data analysis was conducted using SPSS version 29. The Spearman rank correlation test was applied because the data did not meet normality assumptions. (Corder & Foreman, 2014).[17] Correlation coefficients were interpreted using standard criteria to determine the strength and direction of associations. A p-value <0.05 was considered statistically significant. This test was selected to examine the bivariate associations between learning difficulties (in language and math), screen time, and emotional-behavioral symptoms in children with TB.

Interpretation of correlation strength followed conventional criteria: very weak (0.00–0.25), moderate (0.26–0.50), strong (0.51–0.75), very strong (0.76–0.99), and perfect (1.00). The direction of the relationship was interpreted as positive (indicating both variables increase together) or negative (indicating one variable increases as the other decreases).

Results

The study population consisted of children diagnosed with tuberculosis who attended the pediatric polyclinic in Cirebon during December 2024. A total of 68 children who met the inclusion criteria were selected using a total sampling technique.

The age distribution of respondents in Table 2 showed that the 5-year age group was the most dominant, with 16 children (23.5%), followed by the 6-year (20.6%) and 7-year (22.1%) age groups. The 8-year-old age group had a total of 12 children (17.6%), while the 9-, 10- and 11-year-old age groups were represented by only two children each (2.9%). Furthermore, the 12-year age group recorded five children (7.4%). These results showed that the majority of respondents were in the early primary school age group (5–8 years old).

Table 3 shows that the gender distribution of respondents was relatively balanced, with a slight predominance of female children (36 children; 52.9%) compared to males (32 children; 47.1%). This nearly equal proportion allows for a more representative analysis regarding gender-related differences in study variablesCorrelation analyses were conducted to examine the relationship between learning disabilities (language and mathematics difficulties) and screen time with the emotional–

Tabel 3 Characteristics of Tuberculosis Child Respondents by Gender

Gender	Frequency (n=68)	Percentage (%)
Male	32	47.1
Female	36	52.9

behavioral status of children with tuberculosis. Prior to correlation testing, the Shapiro–Wilk normality test was performed to evaluate the distribution of the study variables.[18] The results presented in Table 5 indicate that all variables had non-normal distributions; therefore, the Spearman Rank correlation test was selected as the appropriate method for subsequent analysis.[19]

Table 4 presents the distribution of the main study variables, including screen time, learning difficulties, and emotional-behavioral status. A majority of the children (61.8%) had screen time of ≤2 hours per day, while 38.2% exceeded that threshold. In terms of learning difficulties, most children experienced difficulties at the light level in both language (86.8%) and math (79.4%). Moderate difficulties were reported in 10.3% of language cases and 16.2% of math cases, while high-level difficulties were rare, with no cases in language and only 4.4% in math. Regarding emotional-behavioral status measured using the PSC-17, 35 children (51.5%) were categorized as within the normal range, while 33 children (48.5%) were identified as having emotional or behavioral concerns. These descriptive findings provide a foundational context for the subsequent correlation analysis.

Table 5 presents the results of the Shapiro-Wilk normality test, which was used to evaluate whether the data for each variable in the study followed a normal distribution. The test includes variables such as screen time, language disorders, and math disorders, each broken down into specific categories. For screen time, both groups children with ≤2 hours and >2 hours of screen timenhad significance (Sig.) values below 0.05 (0.044 and 0.024, respectively), indicating that the data were not normally distributed. In terms of language disorders, the "lightweight" and "medium" categories also showed significance values of 0.001 and 0.006, respectively, both below 0.05, suggesting non-normal distributions. The "high" category had no data (df=0). For math disorders, the categories "lightweight," "medium," and "high" all showed significance values of 0.000, which again indicates non-normal distributions across all categories. Overall, the table demonstrates that all analyzed variables violated the assumption of normality. Therefore, non-parametric statistical methods such as the Spearman Rank correlation were appropriately used in this study.

Table 6 presents the results of the Spearman Rank correlation analysis conducted to examine the relationship between screen time, learning disorders (language and math), and emotional-behavioral outcomes in children with tuberculosis. The analysis revealed a very strong and statistically significant positive correlation between screen time and children's emotional-behavioral symptoms, with a correlation coefficient of 0.838 and a p-value of 0.015 (p<0.05). This indicates that higher screen time is strongly associated with greater emotional

Tabel 4 Distribution of Screen Time, Learning Difficulties, and Emotional-Behavioral Status (PSC-17)

Variable	Category	Frequency (n)	Percentage (%)
Screen time	≤2 hours/day	42	61.8
	>2 hours/day	26	38.2
Language difficulty	Light	59	86.8
	Moderate	7	10.3
	High	0	0.0
Math difficulty	Light	54	79.4
	Moderate	11	16.2
	High	3	4.4
PSC-17 Score	Normal (0–14)	35	51.5
	Indicated (>15)	33	48.5

Tabel 5 Shapiro–Wilk Normality Test Results

Variables	Aspects	Category	Statistic	df	p-value	Decision
Screen time		≤2 Hours	0.945	42	0.044	Not Normal
		>2 Hours	0.908	26	0.024	
Learning disorders	Language disorder	Lightweight	0.918	59	0.001	Not Normal
		Medium	0.933	7	0.006	
		High	0	0	0	
	Math disorder	Lightweight	0.513	54	0.000	Not Normal
		Medium	0.486	11	0.000	
		High	0.750	3	0.000	

Tabel 6 Spearman Rank Correlation Between Screen Time, Learning Disorders, and Emotional-Behavioral Status

Variables	Aspects	Correlation Coefficient (ρ)	p-value)	n	Interpretation
Screen time	-	0.838	0.015	68	Very strong relationship
Learning disorders	Language	0.212	0.083	68	No relationship
	Math	0.001	0.992	68	No relationship

and behavioral difficulties in this population, though no causal relationship can be concluded. In contrast, the correlations between learning disorders and emotional-behavioral outcomes were weak and not statistically significant. Specifically, language difficulties had a correlation coefficient of 0.212 with a p-value of 0.083, while math difficulties showed a near-zero correlation of 0.001 with a p-value of 0.992. These results suggest that learning difficulties at least in this sample were not meaningfully associated with the emotional-behavioral conditions of children with TB.

From the perspective of Ibn Sina, who emphasized the harmony between the physical and emotional aspects of health, the observed association between screen time and emotional–behavioral functioning may reflect an imbalance influenced by environmental exposure. While causality cannot be established, the findings align with Avicenna's view that external factors can impact children's emotional well-being, especially during illness.

Discussion

These findings contradict those of Aro et al.[20] and Benassi et al.,[21] who reported significant associations between learning disorders and children's emotional–behavioral problems. However, in the context of children with TB, there could be a reduction in the direct relationship between learning disabilities and emotional behavior, as Limone and Toto[22] found that severe medical conditions often dominated the influence of academic disabilities on mental health. This interpretation aligns with the findings of Yenduri et al.[23]

Learning disabilities are often associated with academic anxiety, which can affect children's emotional well-being. According to Lajenkar et al.[24], children's cognitive development influences their ability to handle academic challenges. In contrast, Avicenna emphasized that mental development in children is not solely determined by intellectual ability but is also shaped by physical and emotional health. This perspective is especially relevant for children with tuberculosis (TB), whose daily lives may center more on managing illness than academic performance. Therefore, while learning disruptions might serve as emotional stressors, their influence on TB-affected children may be less substantial due to the more pressing impact of the disease itself. However, this interpretation should be viewed as a possibility, since this study did not conduct a direct comparison between TB and non-TB populations or control for disease severity.[25]

A key limitation of this study was the

relatively small sample size, which reduces generalizability. In addition, the data did not explore aspects of the social environment and family support that could influence the impact of learning disabilities on the emotional-behavioral functioning of TB children. For example, studies by Baria and Gomez suggested that social support could reduce the negative effects of learning disabilities on children's emotions. Another limitation was the quantitative approach that did not explore the subjective experiences of children and their families, which could provide more holistic insights.

Although previous literature had highlighted a significant relationship between learning and emotional-behavioral disorders, this study suggested that in TB children, the relationship could be dampened by the complexity of the medical condition. The novelty of this study laid in exploring this relationship in the understudied population of TB children, which presented new challenges in understanding the interaction of academic and health factors. These results reinforced the hypothesis that in TB children, emotional-behavioral outcomes were influenced more by health aspects than learning disabilities. Avicenna, in the Canon of Medicine, emphasized the importance of balancing physical and emotional health as the foundation of child development. This perspective confirmed that emotional-behavioral treatment of TB children must focus on physical health and psychosocial support, rather than solely on academic interventions.

A notable finding of this study was the very strong positive correlation between screen time and emotional–behavioral difficulties in children with TB. Higher screen exposure was associated with increased emotional symptoms, inattention, and behavioral problems. While causation cannot be inferred due to the cross-sectional design, the strength of the correlation suggests that screen time may function as an important psychosocial factor in this population. Limited mobility during treatment and increased reliance on electronic devices may contribute to these outcomes, consistent with existing evidence that prolonged screen exposure can influence emotional regulation and attention. In this study, screen time was measured based on total daily exposure across various devices (e.g., smartphones, tablets, television), and categorized as either ≤2 hours or >2 hours per day.

Avicenna also emphasized the importance of environmental balance in shaping a child's emotional and moral development. The relevance of both theories lies in understanding that extended screen exposure, even without specifying content, may contribute to emotional-behavioral difficulties by displacing healthier interactions, such as play, family engagement, and rest.

It is important to note that this study utilized a correlational design, which identifies associations but does not imply causation. Therefore, while a significant relationship between screen time and emotional-behavioral issues was observed, no conclusions about direct cause-and-effect can be made. Instead, the findings highlight the need for further research that explores mediating factors such as content type, screen context, and family dynamics in children with chronic illnesses like TB.

Limitations of this study included the absence of an in-depth analysis of screen content, which may influence children's emotional responses, as shown by Liu et al.[10] In addition, mediating factors such as sleep patterns and family interactions were not assessed, although they may affect the relationship between screen time and emotional-behavioral functioning. Age-based subgroup analysis was also not conducted, limiting the ability to evaluate developmental differences. Despite these limitations, the study provides novel insight into screen time among children with chronic illnesses such as tuberculosis, a population that may be particularly vulnerable to emotional-behavioral problems due to physical restrictions and social isolation.

In conclusion, this study found a very strong positive correlation between screen time and emotional–behavioral difficulties in children with TB, while learning disabilities showed no significant association. These findings highlight the importance of monitoring screen exposure and incorporating psychosocial support into the management of children undergoing TB treatment. Although causal relationships cannot be established, the results underscore the need for further longitudinal or interventional studies to clarify the mechanisms underlying this association. A holistic approach that considers physical, emotional, and social aspects may be beneficial in improving the well-being of children with TB.

Future studies should examine whether factors such as family support and the educational environment may moderate the relationship between screen time and emotional-behavioral outcomes in children with tuberculosis.

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