



# The Effects of Alcohol Consumption in Type 2 Diabetic Mellitus Individuals

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## Abstract

There is a considerable increase in the proportion of diabetic mellitus (DM) globally. The prevalence of Type 2 DM (T2DM) is increasing across the all over the world. The consumption of alcohol is also rising globally including among the T2DM individuals. Alcohol drinking, principally the heavier consuming is a significant risk factor for many health problems and, thus, it is a main contributor to the global burden of disease. Therefore, the present review article was intended to investigate the effects of alcohol consumption among T2DM individuals which mainly focused on its effect on glycemic control, cardiovascular disease (CVD), mortality associated with T2DM. Several studies have found that light to moderate alcohol consumption among T2DM patients have the beneficial effects regarding the glycemic control, cardiovascular disease, mortality associated with T2DM. However, heavy alcohol ingestion among these individuals has the critical adverse effects. As suggestions, advice on alcohol use should largely aim at lowering heavy ingestions among T2DM subjects. These individuals should be advised on decreasing heavy alcohol consumption since the consequences of heavy amount of alcohol consumption has a severe and substantial impacts on T2DM patients. Further, more attention is needed regarding to these critical public issues to avoid the complications associated with the heavy alcohol consumption among T2DM patients. Health education programs should be created and also any programs that can improve the awareness of these individuals is required to take place in order to improve their health.

**Keywords:** Mortality; Diabetes Mellitus; Alcohol Consumption; Cardiovascular Disease; T2DM

## Introduction

DM could be occurred due to the defects in insulin secretion, insulin action, or both [1]. In individuals with T2DM, the body doesn't respond appropriately to the insulin [2]. In T2DM, glucose metabolism is normally controlled by a feedback loop which comprises islet  $\beta$  cells and insulin-sensitive tissues whilst tissue sensitivity to insulin affects the magnitude of  $\beta$ -cell response. The  $\beta$  cells maintain normal glucose tolerance by increasing insulin output if insulin resistance is present. But when  $\beta$  cells cannot release sufficient insulin in the presence of insulin resistance, the glucose concentrations will be increased [3]. The impaired insulin secretion and enlarged insulin resistance are the

significant pathophysiological features of T2DM [4].

The magnitude of obesity and DM continuous to rise among U.S. adults [5]. DM epidemic was developed in the time of 20th century and remains into the 21st century [6]. The global proportion of DM has enlarged from 4.7% in 1980 to 8.5% in 2014 [7]. Its prevalence was likely to be 8.8% and this was predicted to grow to 10.4% in 2040 [8] while 8.8% of the world population was diagnosed with T2DM in 2017, with the expectation to grow to 9.9% by 2045 globally [9]. The proportion of subjects with T2DM is growing in developed and developing countries [10]. T2DM and its-associated complications lead to a major worldwide public health issues by affecting approximately all populations in

both economically developed and developing countries [11].

Alcohol ingestion is a major risk factor for worldwide disease load and causes momentous health loss [12]. The high amount of drinking is a noticeable risk factor for several health problems. So that, it is a major contributor to the worldwide impact of the disease [13]. More than 40% of the world's adult people consume alcohol globally [14]. Alcohol offers about 4 to 6% of the average energy use in most Western countries [15]. Overall, alcohol drinking has both adverse and beneficial effects on survival [16]. But, moderate dose of alcohol drinking is linked to a self-perception of good health [17]. The alcohol consumption is less recognized in populations with diabetes relative to the general community [18].

## The Effect of Alcohol use in Type 2 Diabetic Subjects

### Glycemia

The study found that the moderate amount of alcohol consumption helps in glycemic control [15,19,20]. Diabetes subjects, alcohol ingesting is inversely associated with glycemic control. Whilst the glycemic control influences an incidence of diabetes complications, the lower A1C levels associated with moderate amount of alcohol drinking where this may reflect the lower risk for complications [19]. The study showed that a moderate amount of alcohol can be consumed with a meal without causing hypoglycaemia in non-insulin-dependent diabetic individuals [15].

A systematic review and meta-analysis of randomized trials that consumption of light to moderate amounts of alcohol, with or without a meal, influence any measure of glycaemic control in individuals with T2DM. These mean that subjects with diabetes do not need to refrain from ingesting moderate amount of alcohol, it does not need to be changed [21]. The meta-analysis finding showed that moderate wine ingestion among T2DM individuals could decrease the level of diastolic blood pressure (DBP) and total cholesterol (TC), but not glucose parameters [22]. Besides, the study showed that heavy alcohol drinkers are at risk for suboptimal long-term weight loss. Whereas, reducing alcohol use may improve weight management among subjects with T2DM [23]. Acute alcohol ingestion improves insulin action by rising insulin sensitivity without influencing beta-cell secretion. This effect might be partially because of the inhibitory effect of alcohol on lipolysis [24]. Besides, the study also revealed that the acute alcohol consumption rises endothelium-dependent brachial artery vasodilation in T2DM and insulin sensitivity [25]. Also, the red wine drinking for two weeks noticeably attenuates insulin-resistance in T2DM subjects without affecting vascular reactivity and nitric oxide production [26].

However, the evidence showed that adults with diabetes who report moderate or heavy alcohol use may be at risk for adverse diabetes outcomes because of suboptimal preventive practices [27]. Alcohol use by diabetics can worsen blood glucose control in these individuals. For instance, chronic alcohol consumptions in well-nourished diabetics can lead to in extreme blood glucose levels while it leads to dangerously low blood glucose levels in patients who are not adequately nourished. Further, heavy use of alcohol in these subjects also can cause the accumulation of certain acids in the blood that may result in severe health outcomes. Added, alcohol use can worsen diabetes-related medical complications [2].

### Cardiovascular Disease

Several studies have been showed that light to moderate alcohol consumption reduces the risk of CVDs [28–33]. Ajani, et al. found that light to moderate amount of alcohol drinking is associated with similar risk reductions in coronary heart disease (CHD) among diabetic and nondiabetic men individuals [28]. The meta-analysis showed that moderate alcohol consumption is associated with a lower risk of CHD in T2DM populations [29]. According to the study findings though potential risks of alcohol intake must be considered, moderate amount of alcohol intake is associated with decreased CHD risk in women with diabetes and should not be routinely discouraged from drinking it [30]. The other study also showed that moderate alcohol intake is associated with the lower risk of CHD in men with T2DM [34].

The moderate wine consumption improved cardio-metabolic factors in alcohol-abstinent adults with T2DM and a healthy diet compared with mineral water [35]. A study showed that a moderate red wine consumption among well-controlled T2DM as part of a healthy diet is seemingly safe and modestly decreases cardio-metabolic risk [31]. In T2DM patients, moderate amount of red wine use with meals, significantly decreases oxidative stress and pro-inflammatory cytokines as well as improving cardiac function after myocardial infarction. Which means it may have a beneficial effect in avoiding of cardiovascular complications in these individuals [36].

In well controlled T2DM subjects 24–31 g alcohol/day (about 2 to 3 standard drinks) increases awake BP and a 24-hour heart rate and lowers asleep BP. However, it does not adversely modify cardiovascular risk factors [37]. Alcohol consumption is a significant prognosticator of coronary events. Low-to moderate ingestion appears to be linked with a decrease in the proportion of acute coronary syndromes in diabetes, whereas heavy ingestion is related to an increase in lipids and BP levels, and risk of acute coronary syndromes occurrence [38]. An evidence from a survey-based cross-sectional study indicated high alcohol ingestion in men with

diabetes associated to a lower incidence of cardiovascular events [39]. It is a light alcohol consumption not the high ingestions that has preventive effects on atherosclerosis in T2DM patients [40].

However, diabetes might be the outcome of excessive alcohol drinking which could lead to insulin resistance, then to coronary heart disease [41]. Also, the high amount of alcohol ingestion facilitates the occurrences of atherosclerosis exclusively in diabetic individuals [42]. Heavy amount of alcohol intake in patients with type T2DM is associated to augmented risk of diabetes-related microvascular and macrovascular complications [43].

### Mortality

The evidence suggested that the moderate alcohol using is associated with a decreased risk of premature mortality in subjects with DM [32,33]. The evidence showed that the countries that consume primarily beer have greater diabetes mortality rates than countries that consume primarily spirits or wine [44]. The meta-analysis showed that moderate alcohol consumption is associated with a lower risk of mortality in T2DM populations [45]. Among people with diabetes, light-to-moderate alcohol consumption reduces the risks of CVD and all-cause mortality [46]. In light-to-moderate alcohol consumers, the higher serum dehydroepiandrosterone (DHEA)-S concentrations may indicate part of the link between light-to-moderate alcohol consumption and lower CVD mortality [47].

Alcohol consumption in men with glucose intolerance was linked with an important decrease in cardiovascular and all-heart disease mortality [48]. A population-based prospective cohort study findings showed that alcohol ingestion was found to have a beneficial effect in reducing the risk of death because of CHD in individuals with older onset diabetes [49]. The moderate alcohol consumption slightly reduced the mortality among middle-aged and elderly population. But its benefit is depended on age and background of cardiovascular risk [16].

However, Diem et al. found that in T2DM subjects even though moderate alcohol use of 16 to 30 g per day was related with decreased mortality from CHD and from all causes, alcohol consumption above 30 g per day was linked with a tendency towards augmented all-cause mortality [50]. Further, the study showed that the raised mortality risk among non-alcohol drinkers seemed to be affected by their past alcohol ingestion rather than their recent abstinence [32]. Lastly, the study suggests that in individuals with T2DM, alcohol consumption should not be discouraged from using alcohol in moderation [51].

### Conclusion

The proportion of DM is increasing globally. As a type of DM, the prevalence of T2DM is growing substantially. This has a critical burden on the individuals with this disease, and also on the government as whole. The present review has found that light to moderate alcohol consumption among T2DM patients has been found to have beneficial effects regarding the glycemic control, cardiovascular disease, mortality associated with T2DM. However, heavy alcohol ingestion among these individuals has the critical adverse effects.

Finally, as suggestions, advice on alcohol use should largely aim at lowering heavy ingestions among T2DM subjects. These individuals should be advised on decreasing heavy alcohol consumption since the consequences of heavy amount of alcohol consumption have severe and substantial impacts on T2DM patients.

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