

Diabetes Complications among Elderly in Family Practice

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Abstract

Background: Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia. It may be due to impaired insulin secretion, resistance to peripheral actions of insulin, or both. Persistent hyperglycemia in uncontrolled diabetes can cause several complications, both acute and chronic. Diabetes is one of the leading causes of cardiovascular disease (CVD), blindness, kidney failure, and amputation of lower limbs.

Aim: In this review, we will look into the complications of acute respiratory infection in elderly population.

Methodology: The review is comprehensive research of PUBMED since the year 2002 to 2019.

Conclusion: Diabetes should be prevented among older adults, or controlled to halt or slow the progression to otherwise inevitable complications, the public health community needs to develop, evaluate, and expand the reach of effective, targeted interventions that address the specific needs of older adults with or at risk for diabetes. Existing public health programs instituted to reach older diabetic patients may need to be modified to fully address their complex, specific needs and functional statuses, while remaining relevant to their interests and to the social and economic contexts in which they live. Possible modifications to these programs include greater use of lifestyle interventions, which have shown impressive early results.

Keywords: Diabetes Mellitus; Complications; Elderly

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia. It may be due to impaired insulin secretion, resistance to peripheral actions of insulin, or both [1]. The prevalence of abnormal glucose states among older adults is high. One third of the elderly population has diabetes and three quarters of the elderly population has pre-diabetes or diabetes. Most people over than 60 years old suffer from type 2 DM due to insulin resistance. However, insulin secretion may be severely reduced at the end stage of type 2 DM [2].

People 65 years and older will make up most of the diabetic population in the United States in the next 25 years. More alarmingly, the proportion of the diabetic population 75 years or older is projected to exceed 30% in the United States in the next 50 years [3]. In the next 2 decades, their numbers are expected to double and their direct medical costs are expected to triple because of the combined effects of an aging population and high rates of overweight and obesity [4].

Persistent hyperglycemia in uncontrolled diabetes can cause several complications, both acute and chronic. Diabetes is one of the leading causes of cardiovascular disease (CVD), blindness, kidney failure and amputation of lower limbs. Acute complications include hypoglycemia, diabetic ketoacidosis, hyperglycemic hyperosmolar state and hyperglycemic diabetic coma. Chronic microvascular complications are nephropathy, neuropathy and retinopathy, whereas chronic macrovascular complications are coronary artery disease (CAD), peripheral artery disease (PAD), and cerebrovascular disease [5].

The specifics of how to manage elderly patients with diabetes, priorities their problems, and implement effective interventions for functional outcomes are not clear. For example, glycemic control, management of blood pressure and hyperlipidemia each could conceivably affect cognitive decline, but few data exist to inform clinicians [6].

Consequently, complications, and management of DM in elderly vary according to hyperglycemia duration, personal background, and co-morbidities. Some old people do not have any complication and are easy to manage; others are multi complicated and have additional severe diseases difficult to treat even in highly specialized centers [7].

Classification of diabetes

The types of diabetes in the elderly population span the spectrum, including Type 1, Type 2, latent autoimmune diabetes of adulthood, and other types. Type 1 diabetes mellitus (T1DM) accounts for 5% to 10% of DM and is characterized by autoimmune destruction of insulin-producing beta cells in the islets of the pancreas. As a result, there is an absolute deficiency of insulin. It occurs in genetically susceptible people and is influenced by environmental factors [8,9].

In T2DM, the response to insulin is diminished, and this is defined as insulin resistance. During this state, insulin is ineffective and is initially countered by an increase in insulin production to maintain glucose homeostasis, but over time, insulin production decreases resulting in T2DM. Type 2 diabetes can generally be treated with lifestyle changes and oral agents early in its course [10].

Diagnosis

In an elderly population, screening for diabetes should be considered in light of its increased prevalence. Diabetic patients most commonly present with increased thirst, increased urination, lack of energy and fatigue, bacterial and fungal infections, and delayed wound healing. Some patients can also complain of numbness or tingling in hands or feet or with blurred vision [11].

These patients can have modest hyperglycemia which can proceed to severe hyperglycemia or ketoacidosis due to infection or stress. T1DM patients can often present with ketoacidosis (DKA) coma as the first manifestation in about 30% [12].

The diagnostic criteria for diabetes remain constant across all ages. Diabetes is diagnosed with fasting glucose greater than or equal to 126 mg/dl; symptoms of hyperglycemia and a random glucose equal to or greater than 200 mg/dl; a 75 gram oral glucose tolerance test with a two hour value equal to or greater than 200 mg/dl; or A1C > 6.5% [13].

Height, weight, and body mass index (BMI) of diabetic patients should be recorded. Retinopathy needs to be excluded in such patients by an ophthalmologist. All pulses should be palpated to examine for peripheral arterial disease. Neuropathy should be ruled out by physical examination and history and nephropathy by early morning urine albumin/creatinine ratios of less than 30 mg/g creatinine [14].

Complications

Diabetes is associated with increased risk of multiple coexisting medical conditions in older adults ranging from CVD to cancer and potentially impacting treatment decisions, such as whether stringent glycemic control would be of net benefit [15]. Old people with DM are at similar risk for macro and microvascular complications as their younger counterparts, but they have a much higher absolute risk for cardiovascular diseases and a higher rate of morbidity and mortality than old people without DM. They are also at high-risk for physical and functional disabilities, co-morbidities, and rheumatic pain. Clearly, the complications of diabetes are responsible for a major component of the total cost [16].

Macrovascular complications

- Older adults with diabetes are at particularly high risk of morbidity and mortality from cerebrovascular disease (CVA). The prevalence of CVA in the older population with diabetes is higher than those without diabetes. Elderly patients with diabetes who experience excess worry related to diabetes symptoms, diet restrictions, treatment satisfaction, and medications and have a lower sense of wellbeing may be more likely to have a CVA [17,18].
- Peripheral Vascular Disease (PVD) is a common diabetes complication in older adults. Predictors of an abnormal ankle brachial index (ABI) included male gender, smoking, dyslipidemia and having other diabetes related complications. Investigators sought to see what risk factors and complications associated with a low ABI in older patients with type 2 diabetes and proliferative retinopathy [19,20].
- Elderly adults with diabetes have a high prevalence of Coronary Heart Disease (CHD). Using a composite definition of CHD (bypass surgery, angiographic evidence of coronary disease, previous percutaneous intervention, documented myocardial infarction (MI), or electrocardiographic features of MI), the prevalence among diabetes patients with a mean age of 80 years at an academic center was 44% CHD among older patients with diabetes is a leading cause of mortality. The Cardiovascular Health Study included participants aged 65 years and older with and without diabetes [21,22].

Heart involvement in diabetes may not be only a macrovascular disease where there is Orchestra of contributing factors to the development of diabetic cardiomyopathy concerning fatty acid and glucose complex structural macrovascular derangements such as hypertrophy and loss of function due to glycation but also a microvascular involvement following “common soil” hypothesis of diabetes complications [23].

Microvascular complications: Diabetes induces pathognomonic changes in the microvasculature, affecting the capillary basement membrane including arterioles in the glomeruli, retina, myocardium, skin, and muscle, by increasing their thickness, leading to the development of diabetic microangiopathy. This thickening eventually leads to abnormality in vessel function, inducing multiple clinical problems such as hypertension, delayed wound healing, and tissue hypoxia [24].

- Diabetic retinopathy (DR) is one of the most common and severe complications of diabetes mellitus (DM). Retinopathy is a common microvascular complication of diabetes. An analysis of National Health and Nutritional Examination Survey (NHANES) data reports a crude prevalence of diabetic retinopathy at 29.5% among patients age 65 years and older with diabetes. Several studies have explored the association between DR and macrovascular complications. As retinal microvasculature shares embryologic and anatomic characteristics with that of cerebral circulation, researchers have studied retinal abnormalities to provide clues to understand the underlying pathophysiology of different cerebrovascular diseases [25-27].
- Depression is a multifaceted phenomenon that involves loss of satisfaction, hope, energy, and interest; and it is often accompanied by feelings of helplessness, worthlessness, boredom, and a loss of interest in previously enjoyed activities. The increased incidence

of major depression among patient with diabetes was shown in the Health, Aging and Body Composition Study. 2,522 community dwelling participants age 70 - 79 were followed for a mean of 5.9 years. None had depression symptoms at baseline. The development of depression was defined as use of antidepressants or depression symptoms via a screening tool at follow up visits [28-30].

- Peripheral neuropathies are a large group of disabling sensory and motor nerve abnormalities that are common among older adults and persons with diabetes. In older persons with diabetes, peripheral sensory neuropathy is associated with impairments in balance, gait, performance of activities of daily living, increased incidence of recurrent falls and fractures and the presence of lower-extremity peripheral arterial disease. The risk of development of diabetic neuropathy is directly proportional to both the duration and magnitude of hyperglycemia. In addition, some individuals may also possess genetic facets that influence their predisposition in developing such complications. Although the precise nature of the injury to the peripheral nerves from hyperglycemia is not yet certain, the mechanisms of hyperglycemia-induced polyol pathway, injury from AGEs, and enhanced oxidative stress have been implicated in its pathogenesis. The damage to peripheral nerves may be mediated by effects on nerve tissue or by endothelial injury or vascular dysfunction [31-34].
- Chronic kidney disease (CKD) is a common diabetes related complication in older adults. For adults older than 60 years, the most common cause of CKD and end-stage renal disease (ESRD) in the United States is diabetic nephropathy. Over the last 25 years, the proportion of patients with diabetic nephropathy who have stage 5 chronic kidney disease and are initiating dialysis in the U.S. rose from one in six persons to almost one in two persons. Most have multiple comorbid conditions, such as heart disease and peripheral vascular disease. In the elderly, ESRD with diabetes is associated with an increased risk of dementia which can further complicate therapy. The pathogenic mechanisms underlying diabetic nephropathy involve generation of reactive oxygen species (ROS), accumulation of advanced glycation end product (AGE), and activation of intracellular signaling molecules such as protein kinase C (PKC) [35-37].
- Urinary incontinence can have a negative influence on a patient's quality-of-life, physical functioning, mental health and general health perception. Older men with diabetes also experience more urinary incontinence when compared to counterparts without diabetes. Urinary incontinence may be associated with social isolation, increase risk of fall and fracture. An initial assessment and examination to evaluate the etiology of urinary incontinence should be performed. Estimates of the prevalence of urinary incontinence among US women aged 60 years or older range from 17% to 49% and estimates of the direct medical costs of the condition range from \$19.5 to \$26 billion annually [38-40].
- Falls represent a major source of morbidity and mortality for the elderly. Older patients with diabetes are at increased risk of having a fall. Potential factors related to the increased frequency of falls in persons with diabetes include polypharmacy, pain, lower physical activity, functional limitations, and cognitive impairments. Osteoporotic Fractures included a prospective cohort of 9,249 patients followed for an average of 7.2 years. The increased risk of falls in elderly diabetic patients is associated with significant morbidity and mortality. It has been reported that 30.6% of older individual with diabetes have recurrent falls compared with 19.4% of individuals without diabetes [41-43].
- Cognitive impairment and dementia: The extent of cognitive decline among people with diabetes has been positively associated with the duration of their diabetes. There is an increased risk of cognitive impairment in elderly diabetic patients. Diabetic retinopathy and hypoglycemia have been linked to memory loss and increase risk of dementia. This impairment may hinder their ability to comply with treatment recommendations and medications and may contribute to increased mortality [44-46].
- Polypharmacy: Older adults frequently take multiple prescription and nonprescription medications to reduce or prevent the complications associated with multiple medical conditions. This can lead to increased side effects, drug-drug interactions and confusion about how and when to take medications. Each assessment of an elderly patient with diabetes should address and document what medications a patient is taking and how they are being taken. Documentation of potential adverse effects as well as benefits and risks of a medication should occur with each new medication prescribed [29,47].

Conclusion

Diabetes should be prevented among older adults or controlled to halt or slow the progression to otherwise inevitable complications, the public health community needs to develop, evaluate and expand the reach of effective, targeted interventions that address the specific needs of older adults with or at risk for diabetes. Existing public health programs instituted to reach older diabetic patients may need to be modified to fully address their complex, specific needs and functional statuses, while remaining relevant to their interests and to the social and economic contexts in which they live. Possible modifications to these programs include greater use of lifestyle interventions, which have shown impressive early results.

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