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Original Article

Sleep quality of benzodiazepine users in nursing homes: A comparative study with nonusers

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ABSTRACT

Objectives: We aim to describe subjective sleep quality among long-term users of benzodiazepines (BZDs) in Belgian nursing homes, to compare it to nonusers, and to investigate determinants of poor sleep quality.

Methods: All mentally competent residents from 10 nursing homes were screened and compiled in a group of long-term BZD users or in a group of nonusers based on the medication chart. We collected demographic, functional, and medication characteristics and global and specific sleep parameters using the Pittsburgh Sleep Quality Index (PSQI). Linear regression was used to investigate which parameters were associated with sleep quality.

Results: Of the 300 residents, 178 (59%) were long-term BZD users and 122 were nonusers. The 2 groups did not differ in demographic and functional characteristics (mean age, 85.5 y; range, 57–100; 75% women). The users reported significantly more difficulties with falling asleep, had more midnight awakenings, felt less rested in the morning, and had a poorer self-perceived sleep quality compared to nonusers. Sleep duration and time to fall asleep did not differ. The self-perceived sleep quality was mainly determined by difficulties during initiation of sleep. After controlling for demographic, medication, and functional characteristics, BZD use remained strongly associated with poor sleep ($r = 0.173$; $P = .003$), and a study centre effect (differences among nursing homes) was observed ($r = 0.229$; $P < .001$).

Conclusion: Our findings do not support long-term effectiveness of BZDs; long-term users slept more poorly than nonusers and were even more outspoken in users of long-acting BZDs. In future longitudinal comparative studies of sleep quality, unexplained variability needs further assessment with medical, psychologic, and institutional parameters.

1. Introduction

Sleep concerns are more frequent with growing age. In the normal aging process, changes in the sleep structure occur with less restorative deep sleep (i.e., stages III and IV of the nonrapid eye movement sleep). A fragmented sleep pattern with more midnight awakenings is associated with aging [1,2]. In addition comorbidities, medication use, psychologic distress and sleep-related disorders (e.g., sleep apnea, restless legs syndrome) all affect sleep quality and increase with age [3].

Benzodiazepines (BZDs) and related Z drugs are the most frequently used symptomatic treatment for sleep concerns in the older population [4] and particularly in the nursing home setting [5]. In a previously published study, we reported that 50% of the Belgian nursing home population used long-term BZDs and Z drugs [6].

Although BZDs alter the sleep architecture by suppressing deep sleep stages, they are initiated because of their ability to shorten the time to fall asleep and to increase total sleep duration [7,8]. Due to their sedating action, the (short-term) adverse effects of BZDs include decreased alertness with risk for falling and anterograde amnesia. After 4 weeks of continuous BZD use most patients engage in long-term use, while the hypnotic effect decreases due to tolerance [9]. Interruption of treatment can lead to withdrawal symptoms [10], and these symptoms often are the reason to continue use.

Guidelines discourage long-term use because of both physical and psychologic dependence as well as the unproven long-term effectiveness [11–13]. Moreover, it has been hypothesized that long-term use might have a detrimental effect on cognition and a potential acceleration of cognitive impairment [14]. The high

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prevalence of long-term BZD users indicates that these guidelines are insufficiently implemented.

Long-term effectiveness is difficult to assess and requires long-term follow-up data [15]. Epidemiologic studies of the effects of long-term BZD use on sleep quality are scarce. Ohayon et al. [16] reported few distinctions in the various dimensions of sleep quality between older drug-taking insomniacs and older nontreated insomniacs. A study among 516 older adults in Berlin [17] reported a higher rate of sleep-related concerns among individuals taking sleep medication. Both studies did not focus on BZD and Z drugs and did not use a standardized method to evaluate sleep. Polysomnography is the objective tool for examining effectiveness of sleep medication [18]. However, the patient's perception of sleep quality remains the determinant of most requests for prescribing hypnotics and is a common criterion by which the general physician and patient judge efficacy [19]. Therefore, a subjective tool such as the Pittsburgh Sleep Quality Index (PSQI) [20] has gained widespread acceptance to analyze sleep quality. It has undergone extensive psychometric evaluation and is used often in older adults [15,21–23]. A Canadian study [15] in a large sample of community-dwelling older adults that aimed to investigate the association between BZD use and overall sleep quality used this instrument and found a poorer sleep quality among BZD users.

However, in this study the BZD use was self-reported, there was no focus on long-term use, and there were no other interfering comedications reported. We found no study especially designed to compare sleep parameters in a well-defined group of long-term BZD users and a group of nonusers. Therefore, we set out to design a longitudinal study investigating sleep quality with the validated PSQI questionnaire. The aim of our study was to describe the sleep parameters of mentally competent nursing home residents and to investigate which sleep parameters are associated with self-perceived sleep quality and which characteristics influence global sleep quality. More importantly, we compared sleep parameters between long-term BZD users and nonusers.

2. Methods

In this baseline assessment of a longitudinal cohort study in the Belgian nursing home setting, we investigated the sleep quality in a group of mentally competent long-term BZD users and in a group of mentally competent nonusers (control group).

2.1. Setting

The Belgian long-term residential care structure consists of residential or nursing homes for the elderly, which offers a home replacement with or without nursing care. Governance of nursing homes for the elderly is either public (community health services) or private (predominantly nonprofit) with little difference in quality. The point prevalence of dementia among residents is approximately 50% with considerable variation among nursing homes [24].

2.2. Design

From a convenience sample of 10 nursing homes, all mentally competent residents were identified, screened for inclusion and exclusion criteria, and separated in an exposure group of BZD users and a control group based on analysis of the medication chart. No matching procedure was applied. Both groups were evaluated at baseline (and will be reevaluated at 3 mo and at 1 y).

2.3. Inclusion and exclusion criteria

We only included mentally competent residents defined as having a Mini-Mental State Examination (MMSE) [25] score of at least 18. We excluded residents that only used the sedative antidepressants trazodone or mirtazapine or phytotherapy as a sleep medication. We also excluded residents that used BZDs for the indication of anxiety. Residents with BZDs or Z drugs administered at bedtime for at least 3 months were allocated to the exposure group. Residents who were free of any hypnotic medication were allocated to the control group.

2.4. Data collection

Demographic data were obtained from the resident's record and medication data were obtained from the medication chart in the period from December 2011 to January 2012. Cognitive function was scored by the MMSE test. The scores of this robust screening tool range from 0 to 30, with higher scores indicating a better global cognition. Functional characteristics were scored by the Katz activities of daily living scale (ADL) [26]. This instrument is mandatory in the Belgian nursing homes. The first part of this instrument scores 6 ADL from 1 (independent) to 4 (total dependent). The second part scores disorientation in time and place ranging from 1 (no disorientation) to 4 (severe) and was used to confirm mental competence.

Based on the Anatomical Therapeutic and Chemical (ATC) classification [27], we selected the classes N05BA (anxiolytics), N05CD (hypnotics), and N05CF (Z drugs) to define the BZD group. The BZDs, tetrazepam and clonazepam, both taken by one person were classified as sleep medication in this study, though they have a different ATC nomenclature. We divided the BZDs and Z drugs according to half life based on a reference source [28]: triazolam, lormetazepam, loprazolam, oxazepam, lorazepam, bromazepam, alprazolam, zopiclone, and zolpidem were grouped into short-acting drugs ($T_{1/2} < 24$ h) and tetrazepam, clonazepam, flurazepam, flunitrazepam, diazepam, prazepam, and chorazepate were grouped into long-acting drugs ($T_{1/2} \geqslant 24$ h). We recorded the total number of medication that were used more than 3 months, and also possible interfering medications, such as antidepressants (ATC, N06A), antipsychotics (ATC, N05A), antidementia drugs (ATC, N06D), anti Parkinson (ATC, N04) drugs, and narcotic pain medications (ATC, N02A).

2.5. Sleep evaluation

The PSQI [20], a self-rated questionnaire that investigates global sleep quality and sleep disturbances was used (Dutch translation [29]). Because our sample was a geriatric population, the researchers assisted the resident with the recording and rating of the questionnaire. The 7 components of the PSQI were scored from 0 to 3, yielding a total score ranging from 0 to 21 with a higher score indicating poorer sleep quality. The component sleep difficulties included nocturia and pain, both defined as waking up in the night more than once a week.

A total PSQI score of more than 5 is a widely used cutoff that indicates poor sleep quality. Because we wanted to compare sleep quality in a group of BZD users and nonusers in our study, we generated a new PSQI score (adjusted PSQI) without the component sleep medication. The adjusted PSQI could range from 0 to 19 and was the variable of choice when we investigated and compared sleep quality in BZD users and nonusers.

2.6. Sample size calculation

We calculated a required sample size of at least 99 individuals per group to detect a difference of 2 points on the PSQI from 4.5 to 6.5 (standard deviation [SD], 5) with a power of 0.80 and $P < .05$ as the level of significance.