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The Association between Insomnia and Prescription Opioid Use: Results from a Community Sample in Northeast Florida

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Abstract

Objective—The current analysis examines whether opioid use is associated with insomnia in a community sample, as the consequences of the growing epidemic of prescription opioid use continue to cause public health concern.

Study Design—A cross-sectional study including 8,433 members in a community outreach program, HealthStreet, in Northeast Florida.

Methods—Community Health Workers (CHWs) assessed health information, including use of opioids (i.e., Vicodin®, Oxycodone, Codeine, Demerol®, Morphine, Percocet®, Darvon®, Hydrocodone) from community members during field outreach. Insomnia was determined based on self-report: "Have you ever been told you had, or have you ever had a problem with insomnia?" Summary descriptive statistics were calculated and logistic regression modelling was used to calculate adjusted odds ratios (ORs) with 95% confidence intervals for insomnia, by opioid use status, after adjustment for demographics and other covariates.

Results—Among 8,433 community members recruited (41% male; 61% black), 2,115 (25%) reported insomnia, and 4,200 (50.3%) reported use of opioids. After adjusting for covariates, opioid users were significantly more likely to report insomnia than non-users (adjusted OR, 1.42; 95% CI, 1.25 –1.61).

Conclusion—Insomnia was 42% more likely among those who reported using prescription opioids compared to those who did not. With one half of the sample reporting prescription opioid use, and a fourth reporting insomnia it is important to further investigate the relationship between the two. Findings provide useful preliminary information from which to conduct further analyses.

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Conflict of interests:
None to declare.

Ethical approval:
This study was approved by the University of Florida Institutional Review Board and informed consent was obtained for each participant.

Keywords

prescription opioids; insomnia; community; opioid use

1. Introduction

Insomnia is one of the most common sleep disorders with approximately 30% of the general population reporting brief symptoms of insomnia and 10% reporting chronic insomnia.[1, 2] The International Classification of Sleep Disorders, 3rd edition (ICSD-3) defines insomnia as “a repeated difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity and circumstances for sleep, and results in some form of daytime impairment."[3] Insomnia usually occurs independently or in combination with psychiatric and medical disorders, such as depression[4], anxiety[5], pain[6], and sleep-disordered breathing (SDB). Half of all individuals suffering from SDB (50%) also report insomnia.[7] In addition to difficulty initiating or maintaining sleep, the diagnostic criteria for primary insomnia from the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) also includes that the difficulty causes distress or impairment in social, occupational, or other areas of functioning that does not occur exclusively during another sleep disorder, and that it is not due directly to physiological effects of a substance or medical condition.[8] Insomnia can cause psychological[9], occupational[10,11], and economical[12] consequences. For example, the National Transportation Safety Board (NTSB) has estimated that 57% of crashes leading to truck driver fatality were caused by fatigue,[13] which may have been precipitated by inability to sleep due to insomnia or work requirements, and workers who report insomnia are much more likely to report injuries or industrial accidents than workers who report sleeping well.[14]

Prescription opioid use has increased dramatically in the United States in the last 25 years.[16, 15] The number of opioid prescriptions almost tripled from 76 million to 207 million between 1991 and 2013, with the United States being one of the largest consumers globally.[15] The increase in opioid prescriptions is problematic because of the associated consequences related to prescription opioid misuse and related to an increase in associated health problems. According to the Centers for Disease Control and Prevention (CDC), nearly 91 Americans die daily due to overdose of prescription opioids.[16] This epidemic does not just have a direct effect on those who use opioids, but its consequences have far reaching effects on both families and whole communities all over the nation.

Previous studies have investigated the relationship between some substances and disrupted sleep, including the association between sleep and cigarette smoking[17], antihypertensive drugs[18], alcohol[19], benzodiazepines[20], hypnotics and anxiolytics.[21] Common side effects from prescription opioid use are sleep disturbances such as SDB[22] and reduction in sleep efficiency.[23] Specifically, a clear relationship between SDB and opioid use has been established[24] with studies reporting prevalence of SDB ranging from 42% to 85% among individuals taking chronic opioids.[25] Insomnia has been found to be common among individuals with opioid use disorder who are going through withdrawal.[8] Recently, Dolsen and Harvey reported that insomnia was related to heroin use among individuals seeking

substance use treatment.[26] Additionally, another study by Tran et al., found opioid use to be associated with five times the odds of developing or at risk of developing a sleep disorder.[27] Insomnia may be an unintended pharmacological effect (side effect) of opioids. While such a relationship is likely, there is limited, but suggestive, information on the association between prescription opioid use and insomnia. This paper presents an analysis of prescription opioid use and insomnia, which was conducted among a large sample of community members in Northeast Florida. We hypothesize that insomnia will be more prevalent among individuals who report using prescription opioids in their lifetime compared to those who do not report prescription opioid use.

2. Methods

2.1 Setting and subjects

Participants were part of a community outreach program, HealthStreet, based in Gainesville, Florida. Through HealthStreet, Community Health Workers (CHWs) directly engage community members to reduce health disparities in health research participation.[28] CHWs are trained and certified to make connections with people where they live and work to assess their health conditions and concerns with a University of Florida Institutional Review Board (IRB) approved Health Intake. Upon obtaining signed informed consent, the CHWs assess health information such as demographics and social determinants of health, research perceptions, medical conditions, and drug use. These data are then used to link people to social and medical services and opportunities to participate in health research. We were interested in examining the history of insomnia and prescription opioid use. These are the focus of these analyses among 8,433 community members who were interviewed between November 2011 and January 2017.

2.2 Measures

As part of an ongoing study this secondary data analysis used sociodemographic variables including age, gender, race (Black/African-American, White, or Other), ethnicity (Hispanic or Latino), marital status (never married; currently married; or separated, divorced, or widowed), and employment (yes or no). Additional self-reported variables were history of depression, history of anxiety, history of pain (back pain, headaches, or arthritis), and history of cancer elicited as: “Have you ever been told you had, or have you ever had a problem with [medical condition]?” Self-reported insomnia was also assessed by asking: “Have you ever been told you had, or have you ever had a problem with insomnia?”

Additional self-report measures for substance use included cigarette use, at risk alcohol use, and prescription opioid use. Cigarette use was assessed for lifetime use: “Have you ever smoked cigarettes? “At risk alcohol use was assessed for past 30 day use: “Within the last 30 days, have you had more than (4 for men, 3 for women) drinks like beer, wine, liquor in a single day?” We do not know if members only drank this quantity of alcohol once in the past 30 days or multiple times; however, we have used this question as a proxy for at risk drinking. Past 30 day and lifetime use of opioids was assessed: “Have you ever used prescription pain medication like Vicodin®, Oxycodone, codeine, Demerol®, morphine, Percocet®, Darvon® ? If yes, have you used prescription pain medications in the last 30

days?" Responses for the insomnia, opioid use, depression, anxiety, and alcohol use variables were coded as yes/no. Persons were coded as a never user, a lifetime but not past 30 day user or a past 30 day user. We used the term prescription opioids to distinguish between these and illicit opioids e.g., heroin; however, it should be noted that we cannot confirm if members had legitimate prescriptions for these opioids. Community members could have been using these opioids medically or non-medically.

2.3 Data Analysis

Data analysis was conducted using SAS, version 9.4.[29] Demographic data were summarized using descriptive statistics. A chi-square test of independence was performed to compare whether there was a significant association between all variables and insomnia. An independent t-test was conducted to compare mean age in individuals who reported insomnia and those who did not. Multivariate logistic regression was used to calculate adjusted odds ratios (ORs) and 95% confidence intervals for insomnia. The covariates of age, gender, ethnicity, race, marital status, employment, history of depression, history of anxiety, history of cancer, cigarette use, alcohol use, and history of pain along with prescription opioid use were included in the model. The Hosmer-Lemeshow test was used to confirm adequate model fit.

3. Results

As shown in Figure 1, 11,218 community members received a 3 minute contact with a CHW and 8,611 stopped to talk and were assessed with the Health Intake questionnaire. After exclusion of persons under 18 and over 90, the sample size was reduced to 8,462 then further reduced to 8,433 to account for 29 people who did not provide information on insomnia. The sample was 58.8% female, 60.8% black, 21.1% are married, 35.1% employed, 27.9% with depression, 23.0% with anxiety, 51.9% used cigarettes in their lifetime, 23.9% alcohol users in the past 30 days, and 65.7% with pain. In addition, 3,475 (41.3%) reported neither insomnia nor prescription opioid use, 707 (8.4%) reported insomnia without any prescription opioid use, 2,831 (33.6%) reported prescription opioid use without insomnia, and 1,405 (16.7%) reported both insomnia and prescription opioid use.

Table 1 displays the demographic characteristics of participants, stratified by reported insomnia, and results of the crude tests of association. Overall, the mean age of participants was 44.2 years and those who reported insomnia were significantly older than those who did not (47.1 years vs 43.3 years). Those who reported insomnia compared to those who did not were significantly more likely to be female, Caucasian, not employed, report depression, anxiety, pain, cancer, cigarette use, and lifetime and past 30 day only opioid use ($p < .0001$).

After adjustment for age, gender, ethnicity, race, marital status, employment, history of depression, history of anxiety, history of pain, lifetime use of cigarettes and at risk alcohol use in the past 30 days, opioid users were significantly more likely to report insomnia than non-users. There was no evidence of effect modification after stratification by sex (data not shown). Table 2 provides results of the adjusted multivariate logistic regression model predicting self-reported insomnia. Depression was the strongest risk factor for insomnia,

with those reporting a history of depression 2.74 times more likely to report insomnia than those without a history of depression (adjusted OR: 2.74; 95% CI, 2.40–3.12). Lifetime opioid users were as likely to report insomnia (adjusted OR: 1.42; 95% CI, 1.25 –1.61) as current users (adjusted OR: 1.44; 95% CI, 1.22 – 1.70), compared to never users.

4. Discussion

In this sample of 8,433 community members we assessed the association between insomnia and prescription opioid use. One-fourth of our sample reported insomnia (25.0%), similar to the rate of insomnia symptoms among the general population (30%).[30] Additional data from the CDC show that 35% of Americans report insufficient sleep (fewer than 7 hours).[31] This high rate of insufficient sleep may contribute to the rate of self-reported insomnia in this sample.

Florida has had one of the highest rates in the nation for prescribing opioids, resulting in an increase in adverse health outcomes associated with prescription opioid use which has prompted the launch of the state's Prescription Drug Monitoring Program.[32] Data from the National Health and Nutrition Examination Survey (NHANES) estimates that 6.9% of Americans have used a prescription opioid in the past 30 days.[33] The results from this community sample yielded a much higher rate than NHANES, with 13.8% reporting past 30 day use, suggesting that this may be a geographic area where targeted interventions to reduce opioid use may be required; however, it is also possible that over-reporting may have occurred in the sample or that this sample represents a group that is using at a higher rate than the general population for other uncaptured reasons.

Risk factors for insomnia are in line with previous studies. Alcohol[19,34], cigarette smoking[17], depression[4], anxiety[5], older age[35], and pain[6] have all been previously associated with insomnia. Specifically, multiple studies have linked pain to sleep disturbance and there is evidence of temporal precedence of sleep disturbances over pain.[36,37] Prior literature has also shown that gender is a risk factor for insomnia, with females more likely to report insomnia than males[38,39]; however after adjustment for confounders in our analysis we did not find a higher rate of insomnia among women. As expected from previous studies[4,40,41], depression was the greatest risk factor for insomnia in our study. Interestingly, after controlling for these established risk factors, including depression, those who reported any opioid use were still more likely to report insomnia than those who never used opioids.

Overall, self- reported insomnia was significantly associated with prescription opioid use and this association remained significant after controlling for demographic and health factors. With opioid use continuing to escalate in the US, and insomnia reaching epidemic proportions[42], it is important to further investigate the possible relationship between insomnia and prescription opioids. The increase in prescription opioid use in the past decade[43] has had many other health implications aside from insomnia such as dependence[44] and overdose.[45] As such, it is important to address both the issue of high levels of opioid use and to further investigate the relationship between prescription opioids and insomnia.

This study had a few limitations. First, the data collected relating to prescription opioid use and insomnia are self-reported; however, the study did not attempt to ask participants to quantify amount of opioid use and so the potential for misclassification of the exposure was limited. We also do not have information on individual dose, frequency and duration of opioid use. Insomnia may be over-reported by participants and so the outcome in this study may not necessarily meet the diagnoses of insomnia according to DSM-5 criteria. Some individuals who reported insomnia may have self-diagnosed rather than visiting a physician. However, results from a sleep study by Lauderdale et al., show that participants self-report of the amount of sleep they attain is moderately correlated with actual sleep time;[46] self-reported data relating to insomnia may also be reported with minimal measurement error. However, we recognize that people may over or under report their sleep problems. In addition to the potential error introduced through self-report, we also used a proxy measure for at risk drinking which may not reflect a pattern of at risk drinking. Secondly, our findings are based on cross sectional data and reflect an association between insomnia and prescription opioid use and not causality. Additionally, we cannot discern whether prescription opioid use occurred at the same time as the sleep impairment. However, the strengths of this study are that this is among the first analyses to assess insomnia and opioid use in a community sample, which has a large sample size and was conducted in a diverse population.

4.1 Conclusions

Overall, these results show a high prevalence of insomnia among community members in Northeast Florida. An association between prescription opioids and insomnia was found even after adjustment for known risk factors. These results provide useful preliminary information and future studies should further investigate the temporal relationship between insomnia and prescription opioid use.

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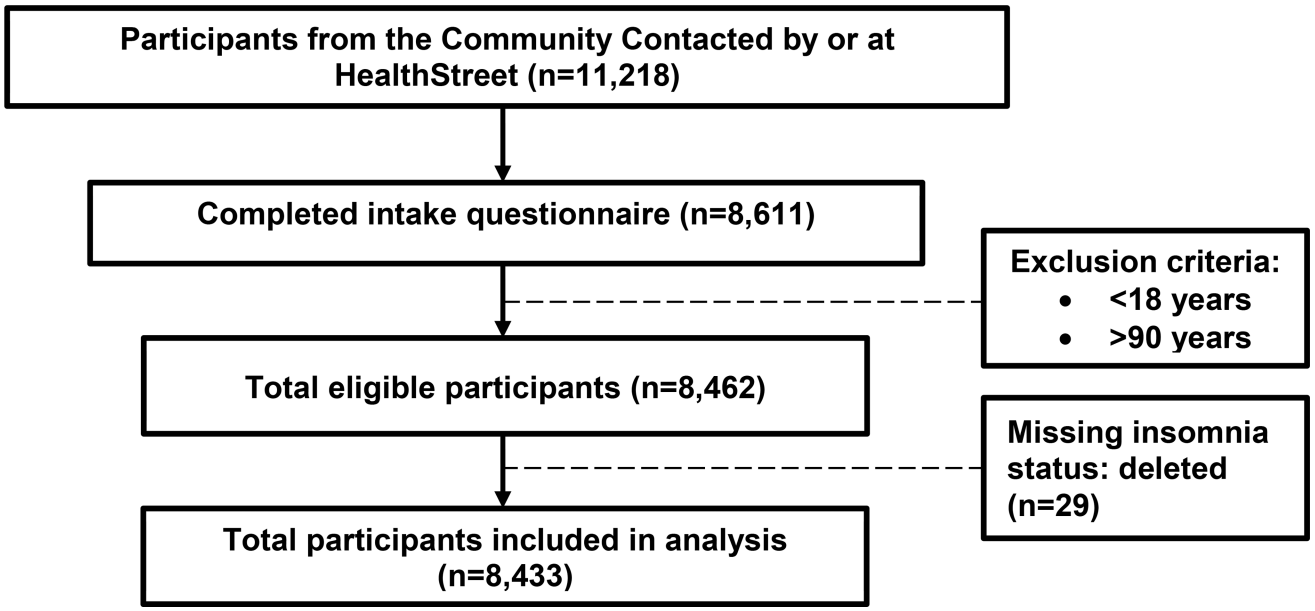

Figure 1.
Participant flow of HealthStreet members 11/2011 through 1/2017

Table 1

Characteristics of HealthStreet members who have and who have not reported insomnia (N=8,433)

Characteristics	Overall (n=8,433) n (%)	No Insomnia (n=6,318) n (%)	Insomnia (n=2,115) n (%)	*p* value
Mean age (±SD) *:	44.2 (15.8)	43.3 (16.1)	47.1 (14.3)	<.0001
Gender (n=8,423) *:				
Male	3473 (41.2)	2729 (43.2)	744 (35.2)	<.0001
Female	4950 (58.8)	3582 (56.7)	1368 (64.8)	
Ethnicity (n=8,318):				
Hispanic/Latino	495 (5.9)	353 (5.6)	142 (6.8)	.0577
Race (n=8,421) *:				
Black	5117 (60.8)	4089 (64.8)	1028 (48.6)	
Caucasian	2740 (32.5)	1827 (30.0)	913 (43.2)	<.0001
Other	564 (6.7)	390 (6.2)	174 (8.2)	
Marital status (n=8,413) *:				
Never married	3998 (47.5)	3165 (50.2)	833 (39.4)	
Currently married	1771 (21.1)	1361 (216)	410 (19.4)	<.0001
Separated, divorced, or widowed	2644 (31.4)	1775 (28.2)	869 (41.2)	
Employed (n=8,382) *:	2941 (35.1)	2383 (40.0)	558 (26.6)	<.0001
Depression (n=8,344) *:	2342 (27.9)	1175 (18.7)	1167 (55.4)	<.0001
Anxiety (n=8,412) *:	1993 (23.0)	932 (14.8)	1001 (47.5)	<.0001
Pain (n=8,395) *:	5513 (65.7)	3745 (59.6)	1768 (83.8)	<.0001
Cancer (n=8,390) *	677 (8.1)	418 (6.7)	259 (12.3)	<.0001
Cigarette use (n=8,431) *:	4378 (51.9)	3051 (48.3)	1327 (62.7)	<.0001
At risk alcohol use (3/4 drinks in past 30 days; n=8,416)	2007 (23.9)	1465 (23.2)	542 (25.7)	.0237
Opioid use (n=8,418) *:				
Never	4182 (49.7)	3475 (55.1)	701 (33.5)	
Lifetime (not past 30 days)	3074 (36.5)	2100 (33.3)	974 (46.1)	<.0001
Past 30 day only	1162 (13.8)	731 (11.6)	431 (20.4)	

Note: P value= P value of chi-square or t-test

* p-value and t-test significant (<.0001)

Table 2

Adjusted odds ratios for the association between self-reported insomnia and risk factors among HealthStreet members (n=2,095)

Characteristic	Adjusted odds ratio for self-reported insomnia		
	Odds Ratio	95% Confidence Interval	Beta coefficient
Age :	1.01	1.00 *	0.0081
Gender:			
Male	Ref	Ref	
Female	1.11	0.98, 1.25	0.0994
Ethnicity:			
Non-Hispanic/Latino	Ref	Ref	
Hispanic/Latino	1.14	0.89, 1.47	0.1340
Race:			
Black	Ref	Ref	
White	1.19	1.05, 1.35 *	0.1709
Other	1.51	1.89, 1.93 *	0.4136
Marital status:			
Never married	Ref	Ref	
Currently married	0.92	0.78, 1.03	−0.0826
Separate, divorced, or widowed	1.11	0.96, 1.29	0.1071
Employed:			
Not employed	Ref	Ref	
Employed	0.91	0.80, 1.03	−0.0982
Depression:			
No depression	Ref	Ref	
Depression	2.74	2.40, 3.12 **	1.0067
Anxiety:			
No anxiety	Ref	Ref	
Anxiety	2.26	1.97, 2.60 **	0.8167
Pain:			
No pain	Ref	Ref	
Pain	2.01	1.75, 2.32 **	0.6994
Cancer:			
No cancer	Ref	Ref	
Cancer	1.28	1.06, 1.55 *	0.2458

Characteristic	Adjusted odds ratio for self-reported insomnia		
	Odds Ratio	95% Confidence Interval	Beta coefficient
Cigarette use:			
No cigarette use	Ref	Ref	
Cigarette use	1.27	1.13, 1.43**	0.2415
Alcohol use:			
No alcohol use	Ref	Ref	
Alcohol use	1.17	1.02, 1.33*	0.1558
Prescription opioid use:			
Never	Ref	Ref	
Lifetime	1.42	1.25, 1.61**	0.3480
Past 30 days	1.44	1.22, 1.70**	0.3620

** $p<.0001$,

* $p<0.05$, Insomnia reported as yes or no; event= yes