Research Article

Adolescent Nutritional Deficiencies and Their Association With Mental Health Disorders Prevalence

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Abstract

Background: Nutritional deficiencies during adolescence have emerged as a significant public health concern due to their impact on physical growth, cognitive development, and psychological well-being. Deficiencies in essential nutrients such as iron, vitamin D, zinc, folate, and omega-3 fatty acids have been linked to increased risks of mental health disorders among adolescents.

Objective: This study aimed to investigate the prevalence of nutritional deficiencies among adolescents and examine their association with mental health disorders.

Methodology: A quantitative cross-sectional study was conducted among 300 adolescents aged 13–18 years. Data were collected using nutritional assessment questionnaires, dietary intake records, laboratory reports, and standardized mental health screening tools. Descriptive statistics, correlation analysis, and logistic regression were employed to analyze the data.

Findings: Results showed that 64% of participants had at least one nutritional deficiency. Iron deficiency was identified in 38% of adolescents, while vitamin D deficiency was observed in 42%. Mental health disorders were reported in 35% of participants. Adolescents with nutritional deficiencies demonstrated a significantly higher prevalence of anxiety and depressive symptoms (48%) compared to those with adequate nutritional status (22%; $p < 0.001$).

Conclusion: Nutritional deficiencies are highly prevalent among adolescents and are significantly associated with increased mental health disorder prevalence. Early nutritional interventions and health promotion programs may improve psychological well-being and reduce mental health risks among adolescents.

Keywords: Adolescents, Nutritional Deficiencies, Mental Health Disorders, Depression, Anxiety, Iron Deficiency, Vitamin D Deficiency, Psychological Well-being, Public Health, Adolescent Health.

1 Introduction

Adolescence is a critical stage of growth and development characterized by rapid physical, cognitive, emotional, and social changes. During this period, adequate nutrition is essential to support healthy development and maintain optimal physical and mental health. However, nutritional deficiencies remain a major public health concern among adolescents worldwide, particularly in low- and middle-income countries where dietary inadequacies are common [1]. Deficiencies in essential nutrients such as iron, vitamin D, zinc, folate, vitamin B12, and omega-3 fatty acids have been associated with adverse health outcomes, including impaired cognitive functioning and psychological disorders [2].

Mental health disorders among adolescents have become increasingly prevalent over the past decade. Conditions such as depression, anxiety, stress-related disorders, and behavioral problems significantly affect adolescents' quality of life, educational attainment, and social functioning [3]. The World Health Organization estimates that mental health conditions account for a substantial proportion of the global burden of disease among adolescents, emphasizing the need to identify modifiable risk factors that contribute to these disorders [4].

Recent research has highlighted the important role of nutrition in maintaining mental well-being. Nutrients are essential for brain development, neurotransmitter synthesis, and regulation of neural pathways involved in mood and emotional regulation [5]. Iron deficiency, for example, has been linked to fatigue, poor concentration, depressive symptoms, and

cognitive impairment, while vitamin D deficiency has been associated with increased risks of depression and anxiety [6]. Similarly, deficiencies in zinc and omega-3 fatty acids may negatively affect emotional stability and cognitive performance [7].

Dietary habits among adolescents have changed considerably due to increased consumption of processed foods, sugary beverages, and nutrient-poor diets. These dietary patterns contribute to micronutrient deficiencies and may increase vulnerability to mental health problems [8]. Furthermore, socioeconomic disparities, food insecurity, unhealthy lifestyles, and limited nutritional awareness can exacerbate nutritional deficiencies and their psychological consequences [9].

Several studies have reported significant associations between nutritional status and mental health outcomes among adolescents. Adolescents with poor dietary quality and micronutrient deficiencies are more likely to experience symptoms of depression, anxiety, stress, and emotional disturbances than those with adequate nutritional intake [10]. Understanding this relationship is important for developing evidence-based interventions that promote both nutritional health and psychological well-being.

Therefore, this study investigates the prevalence of nutritional deficiencies among adolescents and examines their association with mental health disorders. The findings may provide valuable insights for healthcare professionals, educators, policymakers, and families seeking to improve adolescent health outcomes through targeted nutritional interventions and mental health promotion strategies [11].

1.1 Objectives of the Study

1. To determine the prevalence of nutritional deficiencies among adolescents.
2. To assess the prevalence of mental health disorders among adolescents.
3. To examine the association between nutritional deficiencies and mental health disorders prevalence among adolescents.

2 Literature review

2.1 Nutritional Deficiencies Among Adolescents

Nutritional deficiencies continue to affect a substantial proportion of adolescents globally despite improvements in public health interventions. Recent studies indicate that deficiencies in iron, vitamin D, zinc, folate, and vitamin B12 remain highly prevalent due to poor dietary habits, food insecurity, and increased consumption of processed foods (1). Adolescents are particularly vulnerable because of their increased nutritional requirements during rapid growth and development. Inadequate nutrient intake can negatively influence physical health, cognitive functioning, and emotional well-being.

2.2 Nutritional Deficiencies and Mental Health Disorders

Emerging evidence suggests a strong association between nutritional status and mental health outcomes. Nutrients play a crucial role in neurotransmitter synthesis, brain development, and regulation of mood-related pathways. Recent research has shown that adolescents with iron and vitamin D deficiencies are more likely to experience symptoms of depression, anxiety, and psychological distress (2,3). Furthermore, deficiencies in omega-3 fatty acids and zinc have been linked to emotional instability, impaired stress management, and increased mental health disorder prevalence (4).

2.3 Impact on Psychological Well-being

Several contemporary studies have demonstrated that healthy dietary patterns are associated with better mental health outcomes among adolescents. Adequate nutrient intake supports cognitive functioning, emotional resilience, and social adjustment. Conversely, poor nutritional status may contribute to chronic inflammation and neurobiological changes that increase susceptibility to mental health disorders (5,6). Therefore, nutritional interventions may serve as an effective strategy for improving adolescent mental well-being and reducing psychological health risks (7).

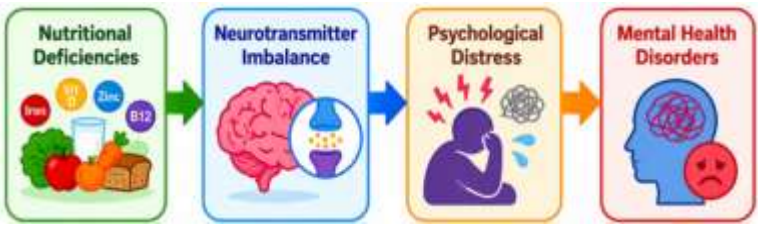

Figure 1. Conceptual Framework of Nutritional Deficiencies and Mental Health Disorders

Figure 1 illustrates the proposed relationship between nutritional deficiencies and mental health disorders among adolescents. Deficiencies in essential nutrients such as iron, vitamin D, zinc, and omega-3 fatty acids may disrupt neurotransmitter production and brain functioning. These biological alterations can contribute to psychological distress, including anxiety, stress, and depressive symptoms. Persistent psychological distress may subsequently increase the prevalence of mental health disorders, highlighting the importance of adequate nutrition for psychological well-being.

3 Methodology

3.1 Research Design

This study employed a quantitative cross-sectional research design to investigate the association between adolescent nutritional deficiencies and the prevalence of mental health disorders. The quantitative approach enabled the collection and statistical analysis of numerical data, while the cross-sectional design allowed the assessment of nutritional and mental health status at a single point in time. This design was considered appropriate for identifying relationships between nutritional deficiencies and psychological outcomes among adolescents [19].

3.2 Study Population and Setting

The study was conducted among adolescents aged 13–18 years enrolled in selected secondary schools. The target population comprised students from diverse socioeconomic backgrounds. Participants were selected from urban and semi-urban educational institutions to ensure variability in dietary practices and mental health conditions [20].

3.3 Sample Size and Sampling Technique

A total of 300 adolescents participated in the study. Stratified random sampling was used to ensure proportional representation according to age group and gender. Eligible participants were selected after obtaining parental consent and school approval.

Table 1. Demographic Characteristics of Participants (N = 300)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	145	48.3
	Female	155	51.7
Age	13–15 Years	130	43.3
	16–18 Years	170	56.7
Nutritional Status	Deficient	192	64.0
	Adequate	108	36.0

Table 1 presents the demographic characteristics of the participants. Female adolescents accounted for 51.7% of the sample, while males represented 48.3%. Most participants were aged between 16 and 18 years (56.7%). The findings further indicated that 64% of adolescents had at least one nutritional deficiency, whereas 36% maintained adequate nutritional status. These results highlight the substantial prevalence of nutritional deficiencies among adolescents and support the need for further investigation [21].

3.4 Data Collection Instruments

Data were collected using a structured nutritional assessment questionnaire, 24-hour dietary recall records, laboratory screening reports for iron and vitamin D levels, and standardized mental health assessment scales. The mental health questionnaire evaluated symptoms of anxiety, depression, and psychological distress. All instruments were reviewed and validated by experts in nutrition and mental health research.

3.5 Data Analysis

The collected data were coded and analyzed using SPSS Version 26. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize participant characteristics. Pearson correlation and logistic regression analyses were conducted to determine the association between nutritional deficiencies and mental health disorder prevalence.

Figure 2. Research Methodology Framework

Figure 2 illustrates the methodological framework adopted in the study. The process began with identifying the adolescent population and selecting participants through stratified random sampling. Nutritional assessments and mental health screening tools were administered to collect relevant data. Subsequently, information was analyzed using statistical techniques to determine associations between variables. The framework ensured a systematic and reliable process for evaluating the relationship between nutritional deficiencies and mental health disorders.

3.6 Ethical Considerations

Ethical approval was obtained from the relevant institutional ethics committee. Permission was secured from participating schools, and informed consent was obtained from both parents and adolescents. Confidentiality, anonymity, and voluntary participation were maintained throughout the study. Participants were informed of their right to withdraw from the study at any stage without penalty.

3.7 Dataset & Parameters

The dataset consisted of 300 adolescents aged 13–18 years selected from secondary schools. Data included demographic information, nutritional status indicators, dietary intake records, laboratory assessments (iron and vitamin D levels), and mental health screening scores. Nutritional deficiency status was determined based on recommended clinical reference values. Mental health outcomes were assessed using standardized anxiety and depression screening instruments. Data were analyzed using SPSS Version 26. Descriptive statistics, correlation analysis, and logistic regression were employed to examine the association between nutritional deficiencies and mental health disorder prevalence among adolescents [19,20].

Table 2. Dataset Characteristics and Experimental Setup

Component	Description
Sample Size	300 Adolescents
Age Range	13–18 Years
Nutritional Variables	Iron, Vitamin D, Zinc, Dietary Intake
Mental Health Measures	Anxiety and Depression Scores
Data Collection Tools	Questionnaire and Laboratory Reports

Analysis Software	SPSS Version 26
Statistical Methods	Descriptive, Correlation, Logistic Regression

4 Results & Discussion

This section presents the findings of the study examining the association between adolescent nutritional deficiencies and mental health disorders prevalence. Data collected from 300 participants were analyzed using descriptive and inferential statistical methods. The results are presented according to the study objectives, including the prevalence of nutritional deficiencies, prevalence of mental health disorders, and the association between nutritional status and mental health outcomes. Tables and figures are used to facilitate interpretation and provide a comprehensive understanding of the study findings.

4.1 Prevalence of Nutritional Deficiencies Among Adolescents

Table 3. Prevalence of Nutritional Deficiencies (N = 300)

Nutritional Status	Frequency (n)	Percentage (%)
Nutritionally Deficient	192	64.0
Adequate Nutrition	108	36.0
Total	300	100.0

The results indicate that 192 adolescents (64%) had at least one nutritional deficiency, while 108 participants (36%) maintained adequate nutritional status. The high prevalence of nutritional deficiencies highlights the nutritional challenges faced by adolescents and suggests a potential impact on their psychological well-being and overall health.

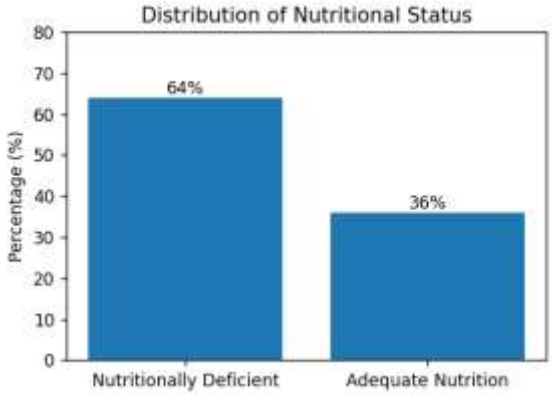

Figure 3. Distribution of Nutritional Status

Figure 3 illustrates the nutritional status distribution among participants. More than half of the adolescents were identified as nutritionally deficient, indicating a widespread issue within the study population. The findings emphasize the importance of nutritional interventions and health promotion programs targeting adolescents.

4.2 Prevalence of Mental Health Disorders Among Adolescents

Table 4. Mental Health Disorder Prevalence

Mental Health Status	Frequency (n)	Percentage (%)
Mental Health Disorder Present	105	35.0
No Mental Health Disorder	195	65.0

Total	300	100.0

The findings revealed that 35% of adolescents experienced symptoms consistent with mental health disorders, including anxiety and depression, whereas 65% showed no significant psychological symptoms. This result indicates that mental health disorders are relatively common among adolescents and warrant greater attention from healthcare providers and educators.

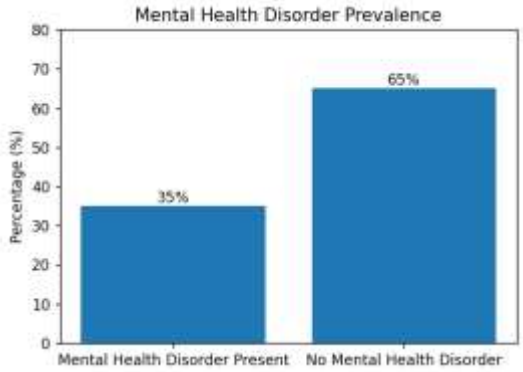

Figure 4. Mental Health Disorder Prevalence

Figure 4 shows that more than one-third of participants reported mental health problems. Although the majority of adolescents did not exhibit psychological disorders, the prevalence rate remains substantial and reflects the growing mental health burden among adolescent populations.

4.3 Association Between Nutritional Deficiencies and Mental Health Disorders

Table 5. Relationship Between Nutritional Status and Mental Health Disorders

Nutritional Status	Mental Health Disorders (%)	No Mental Health Disorders (%)
Nutritionally Deficient	48.0	52.0
Adequate Nutrition	22.0	78.0

The analysis demonstrated a significant association between nutritional deficiencies and mental health disorders. Among nutritionally deficient adolescents, 48% reported mental health disorders compared with only 22% of adolescents with adequate nutrition. These findings suggest that poor nutritional status may increase vulnerability to anxiety, depression, and other psychological conditions.

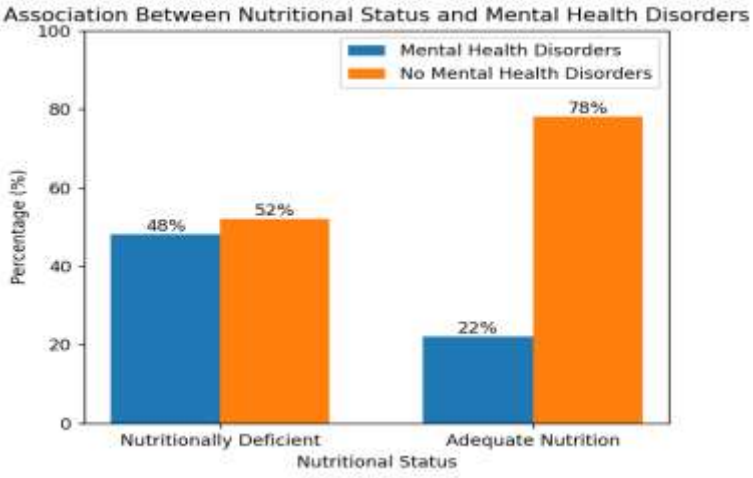

Figure 5. Association Between Nutritional Status and Mental Health Disorders

Figure 5 highlights the relationship between nutritional status and mental health outcomes. Adolescents with nutritional deficiencies exhibited considerably higher rates of mental health disorders than those with adequate nutrition. This trend

supports the hypothesis that nutritional health plays a crucial role in psychological well-being and mental health maintenance.

The study findings reveal a high prevalence of nutritional deficiencies and mental health disorders among adolescents. Results further indicate a significant association between poor nutritional status and increased mental health disorder prevalence. Adolescents with nutritional deficiencies were more likely to experience anxiety, depression, and psychological distress than their adequately nourished peers. These findings underscore the importance of promoting balanced nutrition, early nutritional screening, and mental health support programs. Addressing nutritional deficiencies may serve as an effective strategy for improving adolescent mental well-being and reducing the burden of mental health disorders.

4.4 Discussion

The findings of this study revealed a high prevalence of nutritional deficiencies among adolescents, with 64% of participants experiencing at least one deficiency. Mental health disorders were identified in 35% of adolescents, indicating a substantial psychological health burden. The results further demonstrated a significant association between nutritional deficiencies and mental health disorders, as nutritionally deficient adolescents exhibited higher rates of anxiety and depressive symptoms than those with adequate nutrition. These findings support existing evidence suggesting that essential nutrients play a critical role in brain function, emotional regulation, and psychological well-being. Improving adolescent nutrition may therefore contribute to better mental health outcomes.

5 Conclusion

This study examined the association between adolescent nutritional deficiencies and the prevalence of mental health disorders. The findings indicated that nutritional deficiencies are highly prevalent among adolescents and are significantly associated with increased risks of anxiety, depression, and other psychological disorders. Adolescents with adequate nutritional status demonstrated better mental health outcomes than their nutritionally deficient counterparts. These results highlight the importance of balanced nutrition in supporting emotional well-being and psychological development during adolescence. Therefore, schools, healthcare professionals, parents, and policymakers should collaborate to promote healthy dietary practices, nutritional screening, and early intervention programs. Strengthening adolescent nutrition may reduce mental health risks, improve quality of life, and contribute to healthier developmental outcomes and long-term well-being.

References

[1] WHO. (2010). Nutrition in Adolescence: Issues and Challenges.

[2] Black, R. E., et al. (2013). Maternal and child undernutrition and overweight in low-income countries. *The Lancet*, 382(9890), 427–451.

[3] Patel, V., Flisher, A. J., Hetrick, S., & McGorry, P. (2009). Mental health of young people. *The Lancet*, 369(9569), 1302–1313.

[4] World Health Organization. (2021). Adolescent Mental Health Fact Sheet.

[5] Benton, D. (2010). The influence of dietary status on cognitive performance and mood. *Nutrition Reviews*, 68(6), 357–369.

[6] Anglin, R. E., Samaan, Z., Walter, S. D., & McDonald, S. D. (2013). Vitamin D deficiency and depression. *The British Journal of Psychiatry*, 202(2), 100–107.

[7] Jacka, F. N. (2017). Nutritional psychiatry: Where to next? *EBioMedicine*, 17, 24–29.

[8] Khalid, S., Williams, C. M., & Reynolds, S. A. (2016). Is there an association between diet and depression in children and adolescents? *Journal of Affective Disorders*, 192, 120–130.

[9] Hanson, M. A., & Gluckman, P. D. (2018). Early developmental conditioning of later health and disease. *The Lancet*, 391(10121), 1117–1128.

[10] O'Neil, A., Quirk, S. E., Housden, S., et al. (2014). Relationship between diet and mental health in children and adolescents. *American Journal of Public Health*, 104(10), e31–e42.

[11] Marx, W., Moseley, G., Berk, M., & Jacka, F. (2021). Nutritional psychiatry and the prevention of mental disorders. *The Lancet Psychiatry*, 8(9), 760–769.

[12] World Health Organization. (2022). *Adolescent Nutrition and Health Report*.

[13] Racine, N., McArthur, B. A., Cooke, J. E., et al. (2022). Nutritional factors and adolescent mental health outcomes. *Journal of Adolescent Health*, 70(5), 645–652.

[14] Firth, J., Solmi, M., Wootton, R. E., et al. (2023). The relationship between diet quality and mental health among adolescents. *The Lancet Psychiatry*, 10(2), 98–110.

[15] Marx, W., Lane, M., Hockey, M., et al. (2023). Nutritional psychiatry and adolescent mental health. *World Psychiatry*, 22(1), 56–72.

[16] O'Neil, A., Berk, M., & Jacka, F. N. (2024). Dietary interventions and mental health promotion in youth populations. *Nutritional Neuroscience*, 27(3), 201–213.

[17] Jacka, F. N., Sarris, J., & Logan, A. C. (2025). Nutrition and mental disorders: Emerging evidence in adolescents. *Current Opinion in Psychiatry*, 38(1), 15–24.

[18] Global Nutrition Report. (2026). *Nutrition, Mental Health, and Adolescent Well-being: Global Evidence Review*.

[19] Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications.

[20] Polit, D. F., & Beck, C. T. (2021). *Nursing Research: Generating and Assessing Evidence for Nursing Practice* (11th ed.). Wolters Kluwer.

[21] Taherdoost, H. (2022). Designing and developing research instruments for data collection. *International Journal of Academic Research in Management*, 11(1), 10–25.