

Association of social jetlag with gestational diabetes: Qazvin Maternal and Neonatal Metabolic Study

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ABSTRACT

The association of social jetlag (SJL), as a quantitative measure of circadian misalignment, with insulin resistance and metabolic syndrome has been reported. The present study was designed to investigate the association of SJL with gestational diabetes mellitus (GDM). Pregnant women with gestational age ≤ 14 weeks were enrolled in this longitudinal study. The participants with pre-GDM, shift workers and those who used alarms for waking up on free days were excluded from the study. SJL as well as behavioral and psychological parameters were evaluated at enrollment. The participants were categorized based on each 1-h increment of SJL. The association of SJL with the occurrence of GDM in the late second trimester was evaluated using univariate and multivariate methods. In total, 821 pregnant women entered the study, and after omitting individuals with excluding criteria, analyses were performed on 557 participants. The frequencies of $SJL < 1$ h, $1 \leq SJL < 2$ h and $SJL \geq 2$ h were 44.7%, 37.2% and 18.1%, respectively. Average sleep duration was higher in $SJL < 1$ h compared with the two other groups ($p < 0.001$). During follow-up, 90 (16.1%) women with GDM were identified. $SJL \geq 2$ h was associated with a 4.4–5.6 times higher risk of GDM in different models of adjustment ($p < 0.05$). Pregnant women with high SJL are at a higher risk of GDM. Further studies for evaluating the mechanisms by which SJL affects GDM are warranted.

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Introduction

The circadian system is essential for the regulation of different aspects of metabolism and influences most aspects of metabolism (Zimmet et al. 2019). A higher incidence of metabolic syndrome, insulin resistance and diabetes in shift workers was reported a few decades ago (Zimberg et al. 2012). However, in our modern world, circadian misalignment is no longer restricted to shift workers. The social stimuli on working days and individualized preferences for the time of sleeping and performing daily activities are the main determinants of sleeping and waking times (Mistlberger and Skene 2004). This preference is called as chronotype and is attributed to the individual circadian clock (Soehner et al. 2011). During workdays, the evening chronotype accumulates a substantial sleep debt, which is compensated by long sleep durations on free days (Roenneberg et al. 2019).

The concept of “social jetlag” (SJL) has been introduced since the last two decades. In our society, most people change their sleep and activity times several hours on free days compared with workdays. This schedule of changing

the sleep time is called as SJL and is calculated as the absolute difference between the mid-sleep time on workdays (MSW) and on free days (MSF) (Roenneberg et al. 2019; Wittmann et al. 2006). The association of SJL, as a quantitative measure of circadian misalignment, with metabolic abnormalities has been reported in several studies. Higher incidences of metabolic syndrome, obesity and insulin resistance have been found in subjects with higher SJL (Koopman et al. 2017; Malone et al. 2016; Parsons et al. 2015; Roenneberg et al. 2012; Wong et al. 2015).

Pregnancy is a diabetogen situation mainly due a surge of placenta-produced counter-regulatory hormones that cause progressive insulin resistance (Plows et al. 2018). There are some well-documented risk factors for gestational diabetes mellitus (GDM) such as body mass index (BMI) or history of GDM in previous pregnancies (Zhang et al. 2016); however, the role of some potential aggregators of insulin resistance such as sleep quality or circadian rhythm misalignment is less documented. To the best of our knowledge, there is no study on the role of SJL in GDM.