An Assessment of the Risk Factors for Type 2 Diabetes among Women in Rural Jamaica

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ABSTRACT

This project examined risk factors (lifestyle, socio-economic and cultural) for Type 2 diabetes among 890 women in rural Jamaica in comparison to national and international trends via *the Behavioural Risk Factor Surveillance System (BRFSS) and further analysis via the Kruskal Wallis and Mann-Whitney U tests. Nonparametric tests explored the relationship of body mass index (BMI) and risk factors. Women above age 36 years, sedentary women and women with health insurance showed a significant increase in BMI. Seventh Day Adventists had significantly lower BMIs compared to Protestants. Prevalence of Type 2 diabetes in rural Jamaica is complicated by the lack of adequate health insurance, health practitioners (including dieticians and social workers), and vigorous public awareness campaigns, as well as high healthcare costs. Recommendations include the establishment of a comprehensive plan targeting women to reduce their risk factors for Type 2 diabetes, including early diagnoses, continuing education for healthcare providers and community mobilization among churches, schools, banks, pharmacies and other entities.*

Keywords: Behavioural Risk Factor Surveillance System (BRFSS), diabetes awareness campaigns, risk factors, rural Jamaican women, Type 2 diabetes

Valoración de los Factores de Riesgo en la Diabetes Tipo 2 entre las Mujeres en Jamaica Rural

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RESUMEN

Este trabajo examina los factores de riesgo de la diabetes tipo 2 (estilo de vida, condiciones socio-económicas y culturales) entre 890 mujeres de la zona rural de Jamaica, comparados con las tendencias nacionales e internacionales. Para ello se recurrió al Sistema de vigilancia de factores de riesgo conductuales (BRFSS), y un análisis posterior mediante la prueba de Kruskal-Wallis y la prueba U de Mann-Whitney. Se usaron pruebas no paramétricas para explorar la relación del IMC y los factores de riesgo de la diabetes. Las mujeres mayores de 36 años, las mujeres sedentarias, y las mujeres con seguro de salud, mostraron un aumento significativo del índice masa corporal (IMC). Las mujeres Adventistas de Séptimo Día, tenían índices IMC más bajos con relación a las protestantes. La prevalencia de la diabetes de tipo 2 en Jamaica rural, se complica por la falta de seguros de salud adecuados, insuficiente número de profesionales de la salud (incluyendo diteístas y trabajadores sociales), la escasa promoción de campañas vigorosas de concientización pública, y finalmente los altos costos de la atención a la salud. Las recomendaciones incluyen la implementación de un plan integral dirigido a las mujeres y encaminado a reducir los factores de riesgo de la diabetes de tipo 2. Dicho plan incluiría diagnósticos tempranos, educación continuada para los profesionales de la salud, y movilización de la comunidad en asociación con iglesias, escuelas, bancos, farmacias y otras entidades.

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Palabras claves: Sistema de Vigilancia de Factores de riesgo Conductuales (BRFSS), campañas de concientización acerca de la diabetes, factores de riesgo, mujeres de Jamaica rural, diabetes tipo 2

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INTRODUCTION

With an estimated population of 2.6 million [49.3% males and 50.7% females, 93.7% Black] (1), Jamaica is marked by wide disparity (2). Chronic, non-communicable diseases are significant causes of death (3). The Ministry of Health (MOH) oversees all healthcare delivery (4), at no charge, at regional hospitals and health centres. However, demands for services are not always met.

An estimated 150 000 Jamaicans aged 15 to 74 years have diabetes mellitus. Females show significantly higher rates of obesity and high cholesterol than males. The prevalence of all chronic diseases in Jamaica grows as socio-economic status declines (5). The healthcare of Jamaican women, who in 2007 accounted for 65.4% of Jamaica's 124 500 unemployed, is compromised in terms of effectiveness, access and efficiency. This is especially so for women with chronic illnesses (6).

The average Jamaican's diet consists of carbohydrates and small portions of fruits and vegetables. Fast foods, usually fried, are consumed. Obesity and fat distribution are well-established risk factors for Type 2 diabetes. Several simple anthropometric indices of body composition, including body mass index (BMI), may predict risk of disease. Trials of lifestyle modification have substantially reduced the risk of diabetes in people with impaired glucose tolerance. Weight reduction is also an important intervention (7). The high prevalence of "disease burden" and low prevalence of disease preventability, public perception of disease-related risks, and healthcare access all prevent the effective management of Type 2 diabetes in Jamaica (8).

SUBJECTS AND METHODS

This research examined relationships among risk factor variables of Type 2 diabetes for women in rural Jamaica. It was modelled on Samuel's work in 2005 (9). The design was selected based on its previous uses in the United States of America (USA) and worldwide. The study was conducted in Clarendon, a populous parish (approximately 200 000 residents) of low to moderate income (10).

A cross-sectional, population-based survey of women 18 years and older, hosted by May Pen Hospital, took place from November 7 to November 14, 2010 in Clarendon and other towns within the Southern Regional Health Authority, based on weighted population analyses. Women aged 18 years and older were surveyed at the hospital and at nursing schools, colleges, churches, banks, households and various community gathering places. The study was designed to survey 1000 adults, with a desired sample of 900. The total number of surveys, 890, yielded 801 completed questionnaires.

The survey instrument comprised measurements of BMI and a modified version of the Behavioural Risk Factor Surveillance System (BRFSS), administered by the Centers for Disease Control (CDC) Behavioural Surveillance Branch. It was designed to measure behavioural risk factors of adults living in households. The BRFSS was used to identify the prevalence and incidence of diabetes and other co-morbidities. Participation was voluntary and included written consent. This study was approved by the Institutional Review Board of Central Michigan University, Mt Pleasant, Michigan, USA.

Five interviewers recruited from the School of Practical Nursing in May Pen as survey assistants were trained and monitored by the Principal Investigator. Participants understood that the information they provided would be used in a study but their identities would not be revealed. They filled out the surveys in English; questions were read aloud to them as needed. The instrument assessed subjects' rates of diabetes, healthcare access, history of chronic diseases, awareness of prevention campaigns, and use of chronic screening examinations. Data collection also included demographic facts (age, gender, race and income), measurements of height (in inches) and weight (in pounds, without excessive clothing or shoes). Body mass index was obtained by dividing the weight by the height squared.

Completed surveys were reviewed and incomplete surveys were discarded. Twenty per cent of the completed questionnaires were randomly selected and checked for data entry errors. Frequency tables of categorical variables were provided first, followed by descriptive statistics of continuous variables including weight, height and BMI. Next, the Kolmogorov-Smirnov test of BMI was conducted to test normality. Then nonparametric tests were used to explore the relationship of BMI and risk factors for diabetes. The SPSS 16.0 statistical application was used for analyses. Because the normality assumption of ANOVA was not met, the Kruskal Wallis test was used to determine the presence of significant differences of BMI distribution among the factor categories. The relationship between BMI and significant variables was explored by the Mann-Whitney U test with a significance level of 99%.

RESULTS

The data collection yielded 801 surveys for analysis. The evaluated respondents, all women, included 87.4% Black (n = 700), 6.2% Indian (n = 50), 1.6% Chinese (n = 13), 1.5%

White (n = 12) and 3.2% Other (n = 26). Of the respondents, 34.3% were between ages 18 and 25 years (n = 275), 24.1% were between 26 and 35 years (n = 193), 17.4% were between 36 and 45 years (n = 139), 13.9% were between 46 and 55 years (n = 111), 6.0% were between 56 and 65 years (n = 48) and 4.4% were above 65 years (n = 35). More than 40% had never been married and 27.3% were married. Although approximately 50% were employed, 60% of the respondents' yearly household incomes were less than JA$40 000, which is roughly equivalent to US$400 (Table 1).

As shown in Table 2, the confidence interval of the mean of BMI was 26.6 to 28.0. Several outliers on the right of Fig.1 indicate very obese respondents. Logarithm transformation was used to ease the skewedness of BMI (Fig. 2), but the transformed data still did not pass the Kolmogorov-Smirnov test of normality (a 5% significance level; Table 3). Therefore, nonparametric tests were adopted for further analysis.

More than 50% of the subjects were overweight or obese; more than 25% were obese (Table 4). Although only about 15% had been diagnosed with diabetes, more than 40%

Table 1: Demographic characteristics of sample

Aspect	Frequency	Per cent
Age (years)		
18–25	275	34.3
26–35	193	24.1
36-45	139	17.4
46–55	111	13.9
55–65	48	6.0
65 and older	35	4.4
Race		
Black	700	87.4
Chinese	13	1.6
Indian	50	6.2
White	12	1.5
Other	26	3.2
Marital status		
Married	219	27.3
Divorced	25	3.1
Widowed	34	4.2
Separated	41	5.1
Never married	344	42.9
Unmarried couple	138	17.2
Education		
None or kindergarten only	16	2.0
Grades 1–8	110	13.7
Grades 9–11	247	30.8
Grade 12 or GED	201	25.1
College 1–3 years	154	19.2
College 4 years or more	67	8.4
Refused	6	0.7
Employment		
Earning wages	244	30.5
Self-employed	145	18.1
No work > 1 year	37	4.6
No work < 1 year	14	1.7
Homemaker	24	3.0
Student	276	34.5
Retired	31	3.9
Unable to work	25	3.1
Refused	5	0.6
Household Income (JA$; yearly)		
< 40 000	487	60.8
40 000 – 79 999	115	14.4
80 000 – 299 999	73	9.1
300 000 – 499 999	36	4.5
500 000 – 999 999	30	3.7
1 million – 1 499 999	25	3.1
1.5 million – 2 999 999	15	1.9
> 3 million	20	2.5

Table 2: Descriptive statistics and confidence interval of height, weight and body mass index

	Mean	Standard Deviation	Range	99% Confidence Interval Lower	Upper
Height (inches)	64.8798	4.66248	50.00	64.4544	65.3051
Weight (lbs)	1.61512	36.41075	316.00	158.1889	164.8324
Body mass index	27.3092	7.62656	80.29	26.6134	28.0050

Test value = 0

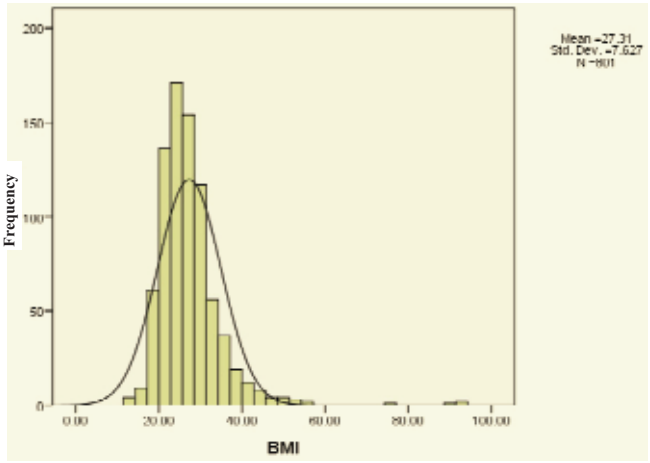

Fig. 1: Distribution of body mass index (BMI) of participants.

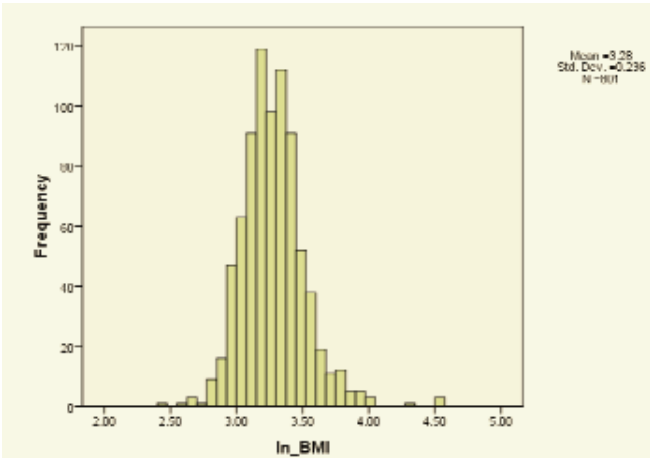

Fig. 2: Distribution of log BMI.

Table 3: One-sample Kolmogorov-Smirnov test of log (BMI)

N		In BMI
		801
Normal parameters[a]	Mean	3.2770
	Standard deviation	0.23631
Most extreme differences	Absolute	0.051
	Positive	0.051
	Negative	-0.033
Kolmogorov-Smirnov Z		1.439
Asymp Sig (2-tailed)		0.032

[a] Normal test distribution

Table 4: Medical demographic characteristics of sample

		Frequency	Per cent
Body mass index	Underweight	31	3.9
	Normal	304	38.0
	Overweight	263	32.8
	Obese	203	25.3
Self-reported diabetes	Yes	104	13.0
	No	675	84.3
	Not sure	5	0..6
	Told only during pregnancy	17	2.1
Family history of diabetes	Yes	347	43.3
	No	393	49.1
	I do not know	61	7.6
Health insurance	Yes	221	27.6
	No	570	71.2
	Not sure	10	1.2
Health check-ups	Yes	628	78.4
	No	119	14.9
	More than 5 times	48	6.0
	Not sure	6	0.7
Diabetes education	Yes	457	57.1
	No	325	40.6
	Not sure	19	2.4

of their immediate family members had diabetes. More than 70% did not have health insurance.

To further investigate which factors influence BMI in rural Jamaica, and because the normality assumption of ANOVA was not met, the Kruskal Wallis test was used to determine significant differences of BMI distributions in the factor categories (Table 5). The Mann-Whitney U test was used for pairwise group comparison with a significance level of 99%. Results show significant differences in the dependent variable BMI, based on age (p = 0.000), exercise (p = 0.021), family history of diabetes (p = 0.000), diagnosed diabetes (p = 0.000), high blood pressure (p = 0.000) and health insurance (p = 0.000). A follow-up Mann-Whitney U test found significantly higher BMI among women above age 36, sedentary women, and those with diagnosed diabetes, high blood pressure, and immediate family members with diabetes. Body mass index was also higher for those with health insurance (Table 5).

In addition, Seventh Day Adventists had significantly lower BMI than other Protestants, perhaps because of food habits linked to religious practices (Fig. 3).

Table 5: Kruskal Wallis test for independence of multiple groups of body mass index (BMI) with Mann-Whitney U test for pairwise group comparison

	Categories	N	BMI mean rank	Group
Age (years)	18–25	275	306.88	C
	26–35	193	411.28	B
	36–45	139	465.79	A
	46–55	111	473.86	A
	55–65	48	501.29	A
	65 and older	35	457.90	A
Exercise	Yes	534	388.04	B
	No	255	431.93	A
	Not sure	12	320.62	B
Family history of diabetes	Yes	347	453.14	A
	No	393	363.85	B
	I do not know	61	343.75	B
Diagnosed diabetes	Yes	104	500.07	A
	No	675	386.34	B
	Not sure	5	379.50	B
	Told only during pregnancy	17	383.32	B
High blood pressure	Yes	206	504.98	A
	No	559	363.66	B
	Not sure	36	385.81	B
Health insurance	Yes	221	452.18	A
	No	570	383.32	B
	Not sure	10	277.80	AB

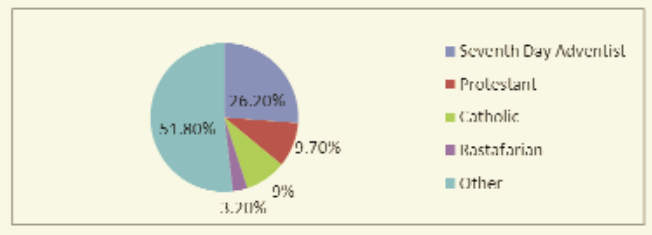

Fig. 3: Religions in Jamaica

DISCUSSION

Although being overweight and obese are risk factors for Type 2 diabetes, these are culturally acceptable for Jamaican women and are most frequent among the least educated. Lifestyle and risk factors among Jamaican women are comparable to those of women in the USA, Britain, Japan, Canada, China and other Caribbean countries, although rural Jamaican women tend to be particularly susceptible to Type 2 diabetes.

Data on diabetes using the BRFSS are self-reported and are subject to bias. Other limitations include question phrasing and limited clinical differentiation among types of diabetes. Literacy may also have affected survey interpretation. Some respondents may have had undiagnosed diabetes and some may not have had a clear understanding of the disease and its symptoms.

More research is needed to define the mechanisms of diabetes development in early life as well as to design suitable public health measures. At this time, diabetes intervention strategies should be directed toward women of childbearing age, as well as children. Greater efforts should be made to systematically improve concurrent risk factors (*ie* blood pressure, lipids, use of antiplatelet agents) and reduce glycaemia in Jamaicans who already have diabetes.

More outreach, awareness campaigns and interventions are needed in rural Jamaica where risk of diabetes is highest and where information and education do not appear to be reaching the population. With appropriate training, more community mobilization and volunteerism could help to reduce the incidence of diabetes and provide efficient outreach. In rural Jamaica, early education and better school lunch programmes would be very beneficial. Mobile clinics could supply healthcare when transportation to traditional clinics is difficult.

Health systems that can deliver optimal care should be designed around patients' needs; diabetics must manage their own care. Where people are open to community-health partnerships, limited government funds can be mitigated through volunteer groups or associations. Partnering with pharmacies, churches, schools, banks and nursing students would be highly beneficial. Outreach strategies will help increase prevention of and education about chronic diseases and will strengthen relationships between patients and their healthcare providers.

Standards for nutrition, as well as lifestyle changes that include exercise regimens and healthier dietary habits must be established in partnership with school administrators, who should be educated about chronic diseases. Improvements are also needed in chronic disease screening, management, prevention, and treatment – particularly for Jamaican women. Appropriate clinic staff and equipment for testing should be supplied, and policies to support prevention should be enacted. The government, healthcare system, and local communities must work together to implement programmes to improve chronic disease health outcomes and to improve existing programmes.

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