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Alcohol Consumption and Risk of Type 2 diabetes: Gender and Race Differences

Editorial

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Worldwide, the incidence of type 2 diabetes (T2D) is rising rapidly, and there are already more than 220 million diabetic individuals. The global epidemic of T2D is a major public health problem of 21st century and the fifth leading cause of death worldwide [1]. In the United States (US), the number of people with diabetes was more than 20 million in 2005, and the number is projected to be 48.3 million by 2050 [2]. T2D is a chronic disease in which there are high levels of glucose in the blood. T2D may increase the risk of cardiovascular disease, and hypertension or comorbidity. It has been shown that individuals with T2D are at 2- to 3-fold increased risk for cardiovascular disease compared with those without diabetes [3]; while the prevalence of hypertension in patients with T2D is between 1.5 and 2.3 times greater than for non-diabetic subjects [4].

Alcohol consumption has been reported to be associated with T2D [5-7]. However, the relationship between alcohol consumption and T2D are inconsistent. A majority of studies were conducted in Caucasian populations, in which the J-shaped or U-shaped relationship between alcohol consumption and T2D was observed. This indicated that light to moderate alcoholic beverage consumption may be associated with a lower risk of T2D [5-7] [8-11], and that binge drinking and high alcohol consumption may increase the risk of T2D [5,9,12].

However, an inverse association between total alcohol intake and risk of T2D was observed only in women in an Australian study [13]. Similarly, the results of eight countries from the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort showed that moderate alcohol consumption is associated with a lower risk of T2D among women only [14]. In contrast, a recent study showed that moderate alcohol consumption was associated with a reduced risk of T2D in men, but not in women [15]. The effect of heavy drinking on body weight may partially mediate its adverse effect [9]. The aspects such as type of drink, frequency of drinking, sex and ethnic differences may need to be further investigated for better understanding of moderate alcohol consumption [5].

Binge drinking and high alcohol consumption may increase the risk of T2D just in women using a 20-year follow-up of the Finnish twin cohort study [10]; however, a high intake of alcohol may increase the risk of diabetes in men [13,16]. However, a meta-analysis of 15 original prospective studies found that no risk reduction was observed in heavy drinkers (≥ 48g/day) [6]; while a recent study showed that high levels of alcohol consumption may not carry an increased risk for T2D [15].

There have been several studies in Asian populations. For example, an approximately J-shaped association was observed between alcohol consumption and combined diabetes and prediabetes in men in Chinese [17]. Another Chinese study showed that a moderate alcohol intake was inversely associated with T2D risk [18]. Whether moderate alcohol intake could decrease the risk of T2D among Chinese population warrants further investigation [17,19]. A Japanese study showed that moderate alcohol consumption was associated with a reduced risk of T2D in men with a body mass index (BMI) ≥ 22.1 kg/m^2, but high alcohol consumption was associated with an increased risk of T2D among lean men (BMI≦22.0 kg/m^2) [20]. While, a negative dose-response relationship was found between alcohol consumption and the risk of T2D in males [21]. Another Japanese study reported that individuals with binge drinking (≥3 drinks per occasion) were at a significantly increased risk of developing T2D regardless of frequency compared with those with <1 drink per occasion [22]. In addition, a study in South Korea indicated that moderate alcohol consumption may not lower the risk of T2D among those with hypercholesterolemia [23].

In Native American population, alcohol consumption did not affect the development of T2D, but it was associated with an increased risk of hypertension [24]. One study conducted among African American women suggested that moderate amounts of caffeinated coffee or alcohol could have a reduced risk of T2D [25].

The concordance rate for T2D among monozygotic twins was 76%, compared with 40% among dizygotic twins, providing convincing evidence that genetic factors contribute to the development of T2D [26]. Genetic components account for 40%-60% of T2D, cholesterol, and triglycerides [26,27]. T2D is a complex trait caused by a complex interplay between genetic predisposition and the environment. It has been shown that there are significant gene–environment interactions in the etiology of T2D

[28]. Recently, genome-wide association studies (GWAS) have identified more than 30 genes/loci for T2D and have hugely improved our understanding of the genetic basis of T2D. However, genetics only partly explain an individuals' predisposition to T2D [29-34]. The recent rapid advances in next generation sequencing (NGS) technologies (including whole exome sequencing, transcriptome sequencing, and whole genome sequencing) will help to identify rave variants for T2D [34-37]. In the future, identification of genes and gene-alcohol interactions may include examining the roles of common and rare variants, gene-environment interactions, gender and race differences, and epigenetics for the risk for T2D including age at onset of T2D and its related phenotypes. This identification will help us better understand the etiology and the progression of T2D, thereby predicting the risk and improving treatment and prevention.

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