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After studying this article, you should be able to:

- Assess patients with sleep disturbances for suicidality

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Sleep Duration and Insomnia Symptoms as Risk Factors for Suicidal Ideation in a Nationally Representative Sample

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ABSTRACT

Objective: Suicidal behavior (suicidal ideation, suicide attempts, and suicide completion) has been increasingly linked with difficulty initiating sleep, maintaining sleep, and early morning awakenings. However, the relationship between suicidal behavior and sleep duration abnormalities is unclear, especially at the population level. The present study used a nationally representative sample to examine the association of suicidal ideation with extreme sleep durations and insomnia symptoms.

Method: Cross-sectional data from adult respondents (≥ 18 years of age, $N = 6,228$) were extracted from the 2007–2008 wave of the National Health and Nutritional Examination Survey. Ordinal logistic regression analyses were used to evaluate the relationship of suicidal ideation with sleep duration, global insomnia, and individual insomnia symptoms in models adjusted for sociodemographic, socioeconomic, and health-related covariates.

Results: Suicidal ideation was associated with abnormalities of sleep duration. This relationship ceased to exist once the model was adjusted for depressive symptoms. As expected, an increased level of suicidal ideation was consistently associated with insomnia. Of the insomnia symptoms, difficulty maintaining sleep was found to be the most predictive of suicidal ideation, followed by difficulty initiating sleep ($P < .05$).

Conclusions: Abnormalities of sleep duration and continuity should prompt a clinical assessment for suicide risk.

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Suicide is the 10th leading cause of death in the United States, claiming more than 36,000 lives per year.¹ Suicide is an important concern for psychiatric and health care professionals as well as public policy makers. Suicide is often associated with psychiatric disorders. According to a 2004 meta-analysis,² the mean percentage of suicides with a psychiatric diagnosis was 87.3%. On average, 43.2% of suicide patients were diagnosed with affective disorders (including depressive and bipolar disorders) and 25.7% with other substance problems.² While completed suicide is the ultimate cause of death, studies of suicidal ideation can yield valuable information on risk factors for committing suicide. Current suicidal ideation is the best

- Increased suicidal ideation was associated with abnormalities of sleep duration.
- Increased suicidal ideation was positively associated with insomnia.
- Clinicians should screen for depressive disorder and suicidal ideation in patients complaining of insomnia and abnormalities of sleep duration.

indicator of a recent suicide attempt in psychiatric patients³ as well as eventual suicide.⁴

Studies^{5–11} have further demonstrated a link between suicidal behavior and sleep continuity disturbances. A prospective cohort study⁷ performed with a representative population in Norway reported a strong association between sleeping problems and completed suicide. In a sleep medical center sample, Krakow et al⁶ found that suicidal ideation was associated with insomnia symptoms. Generally, difficulty initiating sleep, maintaining sleep, and early morning awakening all relate to suicidal behavior. Difficulty initiating sleep has been cited as a predictor of suicidal ideation and planning, while difficulty maintaining sleep has been shown to be a significant predictor of suicide attempts.¹² Yang and colleagues⁵ observed Internet searches for the word *insomnia* were elevated 1 month prior to a known suicide attempt.

A number of other studies utilizing samples from special populations such as adolescents, prisoners, military personnel, and persons misusing alcohol have demonstrated strong links between insomnia and suicide. Insomnia in adolescents has been found to be related to higher rates of substance abuse, depression, and suicide completion—both overall and when sleep patterns from the week prior to suicide are isolated and analyzed.¹³ Another study¹⁴ found that when suicide completers were compared to matched controls, the completers exhibited greater insomnia over the week prior to suicide. Likewise, self-reported insomnia has been shown to associate with suicidal ideation in military personnel, even after controlling for symptoms of depression, hopelessness, posttraumatic stress disorder diagnosis, anxiety symptoms, and drug and alcohol abuse.¹⁵ Prison populations are often plagued by both insomnia and suicide. Existing literature indicates that in prison populations, insomnia is related to both a lifetime history of suicidal ideation and current suicidal ideation.⁸ Those misusing alcohol also are at a higher risk of both suicide¹⁶ and insomnia.^{17–19} Insomnia symptoms in alcohol misusers have been associated with alcohol consumption, cigarette smoking, psychiatric disturbance, and the subject's age.²⁰

Clarifying the role of insomnia as a risk factor for suicide is imperative¹⁰ and may improve suicide risk assessment, suicide prediction, and future treatments. Factors contributing to the paucity of such research include the use of nonstandard and understudied definitions of insomnia,^{21,22} nonstandardized instruments for the measurement of insomnia, the reliance on nonrepresentative samples such as the special populations previously mentioned, and a lack of attention to factors related to insomnia (such as sleep duration). Literature from

some large-scale studies^{11,12,23} indicates that self-reported difficulty initiating sleep, maintaining sleep, and early morning awakening significantly relate to suicidal ideation. However, such studies focused on insomnia while neglecting sleep duration. Sleep duration is a relevant variable, as both extremes (short and long) are associated with depression.^{24,25} Short sleep duration has been associated with insomnia in the general population,²⁶ as well as in those with psychiatric symptoms²⁷ and suicidal ideation.⁹ Furthermore, data have shown an association between suicidal ideation and increased sleep duration on weekends in Korean adolescents.^{28,29} Moreover, although extreme sleep duration has been linked to depression, there are few studies that reported the relationship between sleep duration and suicidal ideation, especially at the population level.

Accordingly, the present study examined a nationally representative sample in order to assess the association of sleep duration and suicidal ideation, while concurrently taking into account insomnia (construed as initial, middle, and late), using data from the National Health and Nutritional Examination Survey (NHANES).³⁰ Specifically, the present study examined whether abnormal sleep duration and insomnia symptoms were associated with suicidal ideation among participants in the 2007–2008 NHANES survey. It was hypothesized that extreme sleep durations (short or long) would be significantly associated with suicidal ideation in the respondents. It was also hypothesized that overall insomnia and insomnia symptoms (difficulty falling asleep, difficulty maintaining sleep, and early morning awakenings) would be linked with suicidal ideation, even after adjusting for comorbid depression.

METHOD

Data Source

The participants used in this study were also participants in the 2007–2008 NHANES, a national survey conducted by the Centers for Disease Control and Prevention reporting the health and nutritional characteristics of children and adults.³⁰ As NHANES is a general health survey, it is believed that participants do not exhibit the self-selection bias that may have been present in some previous studies. Participants were administered questionnaires concerning their demographic, socioeconomic, nutritional, and related statuses during in-person interviews conducted in the home. The unweighted response rate for the total sample was 78.4%. Sampling and weighting procedures were performed to ensure generalizability to the entire US population. In order to compensate for underrepresentation, blacks, Hispanics, and adults over age 60 years were oversampled.

Sampling in this survey was performed to ensure generalizability to the entire US population across all ages. Because of the complexity of the survey design coupled with variable probabilities of selection, the data used in the following analyses also were weighted to control for representativeness by following the procedures outlined in the current NHANES Analytic and Reporting Guidelines.³¹

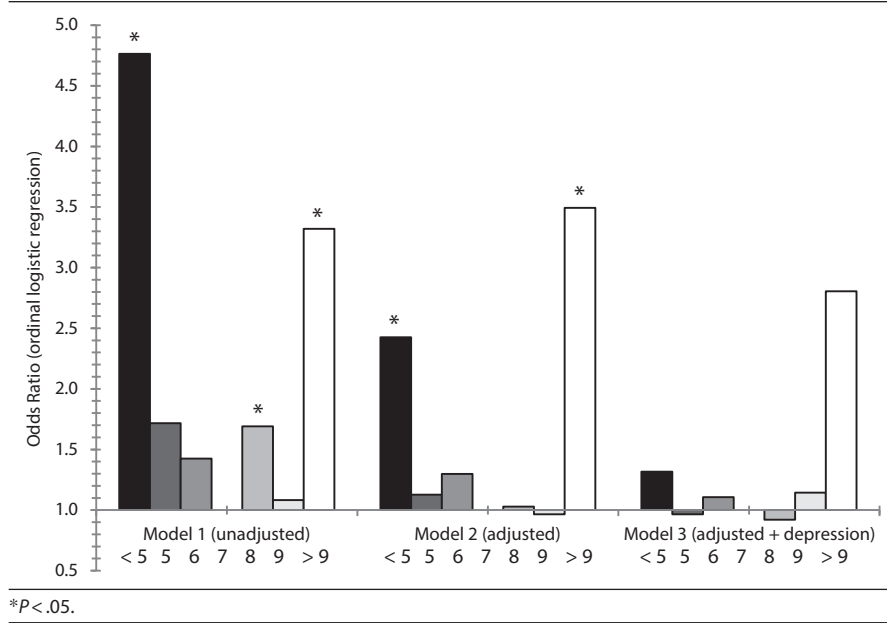
It is illegal to post this copyrighted PDF on any website.**Table 1. Characteristics of the Sample (weighted) Combined and Stratified by Suicidal Ideation^a**

Variable	Category	Overall Sample	Suicidal Ideation				<i>p</i> ^b
			Not at All (n = 5,191)	Several Days (n = 177)	More Than Half the Days (n = 33)	Nearly Every Day (n = 40)	
Age (y)	Continuous	45.760 ± 17.224	45.642 ± 16.951	47.176 ± 19.789	42.957 ± 19.452	45.530 ± 19.965	.676
Sex	Male	0.52	0.51	0.49	0.58	0.51	.889
	Female	0.48	0.49	0.51	0.42	0.49	
Race	Non-Hispanic white	0.69	0.70	0.61	0.55	0.63	.003
	Hispanic/Latino	0.13	0.13	0.24	0.26	0.22	
	Black/African-American	0.11	0.11	0.12	0.17	0.16	
	Asian/other	0.06	0.05	0.04	0.02	0.00	
Income (US \$)	< \$20,000	0.16	0.15	0.34	0.45	0.47	<.001
	20,000–\$24,999	0.07	0.07	0.12	0.16	0.24	
	25,000–\$34,999	0.11	0.11	0.15	0.09	0.25	
	35,000–\$44,999	0.09	0.09	0.08	0.09	0.00	
	45,000–\$54,999	0.08	0.09	0.05	0.04	0.01	
	55,000–\$64,999	0.07	0.07	0.07	0.03	0.03	
	65,000–\$75,000	0.07	0.08	0.06	0.02	0.00	
	> \$75,000	0.33	0.34	0.12	0.12	0.00	
Education	< 9th grade	0.07	0.06	0.16	0.22	0.23	<.001
	9th–11th grade	0.14	0.13	0.16	0.32	0.29	
	High school graduate	0.25	0.25	0.26	0.22	0.11	
	Some college	0.29	0.29	0.32	0.23	0.37	
	College graduate	0.25	0.26	0.11	0.01	0.00	
Marital status	Married	0.57	0.58	0.38	0.30	0.33	<.001
	Widowed	0.06	0.05	0.09	0.12	0.05	
	Divorced	0.10	0.10	0.13	0.19	0.17	
	Separated	0.02	0.02	0.04	0.09	0.14	
	Never married	0.18	0.17	0.25	0.20	0.26	
	Living with partner	0.07	0.07	0.11	0.11	0.05	
Exercise (min)	Continuous	166.06 ± 221.64	168.59 ± 220.19	113.99 ± 213.78	156.21 ± 267.98	134.29 ± 276.23	.018
Sedentary activity (min)	Continuous	334.62 ± 206.86	333.86 ± 204.46	319.26 ± 235.30	345.19 ± 259.41	270.91 ± 208.97	.278
Ever smoked	No	0.53	0.53	0.51	0.23	0.23	.001
	Yes	0.47	0.47	0.49	0.77	0.77	
Type of smoker	Never smoker	0.53	0.53	0.51	0.23	0.23	<.001
	Current smoker	0.23	0.22	0.34	0.70	0.53	
	Former smoker	0.24	0.25	0.15	0.07	0.24	
Alcohol use (no. of drinks/d)	Continuous	2.82 ± 2.76	2.81 ± 2.75	3.08 ± 2.71	3.94 ± 2.83	4.43 ± 4.70	.049
Alcohol use (no. of days ≥ 5 drinks)	Continuous	2.50 ± 2.37	2.48 ± 2.11	3.72 ± 3.66	1.69 ± 3.05	3.38 ± 9.09	.708
Depression	No	0.98	0.98	0.79	0.65	0.23	<.001
	Yes	0.02	0.02	0.21	0.35	0.77	
Overall insomnia	Continuous	3.78 ± 3.23	3.77 ± 3.17	5.81 ± 4.07	4.74 ± 4.21	6.33 ± 4.48	<.001
Difficulty falling asleep	Never	0.39	0.38	0.22	0.23	0.17	<.001
	Rarely	0.21	0.22	0.15	0.31	0.12	
	Sometimes	0.22	0.22	0.22	0.19	0.15	
	Often	0.11	0.11	0.21	0.04	0.23	
	Always	0.08	0.07	0.21	0.23	0.34	
Difficulty maintaining sleep	Never	0.36	0.36	0.19	0.37	0.24	<.001
	Rarely	0.20	0.20	0.09	0.11	0.16	
	Sometimes	0.24	0.24	0.36	0.16	0.16	
	Often	0.13	0.13	0.20	0.23	0.28	
	Always	0.08	0.08	0.16	0.13	0.16	
Early morning awakenings	Never	0.45	0.44	0.30	0.42	0.25	<.001
	Rarely	0.19	0.19	0.13	0.11	0.19	
	Sometimes	0.20	0.21	0.24	0.22	0.17	
	Often	0.10	0.10	0.21	0.18	0.15	
	Always	0.06	0.06	0.12	0.07	0.23	
Sleep duration (h)	< 5	0.05	0.05	0.14	0.15	0.17	<.001
	5	0.09	0.09	0.10	0.09	0.10	
	6	0.23	0.23	0.21	0.24	0.18	
	7	0.29	0.30	0.22	0.12	0.14	
	8	0.26	0.26	0.25	0.36	0.36	
	9	0.05	0.05	0.04	0.04	0.00	
	> 9	0.02	0.02	0.04	0.01	0.06	

^aContinuous variables are presented as mean ± SD, and categorical variables are presented as %. Univariate tests include 1-way analysis of variance for continuous variables and χ^2 tests for categorical variables.

^bBolding indicates statistical significance.

Figure 1. Sleep Duration Associated With Suicidal Ideation Across 3 Models (reference = 7 h)



Measures

Suicidal ideation. Suicidal ideation was assessed with the survey item, “Over the last 2 weeks, how often have you been bothered by the following problem: thoughts that you would be better off dead or of hurting yourself in some way?” Responses were categorized as “not at all,” “several days,” “more than half the days,” or “nearly every day.” Although this item assesses more passive (versus active) thoughts of the wish to die or self-harm, a previous study³² showed that many of those who endorse this item also endorse recent thoughts of hurting or killing themselves (more active suicidal ideation).

Depressive disorder. The 9-item Patient Health Questionnaire,³³ a well-validated tool for depression screening, was used to screen for depressive disorder. Probable depression diagnosis was evaluated using the standard algorithm, which involved assessing for the presence of depressed mood or anhedonia more than half of the days in the past 2 weeks, as well as the presence of at least 5 symptoms (including suicidal ideation) more than half of the days in the past 2 weeks and a report that these symptoms interfere with functioning. Likely depression was coded as “no” or “yes.”

Sleep duration. Sleep duration was assessed with the survey item, “How much sleep do you usually get at night on weekdays or workdays?” Responses were coded as whole numbers in hours. These responses were used to generate the following categories: <5 hours, 5 hours, 6 hours, 7 hours, 8 hours, 9 hours, and >9 hours. These categories were chosen so that independent effects of short and long sleep duration could be examined, as both extremes are associated with depression.^{24,25}

Insomnia symptoms. Insomnia symptoms were operationalized as difficulty falling asleep, difficulty

maintaining sleep, and early daytime awakening, as they represent hallmark symptoms of insomnia.³⁴ Difficulty falling asleep was assessed with the item, “In the past month, how often did you have trouble falling asleep?” Difficulty maintaining sleep was assessed with the item, “In the past month, how often did you wake up during the night and had trouble getting back to sleep?” Early morning awakenings were assessed with the item, “In the past month, how often did you wake up too early in the morning and were unable to get back to sleep?” Responses were coded in whole numbers and categorized as “never,” “rarely: 1 time a month,” “sometimes: 2–4 times a month,” “often: 5–15 times a month,” and “always: 16–30 times a month.”

A global insomnia measure called “overall insomnia” also was developed. Overall insomnia is a severity measure derived from additive scoring of the 3 hallmark symptoms mentioned previously and is continuous in nature, with a potential range of 0–12.

Sociodemographic, socioeconomic, and health covariates. A number of potential confounders were assessed. These confounders included age, sex, race/ethnicity (non-Hispanic white, Hispanic/Latino, black/African-American, and Asian/other), household income (< \$20,000, \$20,000–\$24,999, \$25,000–\$34,999, \$35,000–\$44,999, \$45,000–\$54,999, \$55,000–\$64,999, \$65,000–\$75,000, and > \$75,000), education (< 9th grade, 9th to 11th grade, high school graduate, some college, and college graduate), marital status, physical activity, smoking habits, and alcohol use. These variables were specifically chosen because they all are likely confounders.³⁵

Statistical Analyses

Differences in sociodemographic, socioeconomic, and health covariates; depression symptoms; insomnia

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Table 2. Odds Ratios and 95% Confidence Intervals Reflecting Associations Between Suicide Ideation and Sleep Variables Across 3 Models^a

Variable	Category	Model 1: Unadjusted			Model 2: Adjusted			Model 3: Overcontrolled		
		Odds Ratio	95% CI	<i>P</i>	Odds Ratio	95% CI	<i>P</i>	Odds Ratio	95% CI	<i>P</i> ^b
Sleep duration (h) (reference = 7 h)	<5	4.76	2.76–8.21	<.001	2.43	1.21–4.86	.013	1.32	0.56–3.09	.527
	5	1.72	0.93–3.16	.082	1.13	0.44–2.89	.802	0.97	0.33–2.81	.950
	6	1.43	0.86–2.36	.167	1.30	0.67–2.51	.436	1.11	0.55–2.22	.776
	7		Reference			Reference			Reference	
	8	1.69	1.02–2.80	.041	1.03	0.51–2.09	.939	0.92	0.45–1.89	.823
	9	1.08	0.29–4.09	.908	0.97	0.16–5.90	.971	1.14	0.18–7.18	.886
	>9	3.32	1.55–7.11	.002	3.49	1.31–9.32	.013	2.81	0.98–8.07	.056
Overall insomnia	1-unit increase	1.18	1.13–1.24	<.001	1.16	1.09–1.24	<.001	1.11	1.03–1.18	.003
Difficulty falling asleep (reference = never)	Never		Reference			Reference			Reference	
	Rarely	1.42	0.83–2.42	.203	1.44	0.69–2.99	.331	1.40	0.66–2.96	.376
	Sometimes	1.72	1.04–2.82	.033	2.15	1.05–4.39	.036	1.79	0.88–3.67	.110
	Often	3.14	1.91–5.16	<.001	3.21	1.62–6.34	.001	2.18	1.06–4.48	.035
	Almost always	5.74	3.48–9.45	<.001	4.16	1.81–9.53	.001	2.60	0.94–7.22	.066
Difficulty maintaining sleep (reference = never)	Never		Reference			Reference			Reference	
	Rarely	0.82	0.46–1.46	.491	1.24	0.57–2.71	.587	1.28	0.59–2.77	.534
	Sometimes	2.10	1.31–3.36	.002	3.55	1.80–7.00	<.001	3.02	1.45–6.29	.003
	Often	2.77	1.74–4.42	<.001	3.86	1.92–7.79	<.001	2.80	1.39–5.64	.004
	Almost always	3.33	1.99–5.56	<.001	3.47	1.64–7.34	.001	1.96	0.91–4.24	.087
Early morning awakenings (reference = never)	Never		Reference			Reference			Reference	
	Rarely	1.04	0.61–1.78	.876	0.90	0.46–1.76	.747	0.97	0.50–1.90	.931
	Sometimes	1.59	0.99–2.54	.053	1.66	0.89–3.09	.110	1.46	0.73–2.95	.288
	Often	2.81	1.77–4.46	<.001	2.12	1.03–4.36	.042	1.98	0.97–4.03	.061
	Almost always	3.22	1.93–5.36	<.001	1.99	1.00–3.94	.049	1.32	0.61–2.86	.477

^aModel 1 is unadjusted. Model 2 includes age, sex, race/ethnicity, income, education, marital status, exercise, sedentary activity, smoking, and alcohol use.

Model 3 includes all model 2 variables and depressive symptoms.

^bBolding indicates statistical significance.

symptoms; and sleep duration between suicidal ideation groups were assessed using analysis of variance for continuous variables and Pearson χ^2 for categorical variables. Continuous variables were expressed in terms of mean \pm SD, while categorical variables were expressed as percentages.

The effects of sleep duration and insomnia symptoms on suicidal ideation were assessed using ordinal logistic regression. A total of 3 separate regression models were evaluated. Model 1 evaluated the crude relationships of individual insomnia symptoms and sleep duration (unadjusted). Model 2 evaluated relationships after adjustment for all sociodemographic, socioeconomic, and health covariates (adjusted). Model 3 evaluated relationships after adjustment for all model 2 variables, as well as depression (overcontrolled). Odds ratios and 95% confidence intervals were reported, and a 2-tailed *P* value < .05 was considered significant for evaluating each independent variable. STATA/IC version 12 (STATA Corp, College Station, Texas) was used to perform all statistical calculations.

RESULTS

Sample Characteristics

For the present study, analyses included adults aged ≥ 18 with complete data on all independent and dependent variables ($N = 6,228$). Characteristics of the sample are reported in Table 1. All cases were weighted, resulting in a sample that was closely matched to the general population. Suicidal ideation categories were, however, differentially distributed across sociodemographic, socioeconomic, and health variables, justifying their inclusion as covariates.

Sleep Duration

Sleep duration <5 hours or >9 hours (vs 7 hours) was associated with higher suicidal ideation in model 1 (unadjusted) and model 2 (adjusted). Sleep duration of 8 hours (vs 7 hours) was associated with higher suicidal ideation in unadjusted analyses only. These results are displayed graphically in Figure 1.

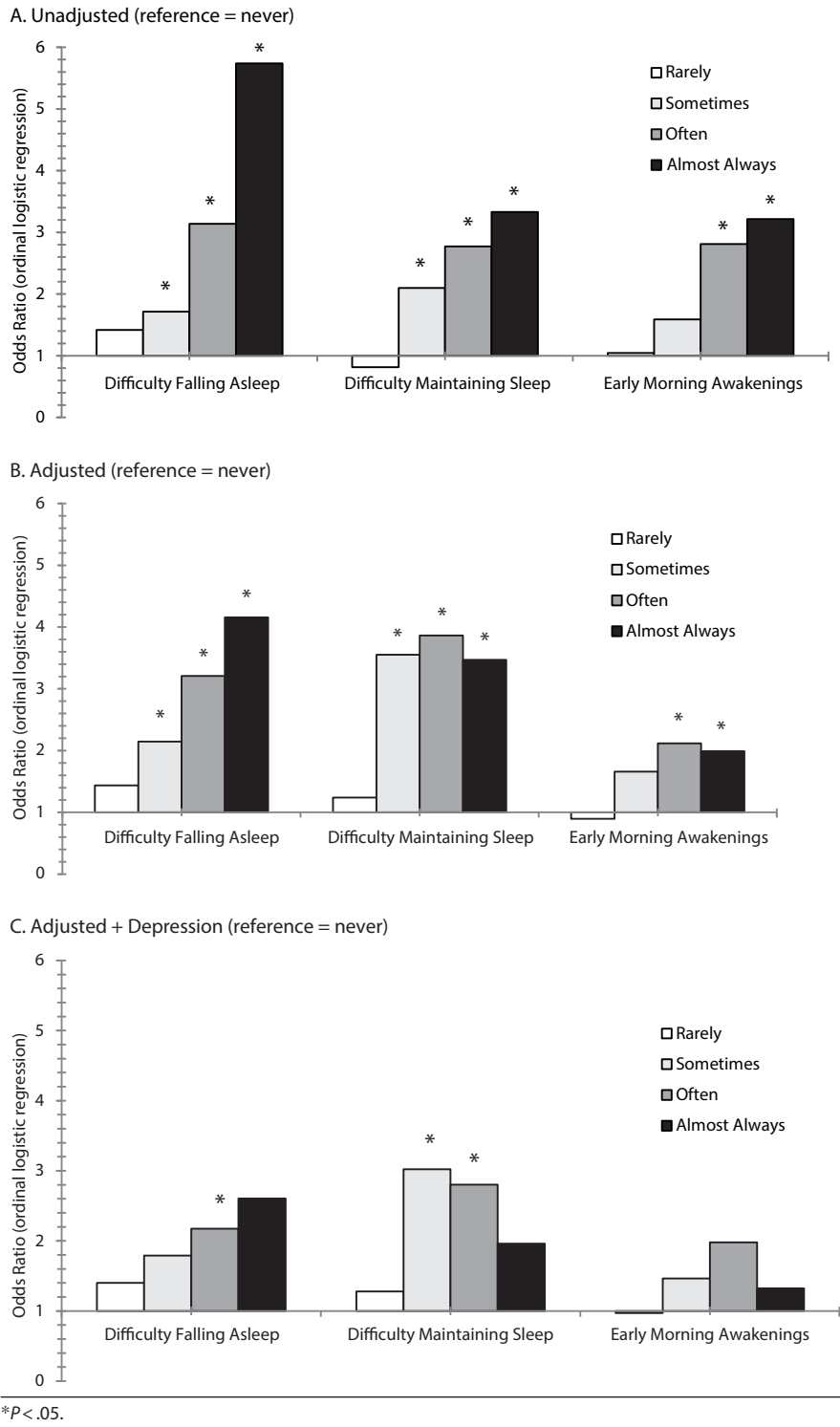
Insomnia Symptoms

Results from unadjusted, adjusted, and overcontrolled logistic regression analyses are reported in Table 2. In all models, including the unadjusted, adjusted, and overcontrolled model, increased overall insomnia was associated with higher level of suicidal ideation. Regarding specific insomnia symptoms, in both unadjusted (model 1) and adjusted (model 2) analyses, increased suicidal ideation was associated with difficulty falling asleep (sometimes, often, or almost always), difficulty maintaining sleep (sometimes, often, or almost always), and early morning awakenings. In the overcontrolled model (model 3), elevated suicidal ideation was still associated with difficulty falling asleep (although only the “often” category) and difficulty maintaining sleep (although only the “sometimes” and “often” categories). These results are displayed graphically in Figure 2.

DISCUSSION

Suicidal ideation has been repeatedly linked with insomnia in previous studies,^{36–38} some above and beyond the effects of depression. Emerging evidence also has associated

Figure 2. Insomnia Symptoms Associated With Suicidal Ideation Across 3 Models



suicidal ideation with abnormalities of sleep duration.^{11,12,23} The present study sought to explore this relationship of suicidal ideation with abnormalities of sleep duration at a population level using nationally representative data from a diverse sample of adults aged ≥ 18 years. In addition, this study also concurrently sought to reevaluate the relationship between insomnia symptoms and suicidal ideation among NHANES survey respondents.

As expected, increased suicidal ideation was found in the non-Hispanic white group, as well as in those with lower socioeconomic status. Interestingly, higher suicide symptoms were seen in those who were married, had a relatively more sedentary lifestyle, used psychoactive substances, and reported depressive symptoms. A higher risk of suicidal ideation was associated with extremes of sleep duration with the contours of a U-shaped distribution. Overall, insomnia

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was consistently found to be associated with increased level of suicidal ideation. Of the 3 types of insomnia, difficulty maintaining sleep was found to be the most predictive of suicidal ideation, followed by difficulty initiating sleep. Early morning awakening, while thought to be a cardinal sign of depression, was not found to be related to suicidal ideation after adjusting for covariates.

The observed relationships between the demographic covariates and suicidal ideation were generally in line with those seen in prior studies. For example, problematic marital relationships may have been associated with suicidal ideation because of associated underlying psychiatric symptoms with and without substance use.^{39,40} Further, smoking may be related to suicidal ideation due to underlying psychiatric symptoms,⁴¹ and the association of alcohol consumption with suicidal ideation is in line with prior literature.^{16,18}

The association of suicidal ideation with sleep duration demonstrated a U-shaped distribution in the unadjusted model as well as the model adjusted for covariates, such that the highest risk is seen in those reporting sleep durations of <5 and >9 hours a day. This pattern was similar to the U-shaped distribution of the hazard ratios for mortality and sleep duration seen in prior literature.⁴²⁻⁴⁴ Similar U-shaped distributions also have been seen for the association of sleep duration with percent body fat,⁴⁵ hemoglobin A_{1C} levels,⁴⁶ Type 2 diabetes, or impaired glucose tolerance,⁴⁷ as well as for sleep time exchanged for waking activities.⁴⁸ Although both short and long sleep duration have been associated with depressive disorder,⁴⁹⁻⁵² only 1 study has demonstrated a U-shaped distribution.⁵⁰ It is therefore plausible that the association of suicidal ideation and sleep duration may have a similar U-shaped distribution as demonstrated in this study.

Both short and long sleep durations were associated with suicidal ideation in the unadjusted model as well as in the model adjusted for most of the covariates. But, sleep duration was no longer a significant variable after adjusting for depression. This finding is consistent with prior literature showing that increased sleep duration on weekends among Korean adolescents was associated with suicidal ideation,²⁸ as well as the relationship of suicidal ideation with abnormalities in sleep duration in veterans misusing alcohol,⁵³ and extends the literature in the general population from short sleep duration⁹ to short and long sleep duration. This relationship between sleep duration and suicidal ideation is largely explained by underlying depressive symptoms as suggested previously.^{24,25}

While it is true that the variance is explained by depression, this finding shows that sleep duration as a marker for suicidal ideation may have some clinical utility, as patients may be more willing to endorse extreme sleep duration than depressive (or suicidal) symptoms. In addition, the presence of short and long sleep duration may be a predictor of a more chronic course of the associated depressive disorder as demonstrated in a recent study.⁵²

These results also replicate the findings from prior epidemiologic studies wherein the presence of individual

insomnia symptoms was associated with a higher intensity of suicidal ideation.^{12,54-59} In an overfitted model including depression, 2 of the 3 hallmark insomnia symptoms, difficulty falling asleep and difficulty maintaining sleep, were still significantly associated with higher suicidal ideation. However, the strength of the association was attenuated. The attenuation suggests that the risk for suicidal ideation conferred by depression partially subsumes the risk conferred by insomnia symptoms. These findings are consistent with prior literature in which insomnia symptoms such as difficulty falling asleep and nonrestorative sleep have been associated with suicidal ideation, suicide attempts, or death by suicide, as well as their association with depressive symptoms using data from population samples across studies from multiple nations.^{7,23,54-58} Despite the association of insomnia symptoms with depressive disorder, it is important to note that insomnia symptoms still independently confer a significantly higher risk of suicidal ideation. This association was demonstrated in a recent study⁵⁹ in which treatment with cognitive-behavioral therapy for insomnia decreased suicidal ideation in patients with insomnia, even after adjusting for severity of depression and other relevant covariates.

Limitations

The present study involves a cross-sectional analysis of survey items. Consequently, the significant association between insomnia and suicidal ideation does not establish a causal relationship between these variables. Second, the NHANES depression questionnaire includes items that refer to subjective symptoms. These survey items are not the “gold-standard” assessments nor are they clinically diagnostic. However, a previous study³² has shown that many of those individuals who endorse this item also endorse recent thoughts of hurting or killing themselves (more active suicidal ideation). Third, no data were available on nightmares or dysfunctional attitudes and beliefs regarding sleep in these respondents. Nightmare as a symptom is important, as its frequency and duration may be independent risk factors for suicide.^{60,61} Further, nightmares and dysfunctional attitudes and beliefs about sleep may mediate the relationship between insomnia and suicidal ideation as demonstrated previously.⁶² Finally, the NHANES questionnaire did not adequately assess acute versus chronic insomnia. The data presented reflect acute insomnia symptoms and do not reflect the chronicity of the symptoms. It is arguable whether the present results will hold true over the course of chronic insomnia. Future research may seek to explore this possibility prospectively or retrospectively.

CONCLUSIONS

In a population-weighted, nationally representative sample of American adults, increased suicidal ideation was associated with abnormalities of sleep duration and insomnia symptoms. Further, this relationship persisted after adjustment for a number of potential confounders,

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including demographics, socioeconomic, and other health risk factors. The relationship of suicidal ideation with insomnia symptoms of difficulty falling asleep and difficulty maintaining sleep persisted after adjustment for variance contributed by likely depression diagnosis (which is highly associated with both insomnia and suicidal ideation). In addition, certain insomnia symptoms (eg, difficulty maintaining sleep) were more strongly associated with suicidal ideation than others (eg, early morning awakenings).

Taken together, these findings suggest that abnormalities of sleep duration and insomnia experienced in the general population are associated with increased levels of suicidal ideation. This relationship has clinical and research-related implications. Since abnormalities of sleep duration and insomnia have now been associated with suicidal ideation in multiple epidemiologic studies, clinical assessments for suicide risk should include an evaluation for these symptoms in addition to other known suicide risk factors.

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POSTTEST

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1. Ms A is a 60-year old woman with a habitual sleep duration of 4.5 hours a night. According to the results of this study, you should evaluate her for suicidal ideation.
 - a. True
 - b. False
2. Mr B is a 58-year old non-Hispanic white man with major depressive disorder, comorbid insomnia, and a history of multiple suicide attempts. He currently complains of passive suicidal ideation with no intent or plan. Recent research suggests that treatment of his insomnia with cognitive-behavioral therapy may lead to ____.
 - a. A decrease in suicidal ideation if his depression is mild
 - b. A decrease in suicidal ideation if his depression is severe
 - c. A decrease in suicidal ideation independent of the severity of depression
 - d. No change in suicidal ideation despite improvement in insomnia