Research Paper

Prevalence and Risk Factors of Depression Among Indonesian Adolescents

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ABSTRACT

Background: Depression affects an estimated 2.8% of adolescents aged 15–19 globally. In Indonesia, the 2023 Indonesia health survey (IHS) reported a national depression prevalence of 1.4%, with the highest rate (around 2%) reported among individuals aged 15–24 years. This study aimed to estimate the prevalence of depression and identify sociodemographic determinants, clinical determinants, and behaviors associated with depression in adolescents aged 15–19 years, based on representative national data from IHS 2023.

Methods: A cross-sectional analysis was conducted using IHS 2023 data, involving 52,531 adolescents aged 15–19. Variables included demographics, health status, lifestyle behaviors, and family history of mental health. Depression was assessed using the Mini international neuropsychiatric interview (MINI). Multivariable logistic regression was performed in R Studio (significance level <0.05).

Results: Key factors significantly associated with depression included living with a family member with a mental disorder (adjusted odds ratio [aOR]=5.741), having non-communicable diseases (NCD) (aOR=6.408), asthma (aOR=3.105), visual impairment (aOR=3.614), smoking (aOR=3.6), and recent alcohol use (aOR=3.16). Heavy physical activity (aOR=1.286) and hearing difficulties (aOR=1.641) were also significant predictors. In contrast, age, employment, marital status, and health insurance were not significantly associated with depression. Male adolescents had a significantly lower risk than females (aOR=0.192).

Conclusion: A multisectoral approach is needed, including adolescent mental health screening, education on healthy lifestyles free from tobacco and alcohol, support interventions for adolescents with chronic diseases or sensory disorders, and family involvement in the early detection and treatment of mental disorders.

Keywords: Adolescent, Cross-sectional studies, Health surveys, Mental disorders, Risk factors

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Introduction

Depression is one of the leading causes of disability worldwide and contributes significantly to the global burden of disease (GBD) [1]. It should not be confused with the momentary sadness that many people experience or the distress that comes with life's challenges. Rather, depression is a serious mental health disorder, characterized by profound and prolonged emotional suffering, and potentially leading to premature death from physical illness or suicide [2]. The impact not only burdens the individual but also has far-reaching effects on families and communities, through disruption of social functioning and reduced economic productivity [3].

Depression represents a major public health concern, ranking as the leading cause of non-fatal health loss globally [4]. According to the latest GBD Study, depressive disorders account for approximately 7.5% of all years lived with disability (YLDs), surpassing both anxiety and bipolar disorders in burden [5, 6]. In 2021, depressive disorders were responsible for 56.3 million disability-adjusted life years (DALYs), constituting 1.9% of total global DALYs [7]. Within the broader category of mental and substance use disorders, major depressive disorder contributes the largest share of YLDs [8, 6]. The burden of depression has escalated significantly since 1990, with notable increases in both prevalence and DALYs [7, 9]. In low- and middle-income countries, depressive disorders consistently rank among the top two causes of disability [6, 10].

Approximately 4.7% of the world's population experienced a depressive episode in the past 12-month period [2]. Among adolescents, the prevalence of depression shows alarming figures. World Health Organization (WHO) estimates that 1.1% of adolescents aged 10-14 years and 2.8% of those aged 15-19 years experience the disorder [11]. National data from the Indonesian health survey (IHS) in 2023 showed a depression prevalence of 1.4%, with the 15-24 age group recording the highest rate of around 2% [12]. One of the main symptoms of depression is a persistent depressed mood (feelings of sadness, irritability, or emptiness), accompanied by a loss of interest or pleasure in daily activities [11].

Depression in Indonesia shows significant variation across provinces, with reported prevalence ranging from 1.2% in Papua Barat to over 14% in Java Island, though actual rates may be higher in underserved rural and eastern regions [13, 14]. Limited access to psychiatric care and weak health reporting systems contribute to underdiagnosis in these areas. Cultural stigma and a lack of mental health awareness further discourage individuals from seeking help, especially outside urban centers [15]. Structural barriers such as travel distance and treatment costs are particularly severe in provinces, such as Papua, Nusa Tenggara Timur, and Papua Barat. In contrast, higher reported rates in Java likely reflect better access to diagnosis rather than a true increase in cases [14, 16].

The biopsychosocial framework explains adolescent depression as resulting from the interaction of biological, psychological, and social factors. Biologically, genetic vulnerability, neurochemical imbalances, and HPA axis sensitivity increase risk [17, 18]. Psychologically, adolescents may develop maladaptive thinking patterns, such as rumination and low self-esteem, which heighten susceptibility to depression [19, 20]. Social contributors include parental neglect, bullying, isolation, and economic hardship, which can both trigger and sustain depressive symptoms [21].

In Indonesian, a range of sociodemographic and behavioral variables has been linked to heightened depressive symptoms among youth. Specifically, female adolescents, those living with biological fathers only, or with non-parent guardians, and individuals without biological siblings are reported to be more susceptible to depression. This susceptibility is notably higher in cases where the mother is either unemployed or engaged in informal employment. Moreover, behavioral patterns, such as irregular sleep duration, tobacco use, frequent intake of sugar-sweetened beverages, and the presence of chronic health conditions necessitating continuous medical care further exacerbates the risk of depressive disorders in this population [22].

Recent studies suggest that psychological interventions, such as self-affirmation, can effectively reduce depressive symptoms, especially in youth with subclinical depression. In India, self-affirmation exercises led to immediate and lasting improvements in well-being, likely by enhancing self-worth and social connection [23]. A second study involving the same population confirmed both preventive and therapeutic benefits, with sustained symptom reduction even post-intervention [24]. These effects appear linked to strengthened internal coping mechanisms and personal meaning-making. Self-affirmation thus shows promise as a low-cost, scalable tool to support adolescent mental health in low-resource settings.

Although previous studies have examined the determinants of adolescent depression in Indonesia, there remains a notable absence of research specifically targeting individuals aged 15–19 years using nationally representative data from the 2023 IHS. To address this critical gap in the literature, the present study aims to investigate the prevalence and key determinants of depression among Indonesian adolescents within this specific age group. The findings from this research are expected to offer significant scientific contributions to the field of public health, particularly in the development of evidence-based strategies for mental health promotion and depression prevention. Furthermore, these insights may serve as a foundational resource for policymakers in designing agespecific screening programs, educational initiatives, and psychosocial interventions tailored to adolescents across familial, educational, and community settings.

Methods

Design and sample

This research utilized a cross-sectional approach, drawing on secondary data from the 2023 IHS (Survei Kesehatan Indonesia [SKI]), a nationally representative survey conducted by the Ministry of Health. Data were collected through structured interviews by trained enumerators. The IHS 2023 applied a multistage stratified cluster sampling design, with stratification by province and urban–rural classification. Clustering occurred at the census block level using the 2020 population census as the sampling frame. Households were then randomly selected within each block, and sampling weights were computed based on the inverse probability of selection and adjusted for non-response and post-stratification. This approach ensures national representativeness and minimizes selection bias. A sub-sample of adolescents aged 15–19 years was extracted from the full dataset using age-based filters to focus the analysis on this target group. Individuals with incomplete data on key variables were excluded, yielding a final sample of 52,531 respondents. Further details on IHS 2023 sampling methods, stratification procedures, and weighting can be accessed in the official technical report available [12].

Data collection and instrument

The dependent variable in this research was adolescent depression, assessed using the mini international neuropsychiatric interview (MINI), a brief, structured diagnostic tool developed by psychiatrists in the U.S. and Europe for mental health screening. The MINI, which consists of 10 binary-response (‘yes’ or ‘no’) items, was translated into Bahasa Indonesia and culturally adapted to ensure semantic and conceptual equivalence for local contexts [25]. Respondents were asked questions, such as: “In the past two weeks, have you been consistently sad, depressed or down, most of the day, nearly every day?”, “Have you been less interested in most things or less able to enjoy the things you used to enjoy?”, and “Did you feel tired or without energy, most of the time?” Youth aged 15–19 were classified as having depression if they responded ‘yes’ to at least two of the first three core items and at least two of the remaining seven items. The Indonesian version of the MINI has been psychometrically validated, showing sensitivity above 85% and specificity above 90%. It has been validated among adolescents and has been used previously in national surveys [26]; all interviewers underwent standardized training, and quality control measures, such as spot-checks and re-interviews, were applied to ensure diagnostic accuracy.

Independent variables encompassed a comprehensive set of sociodemographic and health-related indicators, each defined using standardized operational criteria. Sociodemographic variables included age (15–19 years, based on self-reported date of birth), sex (male or female), marital status (never married, married, or divorced), educational attainment (less than tertiary vs. tertiary education or higher, based on the highest level completed), employment status (student/unemployed vs. employed), and health insurance coverage (insured, uninsured, or unknown). These data were collected via structured self-report during face-to-face interviews. Health-related indicators included having a family member with a diagnosed mental disorder (based on the respondent’s report of a formal medical diagnosis), a personal history of asthma (self-reported physician diagnosis), and the presence of at least one non-communicable disease (NCD). NCD status was determined using a series of standardized questions: “Have you ever been diagnosed by a doctor with cancer, diabetes, heart disease, hypertension/high blood pressure, stroke, or chronic kidney failure (defined as kidney disease lasting at least three consecutive months)?” Respondents were classified as having a chronic disease if they answered “yes” to at least one of these six conditions. The same criteria were applied to assess parental history of chronic disease, based on the adolescent’s report. Self-reported impairments in vision and hearing were assessed by asking whether respondents had difficulty seeing or hearing even with aids such as glasses or hearing devices. Smoking status referred to current use of tobacco products (yes/no), and alcohol use was defined as any alcohol

consumption within the past 30 days. Physical activity was assessed using modified questions from the WHO global physical activity questionnaire within the WHO STEPS instrument, capturing the frequency and duration of moderate and vigorous activities across work, leisure, and transport domains. Activity volume was calculated using metabolic equivalent of task (MET-minutes/week), where vigorous activity (MET=8) was defined as ≥3 days/week with ≥1,500 MET-minutes/week, and moderate activity (MET=4) was defined as ≥5 days/week with ≥150 minutes/week [12].

Statistical analysis

Descriptive analysis was conducted to summarize the characteristics of all study variables. The chi-square test was used to assess the bivariate association between independent variables and depression, followed by multivariable logistic regression to identify significant predictors of depression among adolescents aged 15–19 years. Results were presented as adjusted odds ratios (aOR) with corresponding confidence interval (CI). Given the large sample size (n=52,531) and the exploratory nature of this analysis, a conventional significance threshold of $\alpha<0.05$ was used to balance statistical sensitivity and control for type II error. However, to reduce the risk of type I error due to multiple hypothesis testing across independent variables, a Bonferroni correction was applied by adjusting the significance threshold based on the number of comparisons. All estimates, including P and 95% CIs, were calculated using survey-adjusted procedures that incorporated sampling weights to account for the complex survey design and ensure national representativeness in accordance with the IHS sampling structure. All statistical analyses were conducted using RStudio.

Results

The analysis revealed several key predictors of depression among adolescents aged 15 to 19 years, with notable patterns across sociodemographic, health, and behavioral variables. Females had a higher prevalence of depression (2.18%) than males (0.80%); however, the multivariable model showed lower odds of depression among females compared with males (OR=0.36; 95% CI, 0.31%, 0.42%; P<0.001). Adolescents aged 19 had a lower odds of depression than those aged 15 (OR=0.69; 95% CI, 0.55%, 0.87%; P=0.0015), while higher educational attainment was associated with reduced risk (OR=0.8; 95% CI, 0.68%, 0.95%; P=0.008). Health-related factors showed the strongest associations: having a family member with mental illness (OR=6.04), a history of asthma (OR=4.01), having a NCD (OR=8.75), visual impairment (OR=4.83), and hearing impairment (OR=3.66), all significantly increased the odds of depression (all P<0.001). Smoking (OR=1.44; 95% CI, 1.2%, 1.71%; P<0.001) and alcohol use in the past month (OR=3.19; 95% CI, 2.3%, 4.31%; P<0.001) were also associated with higher odds of depression. Vigorous physical activity was linked to a slight increase in the odds of depression (OR=1.17; 95% CI, 1%, 1.37%; P=0.05). In contrast, marital status, employment, and health insurance ownership showed no significant association with depression (Table 1).

The results of multivariable logistic regression analysis identified several key predictors of depression among adolescents aged 15-19 years, with health-related and behavioral factors showing the strongest associations. Adolescents with a family member diagnosed with a mental disorder had significantly higher odds of experiencing depression (aOR=5.74; 95% CI, 3.37%, 9.21%; P<0.001), while those with a NCD such as cancer, diabetes, or chronic kidney failure were also at higher odds of depression (aOR=6.41; 95% CI, 3.42%, 11.17%; P<0.001). Visual impairment (aOR=3.61; 95% CI, 2.96%, 4.38%), asthma (aOR=3.11; 95% CI, 2.13%, 4.38%), and hearing impairment (aOR=1.64; 95% CI, 1.13%, 2.33%) further increased the odds of depression, highlighting the burden of chronic and sensory health conditions. Among behavioral factors, smoking was associated with over threefold increased odds of depression (aOR=3.6; 95% CI, 2.75%, 4.71%; P<0.001), and alcohol consumption in the past month was also strongly linked (aOR=3.16; 95% CI, 2.18%, 4.48%; P<0.001). Notably, adolescents who engaged in vigorous physical activity—defined as at least three days per week and ≥1,500 MET-minutes—also had a modest but significant increase in odds of depression (aOR=1.29; 95% CI, 1.09%, 1.51%; P=0.003), a finding that may reflect coping mechanisms or unmeasured stressors. In contrast, sociodemographic variables such as age, gender, marital status, education level, employment status, and health insurance ownership did not show significant associations with depression (all P>0.05) (Table 2). These results emphasize that health and behavioral vulnerabilities are more critical determinants of adolescent depression than demographic characteristics within this age group. Model performance was assessed using several statistical indicators. The Hosmer–Lemeshow test produced a P=0.00997, indicating poor model fit, which may result from model misspecification, omitted variables, or unaddressed nonlinear relationships. The Akaike information criterion (AIC) was 7497.868, suggesting moderate model quality, though this value is most useful when

Table 1. Respondent characteristics and their association with depression

Variables		No. (%)		OR	95% CI (Lower, Upper)	P
		Depression	No Depression			
Age	15	146(1.24)	11665(98.76)	Ref		Ref
	16	178(1.51)	11587(98.49)	0.81	0.65, 1.02	0.0679
	17	161(1.51)	10501(98.49)	0.82	0.65, 1.02	0.0773
	18	138(1.45)	9349(98.55)	0.85	0.67, 1.07	0.1671
	19	156(1.77)	8650(98.23)	0.69	0.55, 0.87	0.0015
Marital status	Never married	749(1.47)	50185(98.53)	Ref		Ref
	Married	27(1.79)	1481(98.21)	0.81	0.56, 1.23	0.3106
	Divorced	3(3.37)	86(96.63)	0.41	0.15, 1.72	0.1443
Gender	Male	212(0.8)	26319(99.2)	Ref		
	Female	567(2.18)	25433(97.82)	0.36	0.31, 0.42	<0.001
Highest education level	< Higher education	595(1.41)	41504(98.59)	Ref		
	≥ Higher education	184(1.76)	10248(98.24)	0.8	0.68, 0.95	0.008
Health insurance ownership	Not covered	181(1.62)	10995(98.38)	Ref		Ref
	Covered	594(1.45)	40446(98.55)	1.12	0.95, 1.32	0.182
	Unknown	4(1.27)	311(98.73)	1.23	0.52, 4.09	0.6267
Employment status	Not working/student	705(1.48)	47055(98.52)	Ref		
	Working	74(1.55)	4697(98.45)	0.95	0.75, 1.22	0.683
Family member with mental disorder	Yes	19(8.12)	215(91.88)	6.04	3.63, 9.45	<0.001
	No	760(1.45)	51537(98.55)	Ref		
Asthma	Yes	36(5.49)	620(94.51)	4.01	2.8, 5.57	<0.001
	No	743(1.43)	51132(98.57)	Ref		
Has NCD	Yes	15(11.36)	117(88.64)	8.75	4.87, 14.57	<0.001
	No	764(1.46)	51635(98.54)	Ref		
Visual impairment	Yes	157(5.76)	2570(94.24)	4.83	4.03, 5.77	<0.001
	No	622(1.25)	49182(98.75)	Ref		
Hearing impairment	Yes	38(5.03)	718(94.97)	3.66	2.58, 5.04	<0.001
	No	741(1.43)	51034(98.57)	Ref		
Smoking status	Yes	154(1.99)	7581(98.01)	1.44	1.2, 1.71	<0.001
	No	625(1.4)	44171(98.6)	Ref		
Alcohol in the last month	Yes	43(4.4)	934(95.6)	3.19	2.3, 4.31	<0.001
	No	736(1.43)	50818(98.57)	Ref		
Engaged in heavy physical activity	Yes	223(1.66)	13220(98.34)	1.17	1, 1.37	0.05
	No	556(1.42)	38532(98.58)	Ref		

OR: Odd ratio; CI: Confidence interval.

Table 2. Logistic regression analysis of depression factors in adolescents 15-19 years old

Variables	aOR	95% CI (Lower, Upper)	P
(Intercept)	0.021	0.002, 0.148	0.0002
Age (15)	1	0.937, 1.066	0.9937
Gender (male)	0.192	0.152, 0.24	<0.001
Marital status (never married)	0.675	0.218, 3.011	0.5449
Marital status (never married)	0.692	0.241, 2.976	0.5544
Highest education level (<higher education)	0.912	0.74, 1.125	0.3868
Employment status (not working/student)	1.103	0.856, 1.439	0.4607
Health insurance ownership (not covered)	1.052	0.442, 3.435	0.9204
Health insurance ownership covered)	1.189	0.494, 3.904	0.7357
Family member with mental disorder (yes)	5.741	3.367, 9.209	<0.001
Asthma (yes)	3.105	2.133, 4.379	<0.001
Has NCD (yes)	6.408	3.416, 11.171	<0.001
Visual impairment (yes)	3.614	2.964, 4.381	<0.001
Hearing impairment (yes)	1.641	1.125, 2.332	0.0076
Smoking status (yes)	3.6	2.752, 4.71	<0.001
Alcohol consumption in the last month (yes)	3.16	2.184, 4.484	<0.001
Engaged in heavy physical activity (yes)	1.286	1.09, 1.511	0.0025

OR: Odd ratio; CI: Confidence interval.

Hosmer-Lemeshow test (P)=0.00997; Deviance=7463.868; AIC (Akaike information criteria)=7497.868; F2=0.1.

comparing alternative models. The deviance value of 7463.868 indicates room for improvement in explaining variability in the outcome. The F2 score was 0.1, reflecting limited predictive ability, particularly in identifying true cases of depression. These results suggest that although key predictors were statistically significant, the model's overall predictive performance remains limited and may benefit from refinement.

Discussion

The main finding of this study is that the prevalence of depression among Indonesian adolescents aged 15-19 years in Indonesia is 1.77%. Figure 1 is slightly lower than the 2% depression prevalence reported among adolescents aged 5–24 years in the 2023 IHS. The results of logistic regression analysis showed that the main determinants of depression incidence in this study were family member with mental disorder, NCD, visual impairment, asthma, smoking status, alcohol consumption in the last month, hearing impairment, and engaged in heavy physical activity. These determinants can increase the risk of depression, whereas male gender serves as a protective factor that reduces the likelihood of depression. Meanwhile, age, marital status (never married), education level (<higher education), employment status (not working/student), and health insurance ownership were not significantly associated with adolescent depression.

The association observed in this study between having a family member with a mental disorder and adolescent depression is consistent with previous research reports which say that a family history of psychiatric disorders, including in grandparents, increases the risk of depression across generations due to a combination of genetic predisposition and maladaptive parenting patterns [27]. Adolescents whose parents have mental health disorders are at increased risk of developing depression due to

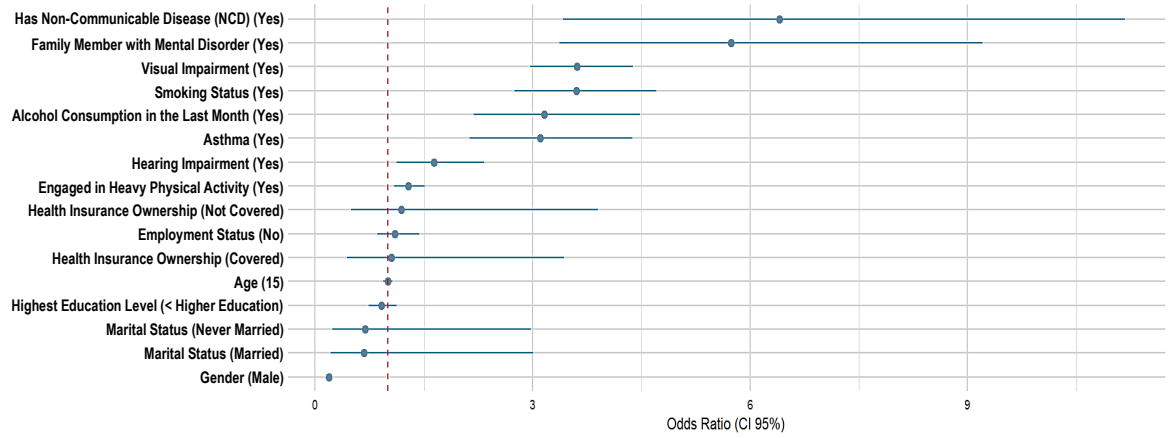

Figure 1. Visualizing odds ratios with 95%CI

complex interactions among genetic, psychosocial, and environmental factors [27]. For instance, daughters of depressed mothers are more likely to experience depression themselves, whereas sons of depressed mothers tend to have lower educational attainment [28]. Paternal depression is also associated with increased family conflict, particularly when both parents are affected. Moreover, paternal psychopathology independently predicts depressive symptoms in adolescents, suggesting both biological and psychosocial pathways of transmission [29].

These findings align with studies from both Western and Asian contexts. In China, intergenerational transmission of depression risk has been shown to occur, particularly through maternal depression and adolescent stress reactivity. A study involving 738 adolescents found that maternal and paternal depressive symptoms can be transmitted through rejecting parenting behaviors, with adolescent perceptual sensitivity moderating the effect in mother-child dyads—supporting a diathesis-stress model [30]. Longitudinal evidence further indicates that fluctuations in maternal depression predict corresponding changes in adolescent depressive symptoms, highlighting the role of negative parenting and stressful family environments in this transmission process [31].

Adolescents with diabetes have been shown to have depression rates 2–3 times higher than their healthy peers [32]. Similarly, approximately 11% of children and adolescents with chronic kidney disease (CKD) exhibit depressive symptoms, triggered by treatment burdens (e.g. dialysis), social isolation, and family stress [33]. The prevalence of psychiatric disorders in pediatric CKD patients ranges from 10% to 35%, depending on disease stage (e.g. post-transplantation, on dialysis, or pre-end-stage renal disease) and patient age (child or adolescent). Studies report that 7% of children and adolescents with CKD meet diagnostic criteria for depression, with an additional 5% reporting elevated depressive symptoms [34].

A systematic review and meta-analysis of 13 studies involving 822 participants estimated the pooled prevalence of depression among children and adolescents with visual impairment at 14% [35]. Increased depression risk among visually impaired adolescents is linked to social isolation, stigma, and reduced independence [36]. In addition to visual impairments, adolescents with severe to profound hearing loss also demonstrate higher levels of depression and anxiety [37]. This study also found that while high-intensity physical activity was associated with an increased risk of depression, physical inactivity carried an even higher risk for mental health issues, including a six-fold increase in anxiety, more than a five-fold increase in depression, and over an eight-fold increase in other mental disorders compared to physically active adolescents [38].

There is also a strong link between asthma and depression among adolescents, particularly when asthma is poorly controlled, as this can impede disease management and create a reinforcing cycle between physical and mental health problems. Adolescents with asthma experiencing high levels of stress are up to nine times more likely to develop depression compared to those with lower stress levels [39]. Unhealthy behaviors, such as smoking and alcohol consumption, further elevate depression risk. The bidirectional relationship between depression and these unhealthy behaviors becomes especially pronounced among adolescents with chronic conditions, such as asthma. These complex interactions highlight the need for a holistic approach to adolescent physical and mental healthcare [40]. While these associations are well-documented globally, their manifestation in Indonesia may be shaped by cultural and sys-

temic factors. For example, access to mental health care remains limited in rural areas, and societal stigma often prevents adolescents from seeking help. Moreover, Indonesia's collectivist family structures may function as either support systems or sources of pressure, depending on household mental health literacy. These cultural dynamics could mediate how risk factors influencemental health outcomes.

Based on the analysis, no significant relationship was found between marital status, education level, employment status, or health insurance ownership and the incidence of depression in adolescents. This finding contrasts with several international studies that suggest lower educational attainment and lack of employment increase depression risk [41, 42]. The discrepancy may be due to the homogeneous characteristics of the study population (most being students) or unmeasured confounders such as parental education, family income, or neighborhood environment.

In light of these findings, psychological interventions such as self-affirmation may serve as a complementary strategy to reduce depressive symptoms, particularly among adolescents at subclinical risk. Two experimental studies conducted in India demonstrated the curative and preventive benefits of self-affirmation among young adults with subclinical depression. Participants who received the intervention showed significantly lower depression scores both immediately post-intervention and at follow-up, suggesting sustained mental health improvements. The mechanism of action is thought to involve enhancement of self-worth, inner strengths, and positive social relationships, which may buffer against relapse even after the intervention ends. These findings support the potential for scalable, low-cost psychological tools to complement broader mental health strategies targeting youth populations [23, 24].

A limitation of this study lies in the dichotomous classification of depression—categorized only as depressed or not depressed—which restricts further analysis. Ideally, depression status could be analyzed as a continuous variable or score, allowing for more nuanced multivariate analyses of common mental health disorders in Indonesian adolescents, especially since both variables are available in the IHS dataset. This binary approach may mask variations in depression severity, hindering efforts to identify early or subclinical symptoms. In addition, the reliance on self-reported data introduces the possibility of reporting bias, especially considering cultural stigma that may lead adolescents to underreport emotional symptoms. Another important limitation is the potential influence of unmeasured confounders such as household income, parental education, or exposure to trauma, which were not available in the dataset but may significantly affect depression outcomes. Finally, the cross-sectional design limits causal inference, making it impossible to determine temporal relationships between risk factors and depression. Future research should consider using longitudinal designs and incorporating standardized psychological instruments to improve diagnostic accuracy and causal analysis.

Conclusion

The results suggest that adolescents with risk factors, such as having a family member with a mental disorder, NCD, visual impairments, asthma, smoking habits, alcohol consumption, hearing impairments, and high-intensity physical activity, are at greater risk of developing depression. Therefore, targeted preventive interventions are essential for these groups, including comprehensive mental health programs, effective management of chronic diseases, and public health campaigns to reduce smoking and alcohol use among adolescents. Incorporating culturally sensitive mental health education, improving access to adolescent-friendly mental health services, and addressing stigma are also crucial for effective implementation in the Indonesian context. Longitudinal studies are necessary to establish causal relationships between risk factors and depression outcomes. In addition, further exploration of unmeasured social determinants—such as socioeconomic status, parental education, and trauma exposure—is essential to provide a more comprehensive understanding of depression risk in this population.

Ethical Considerations

Compliance with ethical guidelines

All research procedures complied with ethical standards and were approved by the Research Ethics Committee of Universitas Dian Nuswantoro, Semarang, Indonesia (Code: 003369/Universitas Dian Nuswantoro/2025). Permission to use the data was granted by the Ministry of Health of the Republic of Indonesia (authorization No.: 2412B889773C1309).

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Authors' contributions

Conceptualization, study design, and data collection: Muhamad Zakki Saefurrohim, Rea Ariyanti, and Eka Putri Rahayu; Data analysis and interpretation: Muhamad Zakki Saefurrohim, Eka Putri Rahayu, and Agustin Putri Rahayu; Initial draft preparation: Muhamad Zakki Saefurrohim, Rea Ariyanti, and Agustin Putri Rahayu; Administrative, technical, and material support: Rea Ariyanti, Eka Putri Rahayu, and Agustin Putri Rahayu; Supervision: Agustin Putri Rahayu and Eka Putri Rahayu; Statistical analyses: All authors.

Conflict of interest

The authors declared no conflict of interest.

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