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IDF Diabetes Atlas

Diabetes in North America and The Caribbean: An update

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ABSTRACT

The North America and Caribbean (NAC) Region faces a high burden of diabetes. In 2013, the number of children (aged 0–14 years) with type 1 diabetes was 108,600, with 16.7 new cases diagnosed per 100,000 children. Furthermore, there were 36,755,500 individuals with diabetes (mostly type 2 diabetes) in adults (20–79 years), and an additional 44,277,700 individuals had impaired glucose tolerance. The age-adjusted prevalence of diabetes in adults was 9.6%; the second highest among the seven Regions of the International Diabetes Federation. This estimate is expected to grow to 9.9% by 2035. There was some heterogeneity in the estimates within the Region with the age-adjusted prevalence for the USA estimated at 9.2%, 7.9% for Canada, 12.6% for Mexico, and 9.6% for the Caribbean islands. Mortality due to diabetes in the NAC Region is not limited to older age groups, with 37.6% of deaths occurring in people under the age of 60. The economic impact was also enormous, with healthcare expenditure due to diabetes estimated at 263.2 billion USD for 2013 – the highest of all IDF Regions. Diabetes threatens the public health and economies of countries in the NAC Region, and efforts in prevention and management must be intensified in order to surmount this growing problem.

1. Introduction

Consisting of the USA, Canada, Mexico as well as 24 Caribbean countries and territories, North America and Caribbean (NAC) is one of the seven Regions of the International Diabetes Federation (IDF). The Region is immensely diverse in terms of health systems, economic development and demographic structure (Table 1). The countries of this Region share a high burden of diabetes. Using the latest epidemiological data from the IDF Diabetes Atlas [1,2], this paper discusses the prevalence, determinants, and consequences of the disease and the health system responses in the NAC Region.

2. Methodology

The methodology for producing these global prevalence estimates has been described elsewhere [1,3]. Briefly, the global, regional, and country estimates of diabetes prevalence

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Table 1 – Populations and development indicators of territories of North America and the Caribbean.

Country/territory	IDF data Region	UN Region	Country designation	Total population in 2012 (000s)[a]	Adult (20–79) population in 2012 (000s)[a]	Potential support ratio in 2010[a,b]	HDI 2012[c]	HDI ranking 2012[c]	LE at birth[c]	GNI per capita[c]
Anguilla	NAC-UMIC-South	Caribbean	British overseas territory	14.1	9.1	–	–	–	–	–
Antigua and Barbuda	NAC-HIC-South	Caribbean	Independent island state	89.1	58.1	8.0	0.76	67	72.8	13,833
Aruba	NAC-HIC-South	Caribbean	Constituent country of Kingdom of the Netherlands	102.4	73.5	6.0	–	–	–	–
Bahamas	NAC-HIC-South	Caribbean	Independent island state	372.0	259.9	8.8	0.79	49	75.9	27,401
Barbados	NAC-HIC-South	Caribbean	Independent island state	283.2	204.7	6.1	0.83	38	77	17,308
Belize	NAC-LMIC-Central	Central America	Independent nation	324.1	182.1	12.8	0.70	96	76.3	5327
Bermuda	NAC-HIC-South	Northern America	British overseas territory	65.2	45.9	–	–	–	–	–
British Virgin Islands	NAC-UMIC-South	Caribbean	British overseas territory	28.1	18.1	–	–	–	–	–
Canada	NAC-HIC-North	Northern America	Independent nation	34,838.0	25,836.7	4.4	0.91	11	81.1	35,369
Cayman Islands	NAC-HIC-South	Caribbean	British overseas territory	57.6	37.2	–	–	–	–	–
Curaçao	NAC-HIC-South	Caribbean	Constituent country of Kingdom of the Netherlands	155.3	112.1	–	–	–	–	–
Dominica	NAC-UMIC-South	Caribbean	Independent island state	71.7	45.9		0.75	72	77.6	10,977
Grenada	NAC-UMIC-South	Caribbean	Independent island state	105.5	65.4	7.5	0.77	63	76.1	9.257
Guadeloupe	NAC-UMIC-South	Caribbean	French administrative division	463.5	314.2	4.6	–	–	–	–
Guyana	NAC-LMIC-Central	South America	Independent nation	795.4	427.2	15.4	0.64	118	70.2	3387
Haiti	NAC-LIC-South	Caribbean	Independent island state	10,173.8	5547.9	10.9	0.46	161	62.4	1070
Jamaica	NAC-UMIC-South	Caribbean	Independent island state	2768.9	1685.6	6.8	0.73	85	73.3	6701
Martinique	NAC-HIC-South	Caribbean	French administrative division	402.7	281.9	3.9	–	–	–	–
Mexico	NAC-UMIC-North	Central America	Independent nation	120,847.5	74,137.4	9.1	0.78	61	77.1	12,947
Sint Maarten	NAC-HIC-South	Caribbean	Constituent country of Kingdom of the Netherlands	44.4	28.8	–	–	–	–	–
St Kitts and Nevis	NAC-HIC-South	Caribbean	Independent island state	53.6	34.6		0.75	72	73.3	12,460
St Lucia	NAC-UMIC-South	Caribbean	Independent island state	180.9	118.3	6.7	0.73	88	74.8	7971
St Vincent and the Grenadines	NAC-UMIC-South	Caribbean	Independent island state	109.4	70.0	8.5	0.73	83	72.5	9367
Suriname	NAC-UMIC-South	South America	Independent nation	534.5	338.0	8.8	0.68	105	70.8	7327
Trinidad and Tobago	NAC-HIC-South	Caribbean	Independent island state	1337.4	953.0	7.7	0.76	67	70.3	21,941
United States	NAC-HIC-North	Northern America	Independent nation	317,505.3	223,937.5	4.6	0.94	3	78.7	43,480
US Virgin Islands	NAC-HIC-South	Caribbean	Unincorporated US territory	106.5	74.5	4.3	–	–	–	–

[a] Population estimates use the United Nations World Population prospects 2012 edition. United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision, CD-ROM Edition.

[b] Potential support ratio is the ratio of population 20–64 per population 65+. UN support ratios provided for all countries with a total population greater than 90,000.

[c] United Nations Development Programme (UNDP). Human Development Report 2013. The rise of the South: Human Progress in a Diverse World, New York, USA. Downloaded 26 October 2013 from http://hdr.undp.org/en/media/HDR_2013_EN_complete.pdf.

presented in the IDF Diabetes Atlas are produced annually from data sources reporting the age-specific prevalence of diabetes. Identified studies are selected favoring those that are nationally representative, based on oral glucose tolerance test, conducted in the last 5 years, and published in peer-reviewed literature. Data from selected studies are combined using logistic regression models to produce smoothed age-specific prevalence rates for adults 20–79 years for 219 countries and territories. These smoothed rates are multiplied using United Nations population estimates [4] to produce estimated numbers of people living with diabetes for 2013 and projections for 2035.

3. Burden of diabetes

3.1. *Diabetes in the young*

Most cases of diabetes in the young (0–14 years) are type 1 diabetes, which is characterized by an insufficiency of insulin production due to destruction of the pancreatic beta-cells. Currently, there are an estimated 108,600 children aged 0–14 years living with type 1 diabetes in the NAC Region, with 16.7 new cases being diagnosed per 100,000 children in the Region in 2013.

While type 1 diabetes is the most prevalent form of the disease in youth, type 2 diabetes in children and adolescents is increasing. The SEARCH for diabetes in youth study in the USA, for example, found that the prevalence of type 2 diabetes in youth under 20 years of age grew 21% increase from 0.29 per 1000 in 2001 to 0.36 per 1000 in 2009 [5]. This trend in type 2 diabetes mirrors an increase in childhood overweight and obesity, all of which are largely preventable.

Any kind of diabetes in young people has the potential for the development of early and debilitating complications placing a heavy disease burden not only on the children affected and their families, but on health systems that must cope with associated costs. Rates of peripheral diabetic nephropathy in youths with type 2 diabetes have been reported to approach those observed in adults. [6]

3.2. *Diabetes in adults*

Estimates of diabetes prevalence in adults in the NAC Region have been consistently higher than the global average. In 2013, the comparative (age-adjusted) prevalence of diabetes in adults (20–79 years) was 9.6%, second only to the Middle East and North Africa (MENA) Region at 10.9%. The comparative prevalence of diabetes in adults in the Region is projected to reach 9.9% by 2035.

There is also considerable heterogeneity in prevalence of diabetes within the countries in the Region (Table 2). The top ten countries in the NAC Region by diabetes prevalence are all located in the Caribbean. The majority of the population in the NAC Region, however, is concentrated in the USA, Mexico and Canada, which also have the highest numbers of people with diabetes.

The burden of diabetes in the NAC Region has grown substantially in several countries in the past decades, with prevalence of diabetes increasing by 70% between 1999 and 2009 in Canada [7], while that for the USA and Puerto Rico increased from 4.5% in 1995 to 8.2% in 2010 [8]. Surveillance data from the Center for Disease Control and Prevention (CDC) for 2009–2011, however, indicated a possible slowing in the increase of prevalence for the USA, with period prevalence in individuals aged 0–44 years decreasing slightly compared to previous years, while remaining constant in people aged 45–64 years [9]. Whether this decrease in prevalence is a result of decreasing incidence, or other factors or is reflective of a long-term trend is yet to be seen.

Table 2 – Age-adjusted adult diabetes prevalence estimates in countries of North America and the Caribbean, 2013.

Country	Age-adjusted diabetes prevalence
Belize	15.9
Guyana	15.9
Curaçao	14.5
Cayman Islands	14.3
Martinique	14.3
Sint Maarten	14.2
Bahamas	14.2
Aruba	13.6
Antigua and Barbuda	13.3
Trinidad and Tobago	13.0
St Kitts and Nevis	13.0
Bermuda	12.8
Mexico	12.6
Anguilla	12.6
British Virgin Islands	12.6
Barbados	12.4
US Virgin Islands	12.1
Suriname	11.1
Dominica	10.9
Jamaica	10.4
St Vincent and the Grenadines	10.0
Grenada	9.4
United States of America	9.2
St Lucia	8.2
Canada	7.9
Haiti	6.7
Guadeloupe	6.3

Methodological limitations must also be taken into account when comparing estimates within the Region. While the estimates for the USA, Canada, and Mexico are based on data from nationally representative surveys, the estimates for most of the Caribbean countries are based on extrapolation from a small number of studies. Only nine out of the 24 Caribbean countries and territories had prevalence estimates based on data originating from studies conducted in the countries. Although similarities in the diet, ethnicity and macro-environment of most island nations allow for extrapolations [10], it is essential that each country establishes its own national surveillance systems to monitor a disease that is quickly becoming a public health crisis.

3.3. *Impaired glucose tolerance*

It is estimated that up to 70% of individuals with impaired glucose tolerance (IGT) eventually develop type 2 diabetes [11] and are thus at high risk of progressing to the disease.

In the NAC Region, the prevalence of IGT in adults (20–79 years) was estimated at 13.2% in 2013, or 44,277,700 adults. Identification of these high-risk individuals and delivering effective lifestyle interventions holds the key for primary prevention of diabetes. Several structured lifestyle intervention trials of diet and exercise have been successful in reducing the risk of progression to type 2 diabetes in people with IGT [12–14].

3.4. *Undiagnosed diabetes*

Type 2 diabetes may remain undetected and asymptomatic for many years, or symptoms may not be recognized as diabetes, leading to a large proportion of the diabetes population that is undiagnosed. Population-based surveys using blood glucose measurement contribute information on the proportion of people found during screening to have previously undiagnosed diabetes. These studies provide the basis for the calculation of a pooled estimate of the proportion of people with diabetes who are undiagnosed.

In 2013, more than quarter of adults with diabetes in the NAC Region were estimated to be undiagnosed. Contrary to expectations, this prevalence of undiagnosed diabetes did not vary by income group for the countries within the Region, with proportions of undiagnosed diabetes at 27.7%, 25.0% and 29.4%, in high-, middle-, and low-income countries, respectively [15]. However, there is a lack of nationally representative, population-based surveys measuring blood glucose that may contribute to the estimates of undiagnosed diabetes in the Region and more data are urgently needed. Estimates of undiagnosed diabetes are particularly sensitive to the performance of health systems rather than the underlying biology of the disease and thus there may be significant variations within and between countries.

4. Consequences of diabetes

4.1. *Morbidity and mortality*

As in other parts of the world, diabetes is a significant cause of mortality in the NAC Region. In 2013, 292,900 diabetes-attributable deaths occurred, of which 37.6% were in individuals under age 60 [2].

Even in lower income countries of this Region where infectious disease mortality remains a significant burden, death due to diabetes and associated non-communicable diseases prevails. In Mexico, diabetes has been the primary cause of death among men and women since 2000, responsible for 14% of deaths [16]. A similar picture was seen in a study of Anglophone Caribbean countries where cardiovascular disease (CHD and stroke) and diabetes were found to be the top two causes of mortality for many of the islands surveyed [17].

Diabetes is also responsible for considerable morbidity as it is associated with major macro-vascular (cardiovascular disease), and micro-vascular (retinopathy, nephropathy, and neuropathy) complications in the Region. In 2009, approximately 31% of people with diabetes in Mexico had a chronic complication, of which the most common were peripheral vascular disease (14%) and diabetic nephropathy (11%) [18]. In 2005–2008 in the USA, approximately 60–70% people with diabetes aged 40 years or older had mild to severe forms of neuropathy, [19] and >28% had diabetic retinopathy. The prevalence of retinopathy in people with type 2 diabetes has been reported to range from 26% to 45% throughout the NAC Region [20]. Diabetic ketoacidosis (DKA) is a particular risk for people with type 1 diabetes, and is observed in 19% of children at diagnosis with diabetes in Canada, and 25–44% in the USA [21].

Furthermore, a large, national, cross-sectional study in Canadian primary healthcare settings found that from September 2002 to February 2003, one or more macro-vascular complications were present in 28% of diabetes patients and 38% had one or more micro-vascular complications [22]. Data are more limited for the Caribbean, but diabetes accounted for approximately 28% of the cases of end-stage renal disease in Jamaica, the Bahamas, Barbados, and Trinidad [23].

4.2. *Economic costs*

In 2013, the estimated health expenditure due to diabetes in the Region was 263.2 billion USD, the highest of any IDF Region. This figure includes medical spending for treatment and management of diabetes by the health system as well as by people living with diabetes.

Due to differences in affluence and public access to healthcare, this expenditure is not proportionately distributed among countries in this Region. In fact, the majority of diabetes-attributable health expenditure occurred in the USA which spent an estimated 239.1 USD billion on diabetes or 43.6% of the total global health expenditure due to diabetes [2]. Further studies from the USA indicate that average age- and sex-adjusted health expenditure among people with diagnosed diabetes were 2.3 times higher than for subjects without diabetes [19]. For people with diabetes in countries lacking universal and accessible healthcare, the costs of the disease can be substantial, especially where the majority of payments are made out-of-pocket. For example, in Mexico, 52% of diabetes expenditure was found to be out-of-pocket [24]. Furthermore, access to care cannot be equated to quality of care, and nations' healthcare spending on diabetes does not always parallel success in managing diabetes or its complications.

In addition to the direct costs of diabetes to individuals and health systems including consultations, drugs, hospitalizations and treatment of complications, the indirect costs related to lost productivity, absenteeism, presenteeism, and costs related to accessing care can be considerable but difficult to measure. Total costs of diabetes including both direct and indirect costs was estimated at over USD 317 million for 2005,including 177 million USD in indirect costs [24]. These indirect costs are not taken into account in the estimates of diabetes-related health expenditure.

5. Determinants of diabetes

The risk of developing type 2 diabetes is influenced by a complex interaction of modifiable and non-modifiable factors.

Combinations of these factors contribute to insulin resistance and beta-cell dysfunction leading to prediabetes and subsequently diabetes [25,26].

5.1. *Modifiable risk factors*

While genetics may contribute to risk of type 2 diabetes, modifiable risk factors such as obesity, unhealthy diet, physical inactivity combined with access to and quality of care as discussed later in this paper exert the greater influence. These factors are often strongly associated with social determinants of health.

Obesity is a powerful risk factor for type 2 diabetes, with 58% of the global burden of the disease attributed to BMI greater than 21 kg/m^2 [27]. It is therefore not surprising that the increasing diabetes prevalence coincides with increases in BMI in the NAC Region. The latest estimates of the prevalence of obesity in countries of this Region (Table 3) reveal the magnitude of this global health problem [28].

Physical activity lowers the risk of type 2 diabetes, not only through reducing obesity via energy expenditure, but also through its independent promotion of insulin response. Despite this, it is apparent that in the NAC Region, physical inactivity and sedentary lifestyle are widespread. In the USA, less than half (48%) of adults met the 2008 Physical Activity Guidelines for Americans. While this represents small improvements from previous years, there is still much progress to be made and disparities exist between regions and socioeconomic groups [29]. Only 15% of Canadian adults met the recommendation of 150 min of moderate-to-vigorous physical activity per week [30]. Data are limited in the Caribbean, but improving with increasing participation in the WHO STEPwise approach to Surveillance (STEPS) Survey. In the Cayman Islands, for instance, the latest survey found that 34% of individuals had low levels of physical activity [31]. Other than the increasingly mechanized environment, adverse social conditions such as crime and violence in many communities of the Caribbean countries may be responsible for low physical activity as they might discourage outdoor activities [10]. Standardized definitions, measurement methods and data sources of physical activity patterns are globally limited calling the need for improvement in this area of research.

Furthermore, diets high in calorie rich nutrients including fats are most likely to lead to obesity. The nutrition transition refers to the increasingly high consumption of diet high in calories, animal fats and processed foods, which have replaced traditional diets high in fiber, fruits and vegetables [32]. This change is largely a result of industrialization and globalization, and is conducive to the rise of nutrition-related chronic diseases such as diabetes. While this transition has likely already taken place in high-income countries in the Region (e.g., USA) several decades ago, low-income countries have only recently begun the process and continue to go through this transition at a rapid rate. In Mexico, obesity prevalence has increased by approximately 2% per year over the past two decades, the largest increase documented globally [16]. Obesity and diabetes are increasingly prevalent in populations of low socioeconomic status, even in developing nations. In the Caribbean, obesogenic diets are more cost-effective in terms of satiety, with higher carbohydrate and fat content reducing cost by >30% per food basket [33] but have the detrimental effect of increasing risk of non-communicable diseases such as diabetes.

Table 3 – Prevalence of adult obesity in selected countries of North America and the Caribbean (2008).

Country	Prevalence of obesity (%)
St Kitts and Nevis	40.9
Bahamas	35.0
Belize	34.9
Barbados	33.4
Mexico	32.8
United States of America	31.8
Trinidad and Tobago	30.0
Antigua and Barbuda	25.8
Suriname	25.8
St Vincent and the Grenadines	25.1
Dominica	25.0
Jamaica	24.6
Canada	24.3
Grenada	24.0
St Lucia	22.3
Guyana	16.9
Haiti	8.4

Even independently of their contribution to obesity, there is some evidence that certain diets can increase risk of type 2 diabetes and associated chronic diseases. Refined carbohydrates may increase risk of diabetes [34] whilst fiber intake could be protective [35]. The dietary patterns in this Region are less than optimal with regard to intake of whole-grains, fruits and vegetables. Despite intense promotional efforts in the past decade in the USA, fiber consumption remained at approximately half the daily recommended amount [36]. Similarly, a small study using food diaries in Barbados found that mean dietary fiber intake was below the Caribbean RDA while sugar intake exceeded the recommendation almost four-fold [37].

5.2. *Non-modifiable risk factors*

Twin concordance, familial aggregation and genetic mapping studies have all provided convincing evidence for a genetic component in type 2 diabetes. While they explain a small proportion of the variance in total risk of diabetes of an individual, genetics may play an important role [38]. There are a large number of genetic variants associated with type 2 diabetes [39]. Notably, in diabetes prevention trials, even those with genes strongly linked to diabetes were able to lower the risk of diabetes with effective lifestyle interventions [40].

Demographic transitions in the NAC Region with regard to age and ethnic composition also explain some of the high burden of diabetes observed in the Region. Regionally, the rapidly aging population, combined with increasing urbanization [4] continues to push diabetes prevalence higher. With these two population changes of age and ethnic structures continuing, it is likely that diabetes prevalence will continue to increase unless effective measures are implemented to combat the disease.

5.3. *Indigenous populations and ethnicity*

An increase in the populations of ethnicities at higher risk of diabetes in the USA and Canada also contributes to the growing burden. The NAC Region is the home of indigenous and non-indigenous populations of many different ethnicities, and the available data are worthy of particular mention. The large ethnic disparities in the prevalence of diabetes may in part be related to genetic susceptibility or to gene–environment interactions. Indigenous peoples seem to be particularly vulnerable to diabetes. In Canada, diabetes prevalence ratio of First Nation to non-First Nation populations has been as high as 4.9 among women and 2.7 among men [41]. In the USA, the prevalence of type 2 diabetes is higher among Native Americans than in those of mixed heritage [42]. In several Caribbean countries, the risk for diabetes and its complications is higher in those of African descent. While genetic predisposition may play a role in the higher prevalence seen among certain ethnicities, the social determinants of health including social disadvantage and low socioeconomic status are also important in contributing to increased risk. An analysis of diabetes prevalence in Boston, USA, showed that Blacks and Hispanics have statistically significantly increased odds of having diabetes, with odds ratios of 2.0 and 2.4, respectively, compared to Whites. Following multivariate logistic regression including adjustments for age, sex, socioeconomic status, difficulties in paying for transportation, housing, health or medical care, medications and food, and health insurance status, these odds were no longer statistically significant, and the authors concluded that socioeconomic status has a much stronger association with diabetes prevalence than race or ethnicity [43].

Macroenvironment-level risk factors are major contributors to the higher prevalence of diabetes in Pima Indians of Arizona (54% in men, 37% in women) versus those of Mexico (6.3% in men, 10.5% in women). Despite their similar genetic heritage and predisposition to diabetes, the obesogenic environmental and sociocultural transition in Arizona has resulted in a notably higher burden of the disease [44].

6. Health system response

As a complex public health problem, the response to diabetes requires interdisciplinary commitment within and beyond the health sector. Researchers, practitioners and policy-makers can each play a significant role in the prevention and management of the disease. Efforts in the NAC Region in disease surveillance, clinical care and health policy are described briefly below.

6.1. *Disease surveillance*

Continuous, accurate and standardized quantification of the burden of diabetes is key to informing strategies to control the disease. Establishing and maintaining disease surveillance systems that monitor prevalence, and ideally incidence, as well as outcomes and quality of care indicators of diabetes are essential. The NAC Region generally has good sources of quality data, but there is variation across countries. In the past ten years many Caribbean nations have performed a STEPS chronic disease risk factor survey, and funding these surveys as a regular monitoring exercise is now necessary. There is a disproportionate financial burden of performing such surveys in small island states, and regional surveillance should be considered as a cost effective strategy. With the combination of various surveys to form the Encuesta Nacional de Salud y Nutrición (National Health and Nutrition Survey; ENSANUT) in 2006, quantification of diabetes prevalence in Mexico has improved. However, incidence data are sparse and a unified national diabetes registry with indicators is still under development [16].

Another essential aspect of diabetes research is the translation of the results of successful clinical trials of prevention and treatment into real world practice and policy, with assessment of cost-effectiveness and long-term impact. This field of translation research needs greater emphasis. Furthermore, barriers to uptake and retention in existing community-based prevention programs should be studied further to provide evidence for scaling up such efforts.

6.2. *Care and management*

Care and management of diabetes must be examined not only in terms of access, but also in terms of quality, which is often linked to but not solely defined by country wealth. Although diabetes care is generally improving in the USA, Canada, Mexico and the Caribbean, it remains suboptimal. Ineffective management of the disease is manifested in the high proportions of diabetes patients who do not meet treatment targets despite receiving care. In Canada, 49% of patients have HbA1c $>$ 7.0% (53 mmol/mol) [16], while in Trinidad, this proportion has been greater or equal to 50% [45]. A study from family medicine clinics in Mexico found that only 23% had HbA1c $<$ 7.0% (53 mmol/mol) or fasting glucose $\leq$ 130 mg/dl in the last three measurements, and only 1% of patients reached combined therapy goals for blood glucose, cholesterol and blood pressure [20]. In the USA, combined therapy goals were met only in 13% of men and 6% of women [46].

The considerable proportion of uncontrolled diabetes is mostly a factor of quality of care and is due to factors at the level of systems, providers, and patients. Addressing this would require system-wide reengineering so that coordinated and integrated care can be delivered, while overcoming ''clinical inertia'' [47] and patient compliance issues.

Another reason for the shortcoming in caring for diabetes, especially in developing nations, is the lack of resources and infrastructure in health systems unequipped for chronic care. For example, out of the patients in a study of family medicine clinics in Mexico, only 4% received nutritional counseling [20]. Similarly, in the Caribbean, a lack of trained nutritionist and dietetic professionals is an obstacle to provision of the necessary multidisciplinary care for diabetes [16].

6.3. *Health policy*

Diabetes and other non-communicable diseases have long been sidelined in the global health agenda. Political commitment and funding sources have generally been inadequate due to the long-term nature of return in investments.

However, significant progress has been made in the past decade in changing this attitude globally. Countries of the NAC Region have intensified national commitment to non-communicable diseases taking steps to improve national programs and financial access to care.

During the 2007–2012 federal administration in Mexico, non-communicable diseases became a top priority in the National Health Plan and efforts in prevention, treatment and control of diabetes were intensified. Such government actions include development of massive communication programs to raise awareness, launch of self-care diabetes campaigns, as well as unification of guidelines and criteria to diagnose and control diabetes [16]. In the USA, the CDC recently launched the National Diabetes Prevention Program which aims to deliver structured lifestyle programs to communities around the country through participating organizations such as the YMCA [48]. Similar national level efforts are present in Canada through the Canadian Diabetes Strategy [49]. Governments of various Caribbean countries have also addressed diabetes prevention, one of the notable being Jamaica's National Health Fund (NHF) efforts to subsidize screening and prevention programs.

Furthermore, countries in the Region are making efforts to address the rising non-communicable disease burden by improving financial access to prevention and care through healthcare reform. In the USA, recently proposed changes through the Patient Protection and Affordable Care act may improve coverage for diabetes by prohibiting insurers from denying individuals with a pre-existing condition, and will likely emphasize prevention. Mexico's recent public insurance system, *Seguro Popular* has also been successful in improving diagnosis and care for diabetes [16].

7. Conclusion

The NAC Region suffers from a high burden of diabetes and its adverse health and economic consequences. The disease should therefore be viewed as a serious threat not just from a public health, but also from a development perspective. With risk factors, such as obesity increasing, and progressively aging populations, the diabetes epidemic is growing, especially in low- and middle-income countries of the Region. Thwarting this trend will require improvement and intensification of efforts in epidemiological, programmatic and behavioral research, improved access to health care, better delivery of quality clinical care, expansion of primary prevention, and national health policies to promote healthy nutrition and activity.

Conflicts of interest

The authors have no conflicts to disclose.

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