



## Diabetes mellitus as a public health problem; a mini-review on the occasion of world diabetes day 2017 with regard to nephrology

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### ABSTRACT

Type II diabetes is predominantly preventable and managing diabetes by using standard protocols and measures such as promoting healthy living, self-care education in patients, regular screening, with the aim of early diagnosis of disease and its treatment is necessary. These modalities can potentially prevent complications and premature death due to diabetes. Therefore, according to increasing prevalence of diabetes in Iran, along with the growth of aging and lifestyle changes towards urbanization and inactivity, it is necessary to plan for the prevention, care and screening of diabetes in rural areas, especially in the cities, which still have a large proportion of unknown patients.

### Implication for health policy/practice/research/medical education:

According to increasing prevalence of diabetes in Iran, along with the growth of aging and lifestyle changes towards urbanization and inactivity, it is necessary to plan for the prevention, care and screening of diabetes in rural areas, especially in the cities, which still have a large proportion of unknown patients.

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### Introduction

Diabetes is a progressive chronic disease that is characterized by an increase in blood glucose levels. The high prevalence of the disease over the past decades has caused that as a public health problem and one of the four priority diseases, non-communicable diseases considered by world leaders. The World Health Organization (WHO) reported that in 2014, around 422 million adults live with diabetes, that figure was about 108 million in 1980. The global outbreak has doubled, rising from 4.7% in 1980 to 8.5% in 2014 (1). This growth reflects an increase in risk factors associated with the disease including overweight and obesity. The outbreak in countries with lower and middle income is higher than that in high-income countries. The Eastern Mediterranean region (EMRO) has the highest ranking among WHO regions with a

prevalence of 13.7% (1,2). The prevalence of diabetes in Iran is increasing, so that the WHO announced it at 10.3, in 2016. This ratio is 9.6% in men and 11.1% in women. On the other hand, the prevalence of the risk factors associated with the disease, including overweight 60.5%, obesity 24.9% and low physical activity 31.9% was estimated. This ratio is considerably higher in Iranian women (3).

### Materials and Methods

For this mini-review, we used a variety of sources including PubMed, Embase, Scopus and directory of open access journals (DOAJ). The search was conducted by using combinations of the following key words and/or their equivalents; diabetes mellitus, kidney failure, cardiovascular disease, hypertension, retinopathy,

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neuropathy, nephropathy, microalbuminuria, macroalbuminuria, chronic renal failure, diabetic kidney disease, type II diabetes and end-stage renal disease.

### Focus on diabetic kidney disease

Around 4 million deaths occur annually due to diabetes that included 9% of deaths (4). This figure in Iran is about 2% of all deaths (5). On the other hand, 43% of deaths due to diabetes occur before the age of 70, more importantly, the lack of control of diabetes during pregnancy can lead to adverse consequences such as maternal and infant mortality, congenital anomalies and other complications such as the birth of preterm infants (1,6). Diabetes has a high direct and indirect cost to the health system annually. Most of these costs are related to the long-term complications of the disease (7). This includes the costs of preventing and treating the disease and its complications, which is done on an outpatient basis. In the study, direct costs of disease were estimated at \$ 827 billion annual (4, 7). When diabetes is not well managed, it causes acute and chronic complications. Acute complications of the disease include diabetic ketoacidosis in both types 1 and 2 diabetes, and hyper osmolar coma in type II diabetes. On the other hand, lowering your blood glucose level may reduce your consciousness or seizure. Late complications include cardiovascular disease, hypertension, retinopathy, neuropathy, nephropathy, cataracts and infections due to complications (8). It is the fifth leading cause of death and the leading cause of kidney failure, non-traumatic foot amputation and blindness (9). The results of the study conducted by Albright et al showed that diabetes is the main cause of blindness, renal failure, amputation and cardiovascular disease in the adult population of many countries, which is the most common cause of death (10). In another study, the prevalence of cardiovascular disease in people with diabetes was reported 2 to 4 times (11). Malik et al highlighted that among patients referring to the diabetes clinic, 77.4% had neuropathy, 33.5% had retinopathy, 18.6% had cardiovascular disease and 13.1% had nephropathy (12). Thayer et al showed that amputation in patients with diabetes is 10 times higher than those without diabetes (13).

In the study of Ford et al on patients with type II diabetes, findings revealed that 20% of patients had nephropathy, which indicated that there was a gap between the onset of the disease and the final individual for several years. Hence delays in diagnosis cause complications of diabetic notably microvascular complications (14). One of the vascular complications of diabetes is nephropathy, which is the main cause of chronic renal failure in many parts of the world (15). Nephropathy occurs in five stages, including hypertrophy of glomerular filtration and increased kidney size, glomerular damage due to increased basal remodeling thickness and mesangial matrix with normal removal of albumin, microalbuminuria (albumen excretion ranging from 300 to 30 mg), macro albuminuria (more proteinuria from 300 mg) and ultimately chronic

renal failure and end-stage renal disease (ESRD) (16). Diabetes causes 40% of end-stage renal disease (ESRD), that leads to cost more than \$4 billion in the United States annually. More importantly, 30% of people with type 1 diabetes and a lower percentage of type 2 diabetes suffer from ESRD but due to the higher incidence of type II diabetes than type I, the incidence of type II diabetes is higher (17). In some studies in diabetic patients, the outbreak of nephropathy was reported to be up to 40%, and the lack of control of blood glucose in increasing micro albuminuria and reducing HbA1c in less than 7% of patients was effective in reducing micro albuminuria (10,17). A study in type 2 diabetes patients showed that 47% had high blood pressure, 58% had hyperlipidemia, and the prevalence of hypertension and hyperlipidemia in patients with nephropathy was significantly higher than those without nephropathy (18). The results of a study on dialysis patients indicated that diabetes and hypertension were the main cause of renal failure, and management of care with diabetes and hypertension was effective in reducing renal insufficiency (19).

If the blood glucose, blood pressure, cholesterol, triglycerides, LDL-C, HDL-C, body mass index (BMI) are controlled in diabetic patients, and are optimal and in accordance with international standards, the complications of the disease will be prevented (20). A clinical trial study showed that with the control of diabetes and its complications, the incidence of retinopathy, nephropathy, and neuropathy decreased by 76%, 54% and 60%, respectively. There is a significant relationship between diabetes complications and HbA1c levels; Thus, the American Diabetes Association (ADA) recommends it at least twice a year; the patient's HbA1c is checked and when this is less than 7, the patient's blood glucose monitoring is good. Along with this care, at least once a year, blood lipid levels and blood pressure measurements are essential for each patient's care (20).

### Conclusion

Therefore, in order to improve the quality of diabetes care in diabetic patients, the following factors should be checked once every three months: fasting blood glucose tests, blood glucose testing 2 hours after food, HbA1c test, blood pressure measurement in both sitting and standing position and pulse rate, body mass index (BMI), examination of the lower limbs, and the care of diagnosed complications including cardiovascular disease and other related illnesses. Additionally, when there are signs of late complications during care, the patient is referred to a specialized level. On the other hand, checking blood lipids are recommended every year. Proper nutrition with the physician's opinion and providing nutritional education by a nutritionist along with education and health interventions, including lifestyle modification, advice on weight loss and increased physical activity are essential for patients every three months (18). Type II diabetes is predominantly preventable and managing diabetes by

using standard protocols and measures such as promoting healthy living, self-care education in patients, regular screening, with the aim of early diagnosis of disease and its treatment is necessary. These modalities can potentially prevent complications and premature death due to diabetes (2). Therefore, according to increasing prevalence of diabetes in Iran, along with the growth of aging and lifestyle changes towards urbanization and inactivity, it is necessary to plan for the prevention, care and screening of diabetes in rural areas, especially in the cities, which still have a large proportion of unknown patients.

### Conflicts of interest

The authors declare no conflict of interest.

### Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

### Authors' contribution

All authors drafted the first version. ZKH, MS and AM edited the first draft. All authors read, reviewed and approved the final draft.

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