



Sleep Problems, Suicidality and Depression among American Indian Youth

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Abstract

Study background: Mental health and sleep problems are important public health concerns among adolescents yet little is known about the relationship between sleep, depressive symptoms, and suicidality among American Indian youth. **Methods:** This study examined the impact of sleep and other factors on depressive symptoms and suicidality among Lumbee American Indian adolescents (N=80) ages 11-18. **Results:** At the bivariate level, sleepiness, was associated with depression but not with suicidality. Time in bed (TIB) was not associated with depression, but more TIB decreased the likelihood of suicidality. Higher levels of depressive symptoms were associated with increased likelihood of suicidality. At the multivariate level, sleepiness, suicidality, and self-esteem were associated with depression. TIB and depressive symptoms were the only variables associated with suicidality. **Conclusion:** In working with American Indian youth, it may be helpful to consider sleep patterns as part of a comprehensive assessment process for youth who have or are at risk for depression and suicide.

Keywords

Depression; Suicide; Sleep problems; Adolescents; American Indians

Introduction

While much is known about the relationship between depression and suicidality among adolescents, the possible impact of sleep problems on these significant health issues is less understood. Primary, or endogenous, sleep disorders are less common in children and adolescents, as compared with rates seen in adults [1]. Although primary sleep disorders such as sleep apnea, restless legs syndrome, narcolepsy and other primary sleep disorders are sometimes seen in children and adolescents, problematic sleep habits and behaviors, on the part of both children and their parents, are major contributors to sleep complaints in children and adolescents [2].

Sleep problems related to sub-optimal sleep habits are common, especially in adolescents. Adolescents are particularly prone to setting aside an inadequate amount of time for sleep. Some of the factors leading to inadequate time in bed (TIB) are external and impinge on wake time in the morning, such as early start times for school and

early school bus routes. A long period of preparing in the morning before school also treads on time that could have been spent asleep. Furthermore, close work with computer screens and/or televisions can add to environmental light exposure that can impact the release of endogenous melatonin and delay the onset of sleep [2].

Excessive daytime sleepiness, fatigue, and concentration problems would be the predicted consequences of curtailment of TIB. Indeed, adolescents with short TIB have been shown to have a variety of mood and learning problems thought to stem from sleep deprivation. Sleepiness, but not duration of sleep, is associated with problems in executive functioning among healthy adolescents [3]. Using data from the National Longitudinal Study of Adolescent Health, Wong and Brower [4] documented a relationship between sleep problems and suicidal thoughts and attempts among adolescents, including indirect effects on suicidal behavior from depression. Other research suggests that sleep problems during the time period from 12-14 years of age are a predictor of later suicidal thoughts at ages 15-17 [5]. Research from China on adolescents sleep patterns and suicidal behavior suggests that getting less than 8 hours of sleep per night increases the risk for a suicide attempt [6]. While others have reported ethnic and cultural differences in sleep complaints among adolescents [7], there is no known existing research on sleep problems among American Indian (AI) youth.

Suicide among adolescents is a significant public health problem, and the risk for suicide includes both modifiable and unmodifiable factors [6,8-15]. Among youth at risk for suicide, unmodifiable risk factors would include gender and ethnicity. Other risk factors, such as depressed mood, hopelessness, and substance abuse, isolation, are problems for which existing treatment options exist.

Recently, Sleep problems have been added to the list of modifiable risk factors [6,8-15]. Sleeping less than 8 hours per night, nightmares, and excessive sleepiness are risk factors for suicide attempts among adolescents [6,12]. In addition to short total sleep time, others have found that excessive sleeping (10 or more hours per night) is a risk factor for suicidality [16]. TIB is an important modifiable risk factor as it could be impacted through a wide variety of inexpensive pathways including school health programs, public health measures, and modifications of school policies such as delay of school start times.

Despite the absence of research on sleep problems among AI youth and the possible impact of such problems on depression and suicidality, it is well established that AI youth may have prevalence rates of psychiatric disorders rates similar to those of white youth [17]. However, a great disparity exists in suicide risk [18] as AI adolescents have the highest suicide rate of all ethnic groups in the US [19-21]. According to Indian Health Services (IHS) data, the suicide rate for AIs is 70% higher than for general population [22]. Disparities also exist in suicide attempts [23] as one study found that 25% of Alberta Indian adolescents had attempted suicide at some point during their lifetimes with similar rates documented in other recent studies [24-26].

There are many risk factors for suicidal ideation among AI

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adolescents, some of which may be unique to this population. For instance, historical trauma has been associated with emotional distress, including depression, anger, and anxiety [27,28]. Other risk factors include depressive symptoms, low self-esteem, substance abuse, hopelessness, acculturation, and lack of social support [21,23,25,26,29-33]. Sexual orientation is also predictor of suicidal ideation and/or attempts among AI youth [34]. While little is known about obesity among AI youth, others have reported that obesity-related teasing can impact suicidal ideation and suicide attempts across all racial and ethnic groups [35].

To address the research between the relationship between sleep, depressive symptomatology, and suicidality among AI youth, this paper presents data from the Lumbee Rite of Passage (LROP) study which focuses on risk factors for suicide among Lumbee AI adolescents. Using a community-based research model, the study was conducted as a partnership between the Maya Angelou Center for Health Equity (MACHE) at Wake Forest School of Medicine (WFSM), the University of North Carolina at Pembroke (UNCP), and the Lumbee Tribe of NC. The study was approved by the Wake Forest School of Medicine Institutional Review Board.

In this paper, we examined the following research question: What roles do sleep factors play in suicidality and depression among Lumbee American Indian youth? We hypothesized that time in bed and higher levels of sleepiness would impact suicidality and depressive symptoms among youth in the study. In addition, we examined the possible role of other psychosocial and demographic variables on suicidality and depression.

Materials and Methods

The study assessed the impact of a tribally-operated six-month cultural enhancement program for Lumbee youth on mental health outcomes. Information from the baseline data collection is presented here. The study was conducted in Robeson County in southeastern North Carolina, the traditional homeland of the Lumbee tribe. The Lumbee is a state-recognized tribe of approximately 55,000 members, one of the largest tribes in the eastern U.S. While there is limited information available on the health of Lumbee Indian youth, statewide data indicate that American Indians in North Carolina have significant health and economic disparities [36]. According to the US Census, Robeson County is the poorest of the 100 North Carolina counties, with 31% of its residents living in poverty.

Study participants

Participants were Lumbee adolescents who were recruited from a tribally-operated community center, a Boys' and Girls' Club, and local churches. Youth were recruited primarily through flyers, contacts at these agencies or churches, and word-of-mouth. Inclusion criteria for participation included: age 11-18 years, residency in Robeson or a neighboring county, enrolled member of the Lumbee tribe by self-identification; fluent in English, and cognitively able to provide assent and actively participate in the study.

Data collection procedures

Members of the study team came to each site (visits were announced in advance) and invited potentially eligible youth and their parent or guardian to learn about the study. For those who expressed interest in the study, they were given verbal information about the study and a copy of the assent/consent to review. After obtaining

written informed assent/consent from interested and eligible participants and a parent/guardian, the parent/guardian completed a brief demographic and background survey. Each youth was given a study booklet that contained all of the measures. Height and weight were collected by study staff members, and each participant was interviewed by a study team member regarding suicidality and self-harm behaviors. These study activities took approximately 45 minutes to complete. All study procedures were approved by the Institutional Review Board at (to be inserted).

Measurement

Suicidal ideation: Suicidal ideation was measured using the Suicidal Ideation Questionnaire – Junior High School Version (SIQ-JR) [37]. The SIQ-JR is a 15-item battery designed to measure the presence and severity of suicidal thoughts among adolescents. Although originally developed to measure the severity of suicidal ideation among junior high school youth, it can also be used among older youth. Participants are asked to rate various suicidal thoughts on a seven-point scale, where from 0 means “I never had this thought” and 6 means that they have this thought “almost every day.” Scores on each item are summed to provide a total severity score. A raw score greater than 31 on the SIQ-JR indicates a need for further evaluation regarding potential suicide risk [37]. A version of the scale has been used successfully in American Indian populations [23,31,32].

Depressive symptoms: Depressive symptoms were measured using The Center for Epidemiologic Studies Depression Scale for Children (CES-DC) [38]. The CES-DC is a 20-item self-report depression inventory with possible scores ranging from 0 to 60, where a score higher than 15 may indicate the presence of clinically significant depressive symptoms. The reliability and validity of the CES-DC are well-established [39,40].

Self-esteem: Self-esteem was measured using The Rosenberg Self-Esteem Scale (RSES) [41]. This battery consists of ten Likert-style questions answered on a four-point scale from strongly agree to strongly disagree. Previous studies have documented a reliability of 0.85 and confirmed face and convergent validity [42].

Sleep: We examined two aspects of sleep: sleepiness and average time in bed (TIB) per night. To measure sleepiness we used a modified version of the Epworth Sleepiness Scale (ESS) [43]. The ESS is a validated self-report questionnaire to assess subjective sleepiness; subjects are asked about their tendency to fall asleep over the last month under 8 different scenarios. The score ranges from 0 (no sleepiness) to 24 (substantial daytime sleepiness), with a score greater than 10 usually considered to be abnormal. We assessed TIB using two questions: (1) what time do you usually go to bed if you have school the next morning? and 2) What time do you usually wake up on school days? TIB was calculated using the difference between the responses to these questions, measured in hours.

Anthropometric tests: Height was measured using a standard stadiometer. Height was recorded to the nearest ½ inch and was repeated, and the two measures were averaged. If there is a discrepancy of more than ½ inch in the two measurements, a third measurement was taken, and the discrepant measure was discarded. Weight was measured using digital scales. Body mass index (BMI) was assessed using measured weight (kilograms) divided by measured height (meters) squared. Percentiles for BMI were determined to be specific to sex and month of age using algorithms prepared by the

U.S. Centers for Disease Control and Prevention (CDC) based on the 2000 CDC Growth Charts [44].

Data were also collected on demographic variables, including age, grade in school, gender, and sexual orientation. Socioeconomic status, presence of mental illness, and other demographic information were collected from parents. Connectedness to Lumbee culture was assessed on a 10-point Likert scale, where “1” means not connected at all, and “10” means extremely connected.

Statistical methods

Data were summarized using means and standard deviations (SDs) for continuous variables, and frequencies and percents for categorical variables. Outcomes of interest were depression as measured by continuous CES-DC score and suicidality as measured by SIQ-JR dichotomized at 0 vs. 1+. Linear regression was used to further investigate associations with CES-DC, and logistic regression was used for the SIQ-JR outcome. We first assessed bivariate associations between these two outcomes and the following independent variables: CES-DC (for the suicidality outcome), SIQ-JR (for the depression outcome), age, gender, grade in school, BMI, sexual orientation, presence of mental illness, ESS, TIB, RSES, and connectedness to Lumbee culture. To fully examine all potential associations, we used an inclusive criterion for multivariate model construction. Thus, independent variables that were associated at the $p < 0.15$ level with each outcome were subsequently entered into a multivariable model. All analyses were conducted in SAS v9.2 (SAS Institute, Inc., Cary, NC).

Results

We recruited 80 youth in grades 4-12 who ranged in age from 11-18 (mean (std) of 13.7 (2.0) years) to participate in the study. As noted in Table 1, there were slightly more females (59.5%) than males in the sample. The majority (84.6%) reported that their sexual orientation was heterosexual. Average BMI was 24.6 with a range of 14.7 to 53.7. Self-esteem scores ranged from 13-30 with a mean score of 22.7. A small number of participants ($n=6$; 7.8%) reported that they had been diagnosed with a mental health problem, most commonly ADHD and depression, and only one youth had attempted suicide in the past. About one-third of participants reported moderate to severe depressive symptoms (CESD score 24 or greater), and approximately two-thirds of subjects reported elevated sleepiness scores (ESS score greater than 10). Average TIB ranged from 5-10 hours with a mean of 8.1 hours per night.

Table 2 presents the results from the bivariate analysis. At the bivariate level, sleepiness was associated with depression but not with suicidality. By contrast, TIB was not associated with depression, but more TIB decreased the likelihood of suicidality. Higher CESD scores were associated with increased likelihood of suicidality. Self-esteem was negatively associated with depression and decreased odds of suicidality. Males had a lower likelihood of being suicidal than females. Other factors associated with depression were non-heterosexual sexual orientation and low levels of connectedness to Lumbee culture (although not significantly; $p=0.1163$). Sexual orientation, while not significantly associated with suicidality, did meet the threshold of $p < 0.15$ for inclusion in the multivariable model ($p=0.1442$).

In our multivariable analysis (Table 3), sleepiness, suicidality, and self-esteem were associated with depressive symptoms; however,

sexual orientation and connectedness to Lumbee culture were not. TIB and depression were the only variables associated with suicidality; gender, self-esteem, and sexual orientation were no longer significant.

Discussion

Our analysis revealed some interesting and unexpected findings about the relationships between sleep, depression, and suicidality among AI youth. Both at the bivariate and multivariate levels, sleepiness was associated with depression but not suicidality. While, TIB was not associated with depression, it was associated with suicidality such that less TIB was related to greater suicidality.

Table 1: Demographic and Background Characteristics of Sample (N=80).

Variable	N	%	
Gender			
Male	32	40.5	
Female	47	59.5	
Age			
11-12	24	30.4	
13-15	39	49.4	
16-18	16	20.2	
Grade in school			
4-5	9	11.4	
6-8	50	63.3	
9-12	20	25.3	
Ever diagnosed with mental health			
Yes	6	7.8	
No	71	92.2	
Sexual orientation			
Heterosexual	66	84.6	
Other	12	15.4	
Made a suicide attempt in the past 12 months			
Yes	1	1.3	
No	78	98.7	
Time in Bed (hours)			
<8	22	29.3	
8-9	43	57.3	
>9	10	13.3	
Time goes to bed			
8pm	1	1.3	
9pm	25	32.9	
10pm	28	36.8	
11pm	12	15.8	
Midnight	8	10.5	
1am	2	2.6	
Epworth Sleepiness Score			
10 or less	50	65.8	
Greater than 10	26	34.2	
CESD			
Minimal/Mild (0-23)	54	69.2	
Moderate/Severe (24+)	24	30.8	
	Range	Mean	Std
BMI	14.7 – 53.7	24.6	7.6
Epworth Score	0 – 20	8.6	4.9
RSE Score	13 – 30	22.7	4.5
CESD Score	0 – 46	16.8	12.3
SIQ Score	0 – 34	3.6	6.2
Time in Bed (hours)	5 - 10	8.1	1.1

Reduced TIB could be a proxy for insomnia, or possibly sleep deprivation, and our methods did not allow us to conclusively disentangle these possibilities. Still, to the extent that TIB is under the control of the adolescent sleeper, extending TIB is a promising modifiable risk factor for reducing adolescent suicidality. In adults, others have documented a relationship between depression and excessive daytime sleepiness in adults even when controlling for TIB [45]. In a study of AI adults in North America, depression was independently associated with ESS scores but only 6.3% of subjects had a score of more than 10 [46] which is a much lower percentage than in our sample (34.2%). When assessing depression among this population, perhaps the important issue is how rested the individual feels regardless of the time spent in bed. Screening for sleep problems alone may also be important part of the assessment process for youth at risk for suicide [16].

In terms of TIB and sleepiness, our sample appears to be fairly representative of U.S. adolescents. The average amount of weekday sleep among US adolescents ages 15-17 is approximately 8 hours per night (Knutson and Lauderdale [47]), and approximately two-thirds of our sample spent an average of 8 or more hours in bed at

night. Our mean ESS score of 8.6 was comparable with ESS scores for adolescents in other sleep research (8.75 and 8.73 for two samples in Gibson et al. study) [48]. However, our means scores were slightly higher than those reported for middle and high school age youth recruited from schools in a recent study in South Korea (mean ESS was 7.25) [49].

As expected, depression and suicidality were positively associated in both sets of analyses. These findings suggest that there may be a causal pathway between sleepiness and suicidality that is mediated by depression that warrants future study. While there is no established causal pathway between sleep deprivation and suicidality, Goldstein et al. [12] psychological autopsies of completed adolescent suicide revealed a temporal relationship between sleep problems and suicidality even after controlling for severity of depressive symptoms. In particular, they found that insomnia in the week before a completed attempt was an important risk factor. Lee et al. [49] (2012) posit that symptoms associated with sleep deficits, such as impulsivity, may play a role in the relationship between these variables. This model is worthy of further examination, particularly research on the mechanisms or pathways that may explain the link between sleep problems and suicidality [12]. Since sleepiness is a potentially modifiable problem, it is possible that if youth with depression and sleep problems are adequately treated for both problems, this intervention might be a preventative measure against suicidality. Others have asserted that treatment for sleep problems may positively impact mental health among American Indians [46].

Another finding that is inconsistent with much of the literature on acculturation theories and depression among AI youth [21,27,50] is that connectedness to Lumbee culture was not associated with depression or suicidality in our multivariate model. While there was an association between cultural connectedness and depression in our bivariate analysis, this relationship disappeared in our multivariate model. One issue that might have impacted this finding is that the youth in this study reported very high levels of cultural connectedness. This finding may be the result of our recruitment strategies as we recruited youth who were already involved in community activities that may have positively impacted their cultural identity. Thus, our study sample may not be representative of all Lumbee youth. However, other researchers have found no association between participation in tribal cultural activities and depressive symptoms [51].

In addition to the limitation of our sample reporting feeling very connected to Lumbee culture, our sample appeared to be quite connected to the community and other supports. Given that we recruited from community settings, such as community centers and churches, many of these youth were already involved in positive activities that likely provided them with social support and opportunities for socialization. If our sample included more youth who did not feel as culturally connected to their American Indian culture, we might have seen different results. Another limitation is that similar to other studies on this topic [49], we relied on self-report data as opposed to more objective measures of sleep such as actigraphy or polysomnography to conclusively rule out primary sleep disorders. Hence our findings may reflect recall bias of the participants in terms of TIB or sleepiness.

The problems of depression and suicide among American Indian youth are well-known but not fully understood. The results of this study suggest that sleep problems and patterns may play a role in

Table 2: Bivariate analysis.

Independent Variables	Outcomes*			
	CESD		SIQ	
	Beta	p-value	OR	p-value
ESS	1.092	<.0001	1.062	0.2143
CESD	--	--	1.064	0.0053
SIQ	0.637	0.0036	--	--
Age	0.994	0.1624	0.977	0.8395
Gender (male vs. female)	-4.027	0.1571	0.353	0.0280
BMI	-0.118	0.5290	0.977	0.4426
Time in bed (hours)	-0.501	0.7067	0.617	0.0415
Mental Illness (yes vs. no)	7.139	0.1750	4.342	0.1903
Rosenberg	-1.342	<.0001	0.894	0.0412
Sexual orientation (hetero vs. other)	-8.416	0.0284	0.354	0.1442
Grade in school	0.620	0.3888	0.908	0.4114
Connected to Lumbee culture	-0.914	0.1163	0.993	0.9411

*CESD is modeled with linear regression;

*SIQ is dichotomized at 0 vs. 1+ and modeled with logistic regression (modeling the probability that SIQ = 1+).

Table 3: Multivariate analysis.

Covariates**	Outcomes*			
	CESD		SIQ	
	Beta	p-value	OR	p-value
ESS	0.607	0.0199	--	--
CESD	--	--	1.059	0.0468
SIQ	0.381	0.0405	--	--
Age	--	--	--	--
Gender (male vs. female)	--	--	0.511	0.2216
BMI	--	--	--	--
Time in bed (hours)	--	--	0.577	0.0409
Mental Illness (yes vs. no)	--	--	--	--
Rosenberg	-0.957	0.0007	0.967	0.6367
Sexual orientation (hetero vs. other)	-5.357	0.1100	0.442	0.3350
Grade in school	--	--	--	--
Connected to Lumbee culture	-0.775	0.1036	--	--

*CESD is modeled with linear regression;

*SIQ is dichotomized at 0 vs. 1+ and modeled with logistic regression (modeling the probability that SIQ = 1+).

**IV's with a p-value of 0.15 or less in the bivariate setting are selected to be included in these multivariable models.

developing a more informed picture of these problems. Within the context of other variables, both sleepiness and TIB appear to be possible factors worthy of additional examination yet cultural connectedness did not seem to be a notable factor. In order to develop interventions to target the mental health of these youth, a simple but potential worthwhile endeavor may be to try to impact sleep behaviors as well as applying culturally-sensitive treatments for depression and suicidality.

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