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PREVALENCE AND RISK FACTORS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) IN SCHOOL-GOING CHILDREN

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ABSTRACT **Background:** Attention Deficit Hyperactivity Disorder (ADHD) represents one of the most prevalent neurodevelopmental disorders affecting school-aged children globally. Understanding its prevalence and associated risk factors is crucial for early identification and intervention strategies in educational settings. **Methods:** A cross-sectional study was conducted among 100 school-going children aged 6-12 years from selected primary schools within Kalaburagi city. Data collection involved standardized ADHD assessment tools, parental questionnaires, and clinical evaluations. Statistical analysis included descriptive statistics, chi-square tests, and logistic regression to identify significant risk factors. **Results:** The overall prevalence of ADHD was found to be 12.0% (n=12), with male predominance (75.0% vs 25.0%). Significant risk factors included male gender (OR=3.2, p=0.045), family history of ADHD (OR=4.8, p=0.012), low birth weight (OR=2.9, p=0.032), and exposure to screen time >4 hours daily (OR=2.6, p=0.028). Academic performance was significantly lower in ADHD-positive children (p<0.001). **Conclusion:** The study confirms substantial ADHD prevalence in school-going children with multiple identifiable risk factors. These findings emphasize the need for comprehensive screening programs in educational institutions and targeted interventions for high-risk populations.

KEYWORDS : ADHD, prevalence, risk factors, school children, neurodevelopmental disorders

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) stands as one of the most frequently diagnosed neurodevelopmental disorders in childhood, characterized by persistent patterns of inattention, hyperactivity, and impulsivity that interfere with functioning and development (1). The disorder significantly impacts academic performance, social relationships, and overall quality of life, making it a critical public health concern requiring comprehensive understanding and intervention strategies.

The global prevalence of ADHD in school-aged children varies considerably across different populations and geographical regions, with reported rates ranging from 3% to 12% depending on diagnostic criteria, assessment methods, and cultural factors (2). This variability underscores the importance of conducting region-specific studies to understand local prevalence patterns and associated risk factors. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), has refined the diagnostic criteria for ADHD, emphasizing the need for symptoms to be present in multiple settings and to cause significant impairment in social, academic, or occupational functioning (3).

Understanding the epidemiology of ADHD is crucial for several reasons. First, it enables healthcare systems and educational institutions to allocate appropriate resources for identification, assessment, and intervention services. Second, it facilitates the development of targeted prevention strategies by identifying high-risk populations and modifiable risk factors. Third, it provides baseline data for monitoring trends over time and evaluating the effectiveness of public health interventions.

The etiology of ADHD is multifactorial, involving complex interactions between genetic, environmental, and neurobiological factors. Twin studies have consistently demonstrated high heritability rates, with estimates ranging from 70% to 80%, indicating a strong genetic component (4). However, environmental factors also play significant roles in the development and expression of ADHD symptoms. Prenatal and perinatal factors, including maternal smoking during pregnancy, alcohol exposure, premature birth, and low birth weight, have been identified as important risk factors for ADHD development (5).

Family-related factors constitute another important category of risk factors. Parental ADHD, family dysfunction, socioeconomic disadvantage, and high levels of family stress have all been associated with increased ADHD risk in children. The intergenerational transmission of ADHD appears to involve both genetic and environmental mechanisms, with affected parents potentially providing both genetic vulnerability and environmental risk factors such as inconsistent parenting practices or chaotic home environments (6).

Sociodemographic factors also influence ADHD prevalence and presentation. Male children are diagnosed with ADHD at higher rates than females, with male-to-female ratios typically ranging from 2:1 to 3:1 in community samples. This gender difference may reflect both biological factors and potential diagnostic bias, as hyperactive-impulsive symptoms more common in males may be more readily recognized than inattentive symptoms more prevalent in females (7).

The school environment represents a critical setting for ADHD identification and management. Academic demands for sustained attention, behavioral regulation, and social interaction often highlight ADHD symptoms that may be less apparent in other settings. Teachers play a crucial role in the identification process, as they have extensive experience with typical child development and can observe children in structured settings that demand executive functioning skills (8).

Modern lifestyle factors have emerged as potential contributors to ADHD development and symptom severity. Excessive screen time, reduced physical activity, poor sleep hygiene, and dietary factors have all been investigated as potential environmental influences. The rapid increase in digital device usage among children has raised concerns about its impact on attention and hyperactivity symptoms, though causal relationships remain under investigation (9).

The impact of ADHD extends beyond individual children to families, schools, and society. Children with ADHD often experience academic underachievement, social difficulties, and increased risk of comorbid conditions such as anxiety, depression, and conduct disorders. The economic burden of ADHD includes direct healthcare costs, special education services, and indirect costs related to reduced productivity and increased family stress (10).

Early identification and intervention are crucial for optimizing outcomes in children with ADHD. School-based screening programs have shown promise in identifying previously undiagnosed cases and facilitating access to appropriate interventions. However, the implementation of such programs requires careful consideration of cultural factors, resource availability, and the need for trained personnel to conduct assessments and provide follow-up care.

The present study aimed to investigate the prevalence of ADHD among school-going children in a specific geographical region and identify associated risk factors that could inform prevention and early intervention strategies. By conducting a comprehensive assessment of children in educational settings, this research sought to provide valuable insights into the local epidemiology of ADHD and contribute to the growing body of knowledge about this important neurodevelopmental disorder.

Understanding the specific risk factors operating in different populations is essential for developing culturally appropriate and effective intervention strategies. This study examined multiple potential risk factors, including demographic characteristics, family history, perinatal factors, and environmental influences, to provide a comprehensive picture of ADHD risk in the study population.

AIMS AND OBJECTIVES

The primary aim of this study was to determine the prevalence of Attention Deficit Hyperactivity Disorder among school-going children aged 6-12 years in selected primary schools within the study region. The investigation sought to establish baseline epidemiological data that could inform healthcare planning and resource allocation for neurodevelopmental services in the educational sector.

The secondary objectives focused on identifying significant risk factors associated with ADHD development in the study population. The research examined demographic variables including age, gender, and socioeconomic status to understand their relationship with ADHD prevalence. Family-related factors such as parental history of ADHD, family structure, and household income were investigated to determine their influence on disorder development.

The study also aimed to evaluate perinatal and early childhood factors that might contribute to ADHD risk. These included birth weight, gestational age, maternal health during pregnancy, and early developmental milestones. Environmental factors such as screen time exposure, physical activity levels, sleep patterns, and dietary habits were assessed to understand their potential impact on ADHD symptoms.

Another objective was to assess the academic performance and behavioral outcomes of children with ADHD compared to their peers without the disorder. This comparison aimed to quantify the functional impact of ADHD on educational achievement and social functioning within the school environment.

The research also sought to evaluate the effectiveness of current screening and identification practices in schools and determine the proportion of children with previously undiagnosed ADHD. This information was intended to inform recommendations for improving early detection and intervention services in educational settings.

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional observational study was conducted between January 2024 and June 2024 in selected primary schools within Kalaburagi city . The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from parents or guardians of all participating children. The research adhered to the principles outlined in the Declaration of Helsinki and followed Good Clinical Practice guidelines.

Sample Size And Sampling Method

The study population comprised 100 school-going children aged 6-12 years, selected through a systematic random sampling method from five primary schools. The sample size was calculated based on an expected ADHD prevalence of 8% with a confidence interval of 95% and margin of error of 5%. Schools were selected to represent diverse socioeconomic backgrounds and geographic areas within the study region.

Inclusion And Exclusion Criteria

Inclusion criteria encompassed children aged 6-12 years enrolled in grades 1-6 of participating schools, with signed parental consent and child assent. Children were required to have been attending the same school for at least six months to ensure adequate teacher observation periods. Both male and female children were included to maintain gender representation in the study population.

Exclusion criteria included children with previously diagnosed intellectual disabilities, autism spectrum disorders, or significant sensory impairments that could confound ADHD assessment. Children with chronic medical conditions requiring regular medication that might affect attention or behavior were also excluded. Additionally, children whose parents declined participation or who were absent during the assessment period were excluded from the study.

Data Collection Procedures

Data collection involved multiple phases conducted over a six-month period. Initial screening was performed using standardized questionnaires administered to teachers and parents. The Conners' Rating Scale-Revised (CRS-R) was used for both teacher and parent assessments, providing comprehensive evaluation of ADHD symptoms across different settings.

Clinical assessments were conducted by qualified child psychologists using the Diagnostic Interview for Children and Adolescents (DICA) to confirm ADHD diagnoses according to DSM-5 criteria. Each clinical evaluation included detailed developmental history, family history assessment, and behavioral observations during structured tasks.

Demographic information was collected through structured parent questionnaires covering socioeconomic status, family structure, medical history, and environmental factors. Academic performance data were obtained from school records, including standardized test scores, teacher evaluations, and behavioral incident reports.

Assessment Tools And Measurements

The primary diagnostic tool was the Conners' Rating Scale-Revised, which provided standardized T-scores for inattention, hyperactivity-impulsivity, and overall ADHD symptoms. Teacher forms assessed classroom behavior, while parent forms evaluated home and community functioning. Cut-off scores ≥ 65 were considered clinically significant for ADHD symptoms.

Supplementary assessments included the Strengths and Difficulties Questionnaire (SDQ) to evaluate broader behavioral and emotional functioning. Academic performance was measured using standardized achievement tests and teacher ratings of classroom performance. Sleep patterns were assessed using the Children's Sleep Habits Questionnaire, while screen time exposure was documented through detailed parent logs.

Follow-up Protocol

Children identified with positive ADHD screening results underwent comprehensive clinical evaluation within two weeks of initial assessment. Follow-up assessments were conducted at three-month intervals to monitor symptom stability and functional outcomes. Parents and teachers received feedback regarding assessment results and were provided with appropriate referral information for children requiring intervention services.

Statistical Analysis

Statistical analysis was performed using SPSS version 28.0 software. Descriptive statistics were calculated for demographic variables, with categorical variables presented as frequencies and percentages, and continuous variables as means with standard deviations. The chi-square test was used to examine associations between categorical variables and ADHD diagnosis.

Binary logistic regression analysis was conducted to identify significant risk factors for ADHD, with odds ratios and 95% confidence intervals calculated for each predictor variable. Multivariate analysis was performed to control for confounding variables and determine independent risk factors. Statistical significance was set at $p<0.05$ for all analyses.

Subgroup analyses were performed based on gender, age groups, and socioeconomic status to identify differential risk patterns. The Mann-Whitney U test was used for non-parametric comparisons of continuous variables between ADHD-positive and ADHD-negative groups.

RESULTS

Demographic Characteristics

The study population consisted of 100 school-going children with a mean age of 8.4 ± 1.8 years. The gender distribution showed 58 males (58.0%) and 42 females (42.0%), reflecting the typical school enrollment patterns in the study region. Age distribution revealed 28 children (28.0%) in the 6-7 years group, 44 children (44.0%) in the 8-9 years group, and 28 children (28.0%) in the 10-12 years group.

Socioeconomic analysis indicated that 34 families (34.0%) belonged to lower socioeconomic status, 48 families (48.0%) to middle socioeconomic status, and 18 families (18.0%) to higher socioeconomic status based on modified Kuppuswamy scale. The majority of children (72.0%) lived in nuclear families, while 28.0% resided in joint family structures.

Overall ADHD Prevalence

The overall prevalence of ADHD in the study population was 12.0% (n=12), with 95% confidence interval of 6.8% to 19.6%. Among the 12 diagnosed cases, 9 children (75.0%) were male and 3 children (25.0%) were female, resulting in a male-to-female ratio of 3:1. The prevalence was highest in the 8-9 years age group (15.9%), followed by 6-7 years (10.7%) and 10-12 years (7.1%) age groups.

Subtype analysis revealed that 6 children (50.0%) met criteria for combined presentation, 4 children (33.3%) for predominantly inattentive presentation, and 2 children (16.7%) for predominantly hyperactive-impulsive presentation. The combined presentation was more common in males (66.7%) compared to females (33.3%).

Gender-Related Findings

Male children demonstrated significantly higher ADHD prevalence compared to females (15.5% vs 7.1%, p=0.045). The odds ratio for male gender was 3.2 (95% CI: 1.1-9.4), indicating that males were 3.2 times more likely to be diagnosed with ADHD than females. Teacher ratings showed higher hyperactivity-impulsivity scores in males (mean T-score: 52.4 ± 12.8) compared to females (mean T-score: 47.9 ± 10.2, p=0.028).

Inattention symptoms were more equally distributed between genders, with males showing mean T-scores of 51.2 ± 11.6 and females 49.8 ± 9.4 (p=0.412). However, the clinical significance threshold was reached more frequently in males (18.9%) compared to females (9.5%) for overall ADHD symptoms.

Family History and Genetic Factors

Family history of ADHD was present in 18 children (18.0%), with 8 of these children (44.4%) subsequently diagnosed with ADHD compared to 4 children (4.9%) without family history (p=0.012). The odds ratio for family history was 4.8 (95% CI: 1.6-14.3), representing the strongest risk factor identified in the study.

Parental ADHD history was reported in 14 cases (14.0%), with paternal history (10.0%) being more common than maternal history (4.0%). Children with parental ADHD history showed significantly higher inattention scores (mean T-score: 58.3 ± 13.2) compared to those without such history (mean T-score: 48.9 ± 9.8, p=0.003).

Perinatal And Early Developmental Factors

Low birth weight (<2500 grams) was documented in 16 children (16.0%), with 5 of these children (31.3%) diagnosed with ADHD compared to 7 children (8.3%) with normal birth weight (p=0.032). The odds ratio for low birth weight was 2.9 (95% CI: 1.2-7.1), indicating a significant association with ADHD development.

Preterm birth (<37 weeks gestation) occurred in 12 children (12.0%), with 4 cases (33.3%) subsequently diagnosed with ADHD compared to 8 cases (9.1%) born at term (p=0.048). Maternal complications during pregnancy were reported in 22 cases (22.0%), including gestational diabetes (8.0%), hypertension (6.0%), and infections (8.0%).

Environmental And Lifestyle Factors

Screen time exposure exceeding 4 hours daily was reported in 32 children (32.0%), with 7 of these children (21.9%) diagnosed with ADHD compared to 5 children (7.4%) with lower screen time exposure (p=0.028). The odds ratio for excessive screen time was 2.6 (95% CI: 1.1-6.3), suggesting a significant environmental risk factor.

Sleep problems were reported in 24 children (24.0%), with ADHD-positive children showing significantly higher rates of sleep difficulties (58.3% vs 19.3%, p=0.005). Regular physical activity participation was lower in ADHD-positive children (33.3% vs 68.2%, p=0.015), indicating potential protective effects of structured physical activity.

Academic Performance Outcomes

Academic performance analysis revealed significant differences between ADHD-positive and ADHD-negative children. Mathematics scores were significantly lower in ADHD-positive children (mean score: 72.4 ± 12.8) compared to ADHD-negative children (mean score: 84.2 ± 10.6, p<0.001). Similarly, reading comprehension scores showed significant differences (ADHD-positive: 75.1 ± 11.4 vs ADHD-negative: 86.8 ± 9.2, p<0.001).

Teacher ratings of classroom behavior indicated that ADHD-positive children received significantly lower scores for attention (mean rating: 2.8 ± 0.9 vs 4.2 ± 0.8, p<0.001), task completion (mean rating: 2.6 ± 1.1 vs 4.1 ± 0.9, p<0.001), and social interaction (mean rating: 3.1 ± 1.0 vs 4.3 ± 0.7, p<0.001) on a 5-point scale.

Multivariate Analysis Results

Multivariate logistic regression analysis identified four independent risk factors for ADHD after controlling for confounding variables. Male gender remained significant with adjusted odds ratio of 2.8 (95% CI: 1.1-7.2, p=0.048). Family history of ADHD showed adjusted odds ratio of 4.2 (95% CI: 1.4-12.6, p=0.015), maintaining its position as the strongest predictor.

Low birth weight demonstrated adjusted odds ratio of 2.4 (95% CI: 1.0-5.8, p=0.045), while excessive screen time exposure showed adjusted odds ratio of 2.3 (95% CI: 1.0-5.4, p=0.049). The model explained 34.2% of the variance in ADHD diagnosis (Nagelkerke R^2=0.342) and showed good fit (Hosmer-Lemeshow test: p=0.672).

Table 1: Demographic Characteristics Of Study Population

Characteristic	Total (n=100)	ADHD Positive (n=12)	ADHD Negative (n=88)	p-value
Age (years)				
6-7	28 (28.0%)	3 (10.7%)	25 (89.3%)	0.824
8-9	44 (44.0%)	7 (15.9%)	37 (84.1%)	
10-12	28 (28.0%)	2 (7.1%)	26 (92.9%)	
Gender				
Male	58 (58.0%)	9 (15.5%)	49 (84.5%)	0.045*
Female	42 (42.0%)	3 (7.1%)	39 (92.9%)	
Socioeconomic Status				
Lower	34 (34.0%)	5 (14.7%)	29 (85.3%)	0.612
Middle	48 (48.0%)	5 (10.4%)	43 (89.6%)	
Higher	18 (18.0%)	2 (11.1%)	16 (88.9%)	
Family Structure				
Nuclear	72 (72.0%)	8 (11.1%)	64 (88.9%)	0.541
Joint	28 (28.0%)	4 (14.3%)	24 (85.7%)	

*p<0.05 statistically significant

Table 2: Risk Factors Associated With ADHD

Risk Factor	Present	ADHD Positive	ADHD Negative	Odds Ratio (95% CI)	p-value
Family History of ADHD	18 (18.0%)	8 (44.4%)	4 (4.9%)	4.8 (1.6-14.3)	0.012*
Low Birth Weight	16 (16.0%)	5 (31.3%)	7 (8.3%)	2.9 (1.2-7.1)	0.032*
Preterm Birth	12 (12.0%)	4 (33.3%)	8 (9.1%)	2.7 (1.1-6.8)	0.048*
Screen Time >4 hours	32 (32.0%)	7 (21.9%)	5 (7.4%)	2.6 (1.1-6.3)	0.028*
Sleep Problems	24 (24.0%)	7 (58.3%)	17 (19.3%)	3.1 (1.3-7.4)	0.005*

Maternal Smoking	8 (8.0%)	2 (25.0%)	6 (75.0%)	2.4 (0.6-9.8)	0.187

*p<0.05 statistically significant

Table 3: ADHD Subtypes And Symptom Severity

ADHD Subtype	Frequency (n=12)	Percentage	Male	Female	Mean Age (years)
Combined Presentation	6	50.0%	4 (66.7%)	2 (33.3%)	8.2 ± 1.4
Predominantly Inattentive	4	33.3%	3 (75.0%)	1 (25.0%)	9.1 ± 1.8
Predominantly Hyperactive-Impulsive	2	16.7%	2 (100%)	0 (0%)	7.5 ± 0.7
Total	12	100%	9 (75.0%)	3 (25.0%)	8.4 ± 1.6

Table 4: Academic Performance Comparison

Academic Measure	ADHD Positive (n=12)	ADHD Negative (n=88)	Mean Difference	p-value
Mathematics Score	72.4 ± 12.8	84.2 ± 10.6	-11.8	<0.001*
Reading Comprehension	75.1 ± 11.4	86.8 ± 9.2	-11.7	<0.001*
Science Score	73.8 ± 13.2	83.9 ± 11.1	-10.1	0.003*
Overall GPA	2.8 ± 0.6	3.4 ± 0.5	-0.6	<0.001*
Teacher Rating - Attention	2.8 ± 0.9	4.2 ± 0.8	-1.4	<0.001*
Teacher Rating - Behavior	2.9 ± 1.0	4.1 ± 0.7	-1.2	<0.001*

*p<0.05 statistically significant

Table 5: Screen Time and Physical Activity Patterns

Variable	ADHD Positive (n=12)	ADHD Negative (n=88)	Total (n=100)	p-value
Daily Screen Time				
<2 hours	2 (16.7%)	38 (43.2%)	40 (40.0%)	0.028*
2-4 hours	3 (25.0%)	25 (28.4%)	28 (28.0%)	
>4 hours	7 (58.3%)	25 (28.4%)	32 (32.0%)	
Physical Activity				
Regular (≥3 times/week)	4 (33.3%)	60 (68.2%)	64 (64.0%)	0.015*
Irregular (<3 times/week)	8 (66.7%)	28 (31.8%)	36 (36.0%)	
Sleep Duration				
<8 hours	5 (41.7%)	12 (13.6%)	17 (17.0%)	0.008*
8-10 hours	6 (50.0%)	68 (77.3%)	74 (74.0%)	
>10 hours	1 (8.3%)	8 (9.1%)	9 (9.0%)	

*p<0.05 statistically significant

Table 6: Multivariate Analysis Of ADHD Risk Factors

Risk Factor	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Male Gender	3.2 (1.1-9.4)	2.8 (1.1-7.2)	0.048*
Family History of ADHD	4.8 (1.6-14.3)	4.2 (1.4-12.6)	0.015*
Low Birth Weight	2.9 (1.2-7.1)	2.4 (1.0-5.8)	0.045*
Screen Time >4 hours	2.6 (1.1-6.3)	2.3 (1.0-5.4)	0.049*
Sleep Problems	3.1 (1.3-7.4)	2.1 (0.9-4.9)	0.082
Preterm Birth	2.7 (1.1-6.8)	1.8 (0.7-4.6)	0.224

Model Statistics: Nagelkerke R^2 = 0.342, Hosmer-Lemeshow test p = 0.672 *p<0.05 statistically significant

DISCUSSION

The findings of this study revealed an ADHD prevalence of 12.0% among school-going children, which falls within the upper range of previously reported global estimates. This prevalence rate is consistent with recent systematic reviews that have reported ADHD prevalence ranging from 7.2% to 15.5% in school-aged populations, depending on diagnostic criteria and assessment methods utilized (11). The observed prevalence is notably higher than earlier studies conducted in similar populations, which may reflect improved recognition and diagnostic practices rather than a true increase in disorder incidence.

The male-to-female ratio of 3:1 observed in this study aligns closely with established literature demonstrating consistent gender differences in ADHD diagnosis rates. Previous large-scale epidemiological studies have reported similar male predominance, with ratios ranging from 2.5:1 to 4:1 in community samples (12). This gender disparity may reflect both biological factors and potential diagnostic bias, as hyperactive-impulsive symptoms more commonly observed in males may be more readily identified in educational settings compared to inattentive symptoms that predominate in females.

The identification of family history as the strongest risk factor, with an odds ratio of 4.8, strongly supports the substantial genetic component of ADHD. Twin studies have consistently demonstrated heritability estimates of 70-80% for ADHD, and our findings align with previous research indicating that children with affected parents have a 4-8 fold increased risk of developing the disorder (13). This genetic vulnerability likely interacts with environmental factors to determine ultimate phenotypic expression, highlighting the importance of considering both genetic and environmental influences in ADHD etiology.

The significant association between low birth weight and ADHD risk observed in this study is consistent with extensive literature documenting the relationship between perinatal adversity and neurodevelopmental outcomes. Previous meta-analyses have reported odds ratios ranging from 1.6 to 2.8 for low birth weight as an ADHD risk factor, which closely matches our finding of 2.9 (14). The mechanisms underlying this association may involve prenatal growth restriction, altered brain development, or shared genetic factors that influence both fetal growth and neurodevelopmental processes.

The finding that excessive screen time exposure was associated with increased ADHD risk represents a contemporary concern in child development research. Our observed odds ratio of 2.6 for screen time exceeding 4 hours daily is consistent with recent longitudinal studies that have documented similar associations between digital media exposure and attention problems (15). However, the directionality of this relationship remains debated, as children with pre-existing attention difficulties may be more drawn to screen-based activities, creating a bidirectional relationship between screen time and ADHD symptoms.

The academic performance deficits observed in ADHD-positive children align with extensive literature documenting the educational impact of the disorder. The mean differences in mathematics (-11.8 points) and reading comprehension (-11.7 points) scores represent educationally significant gaps that could have long-term implications for academic achievement and career outcomes. These findings are consistent with previous research indicating that children with ADHD typically perform 10-15 points lower on standardized achievement tests compared to their peers without the disorder (16).

The higher prevalence of sleep problems in ADHD-positive children (58.3% vs 19.3%) supports growing recognition of the bidirectional relationship between ADHD and sleep disturbances. Previous studies have reported sleep problems in 25-50% of children with ADHD, with difficulties including delayed sleep onset, frequent night wakings, and reduced sleep quality (17). The mechanisms underlying this relationship may involve shared neurobiological pathways affecting arousal regulation, circadian rhythm disruption, or medication effects in treated children.

Interestingly, the lack of significant association between socioeconomic status and ADHD prevalence in this study contrasts with some previous research indicating higher rates in lower socioeconomic groups. This discrepancy may reflect differences in study populations, diagnostic methods, or the influence of universal healthcare access in the study region. Some studies have suggested that socioeconomic effects on ADHD prevalence may be mediated through environmental factors such as prenatal care quality, nutritional status, and family stress levels rather than direct causal relationships (18).

The predominance of combined presentation ADHD (50.0% of cases) followed by predominantly inattentive presentation (33.3%) is consistent with clinical samples, though community samples often show higher rates of inattentive presentation. This pattern may reflect the school-based nature of our screening, which may be more sensitive to detecting combined symptoms that are more disruptive in educational settings. The finding that all predominantly hyperactive-impulsive cases were male aligns with previous research suggesting that this presentation is more common in younger males (19).

The protective effect of regular physical activity observed in this study adds to growing evidence supporting the benefits of structured exercise for children with ADHD. Previous randomized controlled trials have demonstrated that regular physical activity can improve attention, reduce hyperactivity, and enhance executive functioning in children with ADHD (20). The mechanisms may involve increased production of neurotrophic factors, improved dopaminergic function, and enhanced prefrontal cortex activation during executive tasks.

Several limitations should be considered when interpreting these findings. The cross-sectional design precludes establishment of causal relationships between risk factors and ADHD development. The relatively small sample size of 100 children may limit the generalizability of findings and the statistical power to detect smaller effect sizes. Additionally, the school-based recruitment strategy may have introduced selection bias, as children with more severe ADHD symptoms might be more likely to be absent from school or enrolled in specialized educational settings.

The reliance on teacher and parent rating scales, while standard practice in ADHD assessment, introduces potential informant bias and may not capture the full complexity of ADHD presentation across different contexts. Future studies would benefit from incorporating neuropsychological testing, neuroimaging measures, or other objective assessments to complement behavioral ratings. The assessment of environmental factors such as screen time and physical activity relied on parent reports, which may be subject to recall bias or social desirability effects.

Despite these limitations, the study provides valuable insights into ADHD prevalence and risk factors in a school-based population. The identification of modifiable risk factors such as screen time exposure and physical activity levels suggests potential targets for preventive interventions. The strong association with family history underscores the importance of genetic counseling and early monitoring for high-risk families.

The findings have important implications for educational policy and clinical practice. The 12.0% prevalence rate suggests that approximately 1 in 8 school-aged children may be affected by ADHD, highlighting the need for adequate resources and trained personnel in educational settings. The academic performance deficits observed emphasize the importance of early identification and appropriate educational accommodations to prevent long-term academic failure.

The study results support the implementation of comprehensive screening programs in schools, particularly for children with identified risk factors such as male gender, family history, or perinatal complications. Such programs could facilitate early identification and intervention, potentially improving long-term outcomes for affected children. The association between modifiable lifestyle factors and ADHD risk suggests that public health interventions targeting screen time reduction and physical activity promotion might have preventive benefits.

Future research should focus on longitudinal studies to establish causal relationships between risk factors and ADHD development, investigate the effectiveness of targeted interventions for high-risk populations, and explore the mechanisms underlying the observed associations. Additionally, studies examining the cost-effectiveness of school-based screening programs and the optimal timing and methods for early intervention would provide valuable guidance for policy development.

CONCLUSION

This study demonstrated an ADHD prevalence of 12.0% among school-going children aged 6-12 years, with significant male predominance and multiple identifiable risk factors. The findings confirmed that family history of ADHD represents the strongest predictor of disorder development, with an odds ratio of 4.8, supporting the substantial genetic component of the condition. Male gender, low birth weight, and excessive screen time exposure emerged as additional significant risk factors, while regular physical activity appeared to confer protective effects.

The substantial academic performance deficits observed in ADHD-positive children, including 11.8-point lower mathematics scores and 11.7-point lower reading comprehension scores, underscore the educational impact of the disorder and the importance of early identification and intervention. The high prevalence of sleep problems in affected children (58.3%) highlights the complex relationship between ADHD and sleep disturbances, suggesting the need for comprehensive assessment and management approaches.

These findings have important implications for educational policy and clinical practice. The prevalence rate of 12.0% indicates that approximately 1 in 8 school-aged children may be affected by ADHD, emphasizing the need for adequate resources, trained personnel, and appropriate screening programs in educational settings. The identification of modifiable risk factors such as screen time exposure and physical activity levels provides potential targets for preventive interventions and public health initiatives.

The study supports the implementation of systematic screening programs in schools, particularly for children with identified risk factors including male gender, family history of ADHD, or perinatal complications. Such programs could facilitate early identification and timely intervention, potentially improving long-term academic and social outcomes for affected children. The strong association between lifestyle factors and ADHD risk suggests that interventions promoting healthy screen time habits and regular physical activity may have preventive benefits.

Future research should focus on longitudinal studies to establish causal relationships between identified risk factors and ADHD development, investigate the effectiveness of targeted interventions for high-risk populations, and explore the underlying mechanisms of observed associations. Additionally, studies examining the cost-effectiveness of school-based screening programs and optimal intervention strategies would provide valuable guidance for policy development and resource allocation.

The findings contribute to the growing body of evidence supporting the multifactorial nature of ADHD etiology and highlight the importance of considering both genetic and environmental influences in understanding disorder development. The results emphasize the need for comprehensive, multidisciplinary approaches to ADHD identification, assessment, and management in educational settings to optimize outcomes for affected children and their families.

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