



# Excessive daytime sleepiness and related factors in adults

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## ABSTRACT

**Objective:** This study was aimed to determine excessive daytime sleepiness (EDS) and related factors in adults. **Materials and Methods:** This cross-sectional study was conducted in Çorum, an inland province in the Black Sea Region of Turkey, with 575 adults between the ages of 18 and 64 years who registered at a Family Health Center. In this study, a self-administered 37-item questionnaire and the Turkish version of the Epworth Sleepiness Scale were used. **Results:** In our study, the overall prevalence of excessive daytime sleepiness was 11.3%. It was significantly prevalent among adults under the age of 25 years with the increased risk being 1.18-fold. Furthermore, it was more prevalent among women. Increased risk of excessive daytime sleepiness was 3.05-fold higher in adults with chronic disease and 1.78-fold higher with adults having a stressful life. Among the sleep-related habits, it was more often in adults with "sleep speaking, restless sleep, breathing pauses, subjective sense of having a problem related with sleep, waking up feeling unrefreshed." **Conclusion:** The results of our study showed that nearly one in ten adults was suffering from EDS. It is suggested that to improve sleep hygiene and to manage chronic disease for people with daytime sleepiness should be a priority for public health and preventive medicine practices.

**KEY WORDS:** Adults, excessive, somnolence disorder

## INTRODUCTION

Sleep disorders are prevalent in the general population and have devastating consequences on human health such as fatigue-related errors in daily functions and job performance [1,2].

Excessive daytime sleepiness (EDS) is one of the most frequent sleep complaints among adults [3]. According to the definition of the International classification of sleep disorders, EDS is a behavior of falling asleep, including difficulty maintaining alertness or wakefulness and unintentionally falling asleep, and has three diagnostic categories: Narcolepsy, hypersomnia, and behaviorally induced insufficient sleep syndrome [4]. EDS is a growing public health concern worldwide.

Epidemiological studies, evaluating persons with EDS outside of clinical settings, estimate that EDS is prevalent among 18% of the population [5]. Nonetheless, in the Turkish population, studies show an increase [6-8]. Sleep apnea and sleep-disordered breathing, periodic limb movement disorder, and restless legs syndrome are potentially common cause of EDS [9]. Recent evidence suggests that long-term effects of EDS include the increased risk of hypertension, diabetes, obesity, heart attack, and stroke [1,10,11]. The majority of people seeking help at sleep centers are those suffering from EDS. A primary concern for EDS is the increased utilization of the health-care system

and medical costs [1,12]. A recent Australian study estimated the economic costs of sleepiness at \$4.6 US Dollar [13]. One of the greatest challenges is the huge public health burden of sleep disorders because of the low awareness of the general public and health-care professionals despite the extensive research that has been carried out on it [1]. The previous studies have reported that EDS is related with some factors including chronic disease and obesity [2,6,7].

This study was aimed to determine EDS and related factors in adults.

## MATERIALS AND METHODS

### Study Setting and Sample

This cross-sectional study was conducted in the Anatolian city Çorum with adults between the ages of 18 and 64 years in June, 2015. Çorum is inland from the middle Black Sea region in central Turkey and valuable for Hittite archaeology. The reference population consisted of 1550 adults who were in the target age group and were registered at a family physician's records at Family Health Center (FHC). Of these, 775 attended for any reason at the FHC in June and 575 were volunteer participants to the study. The participants were the patients at the FHC. The criteria for selecting the subjects were as follows:

Being literate, have no psychiatric, visual, and hearing problems. Furthermore, the participants selected were Turkish-speaking.

## Demographics and Covariates

In this study, a self-administered 37-item questionnaire was used to collect descriptive data on the demographics and lifestyle behaviors. The descriptive data included age, gender, educational level, occupation, having babies and young children who disrupt parents' sleep due to feeding and other needed care, smoking status, daily coffee, tea and other caffeine usage, alcohol consumption, time for watching television, spending time on the computer and mobile phone, chronic diseases, physical activity, perceived stressful life in general, and body mass index (BMI). The participant's weight and height were measured by a researcher after the questionnaire was administered.

Smoking status was defined as never, former, and current. Daily coffee intake, tea, and other caffeine were defined from the participant's statements. A Likert scale (never, sometimes, every day) was used to assess the evening caffeine intake. Alcohol consumption was defined as nonusers, use once a month, use once a week, use one glass every day. Assessments of daily mean time for watching television, spending time on the computer and mobile phone, moderate-intensity physical activity (5 days/week and 30 min), weight gain, and a stressful life were made according to the participant's statements. Chronic diseases were revealed depending on the FHC records. BMI was calculated as weight (in kilograms) divided by height (in meters) squared. BMI thresholds were set according to the WHO cut off points (underweight, <18.5 kg/m<sup>2</sup>; normal, 18.5-24.9 kg/m<sup>2</sup>; overweight, 25.0-29.9 kg/m<sup>2</sup>; and obese, 30 kg/m<sup>2</sup>) [14].

For the study, four trained male and female nursing students were in attendance as interviewers. For the purpose of the reliability, the interviewers communicated with each participant by pair-group to code correct answers.

## Sleep Habits Assessment

Sleep habits were assessed at the baseline of the participant's self-rated answers (no or yes) by a face-to-face interview. These habits include: (1) Have you ever been diagnosed with any sleep disorder by your physician? (2) How many hours do you sleep per night? (3) How do you feel when you wake up from sleeping? (Answers: 1. refreshed, 2. unrefreshed) (4) do you do anything special to sleep such as drinking warm milk, eating yogurt, drinking linden tea? (Answers: 1. no, 2. yes [if yes, please specify; 1. warm milk, 2. eating yogurt, 3. drinking linden tea, 4. other]) (5) Do you feel the need to use a sleeping pill? (6) How would you evaluate your quality of sleep in the last month? (Answers as Likert; very good, good, moderate, bad, very bad) (7) Do you usually sleep at the same time at night? (8) Do you think that you have a sleep-related problem? (9) Do you have any of the following problems, or have you been told that you have any of these problems when you sleep? - somnambulism, talking, teeth grinding, restlessness before going to sleep, difficulty

falling asleep, waking up in the night, snoring, or breath pauses (10) Do you feel the need to sleep during the day? - if yes, how many hours do you sleep during the day? (11) What do you do to get rid of the state of sleepiness during the day? (Answers were open-ended; subjects indicated as 1. drinking a cup of tea, 2. taking a shower, 3. walking, 4. watching TV) (12) In your opinion, is there a relationship between sleep and exercise?

## Epworth Sleepiness Scale (ESS)

The ESS was developed by Johns to evaluate the level of EDS [15]. We used the Turkish version of the ESS. Reliability and validity studies were made by Izci *et al.* in 2008 [16]. In it, the subject is asked to rate their likelihood of falling asleep in eight everyday situations over the previous month on a scale of 0-3 (0 = no chance of dozing, 1 = slight chance of dozing, 2 = moderate chance of dozing, 3 = high chance of dozing). The ESS score is the sum of the eight-item scores and ranged from 0 to 24. The higher ESS scores indicate greater daytime sleepiness in adults; an ESS score of >10 is taken to indicate increased daytime sleepiness [15].

## Statistical Analysis

In the analysis, comparison tests for continuous and categorical variables were conducted using the independent *t*-test, Chi-squared test. Binary logistic regression analysis was performed to identify possible associations between EDS and independent variables. We presented the odds ratios with 95% confidence intervals (CI). All analyses were performed using the SPSS 17 software.

## Ethical Approval

The study was conducted in accordance with the Helsinki principles, and the study protocol was approved by the Bozok University Ethics Committee. The patients were asked to participate in a 10 min, face-to-face interview. Before the interview, verbal and written study consent was obtained in a private room. The patients were advised that we are studying their sleep habits and daytime sleepiness.

## RESULTS

A total of 575 adults participated in this study (response rate was 74.2%). EDS was determined from the ESS scores. Of the 575 adults who completed the questionnaire, 65 of whom were determined to have EDS, 510 of the participants had no-EDS. In the study group, 349 were women and 226 were men. Participants' age ranged from 18 to 64 years with an average of 33 years. In addition, 39.10% of the participants were 18-24 years of age. Of the participants, 43.1% had university degrees, 55.8% were unemployed (homemaker, student, and retired), and 47.0% were married (Table 1). About one-third of the adults were reported to be a current smoker; one-fifth were drinking per week and month. The majority of the adults (94.3%) were tea drinkers, while just over half of were drinking 1-4 cup/daily. Among the adults, coffee consumption 1-2 cup/

daily was 39.8%. Over half of the adults reported that they were using other caffeine beverages as  $\geq 3$  cup/daily. When asked whether drinking caffeinated beverages in the evening, 42.1% of the respondents reported that the frequency was every night. A minority of the participants (13.6%) responded that they spend time 0-1 h/day watching television, on the computer and mobile phone. Almost two-thirds of the adults (58.1%) reported engaging in physical activity (regularly was 24.2%). Over half had a normal BMI (52.0%) and 20.9% had any chronic disease diagnosed by a physician. The scopes of the chronic diseases identified were asthma (32.5%), hypertension (30.8%), diabetes (24.2%), cardiovascular diseases (15.8%), thyroid disorders (6.6%), and others (liver disorders and types of cancer 6.6%).

Respondents were asked to predefine their sleep habits. When the participants were asked if they have been diagnosed with a sleep disorder before, 3.1% said “yes.” Participants reported sleeping duration between 1 and 12 h/day (mean  $7.6 \pm 1.5$ ), 65.6% slept 7-9 h a day. Among adults, 43.1% reported of feeling unrefreshed when waking from sleep. A minority of the participants (13.8%) expressed using sleep medication and 10.3% indicated self-rated sleep quality in the last month as “bad.” In response to the question: “Do you sleep at the same time generally at night? Only 17.9% said “always.” One-third of the participants believed they had a sleep-related problem. When asked whether they experienced sleep problems or problems expressed by other people, 47.1% indicated that “waking up in the night.” Other responses to this question included snoring

**Table 1: Demographic characteristics of adults**

Characteristics (n=575)	n (%)
Gender	
Women	349 (60.7)
Men	226 (39.3)
Age (years)	
18-24	225 (39.1)
25-34	110 (19.1)
35-44	119 (20.7)
45-64	121 (21.1)
Education level	
< High school	160 (27.8)
$\geq$ High school	415 (72.2)
Employment status	
Unemployed	321 (55.8)
Employed	254 (44.2)
Marital status	
Not-married	305 (53.0)
Married	270 (47.0)
Having babies or young children	
No	471 (81.9)
Yes	104 (18.1)
Smoking	
Current	203 (35.3)
Former/none	372 (64.7)
Daily caffeine consumption	
None	92 (16.0)
1-2 cups a day	194 (33.7)
$\geq 3$ cups a day	289 (50.3)
Physical activity	
Regular-irregular	334 (58.1)
None	241 (41.9)
Diagnosed with any chronic disease	120 (20.9)
Had a stressful life in general	300 (52.2)

(33.2%), difficulty falling asleep (32.7%), restless before going to sleep (22.4%), and teeth grinding (18.8%). Almost one-third of the participants (28.3%) were doing special things (such as drinking warm milk, eating yogurt, drinking linden tea) to sleep. Furthermore, when the participants were asked “do you feel the need to sleep during the day?,” a minority (16.9%) commented “never.” Drinking tea (38.3%) and coffee (33.4%) were the common responses to the question “what do you do to get rid of the sleepiness during the day?” Some participants (49.0%) expressed the belief that there is no relationship between sleep and exercise. The subjective sense of recent weight gain was 42.1% and having a stressful life was 52.2%. Overall, 11.3% had EDS (the mean score was 4, range 0-24).

Table 2 presents the demographic characteristics of the adults with and without EDS.

As can be seen from the Table 2, EDS was more often among women, younger, unemployed, not-married adults, and adults with babies or young children. Interestingly, higher EDS was observed in university graduates. Furthermore, they more often had  $< 30$  kg/m<sup>2</sup> BMI, had any chronic disease, had no physical activity, and had a stressful life. In contrast, the EDS was lower in current smokers. Adults, consuming  $\geq 3$  cup of caffeine beverages daily, had higher EDS.

Sleep habits of the adults with and without EDS also determined that the ESS score was significantly higher in adults with EDS. However, sleep duration was not significantly higher in the adults with EDS. According to the EDS, there was no significant difference between difficulties falling asleep. Adults with EDS were more talkative in their sleep, more restless before sleeping, and had more breathing pauses. The subjective sense of having a problem related with sleep and waking up unrefreshed from sleep were more often with EDS ( $P < 0.05$ ). Anecdotally, adults with EDS were in more need of sleep during the day, did not sleep at the same time, and were currently using medication for sleep ( $P > 0.05$ ).

In the binary logistic regression analysis including age, chronic disease and stressful life were significantly associated with EDS. Adults aged 18-24 years had an excessive risk of EDS by 1.18-fold (95% CI = 1.03-1.77) compared to those aged 45-64 years. In addition, adults with any chronic disease had a 3.05-fold (95% CI = 1.56-5.96) higher risk of EDS than those with no chronic disease. Furthermore, perceived stressful life also increased the risk of EDS by 1.78-fold (95% CI = 1.01-3.21) compared to perceived nonstressful life.

## DISCUSSION

As the importance of healthy sleep plays a vital role in the metabolism of everyone during life the cycle, EDS is at the heart of our understanding of public health dimension. In this cross-sectional study, we found that the overall prevalence of EDS was 11.3% (9.7% for men and 12.3% for women). In Turkey, several studies showed the high prevalence of EDS ranged from 14.6% to 33.5% [6-8,17]. In other countries, the prevalence of EDS in both genders was indicated as 11.6% in Spain [18], 12.2% in

**Table 2: Demographic characteristics of adults according to with and without EDS**

Characteristic	EDS (n=65)	Non-EDS (n=510)	P
Gender			0.419
Women (%)	66.2	60.0	
Men (%)	33.8	40.0	
Age (years)	32.52±14.85	33.20±12.79	0.015
18-24	47.7	38.0	
25-34	16.9	19.4	
35-44	7.7	22.4	
45-64	27.7	20.2	
Education level (%)			0.481
< High school	32.3	27.3	
High school	23.1	29.8	
University	44.6	42.9	
Employment status (%)			0.011
Unemployed	70.8	53.9	
Employed	29.2	46.1	
Marital status (%)			0.112
Not-married	63.1	51.8	
Married	36.9	48.2	
Having babies or young children (%)			0.000
No	44.6	86.6	
Yes	55.4	13.4	
BMI (kg/m <sup>2</sup> )	24.62±5.34	24.56±4.38	0.129
<30	83.1	89.4	
≥30	16.9	10.6	
Smoking (%)			0.963
Current	33.8	35.5	
Former/none	66.1	64.5	
Daily caffeine consumption			0.332
None	21.5	15.3	
1-2 cups a day	27.7	34.5	
≥3 cups a day	50.8	50.2	
Physical activity (%)			0.221
Regular-irregular	49.2	59.2	
None	50.8	40.8	
Diagnosed with any chronic disease (%)	36.9	18.8	0.002
Had a stressful life in general (%)	64.6	50.6	0.033

EDS: Excessive daytime sleepiness

Korea [19], 16.4% in Latin America [20], 17.7% in Norway [21], and 19.5% in Thailand [22]. However, the prevalence varies by gender among adults aged ≥18. In China, the prevalence was presented to be 22.4% for women and 21.9% for men [23]. In the Brazilian population, the prevalence was 10.6% among men and 21.7% among women [24]. Taken together, the evidence of this study support the idea that EDS was common but lower than many countries, and similarly, the prevalence was higher among women than men.

As mentioned in the literature review, women suffer from aggravated EDS but not significantly higher than men due to domestic responsibilities, such as taking care of home and children [25-27]. Our study like most others found no gender difference for EDS. On the other hand, a striking outcome was seen that adults with babies and young children suffered from EDS commonly.

The previous research suggests that EDS is more prevalent in middle ages and elderly than among youngsters [26,27]; contrary to this, we observed a higher prevalence in adults younger than 25 years of age.

In the French population, marital status was not found effective on EDS prevalence [28]. Furthermore, we observed similar results. Conversely, the Greek [29] and Canadian studies [30] reported an increased risk of EDS in married people.

In contrast to an earlier study [24], EDS prevalence was higher among the unemployed than the employers. Unemployment may cause psychological problems and create a handicap on the quality of sleep by disturbing the social lives of people.

Notably, researches indicate that adults who engaged in unhealthy lifestyle behaviors such as smoking, lower exercise, had a high BMI, and use alcohol are often more likely to report EDS [26,27,31-33]. Interestingly, these behaviors had no influence on EDS in our study.

Sleep deficiency and reduced sleep quality are associated with major health risks including cardiovascular, metabolic, and cancer [2]. In this study, the results support the increased risk of EDS with 3.05-fold higher in adults with any chronic disease.

It is common knowledge that daily stressors prevent good sleep quality [34]. Our findings are in line with this knowledge that

increased risk of EDS was 1.78-fold higher in adults perceiving stressful events.

Among the sleep-related habits, we observed a substantive increase of EDS adults with “sleep speaking, restless sleep, and breathing pauses, subjective sense of having a problem related with sleep, waking up feeling unrefreshed.” These results are in accord with the previous studies [19,35].

## CONCLUSIONS

The results of our study showed that EDS was prevalent in adults. Increased risk of EDS is associated with younger ages, medical conditions, and stressful life. Especially for adults aged <25 years improving sleep hygiene and for adults with chronic disease providing relevant disease management should draw out within the context of public health and preventive medicine practices. To develop a full picture of EDS prevalence and prediction factors in adults, additional studies will need to be undertaken.

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