Nocturia has no impact on depression severity in patients suffering from depression but correlates with sleep quality

Mikolaj Przydacz[1], Michał Skalski[2], Tomasz Golabek[1],
Jerzy A. Sobański[3], Katarzyna Klasa[4], Agata Świerkosz[2],
Dominika Dudek[4], Piotr Chlosta[1]

[1] Department of Urology, Jagiellonian University Medical College

[2] Department of Adult Psychiatry, Jagiellonian University Medical College

[3] Department of Psychotherapy, Jagiellonian University Medical College

[4] Department of Psychotherapy, University Hospital in Krakow

[5] Department of Adult Psychiatry, Chair of Psychiatry, Jagiellonian University Medical College

Summary

Aims. In general population, the relationship between nocturia, depressive symptoms and sleep disturbance has been widely investigated. However, there is a paucity of data analyzing the significance of nocturia for depression severity and potential influence of nocturia on sleeping problems in depressed patients. To address this vacuum, we analyzed the impact of nocturia on depression severity and sleep quality in patients suffering from depression.

Methods. We conducted a cross-sectional study of depressed patients treated in outpatient and inpatient Department of Adult Psychiatry, Jagiellonian University, Krakow. All patients met the DSM-5 and ICD-10 criteria for depression. Nocturia was assessed with the International Prostate Symptom Score (IPSS), severity of depression with the 17-item Hamilton Rating Scale for Depression (HRDS), and sleep quality with the Holland Sleep Disorders Questionnaire (HSDQ). Statistical analysis was carried out using an ANOVA test (post-hoc Tukey test).

Results. Totally, 98 patients were included in our analysis. Nocturia was reported by 68 individuals. Majority of our patients (35) suffered from mild depression. The mean HSDQ score was 78.8 (range 32–146). Our analysis rejected the impact of nocturia on depression severity ($p = 0.625$) but revealed statistically significant correlation between nocturia and sleep quality ($p = 0.037$). A post-hoc test investigating the relationship between severity of nocturia and sleeping problems has demonstrated that higher number of night-time episodes of urination (at least 3 episodes) leads to significantly higher scores in the HSDQ.

Conclusions. Our analysis showed no impact of nocturia on illness severity in patients suffering from depression. However, we demonstrated correlation between nocturia and sleep

quality in depressed individuals. Further studies with a larger number of patients are needed to validate the obtained results.

Key words: nocturia, depression, sleep disturbance

Introduction

Lower urinary tract symptoms (LUTS) include storage, voiding and post-micturition symptoms [1]. LUTS are not disease or condition specific, and despite being commonly related to bladder outlet obstruction and overactive bladder syndrome, they may be indicative of other structural and/or functional abnormalities of the urinary tract, as well as they may herald many non-urological conditions [1, 2]. Nocturia, one of the storage-type LUTS, is defined by the International Continence Society (ICS) as a complaint that individual has to wake at night one or more times to void (each void is preceded and followed by sleep) [3]. Nocturia affects a large proportion of adults and is one of the most frequently reported lower urinary tract symptoms.

An overall prevalence of this symptom has been estimated as 54.5% in women and 48.6% in men with higher rates in older populations [4]. Nocturia has been also reported as one of the most common reasons for poor sleep [5, 6]. Repeated fragmentation of sleep due to nocturia results in daytime drowsiness, poor concentration and anxiety that further leads to problems in occupational functioning and physical and emotional health, finally affecting patient's quality of life. Furthermore, nocturia can lead to embarrassment and poor self-esteem [7, 8]. As a result, nocturia may induce some symptoms of depression. It has been demonstrated that waking up at night to void increased the odds of reporting depression from 1.2 to 20.24 [9]. Nonetheless, it should be stressed that presented relationship has been largely investigated only in the general population (mentally-healthy persons without diagnosis of depression and other psychiatric disorders) [10–12]. In the current literature, there is a paucity of data investigating the significance of nocturia for depression severity and potential influence of nocturia on sleeping problems in depressed patients. To address this vacuum, we analyzed the impact of nocturia on depression severity and sleep quality in patients suffering from depression.

Material and method

We conducted a cross-sectional study of depressed patients treated in our outpatient and inpatient Department of Adult Psychiatry, Jagiellonian University, Krakow, between years 2013 and 2014 (KBET/266/B/2013).All of the included patients fulfilled both DSM-5 and ICD-10 criteria for depression and the diagnosis was established by psychiatry specialists. Nocturia was assessed with the question number seven from the International Prostate Symptom Score questionnaire (IPSS): "How many times did you typically get up at night to urinate?". Possible answers: None, 1 time, 2 times, 3 times, 4 times, 5 and more times. Depression severity was evaluated with the 17-

item Hamilton Rating Scale for Depression (HRSD), a validated screening tool for depression, and then classified as: no depression-remission (0–7), mild depression (8–16), moderate depression (17–23), and severe depression ($\geq$24) [13]. The HRSD questionnaire was filled out by a psychiatry specialist. Sleep quality was investigated with the Holland Sleep Disorders Questionnaire (HSDQ) [14]. The HSDQ generates one global sleep disorder score and may further differentiate between the 6 different categories of sleep disorders. In this research, we have focused on the continuous variable of general sleep disorder from the HSDQ. Statistical analysis was carried out using the ANOVA test (post-hoc Tukey test). Data analysis was conducted using SPSS Statistics software (IBM Corporation, Armonk, NY, USA, version 24.0). Statistical significance was considered at $p < 0.05$.

Results

98 patients with a mean age of 46.4 (range 20–67) were included in our analysis. The average time between diagnosis of depression and inclusion in the study was 5 years. The demographic characteristics are presented in Table 1.

Table 1. **Demographic characteristics of the study group**

Characteristic	Number of patients (%)
Number of included patients	98 (100%)
Gender	
Male	42
Female	56
Education	
Primary	3
Secondary (including students)	43
Higher	52
Employment status	
Employed	52
Unemployed	12
Pensioners	30
Students	4
Relationship	
Stable relationship/marriage	70
Unstable relationship/marriage	12
Single	16

Nocturia was reported by 68 patients (37 females, 31 males). Majority of them (33) reported 1 episode of urination per night, followed by 2 episodes per night (13), 5 or more episodes (12), 3 episodes (8), and 4 episodes (2).

When it comes to depression severity, 16 patients were in remission, 35 suffered from mild depression, 28 suffered from moderate depression, and 19 – severe depression. The mean HRSD score was 15.7 (range 1–32). Our analysis rejected the impact of nocturia on severity of depression ($p = 0.625$). Opposite analysis, investigating the influence of depression severity on nocturia, also failed to reveal correlation ($p = 0.087$).

The mean HSDQ score was 78.8 (range 32–146). Statistically significant correlation was found between nocturia and sleep quality of the studied patients ($p = 0.037$). Item number 5 ("I usually fall asleep in the morning hours. In the morning, I have trouble to wake up on time. I sleep in during the weekend") has shown the strongest correlation between nocturia and sleeping problems in depressed patients ($p = 0.018$). A post-hoc test investigating the relationship between severity of nocturia and sleeping problems has demonstrated that higher number of night-time episodes of urination (at least 3 episodes) leads to significantly higher HSDQ scores ($p = 0.013$).

Discussion

To the best of our knowledge, this is the first study analyzing correlation between nocturia, depression severity and sleep quality in patients suffering from depression. Although nocturia increases the incidence of depressive symptoms in the general population [15], our analysis has not demonstrated its impact on illness severity in depressed patients. However, nocturia has statistically significantly correlated with sleep quality in this specific population.

In the current literature, nocturia has been demonstrated as a marker of poor health [16]. It is highly prevalent and clearly associated with various risk factors and comorbidities. There are significant interactions between voiding at night and metabolic, cardiovascular, hormonal, psychiatric, and immunological afflictions. Among these conditions psychiatric disorders, with depression in particular, call for additional attention, as poor general health is a risk factor for depression and association between nocturia and depression may be bidirectional in nature [10, 17].

On the one hand, multiple studies have shown that nocturia may increase the risk of depression [9, 18]. This relationship was first described in 2004 in a population-based study conducted in an unselected group of 1,375 adults from Sweden [11]. In the BACH study, which investigated the association of nocturia with quality of life and depressive symptoms in 5,203 men and women, the risk of depressive symptoms in men with nocturia was 2.79 (95% confidence interval (CI): 1.81–4.31), whereas in women 1.80 (95% CI: 1.29–2.51) [12].

On the other hand, depressive symptoms may increase the risk of nocturia. Hakkinen et al. [8], in their Finnish prospective cohort study *Tampere Aging Male Urologic Study* (TAMUS) conducted among 1,580 men aged 50–70 years old, assessed the influ-

ence of depressive symptoms on the occurrence of nocturia for 5 years [8]. The authors have shown that at the beginning of the study the relative risk of moderate or severe nocturia in people with active depressive symptoms was 2.8 times higher (95% CI: 1.5–5.2) compared with those without active symptoms of depression. However, this study failed to prove the bi-directional nature of the relationship between nocturia and depression, since the occurrence of nocturia at the beginning of the study had no significant effect on the increase in the odds ratio of depressive symptoms during further observation. Despite this, the authors concluded that untreated depressive symptoms may cause nocturia.

It is important to stress that findings from the aforementioned studies were solely based on the results from the general population (i.e., people without a diagnosis of depression or other psychiatric disorder). Furthermore, it has been recently suggested that nocturia per se is probably not a cause of depression, but it may enhance the likelihood of other influences giving rise to depression [19]. It has also been documented that depression may have a negative effect on perception, development and prolongation of LUTS [10]. In view of these findings, correlation between nocturia and depression severity in depressed patients may be more complex than one would expect and more research in this field is needed.

The relationship between nocturia and sleep quality is well documented [20]. Nocturnal voiding can negatively affect the occurrence and length of deep sleep, often considered the most restorative stage of sleep [21]. It has been observed that the most burdensome for sleep quality are voidings during the first 3–4 hours from falling asleep. Sleep fragmentation has numerous negative consequences including daytime fatigue, difficulty concentrating, mood alterations, and decreased workplace productivity, finally affecting patients' quality of life [22]. Several studies have explored even more severe consequences of nocturia, and a meta-analysis of 28,366 patients found that nocturia was associated with a 28% excess mortality risk per year [23]. Nocturia also places a considerable economic burden on the individual and healthcare services, in terms of direct, indirect and intangible costs [24, 25].

The reference values concerning the significant number of micturitions during night-time are still under debate. It is a general agreement that one nightly void does not appear to be sufficiently disruptive to cause significant bother in most patients [26]. The results from a large population study have shown that at least 2 micturitions during night-time become a significant health problem because they substantially reduce the quality of life of the affected patients [27]. However, experts suggest that this threshold is not irrefutably established and should not be extrapolated to different subpopulations of patients [26]. Therefore, our analysis of depressed individuals demonstrated that at least three episodes of nocturia lead to significantly lower quality of sleep in this unique population. These results are in line with those presented by Tikkinen et al. [27], who showed that the majority of people report having at least moderate bother from nocturia when they experience three or more nocturnal void.

Our study has several limitations determined by its cross-sectional, one-institutional design. However, the data used in the analyses were obtained from a prospectively and carefully maintained database, which reduced the risk of errors and/or omissions. We acknowledge that the patients evaluated here represent a highly selected cohort, treated at a single, high-volume academic center, thus obtained results may not be fully transferable into daily clinical practice. Although our sample size was enough for powerful statistical analysis, it remains possible that with larger patient numbers, a significant influence of nocturia on depression severity may be determined. Thus, further large-cohort prospective studies should investigate this relationship.

Conclusions

To summarize, this study provided distinctive data describing the relationship between nocturia, depression severity and sleep quality in patients suffering from depression. Our analysis showed no impact of nocturia on depression severity. However, we demonstrated statistically significant correlation between night-time voiding and sleep quality. Further studies, preferably prospective and with a larger number of patients, are needed to validate the obtained results, as well as to evaluate the usefulness of the presence of nocturia for stratifying the risk of depression severity and impaired sleep quality in this specific population.

Authors declare no conflict of interest.

The study was approved by institutional Bioethics Committee.

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Address: Mikolaj Przydacz
Department of Urology, Jagiellonian University Medical College
31-531 Kraków, Grzegórzecka Street 18
e-mail: mikolaj.przydacz@yahoo.com