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# THE ASSOCIATION BETWEEN ANXIETY AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER SYMPTOMS AMONG PRIMARY SCHOOL STUDENTS

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## ABSTRACT

**Aims:** Anxiety frequently co-occurs with Attention-Deficit/Hyperactivity Disorder (ADHD) and may influence its manifestation in children. This study aimed to evaluate the association and risk of anxiety with ADHD symptoms among elementary school students.

**Study design:** An analytical observational study with a quantitative cross-sectional approach.

**Place and Duration of Study:** This study was conducted at Tanjung Duren Selatan 01 Pagi Public Elementary School, Jakarta, from November 10 to 28, 2025.

**Methodology:** A total of 120 students aged 10–12 years participated in this study. Sociodemographic data were collected using a structured questionnaire. ADHD symptoms were assessed using the Indonesian Hyperactive Child Behavior Rating Scale (SPPHA) with a cut-off score >30. Anxiety levels were measured using the Revised Children's Manifest Anxiety Scale (RCMAS), with scores of 20–28 indicating high anxiety. The association between anxiety and ADHD symptoms was analyzed using the chi-square test, with a  $P$ -value <0.05 considered statistically significant. Odds ratios were calculated to determine risk.

**Results:** Most participants were female (59.2%), 11 years old (51.7%), and in fifth grade (53.3%), with parents mostly adults (97.5%) and having secondary education (69.2%). Low-risk ADHD was present in (74.2%), while (67.5%) displayed typical anxiety levels. A significant link between high anxiety and ADHD symptoms was identified ( $P = 0.028$ ), with elevated anxiety increasing ADHD risk by 2.539 times (OR = 2.539; 95% CI = 1.090–5.916).

**Conclusion:** This research found a significant correlation between anxiety and ADHD symptoms, with anxious students more than twice as likely to exhibit ADHD symptoms. These results underscore the need for early detection and mental health education, involving families, schools, and healthcare professionals, to address anxiety's potential impact on ADHD in children, though further validation of these predictors is necessary.

**Keywords:** Anxiety; Attention-Deficit/Hyperactivity Disorder; ADHD symptoms; Primary school students

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## 23 1. INTRODUCTION

24

25 Attention-Deficit/Hyperactivity Disorder (ADHD) is a persistent neurodevelopmental disorder  
26 characterized by inattention, hyperactivity, and impulsivity (Juniar & Setiawati, 2014). These  
27 symptoms generally appear in childhood and often continue into adulthood. According to the  
28 DSM-V, ADHD must begin before the age of 12, persist for at least six months, and occur in  
29 at least two separate settings, such as home and school (American Psychiatric Association,  
30 2022). The exact cause of ADHD is still unknown; however, various risk factors have been  
31 identified, including genetics, environment, parental socioeconomic status, parental education  
32 level, parental age, exposure to secondhand smoke, and complications during pregnancy and  
33 childbirth (Adiputra, Sutarga, & Pinatih, 2015).

34 Centers for Disease Control (CDC) estimated that around 7 million children in the United  
35 States aged 3–17 had been diagnosed with ADHD in 2022 (Centers For Disease Control And  
36 Prevention(CDC), 2022). Data from the National Statistics Agency in 2007 showed that one in  
37 five children and adolescents under the age of 18 faced mental health issues, with 16 million  
38 of them experiencing mental health problems that include ADHD (Dahlan, Nabila, Rahmani,  
39 Kusumawicitra, & Karyani, 2022). A limited study conducted in 2010 in Jakarta showed an  
40 ADHD prevalence of 4.2%, most commonly found in school-aged children, particularly in boys  
41 (Adiputra, Sutarga, & Pinatih, 2015).

42 Anxiety or anxiety disorders are comorbidities that are commonly found and thought to play a  
43 role in influencing or exacerbating ADHD symptoms (Centers For Disease Control And  
44 Prevention(CDC), 2022). The Centers for Disease Control and Prevention (CDC) states that  
45 about 4 out of 10 children with ADHD experience anxiety. One theory that explains how anxiety  
46 can affect ADHD is the dual-pathway theory. This theory posits that there is dysfunction in the  
47 frontal executive system and dysfunction in the brain systems related to emotion and  
48 motivation (Bob & Privara, 2025). Research related to the relationship between anxiety and  
49 ADHD still shows varied findings—a study conducted by Oh et al.(Oh, Yoon, Kim, & Joung,  
50 2018) showed significant results ( $P<0.0001$ ), while a study by Gair et al. indicated that anxiety  
51 symptoms do not predict ADHD symptoms later on in preschool-aged subjects (Gair, Brown,  
52 Kang, Grabell, & Harvey, 2021).

53  
54 ADHD can affect multiple areas of life, including academic achievement, social interactions,  
55 and job performance. Students with ADHD may face a reduction in executive function and  
56 difficulties in sensory and cognitive processing related to perception and motor skills. Kids with  
57 ADHD often find it difficult to stay engaged in tasks or activities that demand attention and  
58 concentration(Kóbor et al., 2015). Thus, identifying the connection between anxiety and ADHD  
59 in school-aged children is essential to inform parents and educators that additional factors  
60 impact the child's quality and potential.

## 61 2. METHODS

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63 This research is an analytical observational study using a quantitative approach and a cross-  
64 sectional method to analyze the relationship between anxiety and ADHD symptoms in  
65 elementary school students. The research was conducted at Tanjung Duren Selatan 01 Pagi  
66 State Elementary School in West Jakarta from November 10 to 28, 2025. This study included  
67 adolescents aged 10-12 years old who were willing to participate in the research and whose  
68 parents or guardians signed informed consent, and excluded adolescents with a history of  
69 neurodevelopmental disorder and students who were taking psychotherapeutic medication.  
70 Students were recruited by consecutive non-random sampling.

71

72 The number of study subjects (sample size) was calculated by using (1) the formula for an  
73 infinite (unknown) population and (2) the formula for a finite (known) population:

$$74 \quad n_0 = \frac{Z\alpha^2 \times p \times q}{d^2}$$

75 Where  $n_0$ : required optimal sample size;  $Z\alpha$ : 1.96;  $p$ : prevalence of ADHD in Jakarta = 0.042  
76 (Adiputra, Sutarga, & Pinatih, 2015);  $q$ :  $(1 - p) = 0.958$ . Accuracy of measured prevalence  $p =$   
77  $<10\%$  equals  $\frac{1}{2} p$ , resulting in  $n_0 = 350$

$$78 \quad n = \frac{n_0}{(1 + \frac{n_0}{N})}$$

79 There were 140 students at Tanjung Duren Selatan 01 Pagi State Elementary School in West  
80 Jakarta; therefore,  $N = 140$ . From formula (2) with the addition of 15 percent of  $N$  to  
81 compensate for potential dropouts, the final sample size was 115.

82  
83 Data was collected by some questionnaire. The sociodemographic questionnaire is used to  
84 collect information on the respondent's personal data, including name, age, gender, medical  
85 history, medications taken, parents' ages, and level of education. ADHD symptoms were  
86 detected using the Indonesian Hyperactive Child Behavior Rating Scale (SPPAHI)  
87 questionnaire. This questionnaire assesses child's behavior over the past 6 months and was  
88 categorized into numerical scores arranged on a ratio scale. Scores on this questionnaire  
89 indicate a high risk of ADHD, with a cut-off score of more than 30 if completed by parents,  
90 more than 29 if completed by teachers, and more than 22 if completed by doctors. This  
91 questionnaire has been tested for its validity and reliability, with the lowest value 0,5174 and  
92 the highest value 0,9101 for each item (Muna, Jatnika, Purwono, & Siregar, 2023). The anxiety  
93 level was assessed with the Revised Children's Manifest Anxiety Scale (RCMAS). RCMAS  
94 has often been used in Indonesia both as a screening tool and as a tool for detecting anxiety  
95 levels. This questionnaire can be used to assess anxiety in children between the ages of 6 to  
96 19 years old, consisting of 28 questions with a "Yes" answer scored as 1 and "No" counted as  
97 0. Scores of 20-28 indicate anxiety, while the normal range is 0-19. RCMAS has high validity  
98 and a good reliability with  $\alpha=0,822$  (Yunita, Cahyaningsih, Ariyanti, & Sofyana, 2025).

99  
100 Data was analyzed using SPSS version 27. Categorical data was summarized as frequencies  
101 and percentages, while numeric data was summarized as median min-max. Chi-square was  
102 used to determine the relationship and risk between anxiety and ADHD with a statistical  
103 significant threshold of  $P < .05$ .

### 104 105 3. RESULTS

106  
107 Table 3 shows the distribution of respondents, with the majority of the study subjects were  
108 females 71 respondents (59,2%). Most respondents were 11 years old, consisting of 62  
109 respondents (51,7%), and were in the 5th grade 64 respondents (53,3%). The characteristics  
110 of respondents are divided by age and level of education. The majority of respondents' parents  
111 were adults 117 respondents (97,5%), and had a secondary level of education 83 respondents  
112 (69,2%). The ADHD variable: most respondents were in the low-risk category 89 respondents  
113 (74,2%), while the majority of respondents showed a normal anxiety level 81 respondents  
114 (67,5%).

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**Table 1. Distribution of subject characteristics (n=120)**

Variable	Mean ± SD/ median (min-max)	Frequency (n)	Percentage (%)
<b>Age (year)</b>	11 (10-12)		
10		14	11.7
11		62	51.7
12		44	36.7
<b>Gender</b>			
Boys		49	40.8
Girls		71	59.2
<b>Grade</b>			
5 <sup>th</sup>		64	53.3
6 <sup>th</sup>		56	46.7
<b>Parents' Age</b>			
Adults: 18-59 years		117	97.5
Elderly: 60-65 years		3	2.5
<b>Parents' Education Level</b>			
Primary education: Elementary school or no formal education		11	9.2
Secondary Education: Junior high school – Senior high school		83	69.2
Higher Education: Bachelor's degree or higher		26	21.7
<b>ADHD Symptoms</b>			
Low Risk: 0-30		89	74.2
High Risk: 31-105		31	25.8
<b>Anxiety</b>			
Normal: 0-19		81	67.5
High: 20-28		39	32.5

123 *Description: Symptoms of ADHD were measured using the Indonesian Hyperactive Child Behavior Rating*  
 124 *Scale (SPPAH) questionnaire categorized as: low risk (score 0-30), risk (31-105). Anxiety is measured using*  
 125 *the Revised Children's Manifest Anxiety Scale questionnaire, categorized as: normal (0-19), high (20-28).*

126

127 Referring to table 2, ADHD symptoms were commonly found in respondents with high levels  
 128 of anxiety, totaling 15 respondents (38,5%). This data indicates significant difference,  
 129 evidenced by statistical testing with a result of  $P = 0.028$ . Statistical result also shows that  
 130 subjects with high anxiety have a risk 2,539 times more vulnerable of experiencing ADHD  
 131 symptoms, with a significant outcome (OR = 2,539; 95% CI = 1,090 – 5,916).

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**Table 2. Distribution of subject characteristics (n=120)**

Variable	ADHD Symptoms		OR Value	95% CI	P Value
	Low Risk,n(%)	High Risk,n(%)			
<b>Anxiety</b>					
Normal	65 (80,2%)	16 (19,8%)	2,539	1,090-5,916	0.028*
High	24 (61,5%)	15 (38,5%)	1		

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\* $P$ -value < 0.05 indicates a significant relationship (Chi-square test).

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#### 4. DISCUSSION

Our research study classified 5th and 6th grade students into 3 groups based on age, with an adolescent age range of 10 to 12 years, predominantly at age 11, with 62 (51.7%) respondents. The age distribution of the subjects in this study is consistent with the age ranges designated for 5th and 6th graders by international institutions (UNESCO Institute for Statistics (UIS), 2025). The age of the subjects in this study also aligns with the ADHD diagnosis criteria according to DSM V, which states that ADHD can be diagnosed in children under the age of 12 (American Psychiatric Association, 2022). A study by Ayano et al. indicates that ADHD symptoms are difficult to detect before a child reaches the age of four and are most commonly found in children at the elementary school level (Ayano, Demelash, Gizachew, Tsegay, & Alati, 2023).

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These study results show that the majority of subjects were female, totalling 71 (59.2%) respondents. Epidemiologically, ADHD is more commonly found in males compared to females, with the ratio of boys diagnosed with ADHD being three times higher than that of girls (Ayano et al., 2023). The presence of differing symptoms of ADHD in males and females often leads to underdiagnosis in females. Symptoms of ADHD in females are often atypical, predominantly featuring inattention, daydreaming, and lack of focus. In contrast, in males, hyperactivity and impulsivity symptoms are more pronounced and disruptive (Williams et al., 2025). This study found a dominance among fifth-grade students, aged 11, and among female subjects, which was influenced by the distribution of subjects at the research site.

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The majority of parents in our research subjects are in the adult age group, with 171 (97.5%) respondents. According to a study conducted by Nomaguchi et al., parents within the adult age range tend to have emotional readiness, more mature psychosocial relationships, and more stable economic stability, which can be protective factors for children during their developmental period (Nomaguchi & Milkie, 2020).

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The educational level of our research subjects' parents is dominated by those with secondary education, accounting for 69.2% of participants. The level of education of the parents is said to influence the family's socioeconomic status and tends to impact parenting styles, understanding of child development, and problem-solving abilities (Hoff & Laursen, 2019). Parents with higher levels of education are more likely to apply a warm parenting style while still providing clear boundaries that support good emotional regulation in children (Pinquart, 2017). These findings illustrate the backgrounds of the subjects' parents in the research location.

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Our study shows that the majority of our subjects have a low risk of ADHD symptoms, totaling 89 (74.2%) respondents. According to a study conducted by Wimbari et al. in Yogyakarta, it was found that 45.85% of children experienced ADHD symptoms (Wimbari, 2023). There is a difference in results, as 31 (25.8%) subjects exhibited ADHD symptoms in our research. This difference is caused by variations in the questionnaires used, who completed them out, and the number of respondents participating in the study. That research utilized The Conners 3 Teacher Rating Scale questionnaire completed by teachers and involved students aged 6-12 years (Wimbari, 2023). Our study only involved respondents aged 10-12 years, which led to a significant difference in results.

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Our research found that the majority of subjects in our study had a normal level of anxiety, with 81 (67.5%) respondents. Based on research conducted on students aged 10 and 11, it was found that 79.3% of respondents experienced anxiety. In our study, there were 39 (32.5%) subjects who experienced high anxiety. This difference is due to the use of different

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25 185 instruments and a broader subject coverage in the previous research. That study used the  
186 Screen for Child Anxiety Related Disorders (SCARED) questionnaire, which categorizes  
187 anxiety into several types. It also included a larger number of respondents, totaling 135, all  
188 from the same grade level (Niman, Kumala Dewa, & Yunita Indriarini, 2021). Furthermore, a  
189 study conducted among school-aged adolescents in East Jakarta during the COVID-19  
190 pandemic reported an anxiety prevalence of 79.3%, indicating a substantially higher burden  
191 of anxiety during the pandemic period. Notably, the prevalence of anxiety observed in our  
192 study (39.5%) was higher than that reported among adolescents in Indonesia during the  
193 COVID-19 pandemic, which was 19.4%, suggesting variability in anxiety prevalence across  
194 populations and study contexts (Akbar & Yenny, 2022).

23 195 Our statistical test showed a significant relationship between anxiety and ADHD symptoms in  
196 primary school students ( $P < 0.028$ ). The significance of the results from this study aligns with  
197 previous research that states anxiety can exacerbate or cause ADHD symptoms. Several  
198 previous studies have shown similar results. The study conducted by Oh et al. indicated that  
199 anxiety is significantly related to the severity of ADHD symptoms, such as inattention,  
200 hyperactivity, impulsivity, and functional impairment, ( $P < 0.001$ ) (Oh et al., 2018). Furthermore,  
201 the study by Van de Meer et al. stated that the severity level of anxiety can influence the  
202 relationship between ADHD and cerebellar activity (van der Meer et al., 2018). Research  
203 conducted by Gair et al. showed different statistical results, indicating that anxiety did not  
204 predict ADHD ( $P = 0.865$ ). This study stated that subjects with anxiety did not experience  
205 significant changes in ADHD symptoms and tended to remain the same over the 3-year study  
206 period. This difference in results could be due to age differences among subjects, as that  
207 research used subjects who were 3 years old, which may have led to variation in questionnaire  
208 responses. That study used the BASC-PRS and the NIMH Diagnostic Interview Schedule for  
209 Children-IV to assess ADHD, completed by the subjects' parents. The results indicated that  
210 ADHD significantly affects anxiety, but anxiety did not significantly affect ADHD (Gair et al.,  
211 2021). Anxiety may interact with ADHD symptoms by impairing attention regulation and  
212 increasing emotional reactivity, which can intensify behavioral difficulties.

2 213 Our study shows that respondents with high anxiety are 2.539 times more vulnerable to  
214 experiencing ADHD symptoms with statistically significant results ( $OR = 2.539$ ;  $95\%CI = 1.090$   
215  $- 5.916$ ;  $P = 0.028$ ). Previous studies have largely described the relationship between anxiety,  
216 ADHD, and factors or conditions that may arise among them (Schein et al., 2023). Farchakh  
217 et al. found that higher anxiety due to social media use is significantly associated with a higher  
218 risk of ADHD ( $OR = 1.043$ ;  $95\%CI = 1.013 - 1.075$ ;  $P < 0.005$ ) (Farchakh et al., 2022). A study  
219 conducted by Schein et al. indicates that anxiety is a comorbid factor that poses a risk for  
220 ADHD symptoms with an OR value of 1.24. Respondents with anxiety are said to have a 24%  
221 increased risk of being diagnosed with ADHD, while those receiving anxiety treatment also  
222 have a risk of up to 40%, which is suspected to be caused by medication side effects (Schein  
223 et al., 2023). A longitudinal study conducted over 2 years by Overgaard et al. showed different  
224 statistical results with a statistical value of ( $OR = 1.08$ ;  $95\%CI = 1.090 - 5.916$ ) (Overgaard et  
225 al., 2014). Statistical tests in the study indicated that children with anxiety do not have a  
226 significantly higher risk of experiencing ADHD. The difference in results between our study  
227 and Overgaard et al. may be due to the considerable age difference in subjects, as the study  
228 used children aged 18 months to assess anxiety and ADHD with a questionnaire that  
229 evaluated child behavior and was monitored until the children were three and a half years old.  
230 The influence of anxiety on ADHD symptoms may become more apparent as cognitive and  
231 emotional demands increase, leading anxiety to play a more noticeable role in the  
232 manifestation of ADHD symptoms.

21 233 Both diseases share a common underlying mechanism. This statement is in line with the  
234 cross-lagged analysis conducted by Murray et al., which shows that an increase in ADHD

235 symptoms when respondents were aged 13 to 15 resulted in relatively higher levels of anxiety.  
236 The study on respondents continued until they were 17 years old, and the results indicated  
237 that high levels of anxiety at age 15 led to an increase in ADHD symptoms by age 17 (Murray  
238 et al., 2022). Excessive anxiety or worry symptoms can lead to ADHD symptoms, such as  
239 inattention or hyperactivity, in children. There is still not much statistical evidence and strong  
240 theory to prove the unidirectional relationship between anxiety and ADHD; there are still many  
241 differing opinions on whether anxiety affects the symptoms of ADHD.

242  
243 According to the WHO Guidance for Mental Health, ADHD is part of child and adolescent  
244 mental and neurodevelopmental disorders that require attention within mental health systems  
245 and public policy. ADHD is presented within the broader framework of mental health conditions  
246 that can affect children's functioning, including learning, behavior, and social participation.  
247 WHO emphasizes that mental health conditions require an integrated service approach. This  
248 approach includes early detection and identification within primary health care and school  
249 settings, as well as functional-based assessments that extend beyond medical diagnosis  
250 alone. The guidance highlights the importance of non-pharmacological interventions, including  
251 psychosocial support, family education, and school-based interventions, to address the  
252 functional impact of ADHD. In addition, WHO underscores the need for cross-sectoral  
253 collaboration among health services, educational institutions, and social support systems to  
254 ensure comprehensive care. The document further affirms that children with mental health  
255 conditions, including ADHD, have the right to equitable, inclusive, and stigma-free access to  
256 mental health services (World Health Organization, 2025). Increasing educational awareness  
257 among families regarding anxiety and ADHD so that any minor symptoms observed in children  
258 can be reported immediately. The sooner they are detected, the better the outcomes will be.  
259 There'll be a need for collaboration among schools, families, and the surrounding community  
260 to create a healthy, supportive learning environment that enables children to develop  
261 optimally, both psychologically and academically.

262

## 263 **5. CONCLUSION**

264

265 This study showed that anxiety was significantly associated with ADHD symptoms among  
266 elementary school students, with anxious children having more than a twofold increased risk  
267 of developing ADHD symptoms. These findings indicate the need for early mental health  
268 screening, increased attention from healthcare professionals, and supportive involvement of  
269 families and schools to reduce anxiety and prevent its impact on ADHD symptoms in children.

270

## 271 **6. LIMITATIONS**

272

273 This study has several limitations. The cross-sectional design limits the ability to infer temporal  
274 or causal relationships between anxiety and Attention-Deficit/Hyperactivity Disorder (ADHD)  
275 symptoms. Anxiety levels and ADHD manifestations may fluctuate over time and across  
276 different contexts, which were not captured by single-time-point measurements. Furthermore,  
277 the reliance on questionnaire-based assessments may have introduced reporting and  
278 response biases, potentially affecting the accuracy of symptom classification and the strength  
279 of the estimated risk. However, these potential biases were minimized by using standardized  
280 questionnaires that have been previously validated and demonstrated good reliability, thereby  
281 enhancing measurement consistency and credibility. The questionnaires used in this study  
282 functioned as screening tools rather than diagnostic instruments. The identified anxiety levels  
283 and ADHD symptoms require confirmation through comprehensive clinical evaluation by  
284 qualified healthcare professionals.

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286 **ETHICAL APPROVAL**

287

288 This study was approved for ethical clearance by the Research Ethics Committee of the  
289 Faculty of Medicine, Universitas Trisakti (006/KER/FK/10/2025).

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