Research Article

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Sleep problems and suicide associated with mood instability in the Adult Psychiatric Morbidity Survey, 2007.

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Abstract

Objective: Mood instability (MI) is common in the general population. Mood instability is a precursor to mental illness and associated with a range of negative health outcomes. Sleep disturbance appears to be closely linked with MI. This study assesses the association between MI and sleep disturbance and the link with suicidal ideation and behaviour in a general population sample in England.

Method: The Adult Psychiatric Morbidity Survey 2007 collected detailed information about mental health symptoms and correlates in a representative sample of adult household residents living in England (n=7303). Mood instability was assessed using the Structured Clinical Interview for DSM IV Axis II. Sleep problems were defined as sleeping more than usual or less than usual during the past month. Other dependent variables included medication use and suicidal ideation and behaviour (response rate 57%). Generalized linear modelling was used to estimate the prevalence of MI and sleep problems. Logistic regression was used to estimate odds ratios. All estimates were weighted.

Results: The prevalence of MI was 14.7% (95% CI 13.6%-15.7%). Sleep problems occurred in 69.8% (95% CI 66.6%-73.1%) of those with MI versus 37.6% (95% CI 36.2%-39.1%) of those without MI. The use of sedating and non-sedating medications did not influence the association. Sleep problems were significantly associated with suicidal ideation and behaviour even after adjusting for MI.

Conclusion: Sleep problems are highly prevalent in the general population, particularly among those with MI. Sleep problems are strongly associated with suicidal ideation and behaviour. Treatments that target risk and maintenance factors that transcend diagnostic

boundaries, such as therapies that target sleep disturbance, may be particularly valuable for preventing and addressing complications related to MI such as suicide.

Keywords

Mood instability, cross-sectional studies, psychiatric illness, sleep problems, suicidality

Introduction

Mood instability (MI) is a poorly understood, but common mental health problem in the general population (Marwaha et al., 2013b). MI is a risk factor for suicidal behavior in the general population (Marwaha et al., 2013a). It has been linked with a number of psychiatric conditions such as mood, personality, and anxiety disorders (Patel et al., 2015; Marwaha et al., 2014). Although commonly a symptom of psychiatric disorders, it can occur independent of and may be a precursor to mental illness. Given the significance of MI in psychopathology, it is important to understand its nature and correlates

Sleep may play a key role in affective regulation. Mood changes are often preceded by and co-occurring with sleep disturbance (Bauer et al., 2008) and poor sleep may contribute to or worsen MI (Bowen et al., 2013). In bipolar disorder, sleep disturbance has been identified as the most robust prodrome of mania (Jackson et al., 2003) and has been associated with more severe course of illness including recurrence of major mood episodes, history of psychosis, and number of suicide attempts (Sylvia et al., 2012). In unipolar depression, sleep appears to be a mediator of the association between MI and depression (Marwaha et al., 2015). It is unclear to what extent this association is limited to diagnosed psychiatric disorder or whether it is a more pervasive pattern observed in the population more generally.

A major advantage of population surveys is that they are capable of capturing a representative sample of the population. Clinical investigations and administrative data represent only individuals who have been in contact with health services and therefore miss a large portion of the population. Studying MI in this type of survey allows a unique opportunity to examine individuals who may have subsyndromal mood symptoms or who are at risk for future clinical illness and to identify potential transdiagnostic processes.

The aim of this study was to examine the association between sleep problems and MI and the link with suicidal ideation and behaviour in a general population sample. We hypothesized that (a) sleep problems are positively associated with MI (b) individuals with MI who are using psychotropic medications who have MI are less likely to have sleep problems than individuals with MI not taking psychotropic medication; and (c) sleep problems are positively associated with suicidal behaviour, particularly in those with MI. To our knowledge, this is the first study to examine MI and sleep disturbance in a general population sample.

Method

Adult Psychiatric Morbidity Survey 2007

Data were from phase one of the Adult Psychiatric Morbidity Survey 2007 (APMS 2007), a cross-sectional survey of sociodemographic features, mental health, and morbidity and correlates in adults age 16 and older living in private households in England. Data were collected via multi-stage stratified random sampling between October 2006 and December 2007. Interviews were completed in person by trained lay interviewers. Details of the survey have been published elsewhere (National Centre for Social Research, 2011; Bebbington et al., 2009). The overall response rate for phase one of the survey was 57%, for a final sample size of 7403 respondents. Data are available from the UK Data Archive; further information is available online (http://www.hscic.gov.uk/pubs/psychiatricmorbidity07). The Royal Free Hospital and Medical School Research Ethics Committee provided ethical approval for APMS 2007.

Measures

MI was measured using a single item from the borderline module of the Structured Clinical Interview for DSM IV-II (SCID-II): "Do you often have a lot of sudden mood changes?" (First et al., 1997). This item was answered by all respondents.

Self-reported sleep problems included (a) sleeping less than usual, "In the past month, have you been having problems with trying to get to sleep or with getting back to sleep if you woke up or were woken up?"; and (b) sleeping more than usual, "Has sleeping more than you usually been a problem for you in the past month?". For the purpose of this study, any sleep problem includes all respondents who experienced sleeping more than usual or sleeping less than usual.

Income represents equivalised annual household income (total household income divided by a score computed based on the number, age, and relationships of household members). Body mass index (BMI) was calculated from self-reported height and weight of the respondent. Prescribed medications were self-reported and verified by the interviewer by examining the medication packages, and included commonly prescribed medications (antipsychotics, antidepressants, sedative-hypnotics, and lithium) for psychiatric symptoms. We then grouped medications by those with high risk of sedation (sedating) and medications with low risk of sedating effects (non-sedating). The Alcohol Use Disorders Identification Test (AUDIT) is a 10-item screening test designed to assess patterns of alcohol consumption. Higher scores indicate more hazardous drinking patterns (Saunders et al., 1993). Alcohol and substance dependence were measured using questions based on the diagnostic interview schedule (DIS; Compton and Cottler, 2004).

Statistical Analysis

Demographic features were described as frequencies and percents. Prevalence of mood instability and sleep problems were estimated using generalized linear modeling of the binomial family with a log link function. To examine if having any sleep problem was associated with MI independently or if it was influenced by psychiatric disorder, we calculated the odds ratio (OR) of any sleep problem in those with MI and psychiatric condition, with MI and no psychiatric condition, and psychiatric condition without MI against the reference group without MI or a psychiatric condition. Using the same reference group allows direct comparison of the relative influence of MI and psychiatric diagnosis on the association with sleep problems. We also explored the influence of taking psychotropic medications on the association between sleep problems and MI. We compared models

including any medication, sedating medications, and non-sedating medications to crude models. Finally, we explored the association between sleep problems and suicide in those with and without any sleep problem. ORs were calculated using logistic regression. Analyses were assessed for age and sex interactions and confounding, including the possible influence of quadratic age trends. Potential modifiers of the association were determined using Wald tests. The presence of a potential confounder was assessed by comparing the adjusted and crude estimates, if the two estimates were meaningfully different, the variable was considered a confounder. All statistical tests used a 5% significance level.

Since a multi-phase stratified sampling design was used, all analyses were weighted using the *svy* commands (using Taylor linearized variance and scaled variance for singleton strata) in order to produce corrected variance estimates and results that are more representative of the target population. Analyses were carried out in Stata version 11 (StataCorp, 2009).

Results

The weighted sample size was 7393. All sample sizes and statistics presented in this paper are weighted and sample sizes are rounded to the nearest whole number. Proportions of missing data for each major subgroup (MI, professionally diagnosed psychiatric condition, any sleep problem) were less than 1%.

Demographic features and selected covariates of sleep problems in the subsamples are shown in table 1. Those who were female, single, employed part-time, and those with a lower income more frequently reported MI. MI was also very common among those with alcohol or substance use problems.

Table 1. Frequencies and percents of those with mood instability (n=1073) and sleep problems (n=3299) reporting levels of selected demographic features and possible covariates.

	Mood Instability		Sleep Problems	
	n[1]	%	n[1]	%
Age (years)				
16-34	504	22.5	906	39.9
35-54	393	15.1	1084	41.3
55+	176	7.1	1142	45.6
Sex				
Male	409	11.5	1256	35.0
Female	664	17.6	1875	49.3
Ethnicity				
White	958	14.5	2798	42.2
Black	33	14.9	95	42.4
South Asian	42	15.7	111	39.0
Other	34	16.1	102	47.6
Marital Status				
Single	387	23.2	700	41.7
Widowed/ Divorced/ Separated	136	12.9	529	49.6
Married/ Cohabitating	551	12.0	1903	40.9
Employment				
Full-time	411	14.9	1564	42.0
Part-time	198	18.0	638	34.9
Not employed	459	13.2	1564	49.8
Income[2]				
< £10,575	240	22.2	570	52.4
≥ £10,575 - < £16,195	130	13.1	455	45.7

≥ £16,195 - < £24,700	152	13.3	487	42.4
≥ £24,700 - < £40,384	126	10.9	419	36.2
≥ £40,384	135	10.9	478	38.3
Body mass index				
<18.5 kg/m2	46	26.8	88	50.7
18.5 to <25 kg/m2	461	14.6	1322	41.4
25 to <30 kg/m2	287	12.0	985	40.6
≥ 30 kg/m2	207	16.8	570	45.9
Psychotropic medications				
Any medication	179	41.2	318	72.3
Antipsychotic	25	54.6	32	67.9
Antidepressant	146	42.2	253	72.9
Sedative-hypnotic	39	42.7	71	76.3
Lithium	6	41.6	7	64.9
Audit				
0-7	712	12.8	2345	41.9
8-15	260	17.3	641	42.6
16-40	102	37.1	135	51.4
Alcohol dependence, % yes	167	38.7	247	56.9
Substance dependence, % yes	108	42.8	142	56.3

1 Weighted sample size, rounded to the nearest whole number; 2Equivalised annual household income

The estimated lifetime prevalence of MI was 14.7% (95% CI 13.6%-15.7%). Estimated prevalence was significantly higher in females (17.6%, 95% CI 16.1%-19.1%) compared with males (11.5%, 95% CI 10.1%-12.9%) and decreased approximately linearly with age (by about 1% prevalence per year of age) for both sexes.

Among those with MI, approximately 69.8% (95% CI 66.6%-73.2%) reported sleeping more or sleeping less than usual, considerable higher than 37.6% (95% CI 36.2%-39.1%) of those without MI.

The estimated odds of having any sleep problem in those with MI versus those without MI depended on gender. In males, the association between having a sleep problem and MI was modified by quadratic age. After accounting for quadratic age, there was no significant association between sleep problems and MI in males. Neither quadratic age nor linear age terms modified or confounded the relationship among females. In females, the odds of having a sleep problem were significantly higher in those with MI than in those without MI (OR=2.8, 95% CI 2.3-3.6).

Compared with the reference group (having no diagnosed psychiatric condition or MI), the OR of any sleep problem for those with both MI and a diagnosis was highest, followed by MI without a diagnosis, then a diagnosis without MI (table 2). Similar trends were observed for both genders, however, the strength of relationship in males appeared stronger at all levels. Odds ratio did not depend on age for these subgroups.

Table 2. Estimated odds ratios of having a sleep problem comparing three mood instability and professionally diagnosed psychiatric condition groups.

	Male		Female	
	OR[1]	95% CI	OR[1]	95% CI
Diagnosis with MI[2]	11.6	6.7-19.9	3.8	2.8-5.1
No Diagnosis with MI[2]	4.2	3.1-5.8	2.9	2.2-3.8
Diagnosis without MI[2]	2.3	1.7-3.1	1.9	1.6-2.3
No diagnosis and no MI[2,3]	1		1	

1 OR = odds ratio; 2 MI = mood instability; 3 Reference group

Sleeping less than usual and sleeping more than usual were significantly associated with MI. The association between sleeping less than usual and MI was stronger in males (OR=4.2, 95% CI 3.2-5.4) than females (OR=2.6, 95% CI 2.1-3.2). The OR of sleeping more than usual was similar for both males and females (OR=4.5, 95% CI 3.1-6.6). Age did not influence the estimate of association for either sleeping more or sleeping less than usual.

We assessed the influence of taking sedating and non-sedating medicatinos on the estimated OR of having a sleep problem in those with MI versus those without. We observed no influence of taking either sedating or non-sedating medication for any of any sleep problem, sleeping more or sleeping less than usual.

The prevalence of suicide ideation in the total sample was 0.81% (95% CI 0.6%-1.0%) during the past week, 4.3% (95% CI 3.7%-4.9%) during the past year, and 13.7% (95% CI 12.8%-14.7%) during the lifetime. The prevalence of suicide attempt was 0.7% (95% CI 0.4%-0.9%) during the past year, and 4.8% (95% CI 4.2%-5.4%) during the lifetime (there was only n=1 suicide attempt during the past week).

Estimates of the association between any sleep problem and suicidal ideation or behavior are presented in table 3. MI, age, and sex were assessed to determine if their inclusion in the model significantly changed the estimate of association using a combination of forward and backward selection. The relationship between sleep and suicidal ideation or

behavior did not appear to be influenced by age or sex and was not modified by the presence of MI. However, adjusting for mood did appear to diminish the strength of the association. Estimates for past week suicide attempt were unavailable owing to insufficient sample size.

Table 3. Estimated odds ratios of suicide ideation or attempt among individuals with any sleep problem versus no sleep problem.

	Unadjusted OR[1]	(95% CI)	Adjusted OR[1-2]	(95% CI)[1]
Suicide ideation				
Past week	8.0	3.6-17.8	5.0	2.1-11.8
Past year	5.0	3.6-6.8	3.1	2.2-4.3
Lifetime	3.1	2.6-3.7	2.2	1.8-2.7
Suicide attempt				
Past week[3]				
Past year	2.5	1.2-5.2	1.1	0.4-2.6
Lifetime	3.2	2.4-4.3	2.1	1.5-2.8

1 OR = Odds ratio; 2 Adjusted for mood instability; 3 Estimates unavailable owing to insufficient sample sizes

Discussion

The lifetime prevalence of MI in this study was approximately 14.7%. A previous study using the same data (Marwaha et al., 2014) observed a prevalence of 13.9%. This discrepancy is the result of differing methods of analysis; the prevalence estimate from the present study has been weighted, while the estimate made previously was unweighted. Weights are applied in order to account for non-response and to produce results that are more representative of the target population. Owing to the complex survey design, individuals have unequal selection probabilities and weights are applied to address potential resulting bias. Given that our analyses included weights, it is likely that our estimate is more representative of the true population prevalence of MI.

We observed that MI was significantly and positively associated with having sleep problems among females, but not males. This is an important finding because sleep problems have been associated with a range of negative health consequences including decreased quality of life (Ohayon et al., 2013), cardiovascular outcomes (Cappuccio et al., 2011), inflammation (Motivala and Irwin, 2007), diabetes (Gottlieb et al., 2005), and early mortality (Ferrie et al., 2007).

Importantly, we observed that the association with having a sleep problem appeared to be strongest when MI was present, especially if also diagnosed with a psychiatric condition. This may suggest that sleep disturbance is more strongly associated with the

presence of MI than a psychiatric condition. However, these findings are limited owing to the cross-sectional data and because the measure of psychiatric condition includes all individuals who have ever been diagnosed with a mental illness and may not have symptoms of the condition at present.

Finally, we observed that having any sleep problem was significantly and positively association with suicidal ideation and attempt for all measured time periods. This finding is consistent with prior research, which shows evidence that sleep problems such as insomnia, nightmares, and other sleep disorders increase the risk of suicidal ideation and behaviour.(Pigeon et al., 2012; Bernert et al., 2015) Adjusting for MI diminished the strength of association, particularly for past week and past year suicidal ideation; the unadjusted odds of suicidal ideation during the past week were approximately 8-fold higher in those with sleep problems versus those without, and still nearly 5-fold after adjusting for MI.

Identifying modifiable risk factors associated with the development and maintenance of multiple different pathologies is relevant for guiding clinical interventions and preventing and diminishing morbidity and mortality. Sleep disturbance may be a modifiable and transdiagnostic risk factor for psychiatric morbidity (Harvey et al., 2011; Harvey, 2008). Individuals reporting MI may be showing prodromal or subsyndromal symptoms. Effectively treating early symptoms of illness is critical for prevention or improving disease course. Preliminary evidence shows that maintaining sleep reduces MI (Bowen et al., 2013). Therapies that address transdiagnostic factors such as sleep therapies may be effective, particularly given that psychiatric illnesses that are often complex, multifactorial, and commonly comorbid. Although these cross-sectional data cannot reveal causality, the results also suggest that addressing current sleep problems may be particularly valuable for ameliorating immediate suicidal thoughts or behaviours. Future research should aim to investigate the link between MI and development of psychiatric disorders and the potential role of sleep-related therapies.

Limitations

We recognize a few limitations to this study. First, the measure of MI in the survey relies on a single, subjective question about the frequency of mood changes. While there is no clear and consistently used definition of MI, existing definitions typically involve aspects of lability, intensity, and proportionality to social situations in addition to frequency of mood changes (Marwaha et al., 2014). The question in this survey only involves one of several aspects of mood instability and it is based on the SCID-II, which is founded in the DSM-IV (American Psychiatric Association, 2000) diagnosis of borderline personality disorder. Although the question has been thoroughly validated in borderline personality disorder, the phenomenological meaning of a positive answer is less clear in other groups. Additionally, the cross-sectional nature of the study provides no indication of temporality of the association. Both MI and sleep problems were self-report and not assessed prospectively. Sleep problems may represent a symptom of MI, but poor sleep quality appears to also produce or exacerbate MI (Bowen et al., 2013). In bipolar disorder, the association appears to be bidirectional (Talbot et al., 2012). While the results of this study represents a cautious estimate of MI, it is useful for generating future hypotheses and guiding possibly meaningful future research avenues.

Finally, the role of medication in the relation between sleep and MI warrants more systematic investigation. In this study, accounting for the use of sedating and non-sedating

medication in the analysis did not appear to alter the estimate of association. However, many psychotropic medications such as antidepressants and antipsychotics have sometimes profound effects on sleep (e.g. Winokur et al., 2001 for review). It is possible that our classifications of medications were too broad, thereby limiting the ability to disentangle the association. We were unable to narrow the classes owing to insufficient power. Narrowing the classes to include only medications with more specific sleep effects may improve control. Additionally, many other medicines commonly prescribed to treat psychiatric symptoms such as antipeileptics were not assessed in this survey. It is likely that the influence of medication on the association between sleep disturbance and mood instability is underestimated in our findings.

Conclusion

Sleep problems are very common in the general population and in those with MI. Suicidal ideation and behavior are higher in those with current sleep problems, even in the absence of MI. Given the apparently strong association between MI and sleep problems in the community, future work should examine this association more rigorously. Improved measures of MI including high frequency prospective mood monitoring (e.g. True Colours; www.truecolours.nhs.uk) have been developed. Future studies using objective, prospective designs may be worthwhile in elucidating the temporality between MI and sleep changes. Future research should also aim to systematically examine smaller classes of psychotropic medications in order to elucidate the effect of psychotropic medications. Finally, sleep problems are a potentially salient therapeutic target for reducing morbidity and mortality in the general population, particularly for those with MI. Treatments that target risk and maintenance factors that transcend diagnostic boundaries, such as therapies that target sleep disturbance, may be particularly valuable for preventing and addressing complications related to MI such as suicide.

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Conflict of Interest

The authors have nothing to disclose.

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