Smartphone addiction and adolescent mental health: a cross-sectional study in West Sumatra province

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ABSTRACT

In West Sumatra Province, Indonesia, approximately 13.01% of individuals aged 15 years or older are affected by mental and emotional disorders, ranking it as the third highest among the 34 provinces. Excessive smartphone use has emerged as a potential influencer of mental health, associated with social networking addiction, shyness, and low self-esteem. This study aimed to examine the relationship between smartphone addiction and mental health issues in adolescents using a cross-sectional design. The sample included 283 randomly selected students aged 15-17 years. Smartphone addiction was measured using the smartphone addiction scale-short version (SAS-SV), and mental health was assessed using the strength and difficulties questionnaire (SDQ). The study revealed a significant association ($p<0.001$) between smartphone addiction and mental health problems among adolescents, with 72.1% of respondents experiencing smartphone addiction and 26.9% classified as having abnormal mental health. These findings emphasize the need for increased awareness regarding the negative impact of excessive smartphone use on adolescent mental health. Schools should play a vital role in addressing this issue through the provision of guidance and counseling services. Future research should investigate causal relationships using longitudinal designs and consider diverse populations to enhance the generalizability of the results.

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1. INTRODUCTION

According to the World Health Organization (WHO) in 2021, globally, around one in seven children between the ages of 10 and 19 has a mental health disorder, which accounts for 13% of the global disease burden in this age group [1]. In Indonesia, the 2022 Indonesia National Adolescent Mental Health Survey (I-NAMHS), which measured the incidence of mental disorders in adolescents aged 10-17 years, found that one in three Indonesian youths has mental health problems. In West Sumatra Province, which has a population aged 15 years and above, 13.01% of the total population has experienced mental and emotional disorders, ranking third out of 34 provinces in Indonesia [2].

During their developmental stages, adolescents experiment with various roles and behaviors in order to discover their identity [3]. The developmental tasks that adolescents need to accomplish include establishing mature relationships with peers, fulfilling social roles, accepting and effectively utilizing their

physical condition, achieving emotional independence, preparing for marriage and family life, and developing ethical values that guide their behavior according to their ideology [4]. If adolescents are successful in completing these developmental tasks, they can develop a strong sense of identity and self-confidence, which is beneficial for their transition into adulthood. Conversely, if adolescents fail to complete these developmental tasks, they may struggle with weak self-identity, not knowing who they are or what they want to do. This can lead them to withdraw and isolate themselves from their environment [5].

Adolescents in developed nations have embraced digital technology as an essential part of their lives, education, and culture, earning them the label of "digital natives". Over the past decade, smartphone platforms have enabled these digital natives to create and sustain virtual communities online. The impact of social networking on their lives is evident in various aspects, including the mobilization of protests and boycotts, the formation and maintenance of romantic relationships, and the timely prevention of potential suicides. Interactions on smartphone through social media have demonstrated their transformative potential, influencing diverse aspects of adolescent life. The growing adoption of smartphone platforms has expanded the avenues through which young individuals can connect, communicate, and engage with one another [6]–[9]. However, this situation has prompted a significant inquiry for the impact of smartphone on the mental health among adolescents. Currently, only a limited number of researchers have explored this question, leaving a gap in our understanding of this subject.

Smartphones are used not only by adults but also by children and teenagers from diverse backgrounds. According to the 2020 Indonesian telecommunications data released by the statistics Indonesia (BPS), 88.99% of children over five years old use smartphones to access social media. Smartphone addiction can have physical, psychosocial, affective, and behavioral effects. Physical problems such as eye and finger strain and neck pain are common [10]. Additionally, smartphone addiction can lead to mental health issues such as depression, neuroticism, and obsessive-compulsive behavior disorder, which can affect academic performance [11].

Parenting patterns, family conflicts, social or environmental changes, and the intensity of smartphone, internet, and social media use are some of the factors that can affect mental health [12]. Lu [13] reported that experiencing less authoritative parenting and negative school encounters were strong predictors of depression among adolescents. Lei *et al.* also state that smartphone addiction has a significant influence on mental health [14]. One of the factors that can influence mental health is the use of smartphones, which at high or intense frequency may pose a risk of addiction [11]. Research by the WHO in South Korea found that as many as 17.9% of 1.63 million teenagers were addicted to smartphones, and more than 24% of children had internet addiction and needed treatment in hospitals [15].

Given the widespread use of smartphones among adolescents and the potential detrimental effects on mental health, it is imperative to conduct additional research to comprehend the underlying mechanisms and establish interventions that can effectively alleviate these negative consequences. This study addresses the research problem of examining the influence of smartphone addiction on the mental health of adolescents, with the aim of offering valuable insights into strategies that can effectively tackle this issue. Employing a cross-sectional design, the study sought to ascertain the correlation between smartphone addiction and mental health problems among high school students. The findings emphasize the importance of raising awareness regarding the adverse impact of excessive smartphone usage on the mental well-being of adolescents.

2.   METHOD

The study employed a quantitative research design and a cross-sectional study approach. It involved 283 adolescents aged 15-17 years, and data was collected from January to February 2023 with 100% respons rate. The study adhered to ethical standards and obtained ethical approval from the Ethics Commission of the Faculty of Medicine at Universitas Andalas, with the assigned ethical approval number 41/UN.16.2/KEP-FK/2023. The student participants were selected using the proportional random sampling method, ensuring representative inclusion. Additionally, convenience sampling was employed during the data collection process.

Self-reported questionnaires were utilized to collect information from participants, and the researchers followed the WHO guidelines to translate, validate, and test the reliability of the questionnaires. The process involved several stages, including: i) Forward translation by native Indonesian speakers fluent in English, ii) Review by an expert panel which included two mental health experts, iii) Back-translation by English native speakers, and iv) Pre-testing with 30 respondents including cognitive interview. The construct validity was assessed using Pearson product moment, and internal consistency was measured using Cronbach's alpha coefficient. The authors also received permission from the original questionnaire developer to modify and use the questionnaires for the study. Three instruments were used to collects the data, namely demographic sheet, the smartphone addiction scale-short version (SAS-SV) [16] and the strength and

difficulties questionnaire (SDQ) [17]. An Indonesian demographic datasheet was developed by the researchers, including gender, age, and class level.

The SAS-SV consisted of 10 statement items, which assessed five indicators of smartphone addiction: daily life disturbance, withdrawal, cyberspace-oriented relationship, overuse, and tolerance. The respondents rated their level of agreement on a Likert scale ranging from 1 to 6. The addiction category for male and female respondents was determined based on their respective scores. The SAS-SV was adapted for use in Indonesia and had good validity and reliability.

The SDQ consisted of 25 statement items, which measured five categories of behavior: emotional symptoms, conduct problems, hyperactivity, relationship problems with peers, and prosocial behavior. The respondents responded 'incorrect', 'slightly correct', or 'correct' ro each statement, and their scores were calculated according to the category. The result of the SDQ was the total score of the difficulties aspects. The interpretation of the results was divided into three categories: normal, borderline, and abnormal. The SDQ had good reliability and construct validity.

The information collected was analyzed using IBM SPSS Statistics (IBM Corp., Armonk, N.Y., USA). The results were presented using descriptive statistics, including frequencies and percentages. Moreover, the study's variables were tested for correlation using the Chi-square test. The p-value for significance was set at <0.05.

3.   RESULTS AND DISCUSSION
3.1. Respondents' characteristics
This study involved a total of 283 students in grades 10 and 11, aged between 15 to 17 years, who were directly recruited by the researchers in Padang. The students were classified based on their age, gender, and class, and their respective characteristics are presented in detail in Table 1. In the study, a large proportion of the participants were identified as female, constituting 169 students which accounts for approximately 59.7% of the total sample. Furthermore, it was found that almost half of the respondents (42.0%) were 16 years old, indicating that the majority of the participants were in their mid-teenage years. In terms of the respondents' class, there was an almost equal distribution between class 10 and 11, with 49.5% and 50.5%, respectively, suggesting that the sample was representative of students from both grade levels.

3.2. Smartphone addiction among adolescents
The objective of this analysis was to investigate the prevalence of smartphone addiction among adolescents, with a particular focus on gender differences. Table 2 presents the results of this analysis, revealing that a majority (72.1%) of the teenagers studied experienced smartphone addiction. It was found that 67.5% of male adolescents and 75.1% of female adolescents experienced smartphone addiction. These findings suggest that females are more likely to experience smartphone addiction compared to males.

3.3. Mental health status of adolescents
The main aim of this analysis was to examine the incidence of mental health problems among adolescents. The findings, as displayed in Table 3, demonstrate that approximately 26.9% of the respondents were classified as having abnormal mental health status. In contrast, over half of the participants (54.8%) were deemed to be within the normal range of mental health status, while 18.4% were in the borderline category. These results highlight the importance of monitoring adolescent mental health, as a significant proportion of the sample displayed signs of potential psychological distress.

3.4. Association between smartphone addiction and mental health among adolescents
The aim of this analysis is to examine whether there is a meaningful association between mental health and smartphone addiction in adolescents. To achieve this, the researchers employed SPSS statistical software to conduct cross-tabulation and chi square analysis. Table 4 displays the results of the cross-tabulation analysis of mental health status and smartphone addiction in adolescents.

In Table 4, it can be seen that nearly half (48.0%) of the respondents who experienced smartphone addiction had normal mental health, while the majority (72.2%) of those who did not have smartphone addiction also had normal mental health. The analysis revealed that there was a significant correlation (with a p-value of <0.001) between smartphone addiction and mental health among adolescents. This implies that smartphone addiction can have an impact on mental health in adolescents. It is important to address this issue and provide necessary interventions to prevent adverse effects on their mental wellbeing.

Table 1. Characteristics of respondents (n=283)

Variables	f	%
Gender		
Male	114	40.3
Female	169	59.7
Age		
15	95	33.6
16	119	42.0
17	69	24.4
Class level		
1st year	140	49.5
2nd year	143	50.5

Table 2. Description of smartphone addiction among respondents by gender (n=283)

Smartphone addiction	f	%
Male (n=114)		
Addiction	37	32.5
No addiction	77	67.5
Female (n=169)		
Addiction	42	24.9
No addiction	127	75.1

Table 3. Description of respondents' mental health status (n=283)

Category	f	%
Normal	155	54.8
Borderline	52	18.4
Abnormal	76	26.9

Table 4. Association between smartphone addiction and adolescents' mental health

Smartphone addiction	Adolescent mental health								
	Normal		Boderline		Abnormal		Total		p§
	f	%	f	%	f	%	f	%	
No addiction	57	72.2	13	16.5	9	11.4	79	100.0	<0.001*
Addiction	98	48.0	39	19.1	67	232.8	204	100.0	
Total	155	54.8	52	18.4	76	26.9	283	100.0	

Note: §Chi-square test was performed, *Significant at $p<0.05$.

3.5. Discussion

The objective of this study was to investigate the correlation between smartphone addiction and mental health issues among high school students. Findings revealed that a majority of respondents (72.1%) experienced smartphone addiction, with 27.2% and 44.9% of male and female respondents, respectively, experiencing smartphone addiction. In the study, it was observed that a higher proportion of female respondents were addicted to their smartphones compared to male respondents. This suggests that females may be more susceptible to developing a dependence on their smartphones than males. This finding is consistent with the results of a previous study, which also showed that smartphone addiction rates among adolescents differ significantly based on gender, with females having a higher likelihood of being addicted to their smartphones than males [18], [19].

The possible reasons for this difference in smartphone addiction rates between gender groups could be related to social and cultural factors, including differences in the use of social media and communication patterns. For instance, it has been suggested that females tend to use their smartphones more frequently for social interactions and validation-seeking purposes, which may contribute to a greater risk of addiction. Additionally, social pressures and gender expectations may lead to females feeling more obligated to respond to messages and notifications promptly, thereby increasing the time spent on their smartphones and potentially contributing to addiction [10], [20]–[22]. Overall, this study adds to the growing body of literature that highlights the potential role of gender differences in smartphone addiction rates and underscores the importance of considering gender as a factor when examining and addressing smartphone addiction.

Furthermore, this study showed that the primary problem associated with smartphone addiction was overuse, with 35.3% of respondents admitting to using their smartphones for longer than they had planned. Gender differences were observed in smartphone usage patterns, with men tending to use their smartphones for gaming, while women used more multimedia applications and social media services. A variety of smartphone applications and psycho-behavioral factors were linked to smartphone addiction, although

research on teenage smartphone addiction among teenagers has shown mixed results with regard to gender differences. Overall, 204 (72.0%) respondents experienced smartphone addiction, with teenagers being more susceptible to addiction than young adults.

Based on the study's findings, 52 respondents were classified as borderline and 76 respondents were classified as abnormal. The period of adolescence, specifically for individuals between the ages of 15 and 17, is considered a crucial time for psychological and emotional development. This phase can pose significant challenges for young people as they face various changes and transitions, both physically and mentally. During this time, adolescents are trying to figure out their identity and sense of self, while also navigating new social relationships and responsibilities. As a result, this period can be particularly challenging for adaptation and adjustment. Adolescents may experience heightened levels of stress, anxiety, and mood swings as they try to find their place in the world. Additionally, this age group may also be exposed to various pressures such as academic demands, peer pressure, and familial expectations, which can add to the complexity of their situation. Therefore, it is essential to recognize and understand the unique challenges that adolescents between the ages of 15 and 17 face. Proper support, guidance, and resources can assist them in navigating this critical period of development and help them to adapt to the changes that come with it [23], [24].

According to the bivariate analysis, 79 respondents did not experience smartphone addiction, with 13 respondents (16.5%) being classified as borderline and nine respondents (11.4%) not experiencing smartphone addiction but being classified as abnormal in terms of mental health. Based on the respondents' responses to the questionnaire, emotional indicators were the main problem, with 125 (44.2%) respondents feeling nervous in new situations and quickly losing confidence. Emotional indicators are a collection of familiar feelings, physical and psychological states, and tendencies to act, as described by Istiqomah in 2017 [25].

Besides smartphones, several factors such as parenting styles, family conflicts, and social or environmental changes [26]–[30], can also impact adolescent mental health. Smartphones affect not only psychosocial, affective, and behavior but also physical well-being, causing eye and finger disorders and neck pain [10], [21]. Smartphone addiction can lead to depression, neuroticism, and obsessive-compulsive behavior disorder and negatively impact academic achievement [11], [16].

Out of the 204 individuals who reported experiencing addiction, 39 respondents (19.1%) fell into the borderline mental health category, while 67 respondents (32.8%) fell into the abnormal mental health category. Previous studies found a significant correlation between smartphone addiction and mental health, indicating that students who are addicted to their smartphones are at risk of negative impacts such as decreased academic performance, reduced participation in extracurricular activities, dissatisfaction with school services, increased anxiety, and symptoms of depression. The primary concern is related to the overuse indicator, which refers to uncontrolled smartphone use that compels users to continue using their phones. High-frequency or high-intensity smartphone use can lead to addiction [31]–[34].

Notwithstanding our utmost endeavor, this study is subject to notable limitations that could have impacted the outcomes. Firstly, due to the utilization of a cross-sectional design, it is inadequate to establish causality based on the current findings. Secondly, variations in social and cultural norms among the participating adolescents, may have influenced the results. Lastly, the employment of convenience sampling introduces limitations in terms of generalizability and increases the risk of bias. Additionally, employing a qualitative research approach may yield more robust findings and provide a more comprehensive understanding of the effect of smartphone use on mental health among adolescents.

4. CONCLUSION

The findings from the research conducted on the correlation between smartphone addiction and adolescent mental health indicate that a considerable number of male and female respondents were addicted to smartphones. Furthermore, a majority of the respondents were in the normal mental health category, and almost half of them were in the abnormal category, while only a few were borderline. The study results also demonstrate a significant relationship between smartphone addiction and adolescent mental health. Therefore, it is essential for the school to provide guidance and counseling services to assist students who may be struggling with mental health issues. With the right support, these students can receive the necessary assistance to overcome any challenges they may be facing.

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