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Gender Differences in Anxiety-Induced Sleep Disturbance: A Survey Among In-School Adolescents in the Republic of Benin

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Abstract: Anxiety-induced sleep disturbance is a common phenomenon that affects the overall well-being and quality of life of school-going adolescents. Nonetheless, evidence on anxiety-induced sleep disturbance among adolescents in Benin is scarce. This study examined the gender differences in the prevalence and correlates of anxiety-induced sleep disturbance among in-school adolescents in the Republic of Benin. We conducted a secondary analysis of Benin's 2016 Global School-Based Health Survey dataset involving 2496 in-school adolescents aged 13 years and above. The proportion of male and female students who reported anxiety-induced sleep disturbance was computed. The multivariable binary logistic regression analysis was conducted to determine the factors associated with anxiety-induced sleep disturbance. Adjusted odds ratios (aOR) were estimated with corresponding confidence intervals at a 0.05 significance level. The overall prevalence of anxiety-induced sleep disturbance among adolescents was 21.3%. The prevalence of anxiety-induced sleep disturbance was 22.4% and 19.9% among the male and female participants, respectively. Among male in-school adolescents, hunger (aOR = 0.51, 95% CI = 0.37–0.71), loneliness (aOR = 0.29, 95% CI = 0.20–0.41), suicide ideation (aOR = 0.37, 95% CI = 0.22–0.61), suicide attempt (aOR = 1.79, 95% CI = 1.12–2.87), ever having sex (aOR = 0.66, 95% CI = 0.48–0.91), and having understanding parents (aOR = 0.64, 95% CI = 0.47–0.87) were significantly associated with anxiety-induced sleep disturbance. On the other hand, hunger (aOR = 0.63, 95% CI = 0.42–0.94), loneliness (aOR = 0.42, 95% CI = 0.28–0.61), and suicide ideation (aOR = 0.52, 95% CI = 0.33–0.83) were significantly associated with anxiety-induced sleep disturbance among the female in-school adolescents. The prevalence of anxiety-induced sleep disturbance among in-school adolescents in Benin poses a great concern for their mental health and well-being. Collaborative efforts between schools, parents, and healthcare professionals should focus on culturally appropriate, gender-specific factors that may contribute to a reduction in anxiety-induced sleep disturbance among in-school adolescents in Benin.

Keywords: adolescents; anxiety; Benin; Global School-Based Health Survey; sleep disturbance



Citation: Sarfo, Jacob Owusu, Newton Isaac Gbordzoe, Valda Deide Commey, Esther Doe-Yo Tawiah, and John Elvis Hagan, Jr. 2024. Gender Differences in Anxiety-Induced Sleep Disturbance: A Survey Among In-School Adolescents in the Republic of Benin. *Social Sciences* 13: 655. <https://doi.org/10.3390/socsci13120655>

Academic Editor: Barbara Fawcett

Received: 22 July 2024

Revised: 20 November 2024

Accepted: 25 November 2024

Published: 30 November 2024



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1. Introduction

Anxiety-induced sleep disturbance is prevalent among adolescents globally, which significantly impacts their overall well-being. Research indicates that a significant proportion of adolescents, ranging from 11% to 16%, are affected by various health challenges (Silva et al. 2020). This challenge includes anxiety-induced sleep disturbance, which has been identified as a key contributor to the overall mental health challenges experienced

by adolescents (Pengpid and Peltzer 2022). The prevalence of anxiety-induced sleep disturbance among adolescents has been examined in various studies. A pooled analysis of data from the Global School-based Student Health Survey (GSHS) found that the prevalence of anxiety-induced sleep disturbance was 11.35% and 10.67% among adolescents aged 12–15 across 29 countries (Xu et al. 2023). In Sub-Saharan Africa, the prevalence of anxiety-induced sleep disturbance among adolescents ranged from 5.1% in Tanzania to 20.5% in Benin, with an overall prevalence of 12.2% (Ahinkorah et al. 2021). Similarly, a study in Benin reported a prevalence of 15.58% (Pengpid and Peltzer 2020a). Studies have revealed that adolescents with anxiety disorders are at a higher risk of experiencing sleep disturbances, such as difficulty falling asleep, frequent awakenings during the night, and early morning awakenings (Brown et al. 2018). These sleep disturbances not only exacerbate the symptoms of anxiety but also contribute to a range of negative outcomes, including impaired cognitive function, decreased academic performance, and heightened emotional reactivity (Alfano et al. 2007; Willis and Gregory 2015).

Various lifestyle behaviours, environmental factors, and psychological factors are linked to anxiety-induced sleep disturbance among adolescents. These include alcohol and drug use, examination workload, loneliness, low self-esteem, bullying victimisation, consumption of ultra-processed foods, and excessive use of smart technology devices (Ahinkorah et al. 2021; Chase and Pincus 2011; Leahy and Gradisar 2012; Zhang et al. 2021). Gender differences in the experience of anxiety-induced sleep disturbance have also been explored. Several studies have found that females are more prone to anxiety-induced sleep disturbances than males. For instance, some studies reported a prevalence of 17.4% in girls compared to 7.9% in boys. These studies also revealed that anxiety-related sleep disturbances are more common in females and that being male could be a significant protective factor against this issue (López-Gil et al. 2022; Xu et al. 2023; Vancampfort et al. 2019). However, some studies have failed to find a significant effect of gender on the relationship between sleep disturbance and anxiety (Laumann et al. 2024).

In the context of Sub-Saharan Africa, the study by Ahinkorah et al. (2021) in Benin found a higher prevalence of anxiety-induced sleep disturbance among female adolescents (12.8%) compared to males (11.5%). This highlights the need to explore further gender-based variations. Therefore, this current study examined the gender differences in the prevalence and correlates of anxiety-induced sleep disturbances among school-aged adolescents in Benin. Two objectives were equally set to guide the study: (1) To examine the prevalence of anxiety-induced sleep disturbance among male and female adolescents in Benin. (2) To investigate the correlates of anxiety-induced sleep disturbance among male and female adolescents in Benin.

Addressing this gap is crucial for developing targeted interventions and policies to improve the mental health and well-being of in-school adolescents in Benin, aligning with the Sustainable Development Goals related to quality health and education.

2. Conceptual Framework of Adolescent Anxiety-Induced Sleep Disturbance

We conceptualised gender-based anxiety-induced sleep disturbance among in-school adolescents in Benin to be associated with various individual, family, and community contextual factors. The framework integrates various risk and protective factors, with a specific emphasis on gender differences. The framework considers socio-demographic factors like gender, age, and grade level, as well as personal factors such as hunger and truancy, and substance use factors including marijuana, alcohol, and cigarettes. Psychosocial factors also include bullying, loneliness, suicidal ideation, planning, attempts, sexual activity, and having understanding parents (Ahinkorah et al. 2021; Hasan et al. 2021; Xu et al. 2023). This framework suggests that these factors can either intensify or alleviate anxiety-induced sleep disturbances among adolescents (Ahinkorah et al. 2021; Hasan et al. 2021; Vancampfort et al. 2019; Xu et al. 2023; Zhang et al. 2021). It has a particular focus on understanding how these influences vary between male and female students in Benin. The study also draws comparative insights from related research studies such as Ahinkorah

et al. (2021), Pengpid and Peltzer (2022), and Hasan et al. (2021) to enhance the understanding of anxiety-induced sleep disturbances among adolescents in Benin. By exploring these gender-specific dynamics, the study aimed to provide valuable insights. This will help tailor interventions and policies addressing the challenges related to anxiety-induced sleep disturbances in adolescents, ultimately contributing to improved well-being and support for this vulnerable population.

3. Materials and Methods

3.1. Data Source and Research Design

The study analysed Benin's 2016 GSHS, a secondary national dataset freely available from the WHO repository. The GSHS is a school-based survey that employed a self-administered questionnaire to collect data on anxiety-induced sleep disturbance among male and female adolescents. The GSHS employs a cross-sectional study design to gather data from WHO member nations interested in preventing anxiety-induced sleep disturbances among adolescents. The Ministry of Health (MoH) of Benin served as the primary investigator, with funding from the WHO and US Centres for Disease Control and Prevention (CDC).

3.2. Sampling, Data Collection and Sample Size

The primary investigators of the GSHS survey employed a two-stage cluster sampling design to gather data representative of students in Grades 6–12 and terminal grades in the country. Usually, students in these grades are adolescents. Initially, schools were selected with probability proportional to their enrolment size. A systematic random sampling of classes in selected schools was then used in the second stage. All selected students' eligibility was considered, and participants were invited. The instructions for the standard survey were clearly explained, and participants were free to withdraw or not respond to any question on the questionnaire. The questions were translated into French for students and were pilot-tested for comprehension. Students completed the self-administered questionnaire during a class period without personal identification. The school response rate was 100%, the student response rate was 78%, and the overall response rate was 78%. Thus, a total sample of 2536 students participated in the Benin GSHS. However, 2496 responses were used in the analysis based on an analytic sample of adolescents aged 13 years and above.

3.3. Study Variables

The key outcome variable was "anxiety-induced sleep disturbances" among the students. The outcome variable was measured using the item, "During the past 12 months, how often have you been so worried about something that you could not sleep at night?" The response options were "1 = yes" or "0 = no". Thus, participants who had been so worried about something that they could not sleep at night one or more times were classified as "Yes", while those who never had sleep disturbances due to anxiety were classified as "No". We also classified the explanatory variables based on our conceptual framework, with correlates classified under socio-demographic (sex, age, and grade), personal (hunger), drugs and substance use (current use of marijuana, current alcohol use, and current smoking of cigarettes), and psychosocial (loneliness, suicidal behaviours (thoughts, plans, attempts), ever having sexual intercourse, and having understanding parents).

3.4. Data Analysis

We analysed the data using the Statistical Package for Social Sciences version 27.0. The sample weighting approach was used at the school, student, and sex within grade levels to make the data representative of Benin adolescents and reduce bias on various trends of nonresponses. The unit of analysis was 2496 in-school adolescents in Benin who were aged 13 years and above. At the data cleaning stage, we conducted multiple imputations to handle missing data. Also, a bivariate analysis was employed to determine

the association between the explanatory variables and anxiety-induced sleep disturbances among adolescents, stratified by gender. A multivariate logistic regression analysis was used to measure the extent to which explanatory factors predict the outcome variable (where $p < 0.05$).

4. Results

4.1. Prevalence of Anxiety-Induced Sleep Disturbance Among Adolescents in Benin, Stratified by Gender

The overall prevalence of anxiety-induced sleep disturbance among adolescents in Benin was 21.3%. Among the male participants, the prevalence of anxiety-induced sleep disturbance was 22.4%, while the prevalence of anxiety-induced sleep disturbance was 19.9% among the female participants. (see Figure 1).

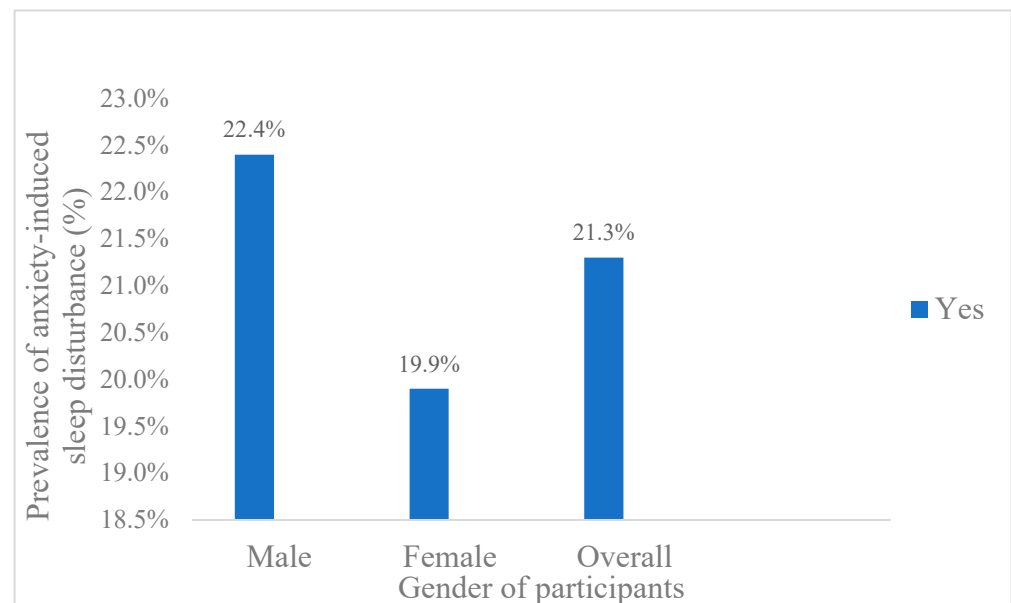


Figure 1. Gender-based and overall prevalence of anxiety-induced sleep disturbance.

4.2. Bivariate Analysis of the Association Between Correlates and Anxiety-Induced Sleep Disturbance Among Adolescents in Benin, Stratified by Gender

The results of the bivariate analysis revealed that age ($p = 0.012$), grade ($p = 0.001$), hunger ($p < 0.001$), loneliness ($p < 0.001$), suicidal ideation ($p < 0.001$), suicidal plan ($p = 0.016$), having close friends ($p = 0.029$), and ever having sexual intercourse were significantly associated with anxiety-induced sleep disturbance among the male adolescents in Benin (see Table 1).

However, among female participants, hunger ($p = 0.003$), loneliness ($p < 0.001$), suicidal ideation ($p < 0.001$), suicidal plan ($p < 0.001$), suicidal attempt ($p < 0.001$), and ever having sexual intercourse ($p = 0.012$) were significantly associated with anxiety-induced sleep disturbance (see Table 1).

Table 1. Chi-square analysis of the correlates of anxiety-induced sleep disturbance among adolescents in Benin, stratified by gender.

Variables		Male				Female			
		Anxiety-Induced Sleep Disturbance				Anxiety-Induced Sleep Disturbance			
		Yes N (%)	No N (%)	Chi-Square (χ^2)	<i>p</i> -Value	Yes N (%)	No N (%)	Chi-Square (χ^2)	<i>p</i> -Value
Age groups (in years)	13–15	23 (7.6)	135 (12.8)	6.255	0.012	34 (15.0)	160 (17.5)	0.835	0.361
	>15	281 (92.4)	917 (87.2)			193 (85.0)	753 (82.5)		
Grade	3rd–6th	151 (49.7)	631 (60.0)	10.269	0.001	154 (67.8)	610 (66.8)	0.087	0.768
	Terminal—2nd	153 (50.3)	421 (40.0)			73 (32.2)	303 (33.2)		
Hunger	Yes	94 (30.9)	164 (15.6)	35.984	<0.001	48 (21.1)	122 (13.4)	8.679	0.003
	No	210 (69.1)	888 (84.4)			179 (78.9)	791 (86.6)		
Bullied	Yes	127 (41.8)	417 (39.6)	0.449	0.503	108 (47.6)	400 (43.8)	1.043	0.307
	No	177 (58.2)	635 (60.4)			119 (52.4)	513 (56.2)		
Loneliness	Yes	91 (29.9)	101 (9.6)	80.226	<0.001	64 (28.2)	106 (11.6)	39.405	<0.001
	No	213 (70.1)	951 (90.4)			163 (71.8)	807 (88.4)		
Suicidal ideation	Yes	61 (20.1)	108 (10.3)	20.760	<0.001	65 (28.6)	136 (14.9)	23.627	<0.001
	No	243 (79.9)	944 (89.7)			162 (71.4)	777 (85.1)		
Suicidal plan	Yes	59 (19.4)	145 (13.8)	5.838	0.016	60 (26.4)	144 (15.8)	14.060	<0.001
	No	245 (80.6)	907 (86.2)			167 (73.6)	769 (84.2)		
Suicidal attempt	Yes	56 (18.4)	173 (16.4)	0.656	0.418	48 (21.1)	108 (11.8)	13.359	<0.001
	No	248 (81.6)	879 (83.6)			179 (78.9)	805 (88.2)		
Having close friend	Yes	39 (12.8)	91 (8.7)	4.751	0.029	37 (16.3)	129 (14.1)	0.688	0.407
	No	265 (87.2)	961 (91.3)			190 (83.7)	784 (85.9)		
Drank alcohol	Yes	147 (48.4)	470 (44.7)	1.287	0.257	94 (41.4)	369 (40.4)	0.074	0.785
	No	157 (51.6)	582 (55.3)			133 (58.6)	544 (59.6)		
Ever had sexual intercourse	Yes	194 (68.3)	547 (56.4)	12.908	<0.001	93 (43.5)	291 (34.3)	6.245	0.012
	No	90 (31.7)	423 (43.6)			121 (56.5)	558 (65.7)		
Having understanding parents	Yes	91 (29.9)	340 (32.3)	0.619	0.431	74 (32.6)	315 (34.5)	0.293	0.588
	No	213 (70.1)	712 (67.7)			153 (67.4)	598 (65.5)		

4.3. Binary Logistic Regression Analysis of Correlates of Anxiety-Induced Sleep Disturbance Among Adolescents in Benin, Stratified by Gender

The results of the binary logistic regression analysis (see Table 2) showed that adolescent males who experienced hunger had 49% significantly reduced odds of anxiety-induced sleep disturbance compared to adolescent males who did not experience hunger (aOR = 0.51, 95% CI = 0.37–0.71). Also, the odds of anxiety-induced sleep disturbance were 71% significantly lower among males who felt lonely compared to adolescent males who did not feel lonely (aOR = 0.29, 95% CI = 0.20–0.41). The results further showed that the odds of anxiety-induced sleep disturbance were 63% significantly lower among adolescent males with suicidal ideation compared to adolescent males without suicidal ideation (aOR = 0.37, 95% CI = 0.22–0.61). However, adolescent males who attempted suicide had 79% significantly increased odds of anxiety-induced sleep disturbance compared to adolescent males who never attempted suicide (aOR = 1.79, 95% CI = 1.12–2.87). Also, the odds of anxiety-induced sleep disturbance were 34% significantly lower among male adolescents who have ever had sex compared to those who have never had sex (aOR = 0.66, 95% CI = 0.48–0.91). Male adolescents who had understanding parents had 36% significantly reduced odds of anxiety-induced sleep disturbance compared to those without understanding parents (aOR = 0.64, 95% CI = 0.47–0.87).

Table 2. Multivariable binary logistic regression analysis of correlates of anxiety-induced sleep disturbance among adolescents in Benin, stratified by gender.

Variables	Anxiety-Induced Sleep Disturbance				
		Males		Females	
		aOR (95% CI)	p-Value	aOR (95% CI)	p-Value
Age groups (in years)	13–15	1.49 (0.87–2.57)	0.147	1.01 (0.64–1.60)	0.967
	>15	1.00			
Grade	3rd–6th	1.27 (0.95–1.72)	0.112	0.93 (0.66–1.31)	0.667
	Terminal—2nd	1.00			
Hunger	Yes	0.51 (0.37–0.71)	<0.001	0.63 (0.42–0.94)	0.024
	No	1.00			
Bullied	Yes	0.90 (0.67–1.21)	0.489	1.05 (0.76–1.44)	0.774
	No	1.00			
Loneliness	Yes	0.29 (0.20–0.41)	<0.001	0.42 (0.28–0.61)	<0.001
	No	1.00			
Suicidal ideation	Yes	0.37 (0.22–0.61)	<0.001	0.52 (0.33–0.83)	0.006
	No	1.00			
Suicidal plan	Yes	1.06 (0.65–1.73)	0.819	1.08 (0.66–1.78)	0.758
	No	1.00			
Suicidal attempt	Yes	1.79 (1.12–2.87)	0.015	0.73 (0.45–1.19)	0.208
	No	1.00			
Having close friend	Yes	0.67 (0.42–1.05)	0.081	0.86 (0.56–1.33)	0.503
	No	1.00			
Drank alcohol	Yes	0.95 (0.71–1.27)	0.708	1.07 (0.78–1.48)	0.660
	No	1.00			
Ever had sexual intercourse	Yes	0.66 (0.48–0.91)	0.010	0.72 (0.52–1.01)	0.052
	No	1.00			
Having understanding parents	Yes	0.64 (0.47–0.87)	0.005	0.88 (0.64–1.21)	0.411
	No	1.00			

Note: 1.00—references category; aOR = adjusted Odds Ratio; CI = Confidence interval; Hosmer and Lemeshow test (goodness of fit) (Males), $\chi^2 (8) = 7.761, p = 0.457$; (Females), $\chi^2 (8) = 8.733, p = 0.365$.

However, some factors showed no significant associations with anxiety-induced sleep disturbance among males. Age, grade level, being bullied, having close friends, alcohol consumption, and having a suicidal plan were not significantly associated with anxiety-induced sleep disturbance, with *p*-values ranging from 0.081 to 0.819.

On the other hand, female adolescents who experienced hunger had 37% significantly reduced odds of anxiety-induced sleep disturbance compared to those who did not experience hunger (aOR = 0.63, 95% CI = 0.42–0.94). Also, the odds of anxiety-induced sleep disturbance were 58% significantly lower among female adolescents who felt lonely compared to those who did not feel lonely (aOR = 0.42, 95% CI = 0.28–0.61). Again, the odds of anxiety-induced sleep disturbance were 48% significantly lower among female adolescents with suicidal ideation compared to those without suicidal ideation (aOR = 0.52, 95% CI = 0.33–0.83).

However, factors such as age, grade level, being bullied, having close friends, alcohol consumption, having a suicidal plan, suicidal attempts, sexual activity, and having understanding parents were not significantly associated with anxiety-induced sleep disturbance among females (*p*-values ranging from 0.052 to 0.774).

5. Discussion

The present study aligns with previous research findings (Kim et al. 2022; Park et al. 2020; Pengpid and Peltzer 2020a), which reported a higher prevalence of anxiety-induced sleep disturbance among male adolescents than females. The findings of the current study, however, contrast with some previous literature, which showed females generally have a higher likelihood of anxiety-induced sleep disturbance compared to males (López-Gil et al. 2022; Pengpid and Peltzer 2020b; Vancampfort et al. 2019; Xu et al. 2023). These highlight potential sociocultural or contextual differences in the manifestation of these issues across populations. Although the reasons for males showing higher prevalence in the Benin sample are unclear, various social, environmental, biological, and psychological factors likely play a role. In particular, Benin's context and culture shape gender identities and dynamics surrounding psychological health for adolescents (Olga et al. 2019).

In Beninese society, traditional gender roles often expect males to exhibit resilience and avoid openly displaying vulnerability (Pengpid and Peltzer 2020a). These norms may lead males to internalise stress, manifesting as sleep disturbances. Conversely, females might receive more familial and social support, reducing their anxiety-related sleep issues (Huang 2024). Additionally, limited mental health resources and stigma surrounding male emotional struggles may exacerbate these trends (Pengpid and Peltzer 2020a).

Furthermore, the multivariable logistic regression analysis assessed the magnitude of the association between explanatory variables and anxiety-induced sleep disturbance among in-school adolescents in the Republic of Benin. Findings revealed that male and female adolescents who reported experiencing hunger demonstrated significantly reduced odds of anxiety-induced sleep disturbance compared to their counterparts who did not experience hunger. This result challenges conventional findings that food insecurity and hunger are associated with increased sleep disturbances and insomnia-related symptoms (Ahinkorah et al. 2021; Jacob et al. 2023; Osei Bonsu et al. 2023). This finding can be attributed to prioritising basic physiological needs over psychological well-being. As proposed by Maslow's (2007) hierarchy of needs, deficiency in more basic requirements tends to suppress the salience of higher-level needs like safety and belonging. Thus, the physical drive to obtain nourishment when hungry could override anxiety manifestations like anxiety-induced sleep disturbance.

The study further revealed an unexpected association between loneliness and anxiety-induced sleep disturbances among adolescents. Both males and females experiencing loneliness showed a significant decrease in the likelihood of sleep disturbances, with males exhibiting a 71% reduction and females a 58% reduction compared to non-lonely peers. This finding contrasts with previous studies that identified better sleep quality as a protective factor for loneliness (Khan et al. 2023; Philbrook et al. 2023). It suggests that loneliness may interact with anxiety and sleep disturbances in complex ways, potentially serving as an unconventional coping mechanism that mitigates the impact of anxiety on sleep. This unexpected protective effect challenges conventional views of loneliness as solely negative and underscores the need to explore underlying mechanisms further. Understanding these

interactions is crucial for developing comprehensive strategies to support adolescents well-being.

Study outcomes illuminate the complex relationship between suicidal ideation, anxiety-induced sleep disturbances, and gender differences among adolescents. Contrary to conventional expectations, our findings reveal that both male and female adolescents with suicidal thoughts exhibited significantly lower odds of experiencing anxiety-induced sleep disturbances. Specifically, adolescent males with suicidal ideation demonstrated a 63% lower likelihood, while females showed a 48% lower likelihood of anxiety-induced sleep disturbances. These results diverge from previous research findings, which often associate suicidal ideation with negative mental health factors such as poor sleep, anxiety, and trauma (Buitron et al. 2023; Vera et al. 2023; Zuckerman et al. 2022). The discrepancy underscores the complexity of adolescent mental health and the need for further research to unravel the underlying mechanisms of this relationship.

Contrarily, the study showed an association between suicide attempts and anxiety-induced sleep disturbances, specifically among adolescent males. Our findings reveal that adolescent males who have attempted suicide exhibit a significantly higher likelihood of experiencing anxiety-induced sleep disturbances compared to their counterparts who have never attempted suicide. This stark revelation underscores the profound impact of suicide attempts on mental health outcomes, particularly concerning sleep disturbances in this demographic. This finding is consistent with broader literature linking suicidal behaviours to adverse mental health consequences (Vera et al. 2023; Soltani et al. 2023; Zuckerman et al. 2022). A potential explanation for the association between suicide attempts and anxiety-induced sleep disturbances among adolescent males may lie in the severe psychological trauma and stress resulting from the suicide attempt itself. Suicidal behaviour often stems from profound emotional distress, which can exacerbate underlying anxiety disorders. The heightened anxiety following a suicide attempt can disrupt sleep patterns, leading to increased sleep disturbances.

The study discovered a notable association between sexual experience and anxiety-induced sleep disturbances. Specifically, male adolescents who reported having ever had sex exhibited a significantly lower likelihood of experiencing anxiety-induced sleep disturbances compared to those who reported never having had sex. This finding contrasts with previous research that found poorer mental health outcomes, including poor sleep and increased anxiety, among adolescent males who were initiated into sexual activity earlier (Langevin et al. 2023; Wesche et al. 2017). This unexpected result suggests a potential protective effect of sexual activity against anxiety-induced sleep disturbances among male adolescents, highlighting the need for further investigation into the underlying mechanisms and psychosocial implications of sexual experiences on mental health outcomes in this demographic.

The study uncovered the significant role of parental understanding in mitigating anxiety-induced sleep disturbances among male adolescents. Male adolescents who reported having understanding parents demonstrated a 36% reduction in the odds of experiencing anxiety-induced sleep disturbances compared to their counterparts who reported not having understanding parents. This association was evidenced by an adjusted odds ratio (aOR) of 0.64 and a 95% confidence interval (CI) ranging from 0.47 to 0.87. This is supported by a previous study by Trong Dam et al. (2023), who found a significant positive relationship between parental relationships and positive mental health outcomes in adolescents with higher scores for males. The presence of understanding parental figures acts as a protective factor, providing emotional support and stability that contribute to improved mental well-being and sleep quality among male adolescents. These findings underscore the importance of familial relationships and support systems in promoting adolescent mental health, highlighting the need for interventions and parenting strategies that foster understanding and communication within the family unit to mitigate the risk of anxiety-induced sleep disturbances in male adolescents.

5.1. Strengths and Limitations

This study had several notable strengths, including using a large national sample of in-school adolescents in Benin, allowing for greater generalisation of findings than localised data. The standardised GSHS measures enabled comparison to prevalence rates across other countries and consistency in assessment.

However, some limitations surrounding the cross-sectional design should be acknowledged. First, the causal inferences about predictive relationships between variables are restricted. Second, the study utilised only a single-item measure for assessing the complex construct of anxiety-induced sleep disturbance. We acknowledged that the use of a single-item self-report measure for anxiety-related sleep disturbance has a potential for response bias, which may limit the scope of the study. Additionally, using dichotomous measures for several exposure variables may reduce the variability of the data and potentially oversimplify complex associations. Nonetheless, previous studies that used the GSHS data also adopted similar approaches to ensure uniformity in the operationalisation and interpretation of these outcome variables (Gbordzoe et al. 2024; Sarfo et al. 2024). Thus, the use of these dichotomous measures, coupled with the choice of appropriate measures of association, such as the Chi-Square and binary logistic regression, helped to address any potential biases that may have resulted from the use of these dichotomous measures.

5.2. Implications for Research and Intervention

There are several implications from this study for targeted interventions to curb anxiety and sleep issues among adolescents in Benin. First, implementing universal mental health literacy and de-stigmatisation programmes in schools could have wide-reaching benefits for awareness and help-seeking (Amado-Rodríguez et al. 2022; Warford 2019). Successful gender-sensitive interventions have been developed globally, highlighting the importance of tailored approaches to address gender-specific needs and promote inclusivity in mental health promotion. Thus, incorporating gender sensitivity in mental health literacy programmes can help reduce stigma, improve help-seeking intentions, and enhance mental health outcomes for all individuals (Pfeiffer and In-Albon 2022; Sagar-Ouriaghli et al. 2023). Improving teacher and parent capacity surrounding adolescent anxiety signs and culturally attuned management is also key (Wiedermann et al. 2023). Screening students for vital issues like loneliness, social isolation, and suicidality risks additionally allows timely support access and secondary prevention (O'Rourke et al. 2023).

Schools must also prioritise increasing student access to psychological services and coping skill development to counteract the widespread challenges revealed in this study (Fazel et al. 2014). Developing peer support and belongingness initiatives, potentially with gender-focused components, presents another evidence-based approach to reducing factors negatively impacting sleep health (Suresh et al. 2021). Overall, interventions should address relevant gender and cultural nuances in risks that manifest during developmental phases. Engaging community leaders, families, and youth in co-creating supportive solutions can further centre cultural expertise and gender needs in prevention efforts.

Further qualitative research is warranted to understand sociocultural and gender-specific risk factors tied to anxiety and sleep issues in this population. Also, longitudinal research across adolescence stages is necessary regarding trajectories and causal pathways related to anxiety and sleep disruption.

6. Conclusions

This study makes an important contribution to investigating the prevalence and factors tied to anxiety-based sleep issues among male and female in-school adolescents in the cultural context of Benin, Africa. Overall, approximately one-fifth of students reported experiencing anxiety-induced sleep problems, a concerning rate indicating substantial negative mental health and developmental impacts for youth. Counter to typical gender patterns, adolescent boys showed slightly higher prevalence compared to girls, igniting

questions about gender-specific sociocultural determinants of mental health burdens in Benin needing further inquiry.

The results also revealed shared and distinct risk and protective correlates across genders. Experiencing hunger, loneliness, and suicidal thoughts associated with anxiety-sleep disturbance across groups, highlighting priority areas for screening and support. However, peer relationship quality, sexual behaviours, suicidal history, and parental dynamics showed differential predictive significance by gender. These trends underscore tailoring evidence-based services and policy efforts with gender awareness and cultural competence in Benin to curb the high rates of anxiety and impairment of healthy sleep, undermining youth well-being.

With study limitations considered, the findings open valuable avenues for research on gender, culture, and adolescent development regarding escalating mental health issues in nations worldwide, especially those experiencing rapid change. Tracking complex and evolving gender-based cultural risk landscapes across adolescence stages can strengthen prevention and worldwide goals for youth quality of life.

Author Contributions: Conceptualisation: J.O.S.; methodology, data curation, formal analysis: J.O.S., N.I.G. and E.D.-Y.T.; writing—original draft preparation, writing: J.O.S., N.I.G., E.D.-Y.T. and V.D.C.; writing—review and editing: J.O.S., N.I.G., E.D.-Y.T., V.D.C. and J.E.H.J.; writing—supervision: J.O.S.; funding—J.E.H.J. All authors have read and agreed to the final version of the manuscript for publication.

Funding: This research received no external funding. However, the authors sincerely thank Bielefeld University, Germany, for providing financial support through the Institutional Open Access Publication Fund.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of WHO and Benin's MoH. This was registered under the Document ID: DDI_BEN_2016_GSHS_v01_M in 2016. Access to the data can be obtained at the WHO website: <https://extranet.who.int/ncdsmicrodata/index.php/catalog/627/study-description> (accessed on 1 January 2024).

Informed Consent Statement: Entry permission protocols were followed to seek permission from the heads of the various schools included in the study. Informed consent, parental consent and child assent were solicited from adolescents 18 years or above and children below 18 years, respectively, using a verbal and written agreement. Additionally, the data were collected and managed in compliance with WHO protocols to ensure the protection of participants' personal information and maintain confidentiality.

Data Availability Statement: Access to the data can be obtained at the WHO website: <https://extranet.who.int/ncdsmicrodata/index.php/catalog/627/study-description> (accessed on 1 January 2024).

Conflicts of Interest: The authors declare no conflict of interest.

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