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Brief Research Report

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Poor self-reported sleep quality associated with suicide risk in a community sample of American Indian adults

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Abstract

Study Objectives: Although American Indian/Alaska Native (AI/AN) have high suicide rates few studies have systematically investigated sleep quality and its association with suicidal behaviors in AI/AN. This study is a cross-sectional investigation of self-reported sleep quality and suicidal behaviors in an adult AI population.

Methods: A semi-structured interview was used to collect data on suicidal ideation, suicidal plans, and suicidal attempts and the Pittsburgh Sleep Quality Index (PSQI) was collected to assess sleep quality in American Indian adults.

Results: In this sample (n = 477), 91 (19%) of the participants endorsed suicidal ideation (thoughts and plans), and 66 (14%) reported suicidal attempts, including four who subsequently died by suicide. More women reported suicidal thoughts or acts than men. Those endorsing suicidal thoughts slept fewer hours during the night, reported more nocturnal awakenings, and showed poorer subjective sleep quality according to PSQI total scores compared to those with no suicidal thoughts or acts. Participants with suicidal acts (n = 66) reported more bad dreams and higher PSQI total scores compared to those with no suicidal thoughts or acts. When those with any suicidal thoughts or acts (n = 157, 33%) were compared to those without, they were more likely to endorse nocturnal awakenings and bad dreams and demonstrated significantly higher PSQI total scores.

Conclusions: Although additional research is needed to evaluate sleep disturbances as a proximal, causal risk factor for suicidal behaviors in AI, findings highlight need for further study of sleep as a warning sign and intervention tool for suicide prevention among American Indian adults.

Key words: Suicide; sleep; American Indians

Statement of Significance

Findings demonstrate that suicidal thoughts and acts in American Indians are associated with poorer subjective sleep quality and that sleep may be a modifiable risk factor and important intervention tool in suicide prevention.

Introduction

Substantial health disparities are observed among American Indians/Alaska Natives (AI/AN) [1], who remain significantly understudied in sleep medicine [2–10]. Suicide prevention has emerged as a public health emergency among those who identify as AI/AN, with 50% higher suicide rates observed across all age groups compared to the general US population [11–13]. Rates vary and increase further according to geographic region, tribal affiliation, and whether living on a reservation—highlighting urgency to identify risk and protective factors for suicide in individual tribal groups and guide strategies for intervention and prevention (see [14–18]).

Converging evidence from studies in the general population suggests that sleep problems may be associated with elevated risk for suicidal behaviors [19]. Across studies diverse in age, sample, and design, both subjective and objective sleep disturbances confer risk for suicidal ideation, attempts, and death by suicide, and have emerged as an evidence-based risk factor for suicide [15]. In addition, a recent chart review found that 76% of those who died by suicide reported sleep problems in the 30 days prior to their death [20]. Yet few studies have systematically investigated sleep quality in AI/AN [2, 21], nor in association with suicidal behaviors specifically. Sleep duration (at least 7 hours per night) appears more restricted among AI/AN as compared with

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non-Hispanic white, Hispanic, and Asian respondents, according to the Behavioral Risk Factor Surveillance System in at least one report [22]. However, sleep has not been systematically evaluated in association with suicide risk specifically among AI/AN adults. In one study of AI youth, more time in bed was found to be associated with suicidality and depressive symptoms [23].

To address this gap in the literature, the present study represents a cross-sectional investigation of self-reported sleep quality in association with suicidal thoughts and acts in an adult sample of American Indian adults. This report is from a study exploring risk factors for mental and physical health conditions in a community sample of American Indians [21].

Methods

American Indian participants were recruited from eight geographically contiguous reservations with a total population of about 3000 individuals. Participants were recruited using a combination of venue-based methods for sampling hard-to-reach populations and respondent-driven procedures [24, 25] described elsewhere [21, 26]. To be eligible, participants had to be of American Indian heritage, between the ages of 18 and 70 years, and mobile enough to be transported from their home to The Scripps Research Institute. The study protocol was approved by the Institutional Review Board of The Scripps Research Institute and a tribal review group overseeing health issues for reservations where recruitment occurred. Written informed consent was obtained from each participant after the study was fully explained.

Potential participants first met individually with research staff and completed a questionnaire to gather information on demographics, personal medical history, and ethnicity-related items (see [27]). Participants also completed interviews based on the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) which was used to assess diagnoses of psychiatric disorders, including lifetime history of two types of self-directed violence: (1) suicidal thoughts, including ideation (*Have you ever thought about killing yourself?*) and plans (Did you have a plan? Did you actually consider a way to take your life? What were you going to do?), and (2) suicidal acts, including suicide attempt history (*Have you ever tried to kill yourself? How did you try to kill yourself?*) reported by participants. In addition, suicide deaths occurring subsequent to the interview were obtained from community sources (e.g. verified by public records, family/tribal informants) [28]. Several studies have evaluated the concurrent diagnostic validity of the SSAGA, with findings supporting its use as a highly reliable and valid instrument [29, 30]. Sleep quality was indexed by The Pittsburgh Sleep Quality Index (PSQI) [31]. The PSQI consists of 19 items that can be classified into seven components that were used to produce a global sleep quality score. Individual items from the PSQI, that have been reported previously to be associated with suicidality in general population studies such as: total sleep time, sleep onset latency (SoL), number of nocturnal awakenings, and the source of difficulty sleeping, including bad dreams can also be indexed by the PSQI [32, 33]. Higher total scores are associated with poorer self-reported sleep quality and were calculated for each participant as described elsewhere [21, 34].

Results

Sample demographic characteristics are presented in Table 1. The sample was comprised of 477 participants (42% male; 83% unmarried), with a mean age of 32.8 years (±14.5 = SD). Mean education was 11.71 ± 1.5 (SD) years, and 56% reported an annual income of <$20 000 per year. Suicidal behaviors were grouped for comparison into 4 groups: (1) no suicidal thoughts or acts (n = 320,67%), (2) suicidal thoughts (ideation and/or plans) only (n = 91,19%), (3) suicidal acts (suicide attempts or death by suicide) (n = 66, 14%) including four subsequently confirmed suicidal deaths, followed over an 8 year time period; as well as, (4) any suicidal ideation or behavior (suicidal thoughts, suicide attempts, or death by suicide) (n = 157, 33%). Participants within the three groups (thoughts, acts, and any suicidal behavior) were compared to those with no suicidal behaviors, using scores on the PSQI-defined items and total scores. Analyses were ANOVA and T-tests for continuous variables and Chi-squared tests for dichotomous variables. Table 2 presents results of those comparisons.

More women than men reported any suicidal thoughts or acts (F = 4.0, $p < 0.05$), and this held for suicidal thoughts alone (F = 4.4, $p < 0.04$), but not for suicidal acts. There were no significant sex differences on any of the PSQI items, so sex was not used as a covariate in subsequent analyses. ANOVAs revealed that those with suicidal thoughts slept fewer hours during the night (F = 6.4, $p < 0.01$), reported more nocturnal awakenings (F = 4.9, $p < 0.03$), were more likely to be a short sleepers (<6 hours) (Chi Square = 6.1, $p < 0.01$), and showed poorer subjective sleep quality according to PSQI total scores (F = 10.0, $p < 0.002$), compared to those without suicidal thoughts or acts. Those with suicidal acts reported more bad dreams (F = 5.2, $p < 0.02$) and higher overall PSQI total scores (F = 7.6, $p < 0.006$) compared to those with no suicidal thoughts or acts. When those with any suicidal thoughts or acts were compared to those without, they were more likely to endorse nocturnal awakenings (F = 6.2, $p < 0.01$, t = 6.2, $p < 0.01$) and bad dreams (F = 6.8, $p < 0.01$, t = 6.8, $p < 0.01$), were more likely to be a short sleeper (<6 hours) (Chi-Square = 6.8, $p < 0.009$), and demonstrated higher PSQI total scores (F = 13.7, $p < 0.0001$, t = 13.7, $p < 0.0001$) (see Table 2).

A logistic regression was run entering the two items "having bad dreams" and "being a short sleeper" for the three outcome variables (suicidal thoughts, suicidal acts, any suicidal thoughts, or acts) in order to see if they remained significant in the model using that analytic approach. Being a short sleeper remained significant for the outcome of suicidal thoughts (B = –0.763, $p < 0.003$ OR = 0.46,CI = 0.28 to 0.77). Having bad dreams (B = 0.33, $p < 0.02$,

Table 1. Demographics

Demographic (n = 477)	Result
Age	32.8 ± 14.6
Male	201 (42.1%)
Female	276 (57.9%)
Number years education	11.7 ± 1.6.
High school diploma or GED	324 (67.9%)
Household income $20k or more	267 (63.3%)
Married	80 (16.8%)
Employed	141 (29.6%)
Ever taken medication to sleep	136 (28.5%)
Sleeps less than 6 h/night	133 (26.0%)
Sleeps less than 7 h/night	229 (46.7%)

Data are provided as mean ± SD or number of participants and (percentage), GED, completion of the General Educational Development Test.

Table 2. Suicidal behaviors and the PSQI items (n = 477)

PSQI items	No suicidal ideation or acts	Suicidal ideation	Suicidal acts	Any suicidal behaviors
Short sleep (<6 h.)	13.4%	24.2%*	21.2%	22.9%**
Sleep latency (min)	31.9 ± 2.2	33.1 ± 4.7	38.9 ± 5.3	35.5 ± 3.5
Sleep duration (h.)	7.48 ± 0.1	6.93 ± 0.2*	7.41 ± 0.3	7.13 ± 0.2
Nighttime or early morning awakenings [1]	1.26 ± 0.06	1.56 ± 0.1*	1.51 ± 0.1	1.54 ± 0.1*
Cannot breathe comfortably [1]	0.25 ± 0.04	0.4 ± 0.09	0.35 ± 0.10	0.38 ± 0.07
Bad dreams [1]	0.46 ± 0.05	0.65 ± 0.1	0.72 ± 0.1*	0.68 ± 0.08**
PSQI total	4.80 ± 0.2	6.30 ± 0.5**	6.23 ± 0.6**	6.27 ± 0.4**

*$p < 0.05$, ** $p < 0.01$, compared to "no Suicidal ideation or acts" group;
[1]Approximate weekly occurrences.

OR = 1.4, CI = 1.04 to 1.84) remained for the outcome of suicidal acts. Being a short sleeper ($B = -0.531$, $p < 0.017$ OR = 0.59, CI = 0.38 to 0.90) and having bad dreams ($B = 0.26$, $p < 0.018$, OR = 1.3, CI = 1.04 to 1.6) both remained significant for the outcome of any suicidal thoughts or acts.

Discussion

American Indians and Alaska Natives (AI/AN) experience the highest burden of suicide compared to other ethnic or racial groups [11], underscoring need to identify modifiable risk factors in different communities using evidence-based, community-specific prevention and intervention efforts [14]. Converging evidence suggests that sleep disturbances confer risk for suicide across a range of general population studies [19, 35]. A systematic review of the extant literature found that, despite considerable differences in assessment techniques, samples and study designs, sleep disturbances reflect an evidence-based risk factor for suicide ideation, attempts, and death by suicide [19]. In addition, sleep has been recently prioritized by NIH for increased research to guide intervention opportunities and advance innovation in suicide prevention. However, to date, there has been virtually no literature on American Indians, sleep, and suicide risk, despite alarming suicide rates among AI populations and elevated need [221

The present study focused on evaluation of sleep quality and suicidal behaviors in one group of federally recognized AI residing on eight contiguous reservations. Nearly half of participants reported sleeping fewer than 7 hours. per night, and 26% reported sleeping fewer than 6 hoursper night. This is more restricted compared to sleep among the general United States population (7 hours = 29.5%, 6 hrs. = 23%) [22]. In our study, being a short sleeper (<6 hours) was also significantly associated with suicidal ideation and "any suicidal behavior." Short sleep duration has been tied to increased severity of suicidal ideation symptoms and next-day ideation in a number of reports (see [33]). Our findings are likewise consistent with research among AI/AN respondents in the Behavior Risk Factor Surveillance System—showing more restricted sleep among AI/AN compared with non-Hispanic White, Hispanic, and Asian respondents [22].

Another aspect of sleep that was significantly associated with suicidal behaviors in this AI population was reporting bad dreams. This aligns with a large body of work supporting associations between nightmares and disturbing dreams as a risk factor for suicidal behaviors—both according to cross-sectional and longitudinal investigations and across clinical and epidemiological samples. In addition, a recent study identified the presence of nightmares by chart review as significantly associated with an increased likelihood of a suicide attempt or death by suicide—further underscoring its importance as a risk factor and potential intervention tool [36]. In the present study, bad dreams were associated with suicidal acts in particular. At least one report among AI veterans has demonstrated a higher degree of trauma-related nightmares compared to non-AI veterans [37], further underscoring need for additional study.

Interestingly, we found no effect of sex on any of the sleep variables evaluated. These results are consistent with our previous study [21] and a study of sleep-related symptoms in an adult Indigenous population of First Nation people residing in Canada, where no consistent effect of age or sex was found on insomnia complaints [3]. In another study of older American Indians (age 55 or older), no significant sex differences were found on measures of sleep duration, although women reported greater difficulty falling asleep [6]. It is possible that sex/gender roles have less of an influence on sleep quality in indigenous populations than what is typically found in general population surveys.

Regarding explanatory mechanisms, disturbed sleep and suicidal behaviors cut across psychiatric and medical illnesses, suggesting a shared neurobiology. We proposed that mood-related deficits may lie at the intersection between sleep and suicidal behaviors, given the role of sleep in emotion and mood dysregulation and suicide [38, 39]. This model converges with experimental and non-experimental findings of sleep deprivation, and links between nocturnal wakefulness, neurocognitive deficits, and suicide-related outcomes [32, 40]. Additionally, both subjective and ACTi graphically assessed sleep parameters (i.e. insomnia, nightmares, and variability in sleep timing) appear to predict acute suicidal risk, in addition to mood variability [19, 32]. Taken together, poor sleep is modifiable, highly treatable, non-stigmatized, and appears to outperform the more traditional risk factor of hopelessness [32, 38, 41]. This highlights its promise as a risk and protective factor in need of additional research in American Indians, including potential use within strengths-based, community frameworks for suicide prevention [42].

In conclusion, short self-reported sleep duration (>6 hours), poor subjective sleep quality, increased nocturnal awakenings, and bad dreams were significantly associated with suicide risk in the current group of AI. These findings suggest that evaluation of sleep may be an important tool in prevention of suicide in this population. However, the results of this study should be interpreted in light of several limitations. The sleep data were based on a self-report instrument that recorded sleep quality for only 1 month time. Additionally, all the data were collected in a cross-sectional sample. Polysomnographic data (if culturally acceptable

and tolerated) could theoretically provide richer data, especially if collected proximally to suicidal behaviors. Next, analyses were not meant to generate a comprehensive model of suicide risk and sleep in this community group, but rather to determine whether specific associations could be identified between suicidal thoughts and behaviors using a well-established measure of self-reported sleep quality. A larger sample, using multiple assessment methods of sleep and suicidal behaviors within a prospective evaluation, would enable assessment of additional variables associated with suicide risk, according to suicidal behaviors and validated symptom measures. Though conducted in a community sample at elevated risk for suicide, our findings reflect participant responses recruited from eight geographically contiguous tribes in the Southwestern United States and may not generalize to other American Indians in the United States or the population from which the sample was drawn.

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Author Contributions

Cindy L. Ehlers (Conceptualization [equal], Data curation [equal], Formal analysis [equal], Funding acquisition [equal], Investigation [equal], Methodology [equal], Project administration [equal], Resources [equal], Software [equal], Supervision [equal], Validation [equal], Visualization [equal], Writing—original draft [equal], Writing—review and editing [equal]), Katherine J. Karriker-Jaffe (Conceptualization [equal], Data curation [equal], Formal analysis [equal], Funding acquisition [equal], Investigation [equal], Methodology [equal], Project administration [equal], Resources [equal], Software [equal], Supervision [equal], Validation [equal], Visualization [equal], Writing—original draft [equal], Writing—review and editing [equal]), and Rebecca Bernert (Conceptualization [equal], Data curation [equal], Formal analysis [equal], Funding acquisition [equal], Investigation [equal], Methodology [equal], Project administration [equal], Resources [equal], Software [equal], Supervision [equal], Validation [equal], Visualization [equal], Writing—original draft [equal], Writing—review and editing [equal])

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