The Epidemiology of Diabetes Mellitus in Jamaica and the Caribbean

A Historical Review

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ABSTRACT

Epidemiological studies on diabetes mellitus (DM) have been conducted in the Caribbean for more than four decades. In Jamaica, the estimated prevalence of DM among adults ranged from 1.3% in 1960 to 17.9% in 1995. Part of the variation in estimates has been due to the differing age groups that have been studied. The 2007–8 Jamaica Health and Lifestyle Survey (JHLS-2) reported prevalence estimates of 7.9% for diabetes mellitus and 2.8% for impaired fasting glucose in persons 15–74 years old. Across the Caribbean, the overall prevalence of diabetes mellitus is estimated at about 9%. In addition to the high burden of prevalent diabetes, there is also a high burden of complications. In Barbados, the incidence of diabetic foot complications has been found to be second only to a population of Native Americans in Najavo. The Barbados Eye Study revealed that among persons 40–84 years old in Barbados, 28.5% had evidence of diabetic retinopathy on fundus photographs. Regionally, the impact of DM on cardiovascular diseases (CVD) has not been adequately reported.

With regards to diabetes care, poor control rates and inadequate surveillance for complications have been reported in Barbados, Trinidad and Tobago, Tortola and Jamaica. The JHLS-2 showed that while more than 70% of persons with diabetes were aware of the condition less than 50% were under control. In light of the expected increase in the number of people with diabetes mellitus, healthcare planners and researchers will need to redouble their efforts to both prevent as well as limit the impact of diabetes mellitus and its complications in Caribbean populations.

Keywords: Diabetes mellitus, epidemiology, Jamaica

Epidemiología de la Diabetes Mellitus en Jamaica y el Caribe

Revisión Histórica

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RESUMEN

Estudios epidemiológicos de diabetes mellitus (DM) han sido llevado a cabo en el Caribe por más de cuatro décadas. En Jamaica, la prevalencia estimada de DM entre adultos fluctuó de 1.3% en 1960 a 17.9% en 1995. Parte de la variación en los estimados se debe a las diferencias en los grupos etarios en estudio. La encuesta 2007–8 sobre salud y estilo de vida en Jamaica (JHLS-2) reportó estimados de prevalencia de 7.9% para la diabetes mellitus y 2.8% para la glucosa alterada en ayunas en personas de 15–74 años de edad. En todo el Caribe, la prevalencia general de diabetes mellitus se estima en aproximadamente 9%. Además de la alta carga de diabetes prevaleciente, hay también una alta carga de complicaciones. En Barbados, se ha hallado que la incidencia de complicaciones del pie diabético son superadas sólo por las presentes en la población amerindia de Najavo, con respecto a la cual ocupan un segundo lugar. El estudio de ojos en Barbados Ojo reveló que entre las personas de 40–84 años en Barbados, 28.5% tenían evidencia de retinopatía diabética en las fotografías de fondo de ojo. En términos de la región, el impacto de la DM en las enfermedades cardiovasculares (ECV) no ha sido reportado de manera adecuada. En relación con el cuidado de la diabetes, se han reportado tasas de control pobres y vigilancia inadecuada de las complicaciones, en Barbados, Trinidad y Tobago, Tortola y Jamaica.

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El JHLS-2 mostró que si bien más del 70% de las personas con diabetes tenían conciencia de la condición, menos del 50% estaban bajo control. A la luz del aumento esperado en el número de personas con diabetes mellitus, los planificadores e investigadores de la salud necesitarán duplicar sus esfuerzos a fin de prevenir y limitar el impacto de la diabetes mellitus y sus complicaciones en las poblaciones caribeñas.

Palabras claves: diabetes mellitus, epidemiología, Jamaica

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INTRODUCTION

The Global Burden of Diabetes Study (1) has projected that there will be a 122% increase in the number of people with diabetes mellitus worldwide in 2025 compared to 1995. This translates to approximately 300 million people living with diabetes in 2025. The majority of these will be people living in developing countries where there is expected to be a 170% increase in the number of people living with diabetes, from 84 million in 1995 to 228 million in 2025. Updated estimates with projections to 2030 published by Wild and colleagues in 2004 suggest that the number of people with diabetes worldwide will rise to 366 million in 2030 (2). For Latin America and the Caribbean, there was a projected 148% increase in the number of persons with diabetes resulting in 33 million persons living with diabetes by 2030. This projected increase is attributable to an expected increase in the prevalence of diabetes risk factors and an ageing population.

Diabetes mellitus is listed among the leading causes of death in the Caribbean and a number of population based studies have documented the high prevalence of the disease. Despite the role of ageing in the morbidity and mortality from diabetes, data suggest that much of the morbidity and mortality from diabetes occurs in persons in the productive age groups, thus impacting on the overall productivity of the region. Diabetes mellitus is therefore one of the major public health challenges for the Caribbean in the twenty-first century. This paper presents a summary of data on diabetes epidemiology in the Caribbean and highlight gaps in available data with the intent to provide a base for health planning and future research.

METHODS

A PubMed literature search was conducted using the following medical subject headings (MeSH) terms: Jamaica, Barbados, Trinidad and Tobago, Caribbean Region, West Indies and "Diabetes Mellitus/epidemiology". Articles were selected according to relevance. The bibliographies of selected articles were searched to identify other relevant articles. Data were also obtained from reports from health departments and government agencies, periodicals and personal communications from regional researchers.

FINDINGS

Prevalence of Diabetes in Jamaica

Several studies have reported estimates of the prevalence of Diabetes mellitus in Jamaica over the last 50 years (3–9). These are shown in the Table. Early studies by Tulloch (6) in 1959–60 showed a prevalence of only 1.3% but by 1969–70 Florey (3) reported a prevalence of 8.1%, albeit in a slightly older population. Studies in the 1990s showed higher prevalence estimates – 17.9% in a national survey by Ragoobirsingh (5) and 13.4% from a survey in Spanish Town by Wilks (7). It should be noted however that different criteria for diagnosis were used in the two studies, fasting blood sugar (FBS) $\geq$ 6.7 mm/L by Ragoobirsingh and FBS $\geq$ 7.0 mm/L by Wilks. In addition, while the study by Wilks included persons 25–74 years old, Ragoobirsingh's study included persons 15 years and older with 10% of the sample being over 75 years old. Two recent national surveys conducted in 2000–2001 and 2007–2008 (8, 9) reported lower prevalence estimates than the studies in the 1990s, 7.2% and 7.9%

Table: Prevalence of diabetes mellitus in Jamaica 1961–2008

Authors*	Publication Date	Population Type	Sample	Age Range	Test	Prevalence %
Tulloch (6)	1961	Urban Rural	1915 M 2601 F	15+	Urine OGTT	1.3
Florey (3)	1972	Rural	234 M 297 F	25–64	OGTT	8.1
Ragoobirsingh (5)	1995	National	2109 OGTT	15+	Glucometer	17.9
Wilks (7)	1999	Urban	520 M 783 F	25–74	OGTT	13.4
Wilks (8)	2000–2001	National	2012	15–74	Glucometer	7.2
Wilks (9)	2007–2008	National	2848	15–74	Glucometer	7.9

M = Male; F = Female

Number in bracket indicates number in reference list

respectively, among person 15–74 years old. This must however take into consideration that the estimates were based on fasting glucose (≥ 6.1 mmol/L and 6.5% from a capillary blood sample) and might have missed persons with isolated postprandial hyperglycaemia (9–11). In addition, the estimates were weighted to the age/gender distribution of the Jamaican population and are more conservative than sample estimates.

Prevalence of Diabetes in Barbados

Data on the prevalence of diabetes mellitus in Barbados is available from the Barbados Eye Study (12) and the Health Wellbeing and Ageing (SABE) Project (13). The Barbados Eye Study was initiated in 1988 and studied a random sample of 4709 persons in Barbados who were 40–84 years old at the time of recruitment. Prevalence of diabetes was determined by self-report or total glycosylated haemoglobin (GHb) > 10%. The overall prevalence was 17.5% by self-report and 19.4% when those with GHb > 10% were included. The SABE study evaluated health and well-being among persons 60 years and older in seven Latin American and Caribbean cities. Bridgetown was the only English-speaking city included. Diabetes was again identified by self-report. The prevalence of diabetes in this age group in Barbados was 21.6% and was highest among the countries studied.

Prevalence of Diabetes in Trinidad and Tobago

Like Jamaica, epidemiological studies of diabetes prevalence have been conducted in Trinidad for almost 50 years. In a study conducted in 1961–62, Poon-King (14) found a prevalence of 1.4% among Afro-Trinidadians and 2.4% among Indo-Trinidadians. More recent data has been reported from The St James Study (15). Miller and colleagues recruited 1386 men and 1105 women from the St James community in Trinidad and Tobago in 1977 and followed them for almost a decade. This study documented a high prevalence of diabetes especially among the Indo-Trinidadians; 23% among females and 20% among males, compared to 17% among females and 8% among males in the Afro-Trinidadians.

Factors Associated with Diabetes Prevalence

Prevalence of diabetes in the Caribbean increases with age and body mass index and is more common among women. In the Jamaica Health and Lifestyle Survey 2007–2008 (JHLS-2), prevalence of diabetes increased from 1.2% among persons 15–24 years to 29.6% among those 65–74 years (9). For BMI category, prevalence increased from approximately 4% among persons with normal weight to approximately 13% among the obese. Prevalence was 9.3% among females compared to 6.4% among males. Similar findings were seen in the Barbados Eye Study and the Spanish Town Study (7, 12).

Incident Diabetes

Data on diabetes incidence are available from the Spanish Town Study in Jamaica and the St James study in Trinidad (16, 17). In Trinidad, the incidence of diabetes was 12.5/1000 person-years among African men and 14.4/1000 person-years among African women. Among the Indian population, incidence was much higher 23.6/1000 person-years among men and 22.7/1000 person-years among women. In Jamaica, incidence was 15.5/1000 person years among men, 20.4 among females and 18.4 in the combined groups. Comparing the data of Afro-Trinidadians (1977–1985) with that in Jamaica (1993–2000), it would appear that the incidence is increasing.

Diabetes Related Mortality

Recent data on the impact of diabetes on mortality is sparse. In the 1950s, Tulloch found that among patients admitted to the University Hospital of the West Indies (UHWI) with myocardial infarction, diabetes was associated with a higher risk of mortality compared to those without diabetes (18–20). In another study, Alleyne examined 137 015 death certificates and analyzed data for 8855 persons who died from diabetes in Jamaica for the period 1970–1979 (21) and published the following findings: proportional mortality for diabetes increased from 5.2% in 1970 to 7.2% in 1979; the largest number of death among persons with diabetes was in the age-group 60 years and older, however 22% of deaths occurred in persons 40–59 years old; 90% of deaths in persons with diabetes were attributable to the disease; for the years 1977–1978, diabetes was the 5th leading cause of death in men and 9th leading cause of death in women; in 1977, overall diabetes mortality rate was 19/100 000 among males and 34/100 000 among females. Another significant finding was that only 66% of diabetics were coded as having died from diabetes because the disease was not recorded as the underlying cause of death. This suggests that there is substantial under-reporting of diabetes as a cause of death in official mortality statistics.

In Barbados, mortality data have been reported from the Barbados Eye Study (12). After 4 years of follow-up, cumulative mortality among persons with diabetes was 10.2%. Mortality was associated with glycosylated Hb level, with a 9% increase in 4-year mortality for each 1% increase in GHb. Overall, there was a 42% increase in risk of death for persons with diabetes compared to those without diabetes.

With regards to the situation in the remainder of the Caribbean, McDougall published estimates for mortality from diabetes for 17 countries in the CAREC Surveillance Report in July 2002 (4). Mortality rates based on vital statistics reports for the period 1991–1995 are presented in Figure 1. Trinidad had the highest mortality rate 109/100 000 population, Barbados ranked 4th at 59.7 and Jamaica 6th at 53.8. This represents a significant increase compared to the

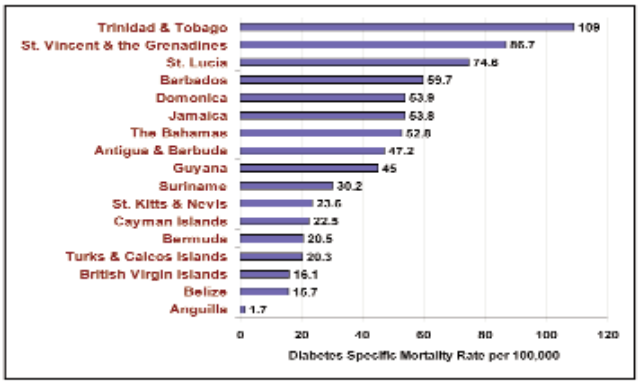

Figure: Age-standardized mortality rates for diabetes mellitus in the Caribbean 1991–1995 Data abstracted from CAREC Surveillance Report 2002 Volume 2 Number 2(4).

rates reported by Alleyne in 1977, despite the fact that these estimates are based on routinely reported data from vital statistics and therefore may be an under-estimate as found in Alleyne's study. McDougall also compared mortality data for the same 17 countries for the period 1981–1995. During this time, there was approximately a 50% increase in the mortality from diabetes mellitus from 40/100 000 to 60/100 000 for the region.

More recent data from the Ministry of Health and Registrar General Department in Jamaica continue to show a high mortality for diabetes in Jamaica. In 1999, diabetes was ranked as the 3rd leading cause of death in Jamaica with death rate of almost 60/100 000 while in 2004 it was ranked 2nd with a death rate of 70/100 000.

Complications of Diabetes

To date, there are only a few sources of published data on the complications of diabetes in the Caribbean. The best data come out of Barbados where incidence of diabetic retinopathy from the Barbados Eye study has been published (22, 23). Researchers from Barbados and Trinidad and Tobago have also published on diabetic foot complications (24, 25). Some data on renal and cardiovascular complications are also available (15, 26, 27).

In the Barbados Eye Study, 29% of participants had retinopathy at baseline. At 4 years, the cumulative incidence of diabetic retinopathy in persons with diabetes at baseline was 32%, while among those with newly diagnosed diabetes the cumulative incidence of retinopathy was 21% (22). At 9 years, overall cumulative incidence was 39.6% among those with no retinopathy at baseline (23). The incidence of retinopathy by severity was: 38.0% for minimum retinopathy, 9% for moderate retinopathy and 2.6% for proliferative retinopathy. Approximately 8% had sight–threatening retinopathy.

Hennis and colleagues conducted a prospective study which documented all cases of lower extremity amputations in Barbados for a 1–year period from 1999–2000 (25). Among persons with diabetes, incidence of lower extremity amputations was 936/100 000. Among women, the incidence was 2nd only to that of Native Americans in the Navajo population. Improper footwear and infrequent foot inspection were associated with increased risk of amputation. Data on foot complications are also available from Trinidad. Gulliford and Mahabir conducted a cross-sectional survey of 2106 persons with diabetes and found that 12% of persons with diabetes reported previous foot ulceration, 4% reported previous amputation and 49% had symptoms of neuropathy (24).

With regards to renal complications, the Caribbean Renal Registry reports that diabetes is the leading cause of end stage renal disease in the Caribbean, accounting for 28% of patients on long term renal replacement therapy (27). Another study from Tobago reported that among persons with diabetes attending primary care clinics, 12% of males and 24% of females had chronic kidney disease (26).

There is very little published data on cardiovascular complications of diabetes in the Caribbean. Apart from Tulloch's report in the 1950s that persons with diabetes had higher mortality from acute myocardial infarction than persons without diabetes (19; 20), Miller and colleagues in Trinidad have reported that the risk of coronary heart disease was 2.5 times higher among persons with diabetes (15). The Epidemiology Research Unit has started to look at cardiovascular disease (CVD) complications among persons with diabetes in Jamaica. A preliminary analysis looking at the frequency of CVD among persons admitted with diabetes at the University Hospital of the West Indies showed that 54% of admissions for diabetes had some form of CVD (28). Hypertension was the most frequent, but stable angina and acute coronary syndrome were also frequently seen, 12% and 7% respectively. Congestive heart failure was reported in 5% of admissions, 9% had strokes and 1.6% peripheral arterial disease. Overall, CVD was more frequent among females than males.

Quality of Care

Two studies in the 1990s reported on the quality of care of patients with diabetes in the Caribbean (29, 30). Gulliford and colleagues evaluated quality of care in 15 public health centres and 17 private clinics in Barbados, Trinidad, Tobago and Tortola (29). Overall quality of care was found to be unsatisfactory. Approximately 50% had poor glucose control (FBS $\geq$ 8; 2 hrpp > 10 mmol/L). There was infrequent surveillance for complications and infrequent advice on diet or exercise. A similar study performed by Wilks and colleagues at 3 clinics in Jamaica (1 public, 1 private and a specialist diabetes clinic) found that 51–62% had poor glucose control (30). While there was frequent measurement of blood pressure and urinary protein, less than 20% were screened for foot or eye complications.

Gulliford's team performed a follow-up evaluation in Trinidad 5 years after the initial study. They found that while

there was improved surveillance for complications, there was no improvement in control rates (31). A second follow-up study, 10 years after the initial study, showed that the proportion with poor control had fallen to 54% compared to 61% in 1993 (32). Data from the JHLS-2 in Jamaica also suggest that there may be some improvement. Of the persons with diabetes identified in the study, 43% were reported to be controlled compared to only 36% in the 2001 survey (9).

Cost

There are limited data on the cost of caring for diabetes in the Caribbean. Attempts to quantify cost is often limited by unavailability of the data from which calculations are made (33). In one study Gulliford and colleagues estimated the annual cost of caring for persons with diabetes at the Port-of-Spain General Hospital in Trinidad (34). They found that diabetes accounted for 13.6% of hospital admissions and 23% of hospital bed occupancy. Hyperglycaemia and foot problems were the most frequent reasons for admissions accounting for 52% of hospital bed occupancy among diabetic patients. The annual cost of admissions for persons with diabetes was estimated at TT$ 10.66 million (UK 1.24 million pounds). A more recent paper by Abdulkadri and colleagues estimated the economic cost of diabetes and hypertension in Jamaica, Barbados, Bahamas and Trinidad and Tobago (35). They found the annual cost of diabetes in the year 2001 was 27 million US dollars (USD) in The Bahamas, 38 million USD in Barbados, 221 million USD in Jamaica and 467 million USD in Trinidad and Tobago. This translated to 0.5% of gross domestic product (GDP) in The Bahamas, 1.83% of GDP in Barbados, 2.66% of GDP in Jamaica and 5.21% of GDP in Trinidad and Tobago.

In another study, Barcelo and colleagues published estimates of direct and indirect cost in Latin America and the Caribbean in the year 2000 (36). The estimated annual number of deaths caused by diabetes in 2000 was at 339 035. This resulted in loss of 757 096 years of productive life among persons < 65 years with a cost of over 3 billion USD. Diabetes was also responsible for over 700 000 persons being permanently disabled resulting in over 12 million years of productive life lost due to disability at an estimated cost of over 50 billion USD. The total annual direct cost was estimated at 10.7 billion USD and total annual indirect cost was estimated at 54.5 billion USD. For the English-speaking Caribbean, direct cost for the year 2000 was estimated at 218 million USD and indirect cost at 812 million USD. Although these estimates appear quite high, they are likely to have underestimated the full cost as the calculations did not include the cost of treating co-morbidities such as hypertension and dyslipidaemia.

IMPLICATIONS AND CONCLUSION

The data in this review show that diabetes continues to be a major public health problem with high disease burden, frequent complications and inadequate quality of care. In addition, despite limited data, it appears reasonable to suggest that the cost of caring for persons with diabetes places a major burden on the healthcare budget accounting for almost 3% of GDP in Jamaica and approximately 5% of GDP in Trinidad and Tobago. Based on current trends, the problem is likely to get worse. Using the incidence data from Spanish Town to estimate projections, in Jamaica alone approximately 49 000 new cases of diabetes per year and almost half a million new cases in 10 years would be expected. Taking into consideration that the incidence of diabetes is much greater than the mortality from the disease, it means that a major public health response is needed.

This response must be a coordinated effort both at the individual 'high risk' level and population level. Measures to reduce high calorie food intake and increase physical activity should be instituted across the region in order to reduce obesity which remains a major risk factor for diabetes. The 'high risk' approach should include identification of persons with pre-diabetes (impaired fasting glucose and impaired glucose tolerance) and enroll them in diabetes prevention programmes as these measures have been shown to reduce the rates of progression to diabetes by almost 60% (37). Measures to improve quality of care and reduce complications should also be instituted.

The regional governments have expressed a desire to tackle the problem of chronic non-communicable diseases in the region with the 2007 Declaration of Port-of-Spain (38). The declaration states that:

> "… the burdens of NCDs can be reduced by comprehensive and integrated preventive and control strategies at the individual, family, community, national and regional levels and through collaborative programmes, partnerships and policies supported by governments, private sectors, NGOs and our other social, regional and international partners;"

The next steps require all stakeholders to play their part in addressing this grave threat to the regions health.

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