



You Can't Avoid Shift Work? Then Focus on Body Fat Rather than Weight

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Since the mid-1800s, working hours have been regulated by law to protect workers' health. The maximal limitation of an 8-hour work day, implying 48 to 52 hours a week, has been a key demand of the working class worldwide, as defined by International Labor Organization since 1958 [1]. In the United States, the Panel Study of Income Dynamics, the longest-running longitudinal household survey of more than 18,000 individuals nationally represented, analyzed repeated measures of working hours of approximately 2,000 participants [2]. They suggested the working hour threshold that best predicts increased risk is at least 52 hours per week for a minimum of 10 years. Workers exposed to this level had higher risks of cardiovascular disease (relative risk [RR], 1.42; 95% confidence interval [CI], 1.24 to 1.63) and cancer (RR, 1.62; 95% CI, 1.22 to 2.17) than those who worked 35 to 51 hours per week during the same period. From this background, the threshold of long working hours that predicted an elevated risk of adverse health outcomes was identified as 52 hours per week.

Various metabolic disturbances associated with long working hours have been reported in previous cross-sectional or longitudinal studies based on population-based cohorts. One individual-participant data meta-analysis of 20 cohort studies of 603,838 participants reported a 1.3-fold higher risk of stroke than standard work hours if they worked 55 hours or more per week for an average of 8.5 years [3]. In addition, workers who worked 55

hours or more per week at a lower socioeconomic status had a 1.29 times higher risk of developing diabetes than those working standard hours [3]. A cross-sectional study of 15,121 working adults analyzed the metabolic outcomes of 15,121 working adults and found a 1.08-fold increased risk of obesity (95% CI, 1.01 to 1.17) when working 40 hours or more per week [4].

Shift work is also associated with endocrine health problems. One observational study reported that shift work increased the risk of diabetes mellitus [5]. Sleep deprivation (less than 4 hours a day for 6 nights) was associated with elevated plasma glucose levels and insulin secretory rates, which were restored after a recovery period of more than 12 hours a day for 6 nights [6]. One prospective cohort study included 24 healthy adults who underwent sleep restriction (5.6 hours per day) and circadian impairment for 3 weeks and then recovered for 9 days. The results demonstrated that sleep deprivation and fragmentation were associated with decreased beta cell function and increased insulin resistance, which could lead to diabetes mellitus. A cross-sectional study of the risk of obesity in shift workers surveyed 1,080 Irish shift workers using a telephone questionnaire and reported that 40% of shift workers were overweight or obese [7]. Men, middle-aged workers, and older workers were independently associated with obesity. A meta-analysis of 26 studies involving 311,334 participants suggested that shift work was positively associated with the risk of obesity [8]. However, the researchers

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found that the cut-off points for obesity used in previous studies varied, and the heterogeneity was considerable. The underlying mechanisms have been described as disruptions in circadian rhythms, changes in sleep, activity or eating patterns, or abnormal light exposure [9]. In addition, shift work is closely related to low economic status, education, mental health, and comorbidities, which also act as risk factors for obesity.

The effects of work on health have also been studied in Koreans. According to the Korea National Health and Nutrition Examination Survey (KNHANES), in a nationally representative dataset of 2,160 adults, patients with hypothyroidism worked longer (average 53.4 hours per week) than those with euthyroid (49.5 hours per week) or hyperthyroid status (51.6 hours per week) [10]. Another study using KNHANES reported that the obesity prevalence tended to increase with working hours [11]. They also suggested that split-shift workers and night-shift workers had a higher prevalence of obesity and abdominal obesity compared to dayshift workers. A single-center cross-sectional study in Korea analyzed 711 participants. For body mass index (BMI), women >50 years of age who worked >9 hours a day were 3.56 times (95% CI, 1.03 to 12.37) more likely to be overweight or obese than those who were <50 years of age and worked <9 hours a day [12].

As the roles of body fat and muscle are increasingly well understood, traditional definitions of obesity based on BMI are being challenged. People with normal-weight obesity (NWO) have a weight in the normal range, but a higher amount of body fat and a higher risk of cardiovascular disease [13,14]. To investigate the relationship between shift work and NWO, Ahn et al. [15] comprehensively analyzed working hours and body composition in the KNHANES dataset. Excluding some specific categories such as part-time workers, military personnel, and pregnant women, 3,800 full-time workers aged 19 or older with a BMI of less than 25 kg/m² were selected. NWO was defined as having a BMI of less than 25 kg/m² but body fat greater than 25% in men and greater than 37% in women. This study found that shift workers were at greater risk of NWO than day and night workers. In addition, there was a stronger association between shift work and NWO among those aged 60 years or older or those who worked 56 hours or more per week. This observation suggests that shift workers should be wary of gaining body fat even if their weight does not change. In addition, extended studies examining long-term cardiovascular disease and additional studies based on ethnically diverse subjects with NWO are needed to reach more generalized conclusions.

The coronavirus disease 2019 (COVID-19) pandemic has trig-

gered a labor reallocation and shifted work to nontraditional hours [16]. As COVID-19 has recently shifted from a pandemic to an endemic condition, it is unclear whether labor patterns will fully revert to the past. However, in order to minimize the health risks posed by shift work, a personalized approach focusing on individual factors such as age, working hours, and work patterns is required. Strategies should include optimizing shift schedules, arranging activities or meals at set times, and administering melatonin or timely exposure to light to prevent sleep disturbances [9].

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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