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Factors associated with generalized anxiety disorder in adolescents with cultural diversity: secondary data analysis

Dong-Hee Kim¹ and Yujin Kim^{2*}

Abstract

Background The number of culturally diverse adolescents in South Korea has reached 290,000 and is increasing every year; however, they still represent only 2.5% of the total adolescent population in middle and high schools, making them a minority. Adolescents experiencing cultural diversity are psychologically vulnerable because they grow up in bicultural environments and experience prejudice. Given the nature of generalized anxiety disorder, which can be exacerbated by stress, these adolescents may face an increased risk of developing the disorder not only because of developmental stress but also because of the stress of cultural adaptation. To identify the prevalence of generalized anxiety disorder among adolescents with cultural diversity, we analyzed related factors. Based on the results, strategies have been proposed to reduce anxiety in adolescents with cultural diversity and generalized anxiety disorders.

Methods This study used data from the 16th – 18th Korea Youth Risk Behavior Survey. Factors associated with generalized anxiety disorders were identified based on the social determinants of the health framework. Statistical analyses were conducted using IBM SPSS 25.0, and statistical methods were used for complex samples.

Results Among adolescents with cultural diversity, 12.8% exhibited generalized anxiety disorders. Among the structural factors, economic status, mother's education level, and gender were significantly associated with the disorder, whereas among the psychosocial factors, suicidal ideation, depressive mood, loneliness, perceived stress level, and subjective health status were significant factors influencing it.

Conclusion The factors identified in our research can be used as a resource for the early identification of culturally diverse adolescents who are vulnerable to generalized anxiety disorders. To prevent generalized anxiety disorder among adolescents with cultural diversity, school or community nurses can implement interventions to reduce loneliness or stress management programs.

Keywords Adolescent, Anxiety, Anxiety disorders, Epidemiology, Cultural diversity, Republic of Korea/epidemiology

Background

Generalized anxiety disorder (GAD) involves excessive worry and tension about uncontrollable daily events for at least six months, causing distress or difficulty in functioning. The symptoms of GAD include tension, anxiety, fatigue, impaired concentration, and hypersensitivity [1]. Excessive or persistent anxiety can cause significant distress and impair adolescents' daily functioning [2]. Additionally, anxiety disorders during adolescence increase the risk of anxiety disorders in adulthood [3], making it

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essential to explore factors related to GAD in adolescents for early detection and intervention.

As of 2020, the number of married immigrants in Korea has reached 373,000, more than tripling the number since the enactment of multicultural laws in 2007 [4]. With the increase in their number, the number of children from multicultural families is also increasing every year. Children from culturally diverse families grow up in bicultural environments and may face emotional difficulties and psychological issues because of social prejudice and discrimination against foreigners, leading to social maladjustment [5, 6]. Therefore, it is necessary to focus on their mental health issues.

Psychological alienation and incomplete parental attachment have been associated with GAD in adolescents [7, 8]. Adolescents from culturally diverse families in Korea have lower levels of attachment to and communication with their parents than those from non-culturally diverse families [9]. Additionally, symptoms of GAD in adolescents can worsen because of stress [10], and adolescents with cultural diversity face increased mental health risks because of both developmental and acculturation stress [11]. In addition, as of 2023, the number of multicultural adolescents attending middle and high schools was only 64,888, accounting for only 2.5% of all middle and high school students in Korea, indicating that they constitute a minority [12]. Discrimination against minorities has been found to increase anxiety-related disorders [13], suggesting that culturally diverse adolescents in Korea are more vulnerable to GAD.

GAD has been previously reported in Korean adolescents [14, 15]. However, to our knowledge, no study has specifically investigated its prevalence or associated factors in culturally diverse adolescents in Korea, who may be more vulnerable to GAD. Therefore, it is essential to identify the factors that contribute to GAD in culturally diverse adolescents and recognize high-risk groups within this population.

Previous research has examined factors related to GAD in adolescents, including sociodemographic variables such as age, gender, maternal education, residence, and economic status [14, 16]. Other studies have focused on psychosocial factors, such as suicidal ideation, loneliness, stress, and sleep [10, 17], as well as health behaviors, such as alcohol use, smartphone dependency, and physical activity [10, 15, 18]. However, these studies have often focused on specific aspects and lacked a holistic interpretation owing to the absence of a unified framework. The social determinants of health (SDoH) framework explores the influence of structural, physical, psychosocial, and behavioral factors on health outcomes [19]. Using this framework, we can comprehensively

understand the factors affecting GAD in culturally diverse adolescents.

Based on the SDoH framework, this study aimed to examine the prevalence of GAD among adolescents with cultural diversity and analyze the associated factors using data from the Korea Youth Risk Behavior Survey (KYRBS) conducted from 2020 to 2022.

Methods

Study design and description of primary data

This study comprised a secondary data analysis using the 16th–18th KYRBS. The KYRBS is an anonymous, self-reported, online survey conducted annually since 2005 among Korean students in grades 7–12 to assess the current status and trends in adolescent health behaviors. The survey is conducted jointly by Korea's Ministry of Education and the Korea Disease Control and Prevention Agency. It employs complex sampling methods to include adolescents from schools nationwide, thereby providing a reliable representative sample. Additionally, for the analysis of raw data, the managing agency provides a manual that includes weight values, stratification variables, and variable descriptions to ensure consistency in the analysis [20].

The KYRBS uses complex sampling designs involving stratification, clustering, and multistage sampling to obtain a representative sample. In the first stage, the population was divided into 117 strata based on 39 regions and school levels as stratification variables. Schools were selected using permanent random-number sampling. In the second stage, one class per grade was randomly selected using stratified cluster sampling. Weights were calculated based on the students' gender, school level, grade, selection rate, and response rate. The participation rates were as follows: 54,948 students (94.9%) in the 16th survey, 54,848 students (92.9%) in the 17th survey, and 51,850 students (92.9%) in the 18th survey [20].

Samples of secondary data analysis

In this analysis, adolescents with cultural diversity refer to those born and living in families with one Korean parent and one non-Korean parent, as defined by Korea's Multicultural Families Support Act [21]. Based on this, in this study, adolescents with cultural diversity were defined as those who responded "no" to one of the following questions: "Was your father born in Korea?" and "Was your mother born in Korea?" Those who responded "yes" or "no" to both questions were classified as belonging to a single culture. Students who did not provide their parents' nationality or study variables were excluded from the study. Consequently, 2,607 adolescents with cultural diversity and 101,673 single-culture adolescents were included in this analysis (Fig. 1).

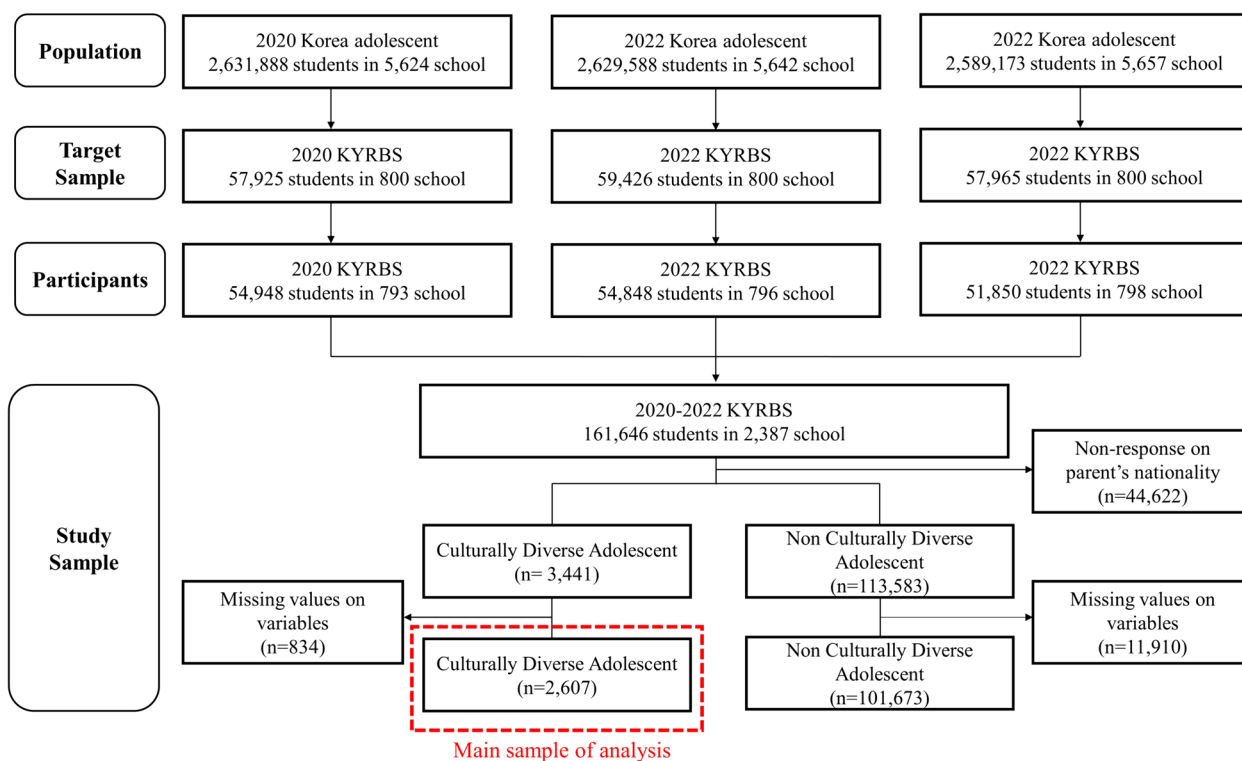


Fig. 1 Flow diagram of the study sample

Measurement

Dependent variables

The GAD was measured using a brief screening instrument, the GAD-7 tool. The tool demonstrated excellent internal reliability, with a Cronbach’s α of 0.92, and test-retest reliability, with an intraclass correlation of 0.83, at the time of its development. Convergent validity was also established through correlations with two anxiety measures: the Beck Anxiety Inventory ($r=.72$) and the anxiety subscale of the Symptom Checklist-90 ($r=.74$) [22]. The internal reliability of the Korean version of the tool was confirmed with a Cronbach’s α of 0.93, and convergent validity was established through correlations with the Beck Anxiety Inventory ($r=.78$) and the Penn State Worry Questionnaire ($r=.72$) [22, 23]. In a study reporting the psychometric properties of the GAD-7 for adolescents, the internal consistency was high, with Cronbach’s α coefficients ranging from 0.93 to 0.95. Additionally, GAD-7 scores showed a strong correlation with the Pediatric Anxiety Rating Scale ($r=.65$) [24, 25].

The tool consists of seven items rated on a 4-point scale ranging from 0 (“not at all”) to 3 (“nearly every day”), with higher scores indicating greater severity of GAD. According to the Diagnostic and Statistical Manual of Mental Disorders [26], a score of 10 or higher indicates the diagnostic threshold for the disorder. Based on this evidence

and the Korean Disease Control and Prevention Agency’s definition, GAD is considered prevalent if the score is 10 or higher [20]. The cutoff score plays a crucial role in identifying patients who require treatment or management [27, 28]. This helps ensure that resources are appropriately concentrated for patients requiring further care [29]. Therefore, our analysis was designed to classify the groups based on a 10-point threshold, focusing on students who were more vulnerable to anxiety and in need of ongoing support.

Independent variables

Structural determinants Structural determinants define an individual’s socioeconomic status [19]. Our study, included economic status, parental educational level, parental nationality, age, and gender. Economic status was assessed using the question, “What is your household’s economic status?” and coded as follows: high and middle-high as affluent, middle as average, and middle-low, and low as low. Parental education level was categorized as middle school graduate or lower, high school graduate, college graduate or higher, or unknown. Parental nationality was classified as foreign father-Korean mother or Korean father-foreign mother. Age was calculated using the birth year and month entered by the

student and was categorized into ages 12–18 years. Gender was reported as either male or female.

Intermediary determinants *Material circumstances* Material circumstances refer to physical environments, such as the location of residence and surroundings that can provide resources for health [19]. This study included both urban scale and multicultural support institutions. The urban scale of students' residences was categorized as metropolitan, medium-sized, or rural. The urban scale is information provided directly from raw data based on the areas where students conducted their responses. The multicultural support institutions include multicultural family support centers for family adaptation and rainbow youth centers, which help culturally diverse adolescents settle and build independence [30]. The support institutions were identified through the Multicultural Family Support Portal and institutional websites and categorized by South Korea's 17 administrative regions. The numbers in parentheses represent the total number of support institutions in each region: Seoul (104), Busan (46), Daegu (15), Incheon (31), Gwangju (9), Daejeon (22), Ulsan (7), Sejong (2), Gyeonggi (92), Gangwon (38), Chungbuk (20), Chungnam (22), Jeonbuk (21), Jeonnam (25), Gyeongbuk (25), Gyeongnam (24), and Jeju (11). These institutions were coded based on the students' places of residence, as indicated in the raw data.

Psychosocial circumstances Psychosocial factors included suicidal behavior, depressive mood, loneliness, perceived stress level, subjective health status, experience of violence, and sleep quality and duration. Suicidal behavior was categorized into suicidal ideation, plan, and attempt. Questions about suicidal ideation, specific plan to commit suicide, and suicidal attempt within the past 12 months were answered with either a “yes” or “no”. Depressive mood was measured using the categorical variable: “In the last 12 months, have you felt so sad or hopeless for two weeks or more in a row that you stopped doing some usual activities?” Respondents answered with a “yes” or “no”. Loneliness was measured using the question, “In the last 12 months, how often have you felt lonely?” Responses were categorized as “high” for always/often, “moderate” for sometimes, and “low” for rarely/never. Perceived stress level was assessed using the question, “How much stress do you usually feel?” Responses are categorized as “high” for extremely/a lot, “moderate” for a little, or “low” for hardly/not at all. Subjective health status was measured using the question, “How do you usually perceive your health?” Responses were categorized as “healthy” for very/quite healthy, “unhealthy” for very/quite unhealthy, and “average” is left as is. Experience of violence was coded as “none” if the student had

not undergone any hospital treatment owing to violence in the last 12 months and “yes” if there was any. Sleep quality was coded as high if the responses were “very sufficient” or “sufficient” and low otherwise. Sleep duration was calculated based on weekday and weekend average hours using the following formula: $\{(\text{weekday average hours} \times 5) + (\text{weekend average hours} \times 2)\} / 7$.

Behavioral and biological factors Behavioral and biological factors are actions that protect or harm health [19]. Smoking was defined as responding “yes” to using regular cigarettes, cigarette-type e-cigarettes, or liquid-type e-cigarettes for a lifetime. Alcohol drinking was assessed using the question, “Have you ever had more than one alcoholic drink?” Sexual intercourse was assessed using the question, “Have you ever had sexual intercourse?” Both questions were answered with either a “yes” or “no”. Smartphone usage time was calculated based on weekday and weekend usage over the past seven days using the following formula: $\{(\text{weekday average usage time} \times 5) + (\text{weekend average usage time} \times 2)\} / 7$. The World Health Organization recommends at least 60 min of exercise per day or at least three days of high-intensity and strength exercises per week for adequate physical activity in adolescents [31]. Based on this, we asked the question, “In the past 7 days, how many days did you engage in physical activity that made your heart beat faster than usual or made you feel out of breath, for a total of 60 minutes or more per day?” “In the past 7 days, how many days did you engage in vigorous physical activity that made you feel out of breath or sweaty?” “In the last 7 days, on how many days did you do exercises that build muscle strength, such as push-ups, sit-ups, lifting weights, dumbbells, barbells, or parallel bars?” If the respondent answered “for 7 or more days” to the first question or “three or more days” to the second and third questions, we defined it as regular physical activity.

Data analysis

All statistical analyses were performed using IBM SPSS version 25.0. The sample was drawn using a complex sample design method. We considered stratification variables, clustering variables, and weights in the analysis. Statistical analysis of national survey data must consider the complex sample design of the survey. By employing complex sample analysis methods, data derived from such designs can be optimized to allow for unbiased population estimates and inferences [32].

Differences in the prevalence of GAD and characteristics between adolescents with cultural diversity and monocultural adolescents were assessed using the chi-square test. Chi-square tests and general linear analysis were used to examine the differences based on the

presence or absence of GAD among adolescents with cultural diversity. Variables showing significant differences were included in the logistic regression analysis. In the logistic model, the effect size for each variable was calculated based on the regression coefficient and its standard error [33].

Ethical consideration

The KYRBS is officially approved by the National Statistical Office of Korea (Approval No. 117058). Students logged in anonymously, using their assigned identification numbers, to complete the online questionnaire. For secondary data analysis, an exemption approval was obtained from the Institutional Review Board of the affiliated university (approval no. OOO IRB/2024_66_HR).

Results

In our analysis, we compared 2,607 adolescents with cultural diversity and 101,673 adolescents without cultural diversity (Fig. 1). Among culturally diverse adolescents, boys comprised 47.9% of the sample (unweighted, $n=1,251$), whereas girls constituted 52.1% ($n=1,356$). The mean age was 14.57 years (standard error=0.04). In terms of geographic distribution, 36.0% of the participants resided in metropolitan areas ($n=894$), 48.1% in medium-sized cities ($n=1,223$), and 15.9% in rural regions ($n=490$). Among adolescents without cultural diversity, boys comprised 48.0% of the sample ($n=48,620$) with a mean age of 15.08 years (standard error=0.02). They were most likely to reside in small to medium-sized cities ($n=49,989$, 52.4%) and least likely to reside in rural areas ($n=7,264$, 5.4%).

Table 1 illustrates the extent of GAD experiences among adolescents and the differences in various factors based on cultural characteristics. Among adolescents without cultural diversity, 11.8% had GAD, compared to 12.8% of adolescents with cultural diversity. Although culturally diverse adolescents showed a higher prevalence rate than monocultural adolescents, this difference was not statistically significant ($\chi^2=2.01$, $p=.155$). Among the structural determinants, there were statistically significant differences in economic status ($\chi^2=586.81$, $p<.001$), parental education level (father: $\chi^2=2323.14$, $p<.001$, mother: $\chi^2=2085.92$, $p<.001$), and age ($F=142.45$, $p<.001$). In the material circumstances, there were statistically significant differences in the urban scale where they lived ($\chi^2=433.48$, $p<.001$). In terms of psychosocial circumstances, differences were observed in suicidal plan ($\chi^2=6.08$, $p=.009$), suicidal attempt ($\chi^2=14.93$, $p<.001$), loneliness ($\chi^2=10.07$, $p=.004$), subjective health status ($\chi^2=36.80$, $p<.001$), experience of violence ($\chi^2=3.32$, $p=.050$), sleep quality ($\chi^2=14.29$, $p<.001$), and sleep duration ($F=159.12$, $p<.001$). Among

the variables classified under behavioral and biological factors, there were significant differences in lifetime drinking ($\chi^2=3.80$, $p=.041$) and average smartphone usage time ($F=171.97$, $p<.001$).

Differences in factors of GAD in adolescents with cultural diversity

Table 2 shows the differences in the factors associated with GAD among adolescents with cultural diversity. Significant differences were found between adolescents with cultural diversity who experienced GAD and those who did not in terms of structural factors, such as subjective economic status ($\chi^2=18.53$, $p<.001$), mother's education level ($\chi^2=16.25$, $p=.003$), and gender ($\chi^2=28.99$, $p<.001$). Psychosocial factors such as suicidal ideation ($\chi^2=275.36$, $p<.001$), suicidal plan ($\chi^2=116.62$, $p<.001$), suicidal attempt ($\chi^2=78.31$, $p<.001$), depressive mood ($\chi^2=300.86$, $p<.001$), loneliness ($\chi^2=384.93$, $p<.001$), perceived stress level ($\chi^2=332.99$, $p<.001$), subjective health status ($\chi^2=125.09$, $p<.001$), experience of violence ($\chi^2=12.87$, $p=.001$), quality of sleep ($\chi^2=41.56$, $p<.001$), and sleep duration ($F=21.81$, $p<.001$) all showed differences. In terms of behavioral and biological factors, statistically significant differences were observed in smoking ($\chi^2=8.24$, $p=.007$), alcohol drinking ($\chi^2=9.80$, $p=.003$), sexual experience ($\chi^2=5.42$, $p=.036$), and smartphone usage time ($F=19.10$, $p<.001$). For comparison, the results for adolescents without cultural diversity are shown in Supplementary Table 1.

Factors associated with GAD among adolescents with cultural diversity

Table 3 shows the results of the logistic regression analysis based on statistically significant factors for GAD. According to the SDoH framework, structural factors influence intermediary determinants [19]. Based on this framework, structural factors were entered into Model 1, followed by intermediary determinants in Model 2. Model 1 had a Cox–Snell R^2 of 0.022 and Nagelkerke R^2 of 0.041, while Model 2 had a Cox–Snell R^2 of 0.206 and Nagelkerke R^2 of 0.386.

In Model 1, the probability of having GAD was higher when individuals felt subjectively poor compared to when they felt affluent (adjusted odds ratio, aOR=2.00, 95% confidence interval, CI [1.38–2.89]), and the difference was also statistically significant for those who felt that their economic state was average (aOR=1.43, 95% CI [1.01–2.02]). If the mother was a middle school graduate or less, the aOR was significantly higher compared to the group with a college graduate or higher (aOR=2.06, 95% CI [1.29–3.29]). The aOR was significantly higher for female students than that for male students (aOR=1.90, 95% CI [1.47–2.45]).

Table 1 Differences in prevalence of GAD and characteristics of adolescents based on cultural factors

Variables	Adolescents with cultural diversity (weighted, <i>n</i> = 34,229.69)	Adolescents without cultural diverse (weighted, <i>n</i> = 1,655,402.53)	χ^2 (<i>p</i>)
	unweighted <i>n</i> (estimate %)	unweighted <i>n</i> (estimate %)	
GAD			
Yes	330(12.8)	11,895(11.8)	2.01 (0.155)
No	2,277(87.2)	89,778(88.2)	
Structural determinants			
Economic status			
Affluent	562(22.2)	43,256(43.5)	586.81 (< 0.001)
Average	1,469(55.8)	48,451(47.1)	
Poor	576(22.0)	9,966(9.5)	
Father's education level			
Middle school graduate or below	252(9.5)	1,107(1.0)	2323.14 (< 0.001)
High school graduate	848(33.0)	21,337(20.2)	
College graduate or above	552(23.1)	60,560(61.8)	
Don't know	995(34.4)	18,669(17.1)	
Mother's education level			
Middle school graduate or below	197(7.2)	870(0.8)	2085.92 (< 0.001)
High school graduate	649(25.9)	24,879(23.8)	
College graduate or above	645(27.5)	59,350(60.2)	
Don't know	1,116(39.4)	16,574(15.2)	
Parental nationality			
Father, Foreign	149(6.6)	-	-
Mather, Foreign	2,458(93.4)	-	-
Age ^a	14.57(0.04)	15.08(0.02)	142.45 (< 0.001)
Gender			
Male	1,251(47.9)	48,620(48.0)	0.02 (0.899)
Female	1,356(52.1)	53,053(52.0)	
Material circumstances			
Urban scale			
Metropolitan	894(36.0)	44,420(42.2)	433.48 (< 0.001)
Medium-sized city	1,223(48.1)	49,989(52.4)	
Rural	490(15.9)	7,264(5.4)	
Number of multicultural support institutions ^a	48.46(0.86)	-	-
Psychosocial circumstances			
Suicidal ideation			
Yes	346(13.1)	12,193(12.0)	2.54 (0.096)
No	2,261(86.9)	89,480(88.0)	
Suicidal plan			
Yes	112(4.5)	3,604(3.5)	6.08 (0.009)
No	2,495(95.5)	98,069(96.5)	
Suicidal attempt			
Yes	77(3.1)	1,995(1.9)	14.93 (< 0.001)
No	2,530(96.9)	99,678(98.1)	
Depressive mood			
Yes	698(27.0)	26,015(25.6)	2.20 (0.133)
No	1,909(73.0)	75,658(74.4)	
Loneliness			
High	440(17.2)	15,581(15.3)	10.07 (0.004)

Table 1 (continued)

Variables	Adolescents with cultural diversity (weighted, <i>n</i> = 34,229.69)	Adolescents without cultural diverse (weighted, <i>n</i> = 1,655,402.53)	χ^2 (<i>p</i>)
	unweighted <i>n</i> (estimate %)	unweighted <i>n</i> (estimate %)	
Moderate	990(38.1)	37,131(36.8)	
Low	1,177(44.7)	48,961(47.9)	
Perceived stress level			
High	970(36.7)	37,809(37.3)	2.06 (0.315)
Moderate	1,143(45.2)	44,243(43.7)	
Low	494(18.1)	19,621(19.0)	
Subjective health status			
Unhealthy	266(10.5)	8,750(8.7)	36.80 (< 0.001)
Average	734(29.1)	24,775(24.5)	
Healthy	1,607(60.5)	68,148(66.8)	
Experience of violence			
Yes	42(1.6)	1,195(1.2)	3.32 (0.050)
No	2,565(98.4)	100,478(98.8)	
Quality of sleep			
Low	1,850(71.2)	75,649(74.8)	14.29 (< 0.001)
High	757(28.8)	26,024(25.2)	
Average sleep duration ^a (m ^b)	434.12(1.84)	410.45(0.50)	159.12 (< 0.001)
Behavioral and biological factors			
Lifetime smoking			
Yes	204(8.5)	8,884(8.8)	0.32 (0.555)
No	2,403(91.5)	92,789(91.2)	
Lifetime drinking			
Yes	732(29.2)	31,600(31.2)	3.80 (0.041)
No	1,875(70.8)	70,073(68.8)	
Sexual intercourse			
Yes	96(4.2)	4,144(4.2)	0.00 (0.995)
No	2,511(95.8)	97,529(95.8)	
Average smartphone usage time ^a (m ^b)	352.12(4.26)	296.29(1.20)	171.97 (< 0.001)
Regular physical activity			
Yes	1,038(39.0)	40,075(38.6)	0.14 (0.709)
No	1,569(61.0)	61,598(61.4)	

^a General linear model for complex samples, estimated mean (Standard Error), adjusted Wald F (*p*)

^b m = minutes

In Model 2, which includes intermediary determinants, participants with suicidal ideation had a higher aOR compared to those without suicidal ideation (aOR=1.80, 95% CI [1.26–2.57]). Additionally, feeling depressive mood (aOR=2.56, 95% CI [1.86–3.52]) and high loneliness (aOR=3.72, 95% CI [2.43–5.69]) were important factors associated with GAD. Compared to adolescents with cultural diversity who perceived low stress level, those who perceived high stress (aOR=8.33, 95% CI [4.04–17.18]) or moderate stress (aOR=2.17, 95% CI [1.02–4.65]) showed significantly higher aOR. Subjective health status was also statistically significant, as

adolescents who rated their health as poor had a higher probability of having GAD compared to those who rated their health as good (aOR=1.79, 95% CI [1.15–2.77]). The logistic regression analysis results for adolescents without cultural diversity are presented in Supplementary Table 2 as reference.

Discussion

This study aimed to assess the level of GAD in culturally diverse adolescents and identify related factors using national survey data. The results showed that 12.8% of adolescents with cultural diversity had GAD, compared

Table 2 SDoH factors of GAD in adolescents with Cultural Diversity ($n = 34,229.69$, weighted)

Variables	Weighted % GAD		$\chi^2(p)$
	Yes	No	
Structural determinants			
Economic status			
Affluent	8.6	91.4	18.53 (<0.001)
Average	12.7	87.3	
Poor	17.0	83.0	
Father's education level			
Middle school graduate or below	15.3	84.7	4.96 (0.237)
High school graduate	13.7	86.3	
College graduate or above	13.2	86.8	
Don't know	10.9	89.1	
Mother's education level			
Middle school graduate or below	21.7	78.3	16.25 (0.003)
High school graduate	11.7	88.3	
College graduate or above	11.0	89.0	
Don't know	13.0	87.0	
Parental nationality			
Father, Foreign	15.7	84.3	1.44 (0.281)
Mather, Foreign	12.5	87.5	
Age ^a	14.66 (0.10)	14.56 (0.04)	0.97 (0.326)
Gender			
Male	9.1	90.9	28.99 (<0.001)
Female	16.1	83.9	
Material circumstances			
Urban scale			
Metropolitan	12.2	87.8	1.39 (0.515)
Medium-sized city	13.5	86.5	
Rural	11.7	88.3	
Number of multicultural support institutions ^a	50.54(1.96)	48.15(0.68)	1.21 (0.272)
Psychosocial circumstances			
Suicidal ideation			
Yes	40.6	59.4	275.36 (<0.001)
No	8.5	91.5	
Suicidal plan			
Yes	44.4	55.6	111.62 (<0.001)
No	11.3	88.7	
Suicidal attempt			
Yes	45.2	54.8	78.31 (<0.001)
No	11.7	88.3	
Depressive mood			
Yes	31.4	68.6	300.86 (<0.001)
No	5.9	94.1	
Loneliness			
High	39.9	60.1	384.93 (<0.001)
Moderate	11.1	88.9	
Low	3.8	96.2	
Perceived stress level			
High	28.3	71.7	332.99 (<0.001)

Table 2 (continued)

Variables	Weighted % GAD		$\chi^2(p)$
	Yes	No	
Moderate	4.7	95.3	
Low	1.2	98.8	
Subjective health status			
Unhealthy	31.3	68.7	125.09 (<0.001)
Average	16.1	83.9	
Healthy	7.9	92.1	
Experience of violence			
Yes	31.2	68.8	12.87 (0.001)
No	12.5	87.5	
Quality of sleep			
Low	15.4	84.6	41.56 (<0.001)
High	6.1	93.9	
Average sleep duration ^a (m ^b)	410.98(5.27)	437.50(1.90)	21.81 (<0.001)
Behavioral and biological factors			
Lifetime smoking			
Yes	18.9	81.1	8.24 (0.007)
No	12.2	87.8	
Lifetime drinking			
Yes	15.9	84.1	9.80 (0.003)
No	11.4	88.6	
Sexual intercourse			
Yes	20.0	80.0	5.42 (0.036)
No	12.4	87.6	
Average smartphone usage time ^a (m ^b)	404.58(12.89)	344.45(4.44)	19.10 (<0.001)
Regular physical activity			
Yes	12.1	87.9	0.63 (0.435)
No	13.2	86.8	

^a General linear model for complex samples, estimated mean (Standard Error), adjusted Wald F (p)

^b m = minutes

to 11.8% of adolescents without cultural diversity. Among the SDoH factors, structural and psychosocial factors were associated with GAD in culturally diverse adolescents. Specifically, economic status, mother's educational level, gender, suicidal ideation, loneliness, perceived stress level, and subjective health status were related to the prevalence of GAD in culturally diverse adolescents. In the logistic model, the effect size of the mother's education level (being a middle school graduate or below) was greater among adolescents with cultural diversity than among those without cultural diversity (Supplementary Table 2). The effect sizes of the other factors were similar or slightly smaller.

Reports on the prevalence of GAD using the GAD-7 indicated that 10.1% of adolescents in Nigeria [34] and 10.0% in Germany [35] have GAD. Notably, the prevalence of GAD in our sample (12.8%) was higher than that

in adolescents from other countries. Our results aligned with those of Blackwell [36], indicating that ethnic minorities have higher GAD-7 scores compared to the national average. Moreover, the prevalence of GAD in culturally diverse adolescents found in this study was higher than that of other mental health issues such as depression (4.4%), Attention-Deficit/Hyperactivity Disorder (9.8%), and Behavioral and Conduct Problems (8.9%) [37]. However, GAD symptoms are often not recognized as disease symptoms and may be perceived as everyday issues [1], which could lead to missed opportunities for early detection. If left untreated, GAD can lead to panic and anxiety disorders in adulthood [3, 38]. Given the prevalence and characteristics of GAD in culturally diverse adolescents, more attention should be paid to it.

When culturally diverse adolescents perceive their families' economic status as poor, the prevalence of GAD

Table 3 Factors associated with GAD in adolescents with cultural diversity ($n = 34,229.69$, weighted)

Variable	Model 1				Model 2					
	aOR	95% CI Lower, upper		Effect size	Wald F (p)	aOR	95% CI Lower, upper		Effect size	Wald F (p)
Structural determinants										
Economic status (ref. Affluent)										
Poor	2.00	1.38, 2.89	0.381	7.22 (0.001)	1.50	0.94, 2.38	0.222	2.03 (0.132)		
Average	1.43	1.01, 2.02	0.196		1.56	1.01, 2.42	0.245			
Mother's education level (ref. College graduate or above)										
Middle school graduate or below	2.06	1.29, 3.29	0.398	3.43 (0.017)	1.68	1.03, 2.74	0.287	2.06 (0.104)		
High school graduate	1.02	0.71, 1.47	0.013		0.97	0.64, 1.48	-0.016			
Don't know	1.21	0.89, 1.65	0.106		1.27	0.89, 1.83	0.133			
Gender Female (ref. Male)	1.90	1.47, 2.45	0.354	24.63 (< 0.001)	1.31	0.94, 1.81	0.147	2.55 (0.111)		
Psychosocial circumstances										
Suicidal ideation Yes (ref. No)					1.80	1.26, 2.57	0.325	10.50 (0.001)		
Suicidal Plan Yes (ref. No)					1.13	0.62, 2.03	0.065	0.15 (0.694)		
Suicidal attempt Yes (ref. No)					1.06	0.57, 2.00	0.034	0.04 (0.850)		
Depressive Mood Yes (ref. No)					2.56	1.86, 3.52	0.518	33.50 (< 0.001)		
Loneliness (ref. Low)										
High					3.72	2.43, 5.69	0.724	23.44 (< 0.001)		
Moderate					1.50	1.00, 2.25	0.224			
Perceived stress level (ref. Low)										
High					8.33	4.04, 17.18	1.169	38.45 (< 0.001)		
Moderate					2.17	1.02, 4.65	0.428			
Subjective health status (ref. Healthy)										
Unhealthy					1.79	1.15, 2.77	0.320	3.40 (0.034)		
Average					1.27	0.91, 1.77	0.132			
Violence experience Yes (ref. No)					1.39	0.41, 4.75	0.181	0.28 (0.600)		
Quality of sleep Low (ref. High)					1.24	0.79, 1.94	0.118	0.89 (0.347)		
Average sleep duration					1.00	1.00, 1.00	-0.000	0.70 (0.403)		
Behavioral and biological factors										
Lifetime Smoking Yes (ref. No)					1.04	0.63, 1.70	0.020	0.02 (0.884)		
Lifetime Drinking Yes (ref. No)					1.07	0.77, 1.50	0.038	0.17 (0.684)		
Sexual intercourse Yes (ref. No)					0.80	0.38, 1.68	-0.126	0.36 (0.551)		
Average smartphone usage time					1.00	1.00, 1.00	0.000	1.37 (0.242)		
Cox and Snell R^2			0.022					0.206		
Nagelkerke R^2			0.041					0.386		

nearly doubles compared to that when they perceive themselves as affluent. This aligns with the systematic review findings that low financial status negatively affects children and adolescents [39]. Lower income reduces one's ability to prevent illness, and income inequality triggers harmful social comparison processes that impose social hierarchies, leading to stress and mental vulnerability [19]. Additionally, difficulties in a family's economic situation can be a source of worry that may cause anxiety [40]. The findings from the SDoH framework and previous studies explain the observed relationship between

low economic status and GAD among culturally diverse adolescents.

In our study, GAD was more prevalent when mothers were middle school graduates or lower compared to mothers who were university graduates or higher. This strong association with maternal education is similar to that reported in a previous study on parental education and depression [41]. Park et al. noted that mothers have a strong impact on their children's mental health, as they play a key role in child rearing and influence coping skills [41]. Given that mothers are the primary caregivers in

South Korea, GAD in culturally diverse adolescents may be more affected by their mothers' influence.

Our results suggest the importance of educational interventions for mothers of culturally diverse adolescents with GAD. This intervention could include information on GAD and guidance for support services. Education should be tailored as per the parents' language proficiency and cultural background. Although educational level is crucial in the SDoH framework [19], previous studies in South Korea have not examined the link between parental education and GAD among adolescents. Future research on the health of culturally diverse adolescents should consider parental education as an important variable.

The occurrence of GAD in girls was 1.9 times higher than in boys. This supports the findings of Mohammadi et al. and Jenkins et al. who reported a higher prevalence of GAD in female adolescents [16, 42]. Ethnically diverse female adolescents may experience fear and anxiety due to gender-based violence and discrimination in school and society [42], highlighting the need for further research on the specific background of anxiety among culturally diverse female adolescents in South Korea. Although it may be challenging for nurses to intervene or change structural factors, they could serve as a means of identifying culturally diverse adolescents who are more vulnerable to GAD at an early stage.

The GAD was 2.56 times more prevalent in adolescents with depressive mood than in those without depressive mood. The prevalence of depressive mood among Korean adolescents is high, at 30.9% [43], and Korean adolescents with cultural diversity have been reported to experience higher rates of depressive mood than monocultural adolescents [44]. Based on prior research and our results, interventions to reduce depressive mood in adolescents with cultural diversity are important for preventing GAD.

Our study revealed that loneliness is associated with GAD. As 82.8% of Korean multicultural families consist of married immigrants, one parent may not be fluent in Korean [4], and adolescents with cultural diversity may face issues with limited bilingualism. Research suggests that lack of linguistic and social skills can increase anxiety mediated by loneliness [45]. This partially explains the findings of this study. With only 2.5% of middle and high school students belonging to multicultural backgrounds [12], these adolescents may feel isolated because of their minority status. Interventions to reduce loneliness such as the use of peer helpers have been shown to facilitate interactions with socially isolated children [46]. The implementation of peer assistance programs within Korean schools has been found to effectively increase multicultural acceptance [47]. Therefore, to reduce

loneliness among culturally diverse adolescents, it is necessary to decrease anxiety through various interventions, as revealed in the existing research.

According to the Intolerance of Uncertainty Model, individuals with GAD perceive uncertain or ambiguous situations as stressful, leading to chronic worry and subsequent anxiety [48]. Our study found that individuals with high stress levels had an 8.33 times higher risk of developing GAD than those with low stress levels, which was consistent with the model. As multicultural adolescents experience significant stress from adapting to new cultures in terms of attitudes, values, and behaviors [49], implementing stress-reduction programs is crucial for preventing GAD in this population. Feen-Calligan et al. emphasized the reduction of stress and anxiety in refugees and immigrant adolescents using photovoice techniques as part of art therapy [50]. Based on these prior studies, school nurses and community health professionals should consider applying stress-reduction interventions to help decrease GAD among culturally diverse adolescents.

Our study found that adolescents with cultural diversity who perceived their health as poor had a 3.4 times higher risk of developing GAD than those who perceived their health as good. Research on adults has also shown that poor perceived health status increases the risk of GAD, which is consistent with our findings [51]. Perceiving one's health as poor can lead to increased fear and worry about health issues, which may in turn elevate anxiety levels [51]. Based on these results, providing education on easily accessible resources for discussing and seeking help with health concerns is essential for preventing GAD. School nurses can serve as valuable and accessible resources to provide support and interventions for students' health concerns [52]. School nurses can effectively assess the health status of culturally diverse adolescents and implement appropriate measures to alleviate anxiety. In particular, in Korea, as education is compulsory up to middle school, it is not difficult for multicultural adolescents to meet school nurses. Additionally, they can guide students with high GAD to community hospitals and agencies for further counseling and assistance. Employing various strategies to improve the subjective health status of culturally diverse adolescents is essential to reduce their anxiety.

Our study has some limitations. It primarily used data from current school students, possibly overlooking out-of-school youths who may display different anxiety patterns. This may have subtly skewed our findings. Reliance on self-reported data may also have introduced bias, although future studies using objective measures and multiple informant reports could improve the validity. Although we adjusted for known confounders, such as economic status and parental education, we could not eliminate the

possibility of residual confounding from unmeasured factors, such as personal or family mental health history. Future studies should include a broader range of variables to address these issues. Although we integrated data from over three years, our ability to determine causal relationships between the identified factors and GAD was somewhat limited by the cross-sectional nature of the data from each year. Longitudinal studies are needed to better elucidate the temporal dynamics and causal effects.

To the best of our knowledge, this is the first study in South Korea to investigate the factors related to GAD in adolescents from culturally diverse backgrounds. This study is significant as it uncovers factors related to the mental health of culturally diverse adolescents. Given their mental health vulnerability, a discussion is required on social support to prevent GAD with an emphasis on paying attention to this group. Therefore, qualitative and ethnographic studies are needed to explore the mechanisms underlying GAD in culturally diverse adolescents. Additionally, research on the development of interventions to reduce anxiety in culturally diverse adolescents is essential.

Conclusions

This study explored the prevalence of GAD and SDoH that influence GAD among culturally diverse adolescents. Key structural factors, such as economic status, mother's education level, and gender, and psychosocial factors, such as suicidal ideation, depressive mood, loneliness, perceived stress, and subjective health status, were identified as factors influencing GAD. These findings can aid in the early screening and intervention of at-risk culturally diverse adolescents by providing information, education, and support services. School and community nurses should focus on implementing stress management programs to reduce anxiety in this population. Our results were based on school students; however, the anxiety levels of students who had dropped out may be higher than those of enrolled students [53]. Hence, future research should address the needs of out-of-school youths to develop comprehensive support policies and programs for all culturally diverse adolescents with GAD.

Abbreviations

GAD	Generalized anxiety disorder
SDoH	Social determinants of health
KYRBS	Korea Youth Risk Behavior Survey
aOR	Adjusted odds ratio
CI	Confidence interval

Supplementary Information

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Supplementary Material 1

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Authors' contributions

D.K. and Y.K. conceived and designed the study. D.K. and Y.K. analyzed and interpreted the data. D.K. drafted the article. D.K. and Y.K. critically revised the article.

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Availability of data and materials

The raw data utilized in this study is accessible through the Korea Disease Control and Prevention Agency (KDCA) website at <https://www.kdca.go.kr/yhs/> upon completing the 'User Agreement for Raw Data Access'. The data used for the analysis in this study includes recalculations and modifications based on the original raw data. The processed datasets are not publicly available but can be obtained from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Since the research involved secondary data analysis and exclusively utilized anonymized data, the Institutional Review Board of Pusan National University granted a waiver of ethics approval and informed consent (Approval Number: PNU IRB/2024_104_HR).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

- Wittchen HU, Hoyer J. Generalized anxiety disorder: nature and course. *J Clin Psychiatry*. 2001;62:15–21.
- Freidl EK, Stroeh OM, Elkins RM, Steinberg E, Albano AM, Rynn M. Assessment and treatment of anxiety among children and adolescents. *Focus (Am Psychiatr Publ)*. 2017;15(2):144–56.
- Pine DS, Cohen P, Gurley D, Brook J, Ma Y. The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Arch Gen Psychiatry*. 1998;55(1):56–64.
- Korean Ministry of Gender Equality & Family. 2021 National Survey on Multicultural Families 2022. http://www.mogef.go.kr/mp/pcd/mp_pcd_s001d.do?mid=plc503&bbtSn=704929.
- Lee BS, Kim J-S, Kim K. Factors that affect the Subjective Health Status of adolescents in Multicultural families. *J Korean Public Health Nurs*. 2013;27(1):64–75.
- Youn YS, Park MH. Behaviors and Mental Health of Adolescents in multicultural families compared to general families. *J Korean Data Anal Soc*. 2014;16(3):1641–51.
- Hale WW III, Engels R, Meeus W. Adolescent's perceptions of parenting behaviours and its relationship to adolescent generalized anxiety disorder symptoms. *J Adolesc*. 2006;29(3):407–17.
- Newman MG, Shin KE, Zullig AR. Developmental risk factors in generalized anxiety disorder and panic disorder. *J Affect Disord*. 2016;206:94–102.
- Back H-Y, Kang HA. The effects of social capital in the multicultural family children and non-multicultural family children on their career maturity: the mediating effects of self efficacy and subjective well-being. *J School Social Work*. 2019;47:155–87.

10. Kim ML, Shin K. Exploring the major factors affecting generalized anxiety disorder in Korean adolescents: based on the 2021 Korea youth health behavior survey. *Int J Environ Res Public Health*. 2022;19(15):9384.
11. Perreira KM, Marchante AN, Schwartz SJ, Isasi CR, Carnethon MR, Corliss HL, et al. Stress and resilience: key correlates of mental health and substance use in the hispanic community health study of latino youth. *J Immigr Minor Health*. 2019;21:4–13.
12. Korea Ministry of Education. The 2023 Educational Basic Statistics Survey results 2023. <https://www.moe.go.kr/boardCnts/viewRenew.do?boardID=294&boardSeq=96191&lev=0&m=0204>. Cited 2024 April 16.
13. MacIntyre MM, Zare M, Williams MT. Anxiety-related disorders in the Context of Racism. *Curr Psychiatry Rep*. 2023;25(2):31–43.
14. Jung YH, Jang BN, Park M, Park E-C. Association between family financial decline due to COVID-19 and generalized anxiety disorder among Korean adolescents. *J Affect Disord*. 2022;309:411–7.
15. Lee Y-S, Joo JH, Shin J, Nam CM, Park E-C. Association between smartphone overdependence and generalized anxiety disorder among Korean adolescents. *J Affect Disord*. 2023;321:108–13.
16. Mohammadi MR, Pourdehghan P, Mostafavi S-A, Hooshyari Z, Ahmadi N, Khaleghi A. Generalized anxiety disorder: prevalence, predictors, and comorbidity in children and adolescents. *J Anxiety Disord*. 2020;73:102234.
17. Mullin BC, Pyle L, Haraden D, Riederer J, Brim N, Kaplan D, et al. A preliminary multimethod comparison of sleep among adolescents with and without generalized anxiety disorder. *Sleep and Developmental Psychopathology*: Routledge; 2018. p. 28–41.
18. Im S-J. The Associated factors with generalized anxiety disorder in Korean adolescents. *Korean Public Health Associ*. 2021;47(4):197–208.
19. Solar O, Irwin A. A conceptual framework for action on the social determinants of health. WHO Document Production Services; 2010. <https://www.who.int/publications/i/item/9789241500852>. Cited 2024 March 25.
20. Korea Disease Control and Prevention Agency. Guidelines for utilizing raw data of KoreanYouth health behavior survey 2023. <https://www.kdca.go.kr/yhs/home.jsp>. Cited 2024 March 25.
21. Korean Law Information Center. Multicultural families support act. 2020. <https://law.go.kr/LSW/eng/engLSsc.do?menuId=2&ion=lawNm&query=multicultu&x=0&y=0#libgcolor2>. Cited 2024 April 10.
22. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10):1092–7.
23. Ahn JK, Kim Y, Choi KH. The psychometric properties and clinical utility of the Korean Version of GAD-7 and GAD-2. *Front Psychiatry*. 2019;10:127.
24. Mossman SA, Luft MJ, Schroeder HK, Varney ST, Fleck DE, Barzman DH, et al. The generalized anxiety disorder 7-item scale in adolescents with generalized anxiety disorder: signal detection and validation. *Ann Clin Psychiatry*. 2017;29(4):227–a34.
25. Sun J, Liang K, Chi X, Chen S. Psychometric Properties of the Generalized Anxiety Disorder Scale-7 Item (GAD-7) in a Large Sample of Chinese Adolescents. *Healthcare*. 2021;9(12):1709.
26. Kroenke K, Spitzer RL, Williams JB, Löwe B. The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. *Gen Hosp Psychiatry*. 2010;32(4):345–59.
27. Beswick E, Quigley S, Macdonald P, Patrick S, Colville S, Chandran S, et al. The Patient Health Questionnaire (PHQ-9) as a tool to screen for depression in people with multiple sclerosis: a cross-sectional validation study. *BMC Psychol*. 2022;10(1):281.
28. Lidington E, Giesinger JM, Janssen SHM, Tang S, Beardsworth S, Darlington A-S, et al. Identifying health-related quality of life cut-off scores that indicate the need for supportive care in young adults with cancer. *Qual Life Res*. 2022;31(9):2717–27.
29. Villarreal-Zegarra D, Barrera-Begazo J, Otazú-Alfaro S, Mayo-Puchoc N, Bazo-Alvarez JC, Huaracaya-Victoria J. Sensitivity and specificity of the Patient Health Questionnaire (PHQ-9, PHQ-8, PHQ-2) and general anxiety disorder scale (GAD-7, GAD-2) for depression and anxiety diagnosis: a cross-sectional study in a Peruvian hospital population. *BMJ Open*. 2023;13(9):e076193.
30. Danuri. Multicultural family support center 2024. Available from: <https://www.liveinkorea.kr/portal/KOR/board/mlbs/boardList.do>. Cited 2024 March 25.
31. World Health Organization. Physical activity 2022. Available from: <https://www.who.int/en/news-room/fact-sheets/detail/physical-activity>. Cited 2024 March 25.
32. Saylor J, Friedmann E, Lee HJ. Navigating complex sample analysis using national survey data. *Nurs Res*. 2012;61(3):231–7.
33. Wilson DB. Practical meta-analysis effect size calculator [Online calculator]. n.d. Available from: <https://campbellcollaboration.org/research-resources/effect-size-calculator.html>. Cited 2024 Aug 20.
34. Victor Mbanuzuru A, Uwakwe R, Sochukwu Anyaoku C, Okwudili Ojimba A, Chinyere Mbanuzuru M, Ezenyeaku CA, et al. Generalized anxiety disorder screening using gad-7 among in-school adolescents of anambra state, Nigeria: a comparative study between urban and rural areas. *Child Adolesc Psychiatry Ment Health*. 2023;17(1):91.
35. Stahl-Pehe A, Selinski S, Bächle C, Castillo K, Lange K, Holl RW, et al. Screening for generalized anxiety disorder (GAD) and associated factors in adolescents and young adults with type 1 diabetes: cross-sectional results of a Germany-wide population-based study. *Diabetes Res Clin Pract*. 2022;184:109197.
36. Blackmore MA, Patel UB, Stein D, Carleton KE, Ricketts SM, Ansari AM, et al. Collaborative Care for low-income patients from racial-ethnic minority groups in primary care: Engagement and Clinical outcomes. *Psychiatr Serv*. 2022;73(8):842–8.
37. Bitsko RH, Claussen AH, Lichstein J, et al. Mental Health Surveillance Among Children — United States, 2013–2019. *MMWR Suppl*. 2022;71(Suppl–2):1–42.
38. Showraki M, Showraki T, Brown K. Generalized anxiety disorder: revisited. *Psychiatr Q*. 2020;91(3):905–14.
39. Reiss F. Socioeconomic inequalities and mental health problems in children and adolescents: a systematic review. *Soc Sci Med*. 2013;90:24–31.
40. Kim B, Kim DH, Jang SY, Shin J, Lee SG, Kim TH. Family economic hardship and adolescent mental health during the COVID-19 pandemic. *Front Public Health*. 2022;10:904985.
41. Park AL, Fuhrer R, Quesnel-Vallée A. Parents' education and the risk of major depression in early adulthood. *Soc Psychiatry Psychiatr Epidemiol*. 2013;48(11):1829–39.
42. Jenkins JH, Sanchez G, Miller EA, Santillanes Allande NI, Urano G, Pryor AJ. Depression and anxiety among multiethnic middle school students: age, gender, and sociocultural environment. *Int J Soc Psychiatry*. 2023;69(3):784–94.
43. Korea Disease Control and Prevention Agency. KoreanYouth Health Behavior Survey 2023.. <https://www.kdca.go.kr/yhs/>. Cited March 28 2024.
44. Jang J, Park EC, Lee SA, Choi Y, Choy YS, Kim W, et al. Association between Parents' Country of Birth and adolescent depressive symptoms: the early stages of Multicultural Society. *J Korean Med Sci*. 2018;33(15):e116.
45. Moeller RW, Seehuus M. Loneliness as a mediator for college students' social skills and experiences of depression and anxiety. *J Adolesc*. 2019;73:1–13.
46. Christopher JS, Hansen DJ, MacMillan VM. Effectiveness of a peer-helper intervention to increase children's social interactions. Generalization, maintenance, and social validity. *Behav Modif*. 1991;15(1):22–50.
47. Lee GJ, Kim YK, Ham EH. The effect of peer helper program on domestic students' Empathy and Multicultural Acceptability in Multicultural classrooms. *J Korea Elem Educ*. 2018;29(3):163–79.
48. Behar E, DiMarco ID, Hekler EB, Mohlman J, Staples AM. Current theoretical models of generalized anxiety disorder (GAD): conceptual review and treatment implications. *J Anxiety Disord*. 2009;23(8):1011–23.
49. Berry JW, Phinney JS, Sam DL, Vedder P. Immigrant youth: Acculturation, Identity, and adaptation. *Appl Psychol*. 2006;55(3):303–32.
50. Feen-Calligan H, Grasser LR, Nasser S, Sniderman D, Javanbakht A. Photo-voice techniques and art therapy approaches with refugee and immigrant adolescents. *Arts Psychother*. 2023;83:83.
51. Buneviciene I, Bunevicius R, Bagdonas S, Bunevicius A. The impact of pre-existing conditions and perceived health status on mental health during the COVID-19 pandemic. *J Public Health (Oxf)*. 2022;44(1):e88–95.
52. Best NC, Oppewal S, Travers D. Exploring School Nurse Interventions and Health and Education Outcomes: an integrative review. *J Sch Nurs*. 2018;34(1):14–27.
53. Singh K, Junnarkar M, Sharma S. Anxiety, stress, depression, and psychosocial functioning of Indian adolescents. *Indian J Psychiatry*. 2015;57(4):367–74.

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