Association of Sleep Time with Type 2 Diabetes Mellitus: A Cross-sectional Study in Bareilly City of Uttar Pradesh, India

Rakesh K Chakrawarty, Arun Singh, Hari S Joshi, Rashmi Katyal, Medhavi Agarwal, Pratima Chakrawarty

ABSTRACT

Introduction: Experimental sleep restriction causes type 2 diabetes mellitus (DM-2); however, little is known about the metabolic effects of habitual sleep restriction. Thus, in this cross-sectional community-based study, we assessed the relationship of usual sleep time duration to DM-2.

Objectives: To study the prevalence of DM-2 and impaired fasting glucose (IFG) in Bareilly city and to study the association of sleep time duration of the study subjects with DM-2.

Materials and methods: A cross-sectional study was conducted using multistage random sampling technique in Bareilly City, Uttar Pradesh, India, from March to August 2016. Fasting blood glucose analysis was done by taking early morning blood sample by finger pricking method using Accu-Chek Active Glucose Monitor and its strips. Diabetes was considered if fasting plasma glucose (FPG) value was >126 mg/dL and impaired plasma glucose (IFG) was considered if FPG value was 110 to 125 mg/dL.

The results were compiled and analyzed in IBM Statistical Package for the Social Sciences (SPSS) Statistics version 22.0. The p-value less than 0.05 was taken as statistically significant.

Results: Prevalence of DM-2 was 17.69%, and the prevalence of IFG was 13.1% in the present study. Out of a total of 130 study subjects, 31 subjects were sleeping 6 hours or less per night, and out of these, 13 (41.9%) subjects were diagnosed with DM-2, and other 13 subjects (41.9%) were diagnosed with IFG. The remaining 99 (76.2%) subjects were sleeping 7 to 8 hours duration per night, and among these, only 13.1% were diagnosed with DM-2, and 18.2% were diagnosed with IFG. Finally, it was analyzed and observed in this study that both DM-2 and IFG were significantly associated with sleep restriction in the study subjects.

Conclusion: The sleep duration of 6 hours or less is associated with increased prevalence of DM-2 and IFG. Because this effect was present in subjects without insomnia, it can be concluded that voluntary sleep restriction may contribute to the large public health burden of DM-2 in the urban community.

Keywords: Impaired fasting glucose, Sleep duration, Type 2 diabetes mellitus.

INTRODUCTION

It was observed in a study that experimental sleep restriction causes type 2 diabetes mellitus (DM-2); however, little is known about the metabolic effects of habitual sleep restriction. In another study, the usual amount of sleep per night has been declining among adults for more than a generation. The median sleep time in adults aged 40 to 79 years was 8 hours per night in 1959, with less than 15% reporting a usual sleep time of less than 7 hours. By 2002, the adult median sleep time had decreased to 7 hours per night, with more than one-third of adults sleeping fewer than 7 hours. Although insomnia is highly prevalent, much of the reduction in sleep time reflects voluntary sleep restriction, with 43% of adults reporting that they often stay up later than they should, watching television or using the Internet, and 45% reporting that they sleep less to get more work done. Several studies have found increased mortality associated with usual sleep times of less than 7 or more than 8 hours per night. Experimental restriction of sleep to 4 hours per night for 6 nights resulted in impaired glucose tolerance (IGT) in healthy young adults. Because DM-2 carries a high risk of cardiovascular-related mortality, the impact of sleep restriction on glucose regulation suggests a mechanism whereby short sleep time might increase mortality. The prevalence of diabetes in India is increasing at an alarming rate. Different nationwide studies showed high prevalence of diabetes and IGT with gross regional variations. The so-called “Asian Indian Phenotype” makes Indians more prone to diabetes. Irregular lifestyle and work-related stress were responsible for increased vulnerability of personnel from certain occupations to noncommunicable diseases including diabetes.
been reported that rotating night shift duty had dose–response relationship with incidence of diabetes among nurses even after adjustment for body mass index (BMI). Thus, in order to incorporate these data on our Indian population, we have conducted the present study by examining the relation of self-reported usual sleep time to prevalent DM-2 in a large community-based sample of middle-aged and older adults.

AIMS AND OBJECTIVES

• To study the prevalence of DM-2 and impaired fasting glucose (IFG) in Bareilly City.
• To study the association of sleep time duration of the study subjects with DM-2.

MATERIALS AND METHODS

Selection of study participants was done using multi-stage random sampling technique in Bareilly City, Uttar Pradesh, India. Out of 70 wards in the urban areas of Bareilly, four wards were chosen, one from each direction (i.e., north, south, east, and west part of Bareilly City) via simple random sampling, and from those wards, 30 houses was chosen again via simple random sampling. From those houses, selection of person aged 30 years and above was done, again via same technique till the required sample size was attained. Fasting blood glucose analysis was done by taking early morning blood sample by finger pricking method and using Accu-Chek Active Glucose Monitor and its strips. Diabetes was considered if fasting plasma glucose (FPG) value was >126 mg/dL, and IFG was considered if FPG value was 110 to 125 mg/dL.

The results were compiled and analyzed in IBM Statistical Package for the Social Sciences Statistics version 22.0. The p value less than 0.05 was taken as statistically significant.

RESULTS

Out of 130 subjects, prevalence of DM-2 was found in 17.69% and impaired glucose fasting 13.1%. Type 2 diabetes mellitus and IFG were significantly associated with sleep restriction (Table 1).

The relation of sleep time to DM-2 and IFG was examined using chi-square test, and the result was found to be statistically significant (p < 0.05); among the total cases (130), 31 subjects slept 6 hours or less per night. Of these, 13 (41.9%) subjects were diagnosed with DM-2, 13 subjects (41.9%) were diagnosed with IFG. Of 99 subjects sleeping 7 to 8 hours per night, 13.1% had DM-2, 18.1% presented with IFG, whereas 68.6% had normal values (Table 1).

The median sleep time was 7 hours per night (Table 1). In the 30 to 40 years age group, a total of 73 subjects were examined, of which three subjects was found to be diabetic, 6 had IFG, and 64 exhibited normal blood sugar levels (100.2 mg/dL on average). In the age group of 41 to 50 years, out of 31 individuals studied, nine individuals were diabetic. Out of 26 individuals studied in the age group of 51 to 60 years, 11 individuals were affected from diabetes, in which 10 were diagnosed as normal and 5 had IFG (Table 1).

The support of the rising prevalence of diabetes comes from the result obtained from Bareilly City. This study was conducted on a representative population including students, employees, and the general population. All the total of 130 individuals fell into three age groups, viz., 30 to 40, 41 to 50, and 51 to 60 years (Graphs 1 and 2).
Mean sleep time for cases who do not have DM-2 was 7.27; for IFG cases whose blood sugar was between 110 and 125 mg/dL, the mean sleeping time was 6.53; and for those having DM-2, the mean sleeping time was 5.74 (Graph 3).

DISCUSSION

Studies of experimental sleep restriction suggest a likely causal association between short sleep and impaired glucose regulation. Sleep restriction to 4 hours per night for 6 nights caused IGT in healthy young adults, which resolved after 1 week of increased sleep duration, similar results were obtained in our study.

CONCLUSION

A total of 130 subjects were screened in three age groups, viz., 30 to 40, 41 to 50, and 51 to 60 years in Bareilly City. This survey included FPG levels and age indices.

The data analysis and observation indicated that among the three groups recruited, all groups showed the incidence of DM-2, but prevalence was discovered more in the last two groups (41–50 and 51–60 year age groups).

The observations also suggest that as age increases, the BMI increases due to lifestyle and eating habits, which directly enhances diabetes in the individuals. Hence, all the parameters studied are correlated. Obesity has recently emerged as a major global health problem and similar observations were recorded in our study too.

REFERENCES