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Effect of age and gender in the prevalence of excessive daytime sleepiness among a sample of the Saudi population

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Abstract The aim of this study is to assess whether the effect of gender on the excessive daytime sleepiness (EDS) is influenced by two confounders (age and hours of sleep per night). A cross-sectional study was conducted at King Abdulaziz Medical City-Riyadh (KAMC-R). A total of 2095 respondents answered a questionnaire that included questions regarding gender, age, hours of sleep per night, and daytime sleepiness using the Epworth Sleepiness Scale (ESS). The prevalence of EDS was 20.5% (females 22.2%, males 19.5%, p-value = 0.136). The EDS did not differ between genders, age groups, or hours of sleep per night (<6 vs. $\geqslant$6 h). However, stratified statistical analysis shows that the prevalence of EDS did differ according to gender (25.3% in females, 19.0% in males, p-value = 0.036) in respondents with shorter hours of sleep per night. EDS was strongly related to female gender and young age (ages $\leqslant$ 29 years) in respondents with short hours of sleep. This study

Abbreviations: OSA; Obstructive sleep apnea; BQ; Berlin questionnaire; ESS; Epworth Sleepiness Scale; ESS; Excessive daytime sleepiness; BMI; Body mass index; PSQI; The Pittsburgh Sleep Quality Index

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reveals that one out of five of the general Saudi population has EDS. The effect of gender on EDS appeared to be influenced by hours of sleep per night. High EDS strongly related to female gender with short hours of sleep.

1. Introduction

Excessive daytime sleepiness (EDS) is one of the most common features of sleep disorders [1]. EDS should be reserved for patients who complain of compulsory sleepiness, or urge to take naps or tendency to fall asleep, or cannot remain awake when intending to stay awake [2—4]. EDS as a manifestation of disturbed sleep or sleep deprivation has tremendous consequences that affect individuals and society in general [5]. Excessive sleepiness may lead to major morbidity and mortality, lack of production, weak academic achievement, accidents and injuries [6—14].

The Epworth Sleepiness Scale (ESS) is the most commonly used questionnaire for assessing a person's average level of daytime sleepiness in daily life [2—4,15]. The ESS questionnaire assesses the degree of sleeping in different circumstances, such as a person with excessive sleepiness may fall asleep while watching TV programs, while reading, when chatting with other people, after eating lunch, in public places, or when the car stops for a short time in front of traffic lights while driving [16,17]. The ESS ranges from 0 (no daytime sleepiness) to 24 points (a high level of daytime sleepiness). There are many causes of EDS; the most common sleep disorders causing EDS are sleep breathing disorders [18], narcolepsy [19] and restless legs syndrome (RLS) [20].

The true prevalence of EDS due to different causes is difficult to know. The published studies reported variations in the prevalence among different countries and ethnicity. The reasons for such variations include definition and methodology used to measure EDS; however, the overall prevalence ranged from 15% to 39% [3,4,15,21—26]. The prevalence of EDS (ESS score > 10) in a sample of the Australian adult population was 10.4% for males and 13.6% for females [27]. The prevalence of EDS was 15.9% and 20.8% in Canadian rural populations [3,28], and 14.6% among Turkish rural populations [4]. The prevalence of EDS was found to be 19.8% in a north Irish population [29], 15% and 2.5% among Japanese adults [25,30], 17.8% among the Swedish population [31], 5.5—15.2% among the British [32] and 45% among US Hispanics [33].

Unfortunately, there is a lack of studies on the prevalence of EDS among the general population in Arab countries, including the Kingdom of Saudi Arabia. The prevalence of EDS in Saudi patients with end-stage renal disease has been estimated to be 44% [34] and 39.3% among healthcare employees [22]. However, symptoms of EDS among Saudi adults and its associated factors in the general population still remain unaddressed. The aim of this research is to investigate gender differences in the risk of EDS among a sample of Saudis using ESS for assessment. When no difference in the risk of EDS is seen between both sexes, the roles of two confounders (age and hours of sleep per night) were further studied, which could lead to the gender differences in EDS.

2. Methods

A cross-sectional study was conducted among Saudi participants aged 18 or older at Riyadh. The authors confirm that the study was reviewed and approved by the research committee and by the institutional review board at King Abdullah International Medical Research Center (KAIMRC), protocol number SP14/045, before the study began. As per IRB approval, all participants were provided with written information about the study purpose and were informed that the information obtained would be kept confidential and no participant identity would be revealed. Once they agreed verbally to participate, they were enrolled in the study. These participants were gathered from the following sources: blood donors, new employees, hospital employees and visitors of primary clinics. Exclusion criteria were shift work, traveling across time zones during the past 4 weeks, and use of any prescriptions or medications known to affect sleep. Research assistants distributed the questionnaire after participants' verbal consent and ensured that all the questions were answered. Demographical data (age, gender, education, marital status, job or profession, hours of sleep per day, underlying medical problems and personal habits regarding sleep pattern, coffee and tea drinks, etc.) were collected. In addition, this study assessed the ESS using the validated Arabic version [35]. The validated