

Physical disability and functional impairment resulting from type 2 diabetes in sub-Saharan Africa: a systematic review

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Abstract

Sub-Saharan Africa, like the rest of the world, is experiencing an increasing prevalence of type 2 diabetes alongside other non-communicable diseases. All kinds of type 2 diabetes complications – such as retinopathy, nephropathy, neuropathy, and cardiac complications – are common in sub-Saharan Africa and the prevalence and burden of type 2 diabetes are projected to rise rapidly. Obesity is one of the most potent risk factors for type 2 diabetes. The rate of diabetes-related morbidity and mortality in this region could grow substantially. Forceful actions and positive responses from well-informed governments are urgently needed to control the incidence of type 2 diabetes in sub-Saharan Africa. This aim of this article is to review the prevalence and magnitude of the risk of physical disability and functional impairment originating from type 2 diabetes in sub-Saharan Africa.

Introduction

The prevalence of diabetes is increasing globally. The sub-Saharan Africa region, like the rest of the world, is experiencing an increasing prevalence of this condition alongside other non-communicable diseases (NCDs). In 2010 over 12.1 million people were estimated to be living with type 2 diabetes in Africa,¹ and this is projected to increase to 23.9 million by 2030.² The worrying trend is that type 2 diabetes is the most common form of diabetes, resulting from increases in life expectancy, obesity, changes in dietary and nutritional habits, and sedentary lifestyles. The risk factors for diabetes vary, but the major risk factors in sub-Saharan Africa are similar to those in other parts of the world. The rising prevalence of type 2 diabetes is often ascribed to changes in lifestyle and urbanisation; with the data now showing that the strongest and most consistent risk factors are

obesity and weight gain.³ It has been reported that chronic complications of diabetes are rarely seen in sub-Saharan Africa.⁴ This is because of the high mortality rate leading to low mean disease duration in the majority of diabetic individuals. Complications such as retinopathy, neuropathy, cardiovascular disease, nephropathy, and microalbuminuria have all been reported in sub-Saharan Africa.⁵⁻⁸ The World Health Organization (WHO) projects that NCDs, such as type 2 diabetes will overtake infectious, maternal, perinatal, and nutritional diseases as the leading cause of mortality on the African continent by 2030.⁹ During the year 2014, the International Diabetes Federation (IDF) reported that people living with diabetes worldwide were 387 million with a prevalence of 8.3%.¹⁰ Out of the total number of people living with diabetes, 77% were living in low- and middle-income countries and 50% of these died under 60 years of age. In the African region, 25 million people were living with diabetes in the year 2014 with an annual prevalence of 5.1%. Africa has the highest percentage of undiagnosed people living with diabetes, who are at a higher risk of developing harmful and costly complications. Diabetes affects people in both urban and rural settings worldwide, with 64% of cases in urban areas and 36% in rural areas.⁶ The annual prevalence of type 2 diabetes in sub-Saharan Africa in 2011 was 4.5%.¹¹ Sub-Saharan Africa is therefore faced with the increasing danger of an overwhelming double burden of disease. The aim of the study was to review the prevalence and magnitude of the risk of physical disability and functional impairment originating from type 2 diabetes in the sub-Saharan Africa region.

Methods

The data search used in this review was limited to studies published after 1995. Combined keywords such as 'type 2 diabetes in sub-Saharan Africa' and 'type 2 diabetes complications', were used to conduct a search on all papers published on type 2 diabetes in sub-Saharan Africa between January 1995 and March 2015. The search was conducted using largely the Medline and Embase bibliographic databases. The Cochrane collaboration database and other sources such as Ebscohost, Joster, and Emerald were also used. The search was done on articles that provided data on type 2 diabetes prevalence

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and type 2 diabetes outcomes such as chronic diabetes complications, disabilities, and functional impairment. Grey literature – from sources including the websites of the IDF, Centers for Disease Control and Prevention (USA), the World Bank, and the WHO – were also reviewed. The data obtained were from case control studies, cross-sectional studies, hospital-based clinical studies, and randomised control trials. We defined sub-Saharan Africa as all mainland African countries south of the Sahara including Madagascar.

We established criteria for eligibility before beginning the review of search results. Data were included in the systematic review if they came from studies that fulfilled all of the following:

- Cross-sectional study, case control, hospital-based clinical studies, and randomised control trials
- Reported prevalence of type 2 diabetes, disabilities and functional impairment
- Reported data on impaired glucose tolerance (IGT) and/or impaired fasting glycaemia (IFG)
- Studies published between 1995 and 2015
- Only fully published articles

Reviews, reports, letters, editorials, commentaries, case studies, etc. were excluded from the study. The primary reviewer then performed a preliminary review by title and abstract to remove articles that were clearly not relevant to the study question or did not meet eligibility criteria. Two other reviewers independently reviewed the remaining articles in full text, and they each noted whether the article should be included or excluded, and

if so, the reason for exclusion. If an article had multiple reasons for exclusion, the primary reason was chosen for exclusion in the order in which they were listed in the inclusion and exclusion criteria (Figure 1).

Results

Prevalence

Table 1 summarises type 2 diabetes prevalence in the sub-Saharan Africa region. The prevalence of type 2 diabetes was as low as 0.6% in rural Uganda and as high as 12.2% in urban Nigeria. Type 2 diabetes is the commonly documented diabetes and in most clinics accounts for about 90–95% of all cases of diabetes.²⁰ Studies done in eight countries in sub-Saharan Africa demonstrated that type 2 diabetes and IGT had a higher prevalence rate among urban dwellers than among rural dwellers. Between the years 2000 and 2011, the 1997 ADA and the 1998 WHO criteria were used in nine sub-Saharan Africa diabetes epidemiology studies. These studies examined the prevalence of type 2 diabetes and pre-diabetes in East Africa (Tanzania, Kenya, and Mozambique), West Africa (Cameroon, Nigeria, Ghana, and Guinea), and South Africa. The prevalence of type 2 diabetes and pre-diabetes in urban dwellers compared with rural dwellers was higher, although there was some inconsistency. Some studies reported crude prevalence rates, while others reported age-adjusted prevalence rates.^{21–25}

It is projected that type 2 diabetes, once considered a rare condition in Africa, will increase by 161% in the next 15 years. The number of adults with diabetes is predicted

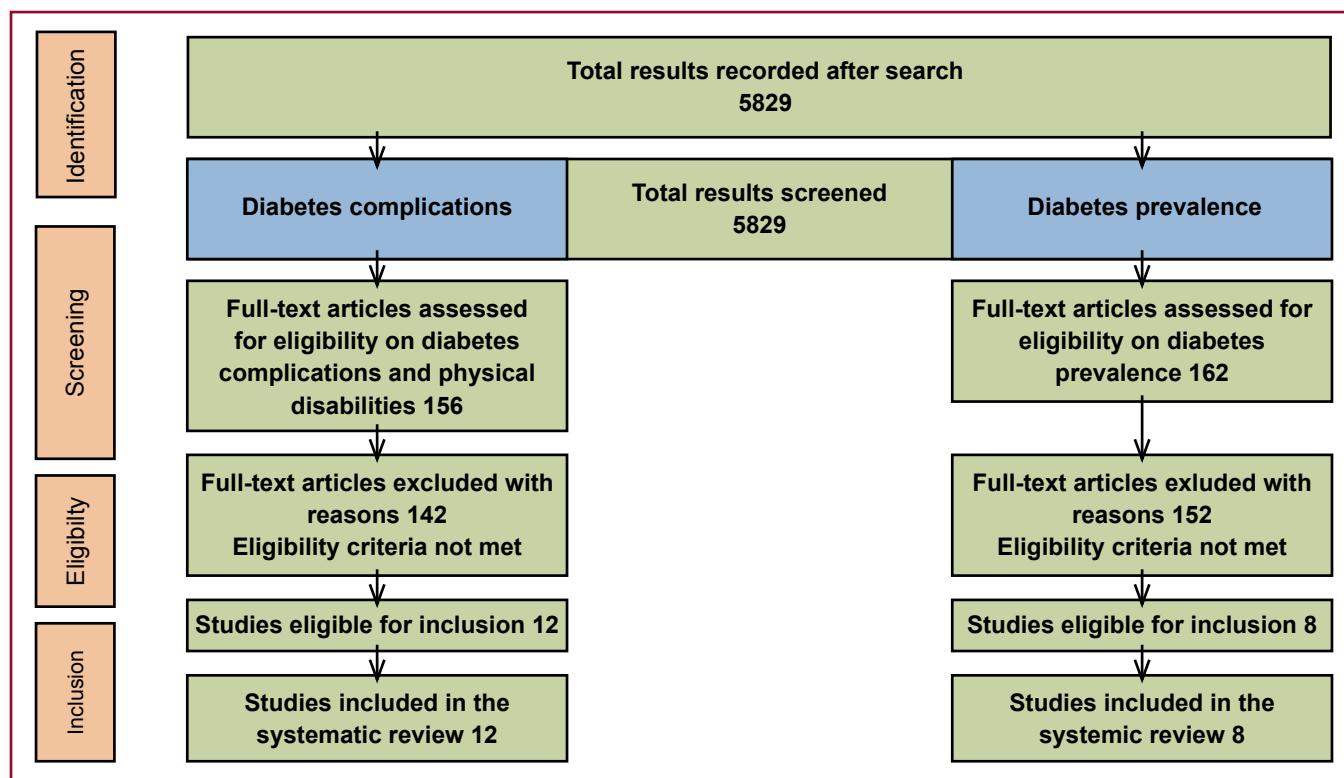


Figure 1. Diagram showing method of data extracted (adapted from Moher et al¹²)

Country	Study type	Number	Year	Prevalence	Other details
Cameroon	Cross-sectional	679	Sobngwi et al ¹³	Urban 2.0% Rural 0.8%	Urban 1.0% Rural 2.8%
Guinea	Cross-sectional	1537	Balde et al ¹⁴	Urban 6.7% Rural 5.3%	Male 13.4% Female 6.1%
Nigeria	Cross-sectional	2000	Oladapo et al ¹⁵	Rural 2.5%	
South Africa	Case-control	1025	Erasmus et al ¹⁶	Rural 3.9%	Male 3.5% Female 3.9%
Tanzania	Cross-sectional	1698	Aspray et al ¹⁷	Urban 5.9% Rural 1.7%	Male 5.7% Female 1.1%
Uganda	Cross-sectional	6678	Maher et al ¹⁸	Rural 0.6%	
Zimbabwe	Cross-sectional	3081	MOH ¹⁹	Urban 10.0%	

Table 1. Type 2 diabetes prevalence in cross-sectional surveys in sub-Saharan Africa

Complication	Country	Year	Study	Number	Setting	Prevalence
Neuropathy	Kenya	Ajala ²⁶	RCT	88	Hospital	59%
	Cameroon	Ndip et al ²⁷	Cross-sectional	300	Hospital	27%
Nephropathy Microalbuminuria	Kenya	Wanjohi et al ²⁸	Cross-sectional	100	Hospital	26%
	Nigeria	Agaba et al ²⁹	Clinical	65	Hospital	49%
	Tanzania	Lutale et al ³⁰	Cross-sectional	153	Hospital	10%
Cardiac autonomic neuropathy	Nigeria	Odusan et al ³¹	Clinical	108	Hospital	34%
	South Africa	Kalk et al ³²	Clinical	744	Hospital	White 23%, Black 4%
Retinopathy	Nigeria	Omolase et al ³³	Cross-sectional	100	Hospital	15%
	Kenya	Mwendwa et al ³⁴	Cross-sectional	100	Hospital	7%
	South Africa	Read & Cook ³⁵	Clinical	248	Hospital	32%
	Kenya	Mwale et al ³⁶	Cross-sectional	96	Hospital	22%
	South Africa	Pirie et al ³⁷	Cross-sectional	292	Hospital	39%

RCT: randomised controlled trial

Table 2. Type 2 diabetes complications in sub-Saharan Africa (all studies were hospital-based)

to increase annually by 33000 per year in Tanzania, 48000 per year in Kenya, 21000 per year in Malawi, and 36000 per year in the Democratic Republic of Congo.¹¹

Complications

The proportions of patients with type 2 diabetes complications in sub-Saharan Africa ranged from 7% to 32% for retinopathy, 27% to 59% for neuropathy, 10% to 49% for microalbuminuria, and 4 to 34% for cardiac complications (Table 2). Diabetes is also likely to increase the risk of several important infections in the region, including tu-

berculosis, pneumonia, and sepsis.

Discussion

This review shows that type 2 diabetes is a common health problem in the sub-Saharan Africa region. There were variations in type 2 diabetes prevalence between different countries in sub-Saharan Africa. Almost all the studies that distinguished between urban and rural areas, observed a higher type 2 diabetes prevalence in urban areas. All types of complications – such as retinopathy, nephropathy, neuropathy, and cardiac complications – are common in sub-Saharan Africa, and the prevalence and burden of type 2 diabetes are rising rapidly. Obesity is the most potent risk factor for type 2 diabetes and underlies the current global spread of the condition and

its complications.³⁸

In type 2 diabetes there may be insulin resistance and/or abnormal insulin secretion; either may predominate, but both are usually present. In sub-Saharan Africa, type 2 diabetes is the most common type of diabetes and can remain asymptomatic for many years. Its diagnosis is often made from connected complications, or incidentally through an abnormal blood or urine glucose test. Beatriz et al³⁹ asserted that more

than three-quarters of deaths due to diabetes in 2013 in sub-Saharan Africa were in people under the age of 60. During this same year of 2013, over 20 million people were living with diabetes, a prevalence of 4.9%, but over the next two decades the number of people with diabetes is expected to double, threatening many of the development gains Africa has achieved.³⁹

Retinopathy

Visual loss from diabetic retinopathy is largely preventable. A systematic review of diabetes in sub-Saharan Af-

rica between 1999 and 2011 reported that the prevalence of diabetes retinopathy varied from 7% to 63%.⁴⁰ Pirie et al³⁷ found in a hospital-based cross-sectional study that retinopathy developed in 39% of the participants in South Africa. Moreover, about a quarter of newly diagnosed type 2 diabetes patients present with retinopathy, and severe retinopathy may represent 15% of all cases.⁴¹ The major risk factors for the development of diabetic retinopathy include disease duration, degree of hyperglycaemia, hypertension, dyslipidaemia, and genetic factors.⁴² Also, Sidebe⁴³ reported that more than half of patients with type 2 diabetes had retinopathy, which accounted for 32% of all eye complications. Diabetes in sub-Saharan Africa greatly increases the risk of serious, costly complications.⁴⁴

Neuropathy

In a prospective longitudinal community-based study in Australia, Bruce et al⁴⁵ found that 28% of subjects had developed new mobility impairment and 18% had developed new Activities of Daily Living (ADLs) disability. It was also found that peripheral neuropathy was increased by 40%, stroke history 123%, and arthritis 82%. Evaluation of the prevalence of neuropathy relating to diabetes varies widely depending on diagnostic methodology. Macrovascular complications of diabetes are considered rare in Africa despite a high prevalence of hypertension. Abbas et al found that lower-extremity amputation varied from 1.5% to 7.0%, and about 12% of all hospitalised diabetic patients had foot ulceration.⁸ Also, a high proportion of patients had lower-limb arterial disease that contributed to the development of diabetic foot lesions. It is common to see patients with diabetic foot ulcers as the presenting complaint of diabetes. Data from Tanzania have shown that the vast majority (over 80%) of ulcers are neuropathic in origin and are not associated with peripheral vascular disease.⁸

Nephropathy

Diabetic nephropathy is the leading cause of end-stage renal disease worldwide.⁴⁶ Additionally, in Africa it is probably the third most common cause of chronic kidney disease after hypertension and glomerulonephritis. Nephropathy also accounts for a third of all patients requiring renal replacement therapies, which are not widely available in Africa due to their high cost and lack of expertise.⁴⁷ Various epidemiological and cross-sectional studies have reported marked variation in the prevalence of microalbuminuria. Cross-sectional and longitudinal studies have identified factors associated with a high risk of nephropathy such as elevated blood pressure and glycosylated haemoglobin, dyslipidaemia, smoking, advanced age, and insulin resistance.⁴⁸⁻⁵⁰ In type 2 diabetes patients, 20-40% of those with microalbuminuria progress to overt nephropathy and 20 years later, approximately 20% develop end-stage renal failure.⁵¹ The progression of diabetic nephropathy from the appearance of clinical pro-

teinuria to end-stage renal failure is usually irreversible.

Cardiovascular complications

Cardiovascular disease is a major cause of death and disability in people with diabetes, accounting for 44% of deaths in people with type 1 diabetes and 52% of deaths in people with type 2 diabetes worldwide in 2001.⁵² Macrovascular complications of diabetes are considered rare in Africa despite a high prevalence of hypertension. Cardiovascular disease is one of the major causes of mortality and morbidity in modern societies, and is set to overtake infectious diseases in the developing world as the most common cause of death. The increasing prevalence of major and emerging cardiovascular risk factors accounts for the growing burden of cardiovascular disease in the world. Diabetes in all its forms is one of the main risk factors. About two-thirds of diabetic patients will die as a result of cardiovascular complications, and many patients treated in cardiovascular intensive care units have diabetes. Approximately 15% of patients with stroke in sub-Saharan Africa have diabetes, and up to 5% of diabetic patients present with cerebrovascular accidents at diagnosis. Coronary heart disease affects 5-8% of diabetic patients in sub-Saharan Africa.⁵³ Nevertheless, although microvascular complications of diabetes are highly prevalent in sub-Saharan Africa, and may occur early on in the course of disease, macrovascular disease remains relatively uncommon.

In conclusion, diabetes and its complications are a major health burden in sub-Saharan Africa. Type 2 diabetes is on the rise in both rural and urban settings, bringing with it the risk of complications. Obesity is the most potent risk factor for type 2 diabetes, probably accounting for 80-85% of the overall risk of developing type 2 diabetes, and underlies the current global spread of the condition and its complications. The rate of undiagnosed diabetes is also high in most countries of sub-Saharan Africa and individuals who are unaware they have the disorder are at risk of developing chronic complications. Therefore, diabetes-related morbidity and mortality in this region could grow substantially. Aggressive action and positive responses from well-informed governments are urgently needed to curb the rise of diabetes in sub-Saharan Africa.

Author declaration

Competing interests: none.

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