
ADULTS WHO SLEEP 3-5 HOURS A DAY ARE AT HIGHER RISK OF DEVELOPING TYPE 2 DIABETES: A COMPREHENSIVE REVIEW

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ABSTRACT

Sleep plays an important role in maintaining human health, In recent years research has more focused on the relation between sleep duration and the risk of developing various chronic diseases including type 2 diabetes mellitus. This review article aims to explore the relationship between short sleep duration which is typically defined as sleeping 3 to 4 hours per day and the risk of type 2 diabetes mellitus. Several underlying mechanisms potentially contribute to this association, including disruptions in glucose metabolism, insulin sensitivity, hormonal regulation (such as leptin and ghrelin). Sleep deprivation alters the balance of hormones, promoting increased food intake and reduced energy expenditure. Moreover, insufficient sleep impairs pancreatic beta-cell function and exacerbates systemic inflammation and oxidative stress, all of which contribute to insulin resistance and glucose intolerance. Behavioral factors associated with short sleep duration, such as irregular eating patterns and reduced physical activity, may further amplify the risk of T2DM. Additionally, individuals with inadequate sleep often experience alterations in circadian rhythms, which can disrupt metabolic processes and exacerbate insulin resistance.

Keywords: Sleep Duration, Type 2 Diabetes Mellitus, Adults, Metabolic Health, Risk Factors.

I. INTRODUCTION

Sleep is a fundamental physiological process essential for health and well-being, influencing various aspects of metabolic function. Adequate sleep duration and quality are increasingly recognized as crucial factors in maintaining optimal health throughout the lifespan.

Over the past few decades, there has been mounting evidence suggesting that sleep duration plays a critical role in glucose metabolism and insulin sensitivity. Specifically, individuals who consistently sleep fewer than 6 hours per night, particularly those who sleep in the range of 3-5 hours, are increasingly recognized to be at higher risk for developing type-2 diabetes mellitus compared to those with longer sleep durations.

Basically, insulin is a polypeptide hormone which is released by beta cells of pancreas which increases the uptake of sugar by the cells in order to lower the blood sugar level. but in case of type 2 diabetes the cells become less sensitive towards insulin by developing insulin resistance. Therefore, the blood sugar level will increase and leads to the hyperglycemic condition. Type 2 diabetes mellitus (T2DM) represents a significant global health challenge, characterized by chronic hyperglycemia resulting from insulin resistance and progressive pancreatic beta-cell dysfunction. As one of the most prevalent chronic diseases worldwide, its prevalence has reached epidemic proportions, particularly affecting adults in both developed and developing countries. The complex interplay of genetic predisposition, lifestyle factors, and environmental influences contributes to its pathogenesis, making it a multifactorial disorder.

Over recent decades, research has underscored the role of modifiable risk factors in the development and progression of T2DM. Lifestyle factors such as sedentary behavior, unhealthy dietary habits, and obesity have been closely linked to the rising incidence of the disease. Furthermore, emerging evidence suggests that sleep duration and quality play pivotal roles in metabolic regulation, with insufficient sleep identified as a potential risk factor for insulin resistance and T2DM.

II. STATISTICAL ANALYSIS

According to 2020 behavioral risk factor surveillance system 33.2% of US adults are short sleepers, a meta analysis of prospective studies involving 4,82,502 participants demonstrated that each hour of sleep duration below 7 hours per day was associated with a 1.09 fold likelihood of developing type 2 diabetes. Similarly, data obtained by UK biobank in the investigating the association between short sleep duration and type 2 diabetes

shows that participants with daily sleep duration below 7 to 8 hours have a hazard ratio of 1.21 for development of type 2 diabetes.

III. INFLUENCE OF SLEEP DURATION ON TYPE 2 DIABETES

Short sleep will stimulate the breakdown of fats into free fatty acids due to which excess of fat deposited in liver and muscle, as a result the cells become less sensitive to insulin by developing insulin resistance.

Appetite hormone :

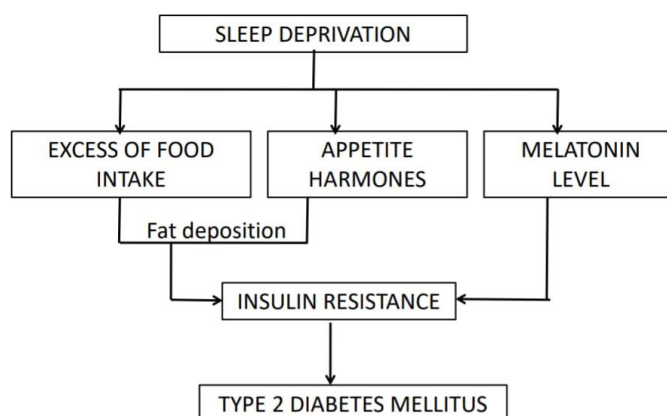
In human body, ghrelin and leptin are two main hormones which regulate the appetite among them ghrelin acts as hunger stimulator and leptin acts as hunger inhibitor.

RECENT STUDIES shows that sleep deprivation lowers the leptin level by 18% whereas ghrelin level increase by 28%. As a result the person feel more hunger and intake more amount of food that leads to weight gain which is one of the risk factor for type 2 diabetes.

MELATONIN :

Melatonin is a sleeping hormone which is in peak level at night and lower level in day. In case of sleep deprivation, the disturbance in melatonin level will be resulting in the impaired insulin uptake by the cells which cause leads to the type 2 diabetes. A study in the year 2000 found that participants with lower melatonin levels have high risk of T2DM

IV. OVERVIEW



V. CONCLUSION

In conclusion, the above evidence suggests that adults who sleep only 3 to 5 hours a day are at higher risk of developing T2DM. addressing sleep insufficiency should be recognized as an integral component of preventive strategies for T2DM and following an appropriate sleep schedule may help reduce to the risk of developing T2DM and future research should focus on the underlying mechanism linking short sleep duration to metabolic dysregulation and diabetes risk. Public health strategies aimed at improving sleep hygiene and promoting adequate sleep duration are essential for T2DM prevention. Interventions targeting modifiable risk factors, such as addressing sleep disorders, promoting regular sleep patterns, and incorporating sleep assessment into routine clinical practice, hold promise in mitigating T2DM risk at the population level.

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