

Effects of Pomegranate Juice Intake on Type 2 Diabetics Adults in Oman: A Review

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ABSTRACT

The health status of an individual is the result of a combination of internal factors such as genetics, age, physical activity, nutritional status, stress levels, external factors such as hygiene and environment, lifestyle factors, and bad habits such as tobacco and alcohol consumption. In Oman, chronic non-communicable diseases have emerged as the major cause of death among Omani adults, and have been attributed to the high prevalence of risk factors. 12% of the Omani population were type 2 diabetics, 20% were obese and 30% were overweight. Over the past decade, the prevalence of type 2 diabetes has increased by up to 16.1% among the Omani population aged 30-64 years. Due to westernization of dietary habits and inactive lifestyle, the young Omani generation is developing type 2 diabetes. Incidence of other non-communicable diseases is also escalating. Pomegranate juice represents a novel dietary intervention for combating non-communicable disease including type 2 diabetes and other non-communicable diseases.

Key words: *Type 2 Diabetes, Oman, Pomegranate Juice, Adults.*

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INTRODUCTION

The health status of an individual is the result of a combination of internal factors such as genetics, age, physical activity, nutritional status, stress levels, external factors such as hygiene and environment, lifestyle factors, and bad habits such as tobacco and alcohol consumption. The consumption of unhealthy food, combined with other risk factors, increases the development of chronic diseases such as obesity, cardiovascular disease (CVD), osteoporosis, diabetes, and certain types of cancer (1-2). Many researchers have focused the importance of diet in the protection and prevention of most common chronic diseases, such as heart disease (3), cancer (4), diabetes (5-6) and obesity (7), although some contradictory results have been reported (8).

A Dutch study showed a reduction of 6–22% in the incidence of CVD and 6–28% of cancer mortality as a consequence of increased consumption of fruits and vegetables (9). The beneficial effects were attributed to bioactive compounds such as carotenoids, vitamin C, dietary fibre and other component such as folic acid, glucosinolates and flavonoids. Other

epidemiologic studies have also found a strong association between high fruit and vegetable consumption and decreased risk of chronic diseases, such as cancer, heart disease, stroke, hypertension and chronic obstructive pulmonary disease (10). Conversely, low consumption of fruits and vegetables together with high consumption of animal products, sugar and total fats has been reported to elevate the risk factors for CVD (11, 2).

An inverse association between the intake of β -cryptoxanthin in citrus fruits and the risk of Type 2 DM, and concluded that “a sufficient intake of antioxidants plays a role in Type 2 DM prevention” (12). Pomegranate is the most valuable fruit in the northern mountainous parts of Oman (13) and is being grown and consumed in Oman for centuries (14). It is an excellent source of antioxidants (15). Unfortunately, little research is done on the consumption of pomegranate and its impact on health in Oman.

Global Prevalence of Non-communicable Diseases

Non-communicable diseases (NCDs) such as CVD, chronic respiratory disease, cancer, and diabetes may be caused by life style and genetic factors (16-17). They are considered to cause major health problems in both developed and developing countries, accounting for 79% of deaths in developing countries (2, 18). Worldwide the incidence of the NCDs is increasing. It was estimated that in the year 2005, NCDs accounted for 49% of health burden and 61% of deaths, with 80% of the deaths occurring in developing countries, especially among people with low- and middle-income (19). The authors predicted that if the trend in chronic disease incidence continued the contribution of NCDs to global disease burden and deaths would increase to 56% and 70%, respectively, by the year 2030.

Prevalence of Chronic Diseases in Oman and other Gulf Countries

Oman has undergone dramatic changes in its demographic and socioeconomic characteristics as well as nutritional and lifestyle changes since the beginning of the on-going economic renaissance in 1970. In the health sector, these changes have resulted in reduced incidence of communicable diseases (CDs) and increased life expectancy to 76 years for women and 71 years for men (20-21). On the other hand, the rapid changes in lifestyle have contributed to the increasing prevalence of chronic diseases such as CVD, diabetes, chronic renal failure, obesity-associated syndromes, and cancer (19, 20, 22). In Oman, chronic non-communicable diseases have emerged to be the major cause of death (18, 19). The high death rate from non-communicable disease in Oman has been attributed to high prevalence of risk factors. 12% of the Omani population were diabetic, 20% were obese, 30% were overweight and 41% had high cholesterol levels (18). The young Omani generation would develop diabetes mellitus and that the incidence of other non-communicable diseases would also increase (20).

Other countries in the Middle East have shown similar trends (23). Various studies have reported increased prevalence of CVD, obesity, impaired glucose tolerance, and diabetes among Middle East populations, including Oman (24). Bahrain was found to have the highest rates of diabetes in addition to high plasma cholesterol levels (25). In Saudi Arabia, the prevalence of diabetes was reported to be 23.7% (26). A study on clinical epidemiology of Type 2 DM in South Hawalli Primary Health Care Center in Kuwait of 256 adults in the age range of 23-84 years (27). The mean duration of diabetes was 6.1 ± 5.5 years, and the mean body mass index (BMI) was 32.56 ± 5.85 kg/m² for men and 27.83 ± 4.84 kg/m² for women. Obesity and overweight were found in 44.7% and 33.7% of male and female patients, respectively.

Past history of hypertension was recorded in 46.5%, ischemic heart disease (IHD) in 12.9%, and hyperlipidemia in 45.5% of the patients. Family history of diabetes in first-degree relatives in woman was most prevalent in 81.1% Kuwaitis and 52.5% expatriates. Prevalence of obesity and hyperlipidemia were found to be higher among Kuwaitis, 71.3% and 61.5%, respectively, than in expatriates, being 59% and 50.8%, respectively. The study also confirmed that obesity, hypertension, and hyperlipidemia were more common among the diabetic population in Kuwait. High prevalence of diabetes in other Gulf countries, reaching 29% in the United Arab Emirates and 16.1% in the Sultanate of Oman (28).

Worldwide Prevalence of Diabetes

Diabetes mellitus is a chronic situation that occurs when the pancreas is unable to produce sufficient insulin, or when the body is unable to use the insulin it produces. There are mainly 3 types of diabetes: Type 1 diabetes, Type 2 DM, and gestational diabetes (29). Modern lifestyle, combined with high consumption of rich food and reduced physical activity, has resulted in dramatic increases in the rates of obesity-associated disease conditions, including Type 2 DM (30-31).

The incidence of Type 2 DM is increasing in both developed and developing countries and becoming the leading cause of morbidity and mortality worldwide (32-33). It is considered to be one of the most common non-communicable diseases (NCDs) globally and to be the major leading cause of death, contributing 5% of all deaths globally, with 80% of them occurring in the 45-65 age groups. It is projected that deaths from diabetes are expected to increase worldwide by more than 50% in the next 10 years (34). Globally, the prevalence of diabetes for all age-groups was estimated to be 2.8% in year 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 (35).

Diabetes is also predicted to be the leading cause of death, mostly via increased risk of CVD (31, 36). The year 2030, the majority of diabetic individuals in the developing countries will be in the age group of 45-64 years old, who, therefore, lose a significant part of their productive years due to disability (37).

Prevalence of Diabetes in Oman

Individuals with abnormal hypertension, glucose metabolism, dyslipidemia and obesity represent a major burden facing health systems in developed and developing countries. Such individuals have increased risk of developing diabetes and CVDs. The prevalence of metabolic syndrome by age and gender in the Nizwa area in Oman using a random sample of 1419 adult participants, aged ≥ 20 years (24). Results showed that almost 85% of the population studied had a minimum of one abnormal value of metabolic syndrome, such as abdominal obesity, which was higher among women compared to men, 44.3 vs. 4.7%, respectively. Approximately 75% of the studied population had low HDL cholesterol abnormality, followed by 24.6% of abdominal obesity. About 20% of the population had hypertriglyceridemia, high blood pressure, and high fasting plasma glucose (FPG).

A survey was conducted on 563 individuals to evaluate the knowledge and awareness of diabetes within the general population of Oman, including the relations between basic knowledge and perception and socio-demographic factors (36). The results suggested that 56.8% of the participants reported that they were aware of diabetes as a medical condition;

however, only 46.5% were able to define the condition. Fifty seven percent of the subjects were aware of at least one of the classical symptoms of diabetes, like polyuria and polydipsia. Polyuria was the most common symptom identified symptom by 44.8% of the subjects, followed by unexplained weight loss by 24.7%, polydipsia by 20.1%, lethargy by 11.4%, and giddiness by 11.4%.

The rates of awareness regarding important diabetes risk factors also varied in the sample population. About 59.9% of the subjects indicated that high intake of dietary sugar is a major risk factor for the development of diabetes, and only 29.5%, 20.8% and 16.9% indicated obesity, physical inactivity and positive family history as other risk factors, respectively. Younger subjects and those with higher education were more aware of the risk factors and complications of the disease diabetes. The study concluded that significant numbers of Omanis lack the knowledge and perceptions required in the preventing and coping with the increased prevalence of diabetes in Oman.

A cross-sectional study conducted on the distribution of body fat as a predictor of Type 2 DM in Oman showed a strong correlation between BMI and Type 2 DM (38). A cross-sectional interviewer-administered survey of 7179 persons aged ≥ 20 years, established a positive relationship between the high prevalence of diabetes in Oman and coronary factors, such as hypertension, elevated cholesterol and obesity, among urban-dwellers and older individuals at age of 50 to 59 years and above (20). The incidence of diabetes was higher among the urban population (17.7%) in comparison to the rural regions (10.5%) of the country. This study emphasized the prevalence of diabetes and its association with coronary risk factors in urban Oman. The prevalence of diabetic retinopathy in a population of patients attending the Diabetic Clinic in Al-Buraimi Hospital in Oman, and evaluated the medical risk factors underlying its development (39). The study of 500 randomly selected diabetic patients indicated that 42.4% of diabetic patient had diabetic retinopathy, 25.6% had mild non-proliferative retinopathy (NPR), 4% had moderate to severe NPR, and 12.8% had proliferative retinopathy. The authors suggested that the factors which significantly related to the occurrence of proliferative diabetic retinopathy were high levels of blood cholesterol, triglycerides, high level of serum creatinine, and high diastolic blood pressure (DBP).

The prevalence of diabetes increased by up to 16.1% of the Omani population over the past decade among the age group of 30 to 64 years old (40). A WHO estimate which suggested that over the next 20 years, number of diabetes mellitus in Oman would increase by 190%, rising from 75,000 in 2000 to 217,000 in 2025¹⁹. The Medline database between January 1989 and March 2009 was searched for publications on the predictable diabetes prevalence in 2010 and 2030 in 133 studies from 91 countries (41). They found that the world prevalence of diabetes in 2010 among adults (aged 20–79 years) is 6.4%, affecting 285 million adults, and will increase to 7.7% and 439 million adults by 2030. Between 2010 and 2030, there will be a 69% increase in numbers of adults with diabetes in developing countries and a 20% increase in developed countries. They estimated that Oman is among the top 10 countries in occurrence of the disorder, ranking number 8 in 2010 and number 9 in 2030, with a prevalence of 13.4% and 14.9%, respectively.

Life Style in Relation to Chronic Diseases

Throughout the entire human history, people have experienced many changes in their life style, mainly in diet and physical activity. In the past century, communicable diseases (CDs)

were considered as the leading cause of death. During the last few decades, the expansion of education, increased income, urbanization, industrialization and, improved medical and public health services have dramatically shifted disease patterns from infectious diseases to non-communicable diseases. Several studies have suggested a direct link between an unhealthy life style in diet, physical inactivity and the emergence of non-communicable diseases (NCDs) such as CVD, diabetes mellitus, cancer, hypertension, dental caries and osteoporosis². Physical inactivity and the consequent overweight and obesity have increased and, as a result, high mortality and morbidity due to Type 2 DM and heart disease have occurred (31, 42).

Dietary Habits in Relation to Diabetes

Dietary habits have been always associated with the prevention and management of different types of chronic diseases, such as obesity, Type 2 DM, and the development of heart disease (6, 43). One of the main factors that have contributed to the increased incidence of diabetes mellitus worldwide is the spread of Westernized life style and food type (44). An increased risk of diabetes was observed mainly with individuals who consumed saturated and Trans fat (45). However, polyunsaturated fatty acid, mainly omega-3 fatty acids were inversely linked with risk of Type 2 DM (10, 46). The various dietary factors associated with diabetes risks are fat, carbohydrate, cereal-fibre, meats, and consumption of coffee and sugars-sweetened beverages (47).

Not only have researchers studied the positive relation between lifestyle and dietary habits and NCDs, they have also focused their attention on the inverse association between a diet rich in fruit and vegetables and chronic disease such as CVD and certain forms of cancer (48-50). In particular, many researchers have examined the dietary antioxidant components and antioxidant activities of various fruit and vegetables and their effect on human health (51). Among fruits, pomegranate has received special interest due to its protective effects on health.

Many studies over the past decade have shown that pomegranate juice (PJ) contains high levels of antioxidants in comparison to other fruit juices and beverages (52,53). The gradation of the antioxidant potency of fruit beverages was reported as follows: PJ > red wine > concord grape juice > blueberry juice > black cherry juice, acacia juice, cranberry juice > orange juice, iced tea beverages, apple juice. Pomegranate juice (PJ) showed an overall antioxidant index of at least 20% higher than any of the other beverages tested (54). Diabetes subjects are associated with increased oxidative stress and atherosclerosis development (55). Several studies have demonstrated the ability of PJ to improve lipid profiles in type 2 diabetic patients (10, 56).

CONCLUSION

The literature referred to in this introductory chapter reveals the following salient points regarding NCDs: The incidence of NCDs has been increasing in modern times, and it is likely to continue increasing if unabated. This increase is associated with unhealthy dietary habits and low levels of physical activities. Fresh fruit, vegetables and juices that have high antioxidant properties and their use in the management of NCDs needs to be explored systematically. PJ has the highest antioxidant index among all fruit juices. Therefore, the potential beneficial effect of PJ on subjects with NCDs is of considerable interest among researchers, health practitioners and the general public.

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