# Quality of Life in Caribbean Youth with Diabetes

MK Tulloch-Reid, SP Walker

***ABSTRACT***

***Background:*** *As the prevalence of youth onset diabetes in Jamaica increases, the impact of this disease on Health Related Quality of life (QOL) needs to be evaluated.*
***Methods:*** *Patients from two major referral hospitals had QOL assessed using a modified diabetes-39 questionnaire administered by a trained interviewer. Subscale scores were transformed to standard scale scores ranging from 0 (lowest impact) to 100 (highest impact) and the impact of socio-demographic factors, treatment and medical history on QOL examined.*
***Results:*** *Fifty-seven participants (21M, 36F, mean age 19.0 ± 5.1 years, diabetes duration 2.7 ± 2.2 years, 96% black) had QOL assessed. Anxiety and worry had the greatest impact (median score = 41) and sexual functioning, the lowest impact (median Score = 0) on QOL. Older age, later age of onset, longer diabetes duration, better glucose control and not using insulin were associated with a higher anxiety and worry score. Multiple regression analysis was conducted to determine which of these were associated with the anxiety and worry score after controlling for age. Anxiety and worry increased with age (regression coefficient (SE); 2.05[0.68]) and was higher in those on oral agents compared to those using insulin (-27.9 [10.9]).*
***Conclusion:*** *Measures to address anxiety and worry in Jamaican youth with diabetes need to be implemented to minimize the impact the disease may have on their QOL.*

# Calidad de Vida entre los Jóvenes Diabéticos del Caribe

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***RESUMEN***

***Antecedentes:*** *A medida que aumenta la prevalencia de la aparición de casos de diabetes entre los jóvenes en Jamaica, se hace necesario evaluar el impacto de esta enfermedad sobre la calidad de vida (CDV) en relación con la salud.*
***Métodos:*** *Pacientes provenientes de dos hospitales importantes de remisión de casos, fueron evaluados en cuanto a su CVD, mediante la administración de un cuestionario de Diabetes 39 modificado, por parte de un entrevistador profesional. Las puntuaciones de subescala fueron transformadas en puntuaciones de escala estándar que fluctuaban de 0 (impacto más bajo) hasta 100 (impacto más elevado), y se examinó el impacto de los factores socio-demográficos, el tratamiento y la historia de la CVD.*
***Resultados:*** *Cincuenta y siete participantes (21M, 36F, edad promedio 19.0 ± 5.1 años, duración de la diabetes 2.7 ± 2.2 años, 96% negros) tuvieron una evaluación de su CDV. La ansiedad y la preocupación tuvieron el impacto mayor (puntuación promedio = 41) y el funcionamiento sexual, el impacto más bajo (puntuación promedio = 0) sobre la CDV.*
*El tener más años de edad, el comienzo de la enfermedad a una edad mayor, un período más largo de padecimiento de la diabetes, un mejor control de la glucosa y la no utilización de insulina, estuvieron asociados con una puntuación más alta de ansiedad y preocupación.*

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*Se llevó a cabo un análisis de regresión múltiple con el propósito de determinar cuáles de estos se hallaban asociados a la puntuación de la ansiedad y la preocupación, luego de los controles según la edad. El grado de ansiedad y preocupación aumentó con la edad (coeficiente de regresión (SE); 2.05 [0.68]) y fue más alto en aquellos expuestos a agentes orales, en comparación con aquellos que usaban insulina (-27.9 [10.9]).*

***Conclusión:*** *Se hace necesario implementar medidas para abordar la ansiedad y la preocupación en la juventud jamaicana que padece diabetes, a fin de minimizar el impacto que la enfermedad pueda tener sobre su CDV.*

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## INTRODUCTION

Diabetes mellitus is a chronic metabolic disease that requires careful dietary and physical activity habits, frequent monitoring of blood glucose and compliance with prescribed medications to reduce the risk of acute and chronic complications. Persons with diabetes often feel overwhelmed by the demands that the disease places on them and their families. The demands of diabetes care can affect health-related quality of life (QOL) of a person at any age but may present a special challenge in the adolescent and young adult (1). Type 1 diabetes, the most common form of diabetes at this age, unlike many other chronic diseases, does not result from poor lifestyle choices and may be perceived as an unfair diagnosis by many youth (2). As the prevalence of youth onset diabetes continues to increase due to improved survival and increasing incidence, there is a need to assess not only the acute and chronic complications of the disease but also the impact it has on QOL (3, 4). In addition, the management of diabetes in adolescents and young adults presents unique challenges and a better understanding of the impact the disease has on their life will allow for the development of appropriate interventions for use in their management.

Quality of life is a multi-dimensional construct comprising the individual's subjective perception of physical, emotional and social well-being, and includes both a cognitive (such as satisfaction) and emotional (such as happiness) component (5). There are few published studies of diabetes QOL in the Caribbean. A study of 1880 adult Afro-Trinidadians and Indio-Trinidadians (33% ? 65 years old and 44% with diabetes for more than 10 years) attending Government Health Centres found that QOL measured by the SF-36 was inversely related to the severity of diabetes symptoms measured using a diabetes symptoms checklist (6). Physical and mental functioning were lowest in those with most severe diabetes-related symptoms. In a telephone survey conducted in Puerto Rico, participants over 18 years old were asked about self-rated health status and the number of days during the 30 days preceding the survey when physical or mental health was not good or usual activity had to be curtailed (7). Persons with self-reported diabetes at all ages reported significantly more unhealthy days than those without diabetes. Neither of these studies focussed on QOL in adolescents or young adults with diabetes or used a diabetes specific QOL instrument.

This cross-sectional study reports QOL in adolescents and young adults who participated in a diabetes classification study and examines associations between QOL and gender, age at evaluation, age at diabetes onset, obesity, diabetes type and duration, glycaemic control and prescribed medications.

## METHODS

### Participant recruitment

Participants were part of a study designed to assess the prevalence of Type 2 diabetes in Jamaican youth with recently diagnosed diabetes. A sample of at least 50 persons would have been able to detect a 10% prevalence (error of 5%) of Type 2 diabetes among young Jamaicans. The study was approved by the Ethics Committees of the Faculty of Medical Sciences, University of the West Indies/University Hospital of the West Indies, and the Kingston Public Hospital. Written informed consent was obtained from each participant (and their parent/guardian if under 16 years of age) prior to enrolment.

A list of hospital admissions for diabetes and specialist clinic records at the island's two largest referral hospitals (The University Hospital of the West Indies and the Kingston Public Hospital) over a 5-year period (1999–2004) was obtained. Patients who were diagnosed with diabetes mellitus after January 1, 1998, were 25 years old or younger at the time of diagnosis and lived in the South-east section of the island (within a 2-hour commute of the study centre) were invited to participate. In addition, patients admitted with diabetes to the University Hospital of the West Indies between 2004–2006 who met the eligibility criteria were also invited to participate. The investigation of QOL was part of a study to develop criteria for the classification of youth onset diabetes and to estimate the prevalence of youth onset Type 2 diabetes in Jamaica. Patients with gestational diabetes who were less than 10 years old when the study was being conducted (as they were unlikely to have Type 2 diabetes) were excluded because of the overall objectives of the study.

### Measurements and Diabetes Classification

Each study participant was evaluated at the Tropical Medicine Research Institute. After verifying an overnight fast and determining when the last dose of insulin had been taken, a fasting blood sample was obtained. Weight was measured to the nearest 0.1 kg using an electronic digital

scale and height was measured to the nearest centimetre using a portable stadiometer. For the purpose of this study, patients who were less than 18 years old were classified as adolescents and those 18 years and older as adults.

Sera for diabetes autoantibodies (Ab) were stored at -70ºC until shipped to Northwest Lipid Laboratory, University of Washington (GAD65 and IA-2) for analysis using a radioligand binding assay (8). Fasting C-peptide was measured at the University Hospital of the West Indies (IMMULITE Diagnostic Products Cooperation, Los Angeles, CA). The assay had a lower detection limit of 165 pmol/L.

Subjects were classified into diabetes subtypes using a modification of the SEARCH study group classification criteria (8):

(i) Type 1A diabetes – GAD65 or IA-2 positive
(ii) Type 1B diabetes – GAD65 and IA-2 negative and fasting C-peptide < 230 pmol/l and or stimulated C-peptide < 660 pmol/lL
(iii) Type 2 diabetes – GAD65 and IA-2 negative and fasting C-peptide > 500 pmol/L and or stimulated C-peptide ? 1160 pmol/lL
(iv) Lipoatrophic diabetes – clinical phenotype and low serum leptin
(v) Untypeable diabetes – GAD65 and IA-2 negative with fasting C-peptide between 230–500 pmol/lL and or stimulated C-peptide 660–1160 pmol/lL

**Quality of Life Assessment – The Diabetes 39**

Quality of life was measured using a modification of the Diabetes-39 questionnaire. The original instrument was developed for use in people with Type 1 or Type 2 diabetes whether managed on insulin, oral agents or diet alone (9). This questionnaire has been used in several settings and has been demonstrated to have good convergent and discriminant validity (10). This questionnaire was selected for use as it was found to have good face and content validity for use in Jamaican youth with Type 1 or Type 2 diabetes based on the authors' experience. It was also not affected by exclusion of the subscale on sexual functioning which was not applicable to all of the patients.

The Diabetes-39 has 5 subscales – Diabetes Control (12 items), Anxiety and Worry (4 items), Social Burden (5 items), Sexual Functioning (3 items) and Energy and Mobility (15 items). Examples of questions from each of the diabetes subscales are presented below:

(i) Diabetes control– the impact of following their doctors prescribed treatment plan, testing their blood sugars and food restriction
(ii) Anxiety and worry – worries about money matters, concerns about the future and life stresses
(iii) Social Burden – restrictions that diabetes places on family and friends; having diabetes interferes with family life
(iv) Sexual Functioning – the effect of diabetes on the sex drive and sexual function
(v) Energy and Mobility – limited energy levels, poor vision, restless sleep, activities of daily living

The impact of diabetes on quality of life four weeks prior to the interview was assessed in this study.

The questionnaire was piloted among persons with diabetes attending government health centres and modifications were made to some statements in the original questionnaire to facilitate better comprehension by the participants. Changes in these statements were discussed with the developer of the questionnaire (J Gregory Boyer) to ensure that the original intent of each question was not lost. All interviews were conducted by trained research personnel. After each statement was read to the participants, they were asked to point to the number on a scale that represented most closely the degree to which their quality of life was affected by that factor over the previous month. Responses could range from 1 (least affected) to 7 (most affected) and were recorded by the interviewer.

The raw scores obtained from each subscale were transformed into a 0 to 100 scale. The

$$\text{Transformed score} = \frac{(\text{raw score} - \text{lowest possible scale score})}{\text{Possible scale score range}} \times 100$$

where the Possible Scale Score Range was the difference between the Highest Possible Score and the Lowest Possible Score. Higher scores were indicative of a greater impact on QOL.

**Statistical Analysis**

Median values and their 25$^{th}$ and 75$^{th}$ centiles of the transformed scores are presented as the distribution of the sexual functioning subscale scores was skewed. The Cronbach's alpha test was used to assess the consistency of the questions used in each diabetes subscale and measures the internal consistency of the questions. The test is based on the average correlation among items and the number of items in the instrument. The minimally accepted standard for this statistic is 0.7 (11). The intra-class correlation coefficient was also used as a measure of the reliability of the subscales. It compares the variance between subjects, raters and between times with error variance. An intra-class correlation of 0.8 or higher indicates high reliability for the scale (11). The Wilcoxon Rank Sum test was used to compare diabetes subscale scores according to diabetes type, gender, age (adolescent *vs* adult), obesity (normal, overweight/obese), duration (less than 6 months, more than 6 months) and glucose control. Skewed variables were log transformed and multiple regression analysis was used to explore the relationships between the diabetes subscales and gender, age at the time of the visit, age of diabetes onset, obesity, average glucose control and medications. Correlation coefficients were examined to ensure that highly correlated variables were not included in the same regression models to prevent colinearity. All analysis was performed with Stata Version 8.0 (College Station, Texas).

## RESULTS

Of the 65 patients identified, two refused to participate in the study, two could not be located, two had died and one was not found to have diabetes on repeat testing. Fifty-eight subjects were therefore enrolled in this study. All except one completed the Diabetes-39 at the time of their evaluation. For the sexual functioning, subscale analysis was limited to 37 participants over 16 years old at the time of interview.

The characteristics of the sample completing the Diabetes-39 are presented in Table 1. Most of the participants were female (36/57) and less than 18 years old (31/57) at the time of evaluation. The mean age of the sample was 19.0 ± 5.1 years and the mean diabetes duration was 2.7 ± 2.2 years. Most participants had Type 1 diabetes (61%) with the remainder having Type 2 diabetes (23%), untypeable diabetes (11%) and lipoatrophic diabetes (5%).

Table 1: Characteristics of the participants who completed the Diabetes-39 Questionnaire

| Variable | Mean ± SD |
|---|---|
| Age at evaluation (years) | 19.0 ± 5.1 |
| Number < 18 years old at evaluation* | 31 (54) |
| Diabetes duration (years) | 2.7 ± 2.2 |
| Number with duration < 6 months* | 12 (21) |
| Age of onset (years) | 16.4 ± 5.0 |
| Number with age of onset < 18 years* | 35 (61) |
| Female* | 36 (63) |
| Body Mass Index (kg/m$^2$) | 25.9 ± 8.3 |
| Number with normal weight* | 32 (56) |
| Number overweight/obese* | 25 (44) |
| **Diabetes Type (%)*** | |
| Type 1 | 35 (61) |
| Type 2 | 13 (23) |
| Untypeable | 6 (11) |
| Other | 3 (5) |
| Number Taking Insulin* | 52 (91) |
| Glycosylated Hemoglobin (HbA1c) | 10.2 ± 3.5 |
| Number with HbA1c < 7%* | 9 (16) |
| Diabetes control score | 35 (13 – 57)** |
| Anxiety and worry score | 41 (21 – 67)** |
| Social burden score | 16 (3 – 30)** |
| Sexual functioning score † | 0 (0 – 33)** |
| Crude total score | 30 (13–49)** |

*Number of subjects (percentage) ** Median (25$^{th}$ and 75$^{th}$ centiles)
† restricted to 37 subjects

### Validity and reliability of the Diabetes-39 in Jamaican Youth

The Cronbach Alpha for diabetes control, anxiety and worry, social burden, sexual functioning, energy and mobility subscales were 0.89, 0.71, 0.78, 0.81 and 0.77 respectively. A subset of the subjects (11) had the interview repeated within two weeks of the date the questionnaire was first administered by the same interviewer. The interclass correlation coefficients for subscales were 0.95 for social burden of diabetes, 0.91 for diabetes control, 0.89 for anxiety and worry, 0.84 for sexual functioning and 0.61 for energy and mobility. The energy and mobility subscale was excluded from further analyses because of the poor reliability. As the energy and mobility subscale was excluded, the total QOL score was therefore calculated as [(Raw Score – 24 {*Lowest Possible Scale Score*})/(168–24 {*Range for Scale Score*})] x 100. In participants who were not sexually active (with 3 fewer items) their total QOL score was calculated as [(Raw Score – 21) / (147-21)] x 100.

### Determinants of the Diabetes-39 Score

The median Diabetes-39 scores for each subscale are presented in Table 1. The population scored highest in the diabetes control and anxiety and worry subscales and lowest in the social burden and sexual functioning scales. There was a high correlation between the diabetes subscales and the total score (data not shown).

There were no statistically significant differences in the median social burden and sexual functioning subscales by gender or any of the characteristics that were examined (Table 2). None of the diabetes subscales was statistically different by diabetes type or obesity. Participants with diabetes for more than 6 months scored higher on the diabetes control subscale. Older participants, those with a duration of

Table 2: Diabetes-39 subscale scores according to patient characteristics Medians (25$^{th}$ to 75$^{th}$ percentiles) for each of the diabetes subscales.

| | Diabetes control | Anxiety and worry | Social burden | Sexual functioning* |
|---|---|---|---|---|
| **Age at evaluation** | | | | |
| < 18 years | 33 (19–49) | 25 (8–50)† | 20 (7–33) | 0 (0–38) |
| 18 and more | 38 (14–71) | 56 (38–71)† | 13 (0–30) | 0 (0–28) |
| **Gender** | | | | |
| Male | 43 (19–49) | 33 (25–50) | 17 (7–30) | 3 (0–31) |
| Female | 29 (14–62) | 42 (21–71) | 18 (0–32) | 0 (0–33) |
| **Onset age** | | | | |
| Before 18 | 29 (18–47) | 29 (13–46)† | 20 (3.3–33) | 0 (0–28) |
| 18 and over | 64 (8–78) | 71 (42–79)† | 13 (0–33) | 3 (0–50) |
| **Body Mass Index** | | | | |
| Normal weight | 38 (25–59) | 40 (19–52) | 22 (5–32) | 0 (0–33) |
| Overweight/obese | 21 (10–56) | 42 (25–71) | 13 (0–30) | 0 (0–6) |
| **Diabetes Duration** | | | | |
| Less than 6 months | 25 (11–35) ‡ | 21 (4–33)† | 7 (3–20) | 0 (0–100) |
| 6 or more months | 47 (15–64) ‡ | 45 (25–71)† | 20 (0–33) | 0 (0–22) |
| **Diabetes Type** | | | | |
| Type 1 | 46 (25–63) | 42 (17–50) | 20 (10–33) | 6 (0–33) |
| Type 2 | 21 (14–58) | 63 (21–88) | 13 (0–23) | 0 (0–50) |
| Other types | 11 (7–25) | 33 (25–50) | 0 (0–30) | 0 (0–6) |
| **Glucose Control** | | | | |
| Poor control (A1c >7%) | 35 (14–57) | 38 (21–50)† | 20 (3–33) | 0 (0–33) |
| Good control (A1c <7%) | 38 (19–58) | 75 (29–88)† | 13 (0–23) | 0 (0–33) |
| **Medications** | | | | |
| Insulin therapy | 33 (14–51) | 33 (17–50)† | 17 (3–30) | 0 (0–28) |
| No insulin | 57 (14–64) | 77 (67–88)† | 20 (0–70) | 25 (0–56) |

* Analysis restricted to 37 subjects over 16 years old who responded to the sexual functioning questions
† $p < 0.01$, ‡ $p = 0.04$

diabetes of more than 6 months, those diagnosed with diabetes after age 18 years, participants with better glucose control and those not taking insulin scored higher on the anxiety and worry subscale (Fig. 1).

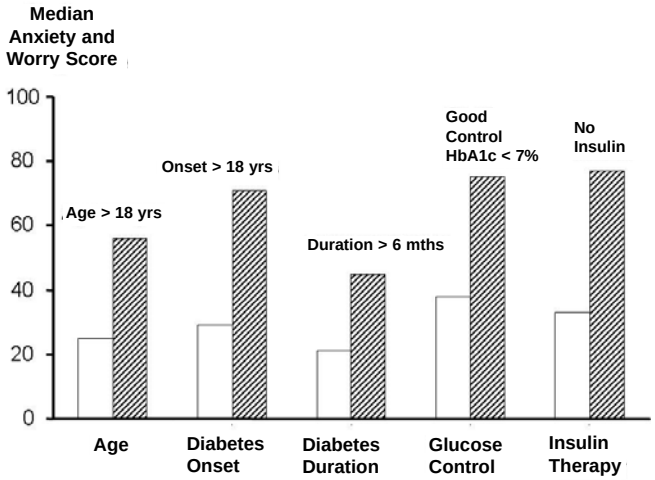


Figure: The median anxiety and worry subscale scores by patient characteristics

In order to further examine the role of the factors identified as significantly associated with anxiety and worry, regression analysis was performed. The results of this analysis are presented in Table 3. Participants' age and age at diagnosis were evaluated in separate models as they were highly correlated. In the remaining models, participants' age was entered along with each of the other characteristics (diabetes duration in years, glucose control measured by HbA1c, and current insulin use – yes or no) in separate models (Models 3–5). Diabetes duration and glucose control were no longer significant after adjusting for age. Participant age and not using insulin were found to be independently related to the anxiety and worry diabetes subscale score, even after adjusting for differences in glucose control (Model 6). Adjusting all the models for gender did not make any difference to the findings (results not shown).

## DISCUSSION

We found that anxiety and worry and diabetes control were the components of QOL most greatly affected in Jamaicans with youth onset diabetes. The impact of the other factors on QOL was low and may be related to the young age of the population and the short duration of diabetes as none of the patients had developed any of the chronic complications of diabetes.

This is one of the few studies to examine the effect of diabetes on QOL in the Caribbean. Previous studies have been conducted in older populations (6, 7) and neither of these studies utilized a diabetes specific quality of life scale.

The Diabetes-39 is not a frequently utilized QOL scale in this age group (12). Most of the QOL scales for younger populations have been designed for use in patients with Type 1 diabetes, however we wanted a tool that was not focussed on insulin use and could be applied to patients with Type 1 and Type 2 diabetes. The Diabetes-39 was found to have good face and content validity and has been validated in several studies in different populations (10). Despite the modification of a few of the questions the scale had good internal consistency with a high correlation between items within each subscale. Its repeatability for most of the subscales was also good – with the exception of the energy and mobility subscale. We did not evaluate concurrent or discriminant validity in this study due the small sample size and the demands from other aspects of the protocol visit.

Only one published study from the Caribbean and Latin America that utilized the Diabetes-39 was found (13).

Table 3: Models with regression coefficient (standard errors) for variables associated with the anxiety and worry subscale

| | Age | Onset age | Duration | Glycosylated haemoglobin | Insulin therapy |
|---|---|---|---|---|---|
| Model 1 | 2.56 (0.65)<br>$p < 0.01$ | | | | |
| Model 2 | | 2.58 (0.69)<br>$p < 0.01$ | | | |
| Model 3 | 2.63 (0.70)<br>$p < 0.01$ | | -1.43 (1.67)<br>$p = 0.40$ | | |
| Model 4 | 2.47 (0.69)<br>$p < 0.01$ | | | 0.27 (1.00)<br>$p = 0.78$ | |
| Model 5 | 2.14 (0.65)<br>$p < 0.01$ | | | | -27.0 (10.8)<br>$p = 0.01$ |
| Model 6 | 2.05 (0.68)<br>$p < 0.01$ | | | 0.71 (1.00)<br>$p = 0.56$ | -27.9 (10.9)<br>$p = 0.01$ |

Beta coefficients (Standard Error) presented for each of the variables in the models. Age, onset age, diabetes duration and glycosylated hemoglobin entered as continuous variables in the models. Insulin therapy entered as a dichotomous variable (1= on insulin, 0- not on insulin)

In this study, Lopez-Carmona evaluated QOL in 249 Mexican participants. The sample was predominantly female (63%) and consisted of older persons (5% of the sample < 40 years old) with nearly 60% of them having diabetes for more than 5 years. As was found in the present study, the median scores for each of the diabetes subscales were not very high. The population scored highest on the anxiety and worry subscale. The overall QOL scores were similar for both populations despite the differences in the characteristics of the two samples.

In another study of low income persons with diabetes in North Carolina, the Diabetes-39 was administered by telephone to an older population that was almost 50% African-American (14). Three subscales were utilized – social burden, sexual function and energy and mobility subscales. With the exception of the sexual functioning subscale, the average scores on each of these subscales were similar to those reported in this study of Jamaican youth.

No published studies utilizing the Diabetes-39 in young people were found on literature review. In studies that have examined factors associated with QOL in young people with diabetes, patient age, education, income, family support, diabetes duration, gender, glucose control, acute and chronic complications and the use of insulin have all been important determinants (5). In this study, older age, greater diabetes duration, later age of onset of diabetes, better glucose control and not using insulin were positively associated with the anxiety and worry score, however only the age of the subject and not using insulin were independently related to the anxiety and worry score. Longer duration of diabetes was also associated with greater impact of diabetes control on QOL.

In general, the reported diabetes subscale scores were in the low range suggesting that diabetes did not have a very great impact on the QOL. This may to some extent be determined by the patients' knowledge about and perception of diabetes and its complications and could explain why the diabetes control scores were higher in participants who had diabetes for more than 6 months. The demands placed on patients with diabetes may also affect the extent to which diabetes control becomes a burden and control of glucose becomes a concern for the patient. For instance, most patients with long-standing diabetes were not using glucometers to test their blood sugar levels at home and visited their healthcare provider an average of every 3 months for glucose measurement and clinical evaluation and may not have found this to have any significant impact on their QOL.

The association of increased anxiety and worry in patients who had better glucose control was unexpected but may reflect that participants who were more anxious expended a greater effort in ensuring better glucose control. Participants with better glucose control tended to be older (young adults), a finding consistent with studies of glucose control showing worsening of glycaemic control in late adolescence (15, 16). The impact of glycaemic control on anxiety and worry was no longer significant with adjustment for patient age. Anxiety and worry was more common in the older subjects and this may be related to the fact that many of the young adults with diabetes who participated in the study were marginally employed and therefore more likely to be concerned about money matters, their future and to feel more stressed. In addition, better knowledge about their medical condition may also contribute to increased anxiety and worry. It might have been expected that those subjects not on insulin would have been less anxious as tablets or diet are usually less expensive to maintain than insulin therapy. However, subjects not on insulin reported more anxiety and worry than those on insulin therapy. This was initially thought to have been due to confounding by age as participants with Type 2 diabetes tended to be both older and treated without insulin, however adjustment for age did not significantly attenuate the effect of treatment on the anxiety score. These relationships will also need exploration in future studies.

This study sample may not be representative of all patients with youth onset diabetes in Jamaica as only patients from tertiary referral hospitals in Kingston who lived within a certain geographic radius of the Tropical Medicine Research Institute were recruited. In addition, patients were identified using hospital admissions data during the study period so those not ill enough for admission or who had been admitted to private institutions might not have been identified. From clinical experience, most young persons with newly diagnosed Type 1 diabetes are hospitalised within weeks of diagnosis. We may however have missed some patients with Type 2 diabetes who could have had treatment initiated as outpatients. At both hospitals' outpatient clinics, visits were not coded and therefore we were not able to use this as a means of identifying eligible patients who may have been initially hospitalised elsewhere or were never hospitalised at diagnosis. Additionally, as one of the aims of the study was to evaluate clinical and laboratory characteristics at diagnosis, hospitalized patients were more likely to have this information available for review.

Currently there is no data available on the incidence of youth onset diabetes in Jamaica. A national survey of 2012 persons in Jamaica conducted in 2001 did not identify any patients with diabetes in the 15–24 year old age group (Personal Communication, Jamaica Healthy Lifestyle Survey 2000). More recent studies conducted in the last two years have also demonstrated a low prevalence of diabetes in the 18–20-year age group (Personal communication, Cardiovascular Risk, Asthma and Bone Mineral Density Study) and in a nationally representative sample of 1318, 15–19-year olds (Jamaica Youth Risk and Resiliency Study) 0.25% and 2% respectively.

In summary, issues related to diabetes control, and anxiety and worry had the highest impact on QOL in this sample. Anxiety and worry increased with older age of onset of diabetes, older age at the time of evaluation and in participants not using insulin. Further studies to understand

the reasons for the impact of anxiety and worry on QOL and interventions to address its impact in young diabetic patients are warranted.

**Competing Interests**

Both authors have expressed no competing interests that may have affected the writing of the manuscript.

**Authors Contributions**

MTR has coordinated the research, collected and analysed the data and drafted the manuscript. SW participated in the design of the study, interpreting the results and helped to draft the manuscript.

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