Profile of Diabetes Mellitus among Immigrants from Guyana: Epidemiology and Implications for Community Action

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Objective: Prompted by anecdotal evidence of a higher rate of type 2 diabetes, we set out to investigate the prevalence of diabetes, its risk factors, and co-morbidities among immigrant Guyanese patients being treated in a family medicine health center in Schenectady, New York.

Methods: Patients were ascertained from a registration database of all patients aged ≥ 30 years who were treated from 2004 to 2006. We then conducted a detailed retrospective chart review of all Guyanese, Caucasian, African American, and Hispanic patients with diabetes and randomly selected non-diabetic controls.

Results: Of 222 Guyanese patients, 67 (30.2%) had a diagnosis of diabetes, compared with 47/219 (21.5%) of Hispanics, 132/777 (17.0%) of African Americans, and 442/2834 (15.6%) of Caucasians ($P<.0001$). Compared with the other racial and ethnic groups, the Guyanese diabetic patients were significantly leaner and more likely to be male.

Conclusion: We found a very high prevalence of type 2 diabetes among the Guyanese patient population studied and found unique characteristics when compared with other ethnic and racial groups. These findings have alerted local clinicians to intensify diabetes screening among Guyanese patients. Furthermore, in response to these findings, a broad coalition including public health, clinical, and community groups has been established with the goal of developing culturally appropriate strategies to prevent and control diabetes among Guyanese residents. (*Ethn Dis.* 2012;22[4]:473–478)

Key Words: Guyanese, Guyana, Type 2 diabetes, Minorities

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Introduction

Guyana, the third smallest country in South America, is nestled in the north of the continent between Suriname and Venezuela and borders the Atlantic Ocean. Originally a Dutch colony in the 17th century, Guyana came under British rule in 1815. The abolition of slavery led to Black settlement of urban areas and importation of indentured servants from India to work on the sugar plantations.[1] According to the 2002 census, the ancestry of the population is 44% East-Indian, 30% African, 17% mixed, and 9% Amerindian. The population is predominantly young, with a median age of 23.9 years. Only 4.8% of Guyanese are older than 65 years. Life expectancy is 71.4 years for females and 63.6 years for males. As of July 2011, the population of Guyana was estimated to be 741,908 people.[1, 2] According to the Guyanese Ministry of Health, diabetes is ranked as the fourth leading cause of death in the country and the second most prevalent cause of chronic non-communicable disease among individuals older than 45 years.[3]

Over the past four decades, it is estimated that more than 500,000 people have emigrated from Guyana to North America, with approximately 50,000 people immigrating annually.[4] Most of the Guyanese immigrants reside in the northeastern United States and Canada. In 2006, the Guyanese community was ranked the 5th most populous recent immigrant group in New York City, amounting to a population of 142,946.[5]

It is estimated that approximately 6,000–10,000 Guyanese have immigrated to Schenectady, N.Y. since 2000, but absolute statistics are lacking, as they are not captured in official census data. Spurred by a continuing decline in population (according to census figures, the population of Schenectady dropped 33% from 92,000 in 1950 to 62,000 in 2000), with associated abandoned housing, shuttered store fronts, rising crime rate and a shrinking tax base, the incumbent mayor set out to recruit a new population for the city.[6] Initially, he recruited Guyanese living in the Richmond Hills area in Queens, N.Y. and later directly from Guyana. These industrious, English-speaking South Americans, largely of Indian heritage (Indo-Guyanese), were offered low-cost housing and improved job prospects. The recruitment effort was successful and, according to the 2010 census, Schenectady experienced a 7% population increase from 2000 to 2010, thought to be primarily affected by the influx of Guyanese into the city.[7]

As Guyanese immigrants began to seek medical care in Schenectady, community physicians noted that many had type 2 diabetes mellitus. Furthermore, diabetes appeared to be more common in younger and leaner men and women than was normally seen among other non-Guyanese patients. These observations led us to conduct an initial retrospective chart review of 140 Guyanese adults seen in our family health center. This initial study revealed an unusually high prevalence of type 2 diabetes (32.6%), afflicting relatively young (mean age 40.2 years) and lean (66% with BMI <30) Guyanese patients.[8] Medline literature and Google internet searches performed prior to initiating this study yielded no reports about diabetes among Guyanese, either in Guyana or in expatriate communities. The absence of information in the medical literature and the results of our initial study prompted us to undertake

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this study, setting out to characterize diabetes among the Guyanese patients compared to patients of other racial and ethnic groups seen in our primary care health center in Schenectady, N.Y.

METHODS

Ellis Hospital (including the former St. Clare's Hospital) is a 495-bed community hospital with a Family Medicine residency program, located in Schenectady, N.Y. The residency program operates the Family Health Center (FHC), a primary care clinic that serves a diverse urban population. Study patients were ascertained by reviewing an electronic billing database of all patients aged ≥ 30 years who were treated at the FHC between May 1, 2004 and April 30, 2006. Elements abstracted from the database included race/ethnicity, age, sex, and ICD-9 diagnosis of diabetes (250.*).

We then conducted a detailed review of paper charts for patients with diabetes and randomly selected non-diabetic controls. The chart review included all Guyanese, African American, and Hispanic patients with diabetes and a random sample of Caucasian patients with diabetes (chosen to equal the number of diabetic African American cases). Two controls for each case, matched on race/ethnicity, were randomly selected from the non-diabetic patients of the FHC. Elements abstracted from the charts of all patients included height, weight, calculated body mass index (weight/height^2), co-morbid diagnoses of hypertension and hyperlipidemia, and tobacco use. Charts of patients with diabetes were reviewed for accuracy of diabetes diagnosis, HgbA1c levels, and diagnosis of end-organ complications.

Data were compiled using Microsoft Excel spreadsheets and analyzed using EpiInfo™ version 3.5.1 (CDC) software.[9] Test statistics were chi square, F test from analysis of variance (ANOVA) or Kruskal-Wallace test, where appropriate. For the case control analysis, odds ratios with 95% confidence intervals were computed to compare correlates of diabetes across the racial and ethnic groups. The study was approved by the St. Clare's Hospital institutional review board.

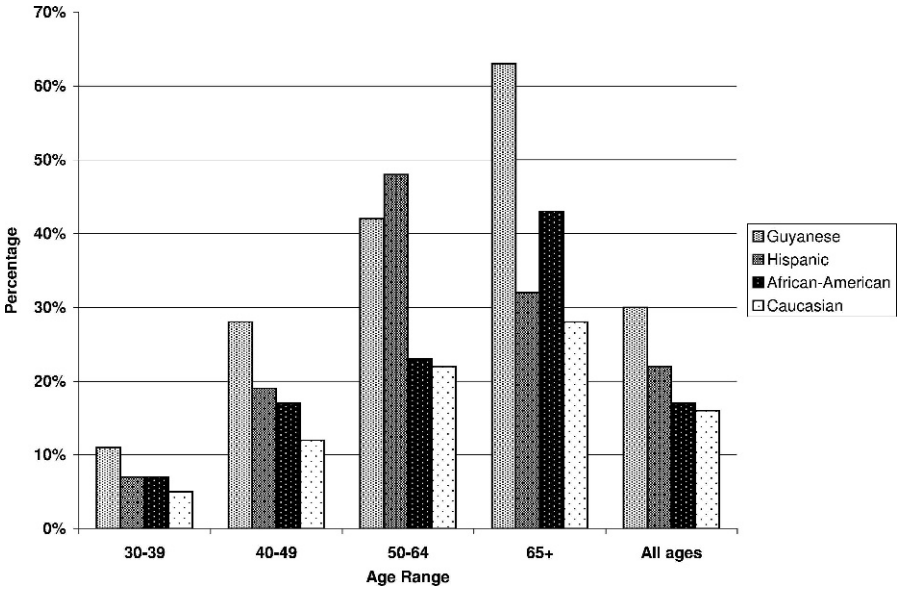

Fig 1. Prevalence of diabetes by race/ethnicity and age range

RESULTS

A total of 4,285 patients aged ≥ 30 years were seen in the FHC during the study period, including 2,834 (66.1%) Caucasian, 777 (18.1%) African American, 222 (5.2%) Guyanese, 219 (5.1%) Hispanic, and 233 (5.4%) other. Of the 222 Guyanese patients, 67 (30.2%) had been diagnosed with diabetes, compared with 47/219 (21.5%) of Hispanics, 132/777 (17.0%) of African Americans, and 442/2834 (15.6%) of Caucasians ($P<.0001$). Adjusting for age, using the age distribution of the entire FHC patient population, the rank ordering of prevalence was similar (31.6% among Guyanese, 24.4% among Hispanics, 19.2% among African Americans, and 14.5% among Caucasians). The probability of being diagnosed with diabetes increased with age (Figure 1). By age 50, more than 65% of the Guyanese males and 38% of the females seen in the FHC had been diagnosed with diabetes.

Case-control data on the association of diabetes with sex, age, weight, and BMI are summarized in Table 1. Within the FHC patient population, the increased prevalence of diabetes among Guyanese men (OR=2.8) was not observed in Hispanics, African Americans, or Caucasians (OR=0.9, 1.2, and 1.4, respectively). In contrast, the age of

Table 1. Characteristics of diabetic cases and non-diabetic controls, by racial and ethnic group, FHC, 2004–2006

	Guyanese					Hispanics				
Characteristic	**Diabetics**	**Non-Diabetics**	**OR**	**95% CI**	***P***	**Diabetics**	**Non-Diabetics**	**OR**	**95% CI**	***P***
Total *n*	67	132				47	94			
Sex										
Males	39 (58%)	44 (33%)	2.8	1.5,5.1	<0.001	18 (38%)	38 (40%)	0.9	0.5,1.9	0.48
Females	28 (42%)	88 (67%)				29 (62%)	56 (60%)			
Mean age (+/−SD)										
Males	52.5+/−12.2	43.0+/−10.5			<0.001	51.9+/−18.1	45.9+/−13.3			0.16
Females	57.4+/−14.4	43.8+/−12.1			<0.001	55.8+/−11.9	42.9+/−14.0			<.001
Mean BMI (+/− SD)										
Males	28.6+/−5.0	26.4+/−5.2			0.04	31.0+/−5.6	27.9+/−5.2			0.04
Females	27.5+/−4.8	29.0+/−5.6			0.24	34.6+/−7.6	30.8+/−6.6			0.03
Mean weight(Kg +/−SD)										
Males	81.7+/−14.3	75.8+/−16.0			0.08	93.0+/−21.0	83.1+/−14.1			0.04
Females	69.9+/−14.6	71.9+/−15.7			0.55	83.4+/−21.5	79.1+/−18.8			0.35
	African Americans					**Caucasians**				
Characteristic	**Diabetics**	**Non-Diabetics**	**OR**	**95% CI**	***P***	**Diabetics**	**Non-Diabetics**	**OR**	**95% CI**	***P***
Total *n*	126	252				126	252			
Sex										
Males	48 (38%)	85 (34%)	1.2	0.8,1.9	0.23	64 (51%)	105 (42%)	1.4	0.9,2.2	0.06
Females	78 (62%)	167 (66%)				62 (49%)	147 (58%)			
Mean age (+/−SD)										
Males	48.6+/−10.6	43.5+/−9.4			<0.001	57.8+/−12.1	47.0+/−12.8			<0.001
Females	56.4+/−14.9	45.6+/−11.4			<0.001	62.1+/−11.7	47.6+/−15.0			<0.001
Mean BMI (+/− SD)										
Males	34.2+/−6.7	29.7+/−8.3			0.002	33.0+/−8.1	28.5+/−6.2			<0.001
Females	35.3+/−9.1	32.6+/−9.1			0.04	34.4+/−8.2	30.9+/−10.0			0.02
Mean Weight(Kg +/−SD)										
Males	109.8+/−27.0	95.2+/−27.0			0.003	101.7+/−25.7	88.8+/−21.0			<0.001
Females	95.7+/−25.4	87.4+/−26.6			0.02	89.4+/−23.0	82.2+/−27.7			0.07

patients and age difference between cases and controls were fairly consistent across race and ethnicity. The analysis of weight and BMI revealed unique features of the Guyanese patients (Table 1, Figure 2). Compared with the other three racial and ethnic groups, the Guyanese patients were leaner and the case-control difference in BMI seen in Hispanics, African Americans, and Caucasians was smaller among the Guyanese men and reversed in direction for Guyanese women.

Data by race and ethnicity and comorbidities and sequelae often linked with diabetes are summarized in Table 2. Hypertension was strongly associated with prevalence of diabetes in each racial and ethnic group (OR ranging from 4.6 to 6.5). Hyperlipidemia also was associated with prevalence of diabetes, but more strongly in African American and Caucasian patients (OR=7.4 and 9.3, respectively) than in Guyanese and Hispanic patients (OR=2.5). Smoking had little association with diabetes among FHC patients, and the prevalence of smoking was markedly low among both diabetic and non-diabetic Guyanese patients.

Although not statistically different than the patients from the other ethnic and racial groups, Guyanese patients with diabetes who were seen in the FHC generally had poorly controlled diabetes, with a mean (most recent) HgbA1c of 8.3% (SD±1.8). During the study period, 24 patients (36%) had already exhibited end-organ damage, having been diagnosed with coronary artery, cerebrovascular, peripheral vascular, renal, and/or ophthalmic disease. Twelve patients (17%) (data not shown) had experienced a myocardial infarction and/or coronary artery bypass surgery, 4 patients (6%) had undergone amputations, 7 patients (10%) had nephropathy, 4 (6%) had suffered a stroke, and 3 (4%) were blind in at least one eye. Although the incidence of end-organ disease increased with age, seven Guyanese patients (23%) under aged 50 years already manifested at least one complication.

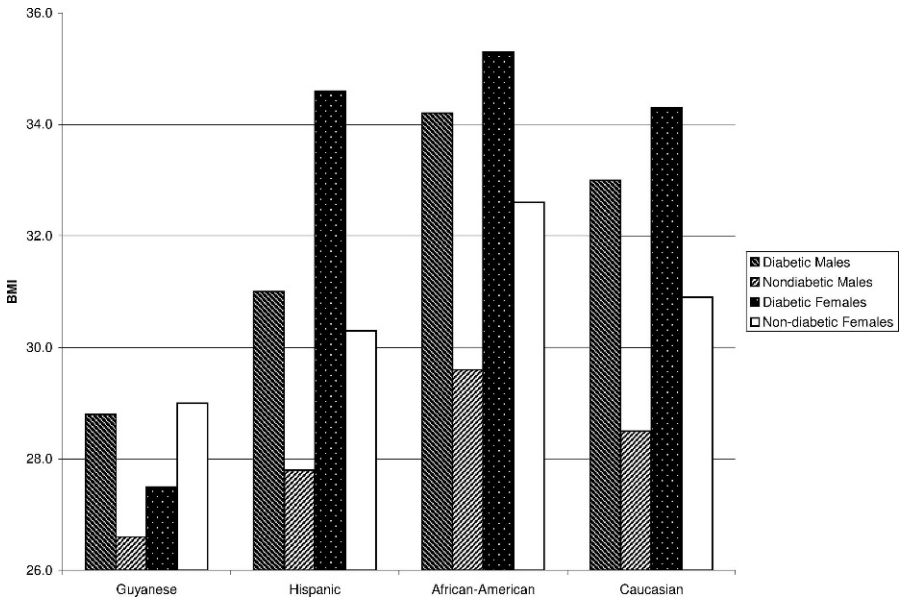

Fig 2. Body mass index (BMI), by race/ethnicity and sex

DISCUSSION AND CONCLUSION

This study of Guyanese patients supports our initial impression that diabetes is significantly more prevalent among these newly arrived immigrants to Schenectady than among other racial and ethnic groups at our practice. Furthermore, the Guyanese with diabetes differ from these other groups, being leaner and more likely to be male. Although the incidence of diabetes among Guyanese increases with age, we did not confirm our initial impression that it was more common among younger Guyanese patients than young patients from other racial or ethnic groups. We found BMIs to be lower among Guyanese patients compared with other ethnic groups, a weaker association between BMI and diabetes in men, and no association in women. This finding is markedly different from the strong association between BMI and weight found in the African American, Caucasian, and Hispanic patients. Diabetes among the Guyanese studied was not well controlled; two thirds of Guyanese patients had hypertension and/or hyperlipidemia, and one third of these patients had already experienced at least one end-organ complication.

We believe this study to be the first in the medical literature systematically investigating diabetes among immigrants from Guyana. A recent literature search yielded only three reports regarding diabetes among Guyanese, either in Guyana or North America. The first was a 2006 report from the New York City Department of Health that listed diabetes as the third leading cause of death among Guyanese-born immigrants. By comparison, diabetes was the sixth leading cause of death among North American-born New Yorkers and fifth among all foreign-born New Yorkers.[10] The second was the aforementioned report published by the Guyanese Ministry of Health in 2008 that ranked diabetes as the second most prevalent cause of chronic noncommunicable disease among individuals over the age of 45 years.[3] The third was a recently published study from New York City that reported a higher incidence of three vessel coronary artery disease, diabetes, hypertension, and dyslipidemia among Guyanese, compared with Caucasian patients referred for cardiac catheterization.[11]

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There is a growing literature regarding the high and increasing prevalence of diabetes in migrant South Asians and Indians, the latter of significance since they constitute the genetic ancestry of the Indo-Guyanese. For example, the prevalence of diabetes among South Asians living in the United Kingdom is estimated to be approximately 20%, which is nearly fivefold higher than the indigenous white population.[12] In South India, the Chennai Urban Rural Epidemiology Study (CURES) screened more than 26,000 urban Indian adults and found an overall diabetes prevalence of 15.5%. In the span of 14 years, the prevalence of diabetes increased by 72.3%.[13] As with the Indo-Guyanese in our study, other published reports reveal that Asian Indians with diabetes are leaner than other populations.[13–16]

Diabetes is clearly influenced by genetic predisposition, with the thrifty genotype and phenotype and the thin-fat phenotype thought to partially explain the increased risk among Indians.[16] The thrifty genotype theory ascribes the increased susceptibility to diabetes to the evolutionary enrichment

Table 2. Co-morbidities, sequelae, and HbgA1c, by racial and ethnic group, FHC, 2004–2006

	Guyanese					Hispanics				
Characteristic	Diabetics	Non-Diabetics	OR	95% CI	*P*	Diabetics	Non-Diabetics	OR	95% CI	*P*
Total *n*	67	132				47	94			
Hypertension	39 (64%)	26 (21%)	5.8	3.0,11.3	<0.001	26 (55%)	15 (16%)	6.5	2.9,14.5	<0.001
Hyperlipidemia	41 (68%)	26 (46%)	2.5	1.2,5.3	0.01	16 (34%)	16 (17%)	2.5	1.1,5.6	0.02
Current smoking	3 (4.6%)	10 (9.3%)	0.5	0.1,1.8	0.25	12 (25.5%)	29 (31.2%)	0.8	0.5,1.8	0.49
Mean HgbA1c	8.3+/−1.8					7.9+/−1.9				
End-organ disease	24 (35.8%)					13 (28.9%)				
	African Americans					Caucasians				
Characteristic	Diabetics	Non-Diabetics	OR	95% CI	*P*	Diabetics	Non-Diabetics	OR	95% CI	*P*
Total *n*	126	252				126	252			
Hypertension	90 (71%)	89 (35%)	4.6	2.9,7.3	<0.001	80 (64%)	61 (24%)	5.4	2.9,7.3	<0.001
Hyperlipidemia	62 (50%)	30 (12%)	7.4	4.4,12.4	<0.001	86 (68%)	47 (19%)	9.3	5.7,15.3	<0.001
Current smoking	57 (45.2%)	111 (44%)	1.0	0.7,1.6	0.83	43 (34.1%)	101 (40.1%)	0.8	0.5,1.2	0.26
Mean HgbA1c	7.6+/−2.1					7.8+/−2.0				
End-organ disease	32 (26.2%)					33 (26.4%)				

of thrifty genes, which enhanced the chances of survival in the past when food supplies were scarce and intermittent, but have become detrimental in contemporary conditions of plentiful food and sedentary lifestyles. The thrifty phenotype hypothesis ascribes the increased risk of diabetes to an unfavorable intrauterine environment. The thin-fat phenotype describes the observation that Indians have a higher percentage of body fat and more visceral fat than members of other populations, thereby increasing their risk for insulin resistance when exposed to increased food and decreased exercise.[16] Irrespective of the underlying etiology and pathogenesis, it is clear that diabetes is increasing in both urban and rural areas in association with improvement in living conditions, and changes in exercise and diet.[13,15–17] We believe that these multiple combined factors help explain the high prevalence of diabetes among the Guyanese immigrants in North America as well.

Study Limitations

Our study is limited by its small sample size and the possibility of selection bias. Since all cases were from one family medicine practice, they may not be representative of the community at-large and we may have investigated a population consisting of sicker patients with diabetes seeking care. This potential bias could help explain the higher prevalence of diabetes that we found among Guyanese men, who have been noted to be less likely than women to seek medical care unless ill. Nonetheless, approximately two thirds of the Guyanese patients with diabetes in the study had no known end-organ disease and many were being seen for routine primary care visits. Furthermore, it is reasonable to expect that selection bias would have had a similar influence on the prevalence of diabetes that we found among African American and Caucasian patients, who had rates of diabetes which were proportionally similar to those reported from the National Health and Nutrition Examination Survey (NHANES) [18]

Taking Action

Schenectady clinicians have responded to these findings with a heightened index of suspicion regarding diabetes among Guyanese patients, leading to increased screening of all Guyanese adults, irrespective of traditional risk factors such as obesity.[19] Appreciating the necessity and importance of public health initiatives in addition to the clinical interventions already underway, the Schenectady County Public Health Department, with the assistance of a coalition of health care providers and citizen groups, successfully applied for, and was awarded, a REACH (Racial and Ethnic Approaches to Community Health) grant from the Centers for Disease Control and Prevention (CDC).[19,20] Currently, mid-way through the two-year grant cycle, the health department, in partnership with the Guyanese and West Indian communities, has formed the West Indian Diabetes Action Coalition (WIDAC) to develop primary, secondary and tertiary public health strategies to prevent, identify, and treat type 2 diabetes and its consequences. The coalition is developing culturally sensitive solutions to the identified diabetes problem that exists in Schenectady, with the goal of sharing lessons with the entire community as well as the CDC. Drawing upon the availability and popularity of current technology, the coalition has developed a Facebook page in order to disseminate high-quality health-related information to a wide audience.[21] Other tools and interventions are underway as well.

We are currently in the midst of a worldwide "diabetes epidemic," with enormous implications for health care needs and costs over the next century.[22] As highlighted by this study, despite many similarities, diabetes epidemiology

and presentation differ among racial and ethnic groups, requiring public health and clinical providers to approach diabetes prevention and control within a culturally competent framework.[23–25] In addition to the public health implications, we believe that studying the lean individuals with diabetes whom we identified among our Guyanese patients may ultimately provide key insights into the molecular basis of insulin resistance, thus paving the way for better control and treatment.

ACKNOWLEDGMENTS

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AUTHOR CONTRIBUTIONS

Design and concept of study: Back, Bachwani, Strogatz
Acquisition of data: Back, Bachwani, Sherman
Data analysis and interpretation: Back, Bachwani, Strogatz, Sherman
Manuscript draft: Back, Bachwani, Strogatz, Sherman
Statistical expertise: Back, Strogatz
Administrative: Back, Bachwani, Strogatz, Sherman
Supervision: Back