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Assessment of Self-care Knowledge on Diabetes and Long-term Complications among Type 2 Diabetes Patients in Guyana

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Authors' contributions

This work was carried out in collaboration among all authors. Author CB designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors CB and RK performed the statistical analysis and managed the overall analyses of the study. Authors CB, EC, AO and SH managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: The aim of this study was to assess the relationship between the level of knowledge regarding self-care and awareness as well as long-term complications among type 2 diabetic patients in Guyana.
Methods: A cross-sectional study was conducted at the Georgetown Public Hospital Corporation and West Demerara Regional Hospital Guyana during the period September 2020 and December 2020.
Results: A total of 200 patients with type 2 diabetes mellitus who met the inclusion criteria were recruited via advertisement and telephone interviews. The data revealed about 66.5% of participants were deemed to have good knowledge with men accounting for the majority. Diabetic foot and hypertension were commonly seen among participants with complications. Significant

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association was noted with barrier level of patients with the level of education (p=0.001), ethnicity (0.006) and insurance plan (0.03). Adherence to self-care showed statistically significant association with patient's level of education (p<0.0001), marital status (0.02), employment status (p<0.0001), insurance plan (0.01) and persons living with multiple persons in the household (p<0.0001). Statistically, significant association was also noted among patient's self-health feeling with level of education (0.004), employment status (p<0.0001), insurance plan (0.01) and persons living with multiple persons in the household (p<0.0001). There was no statistical difference between the hospital clinics neither between the groups of participants.

Conclusion: In conclusion, the study highlighted gaps in the knowledge of the disease and patient care. Therefore, efforts should be made to enhance patient care by scheduling regular educational sessions and having services such as counselling available to patients.

1. INTRODUCTION

The prevalence of chronic non-communicable diseases such as type 2 diabetes mellitus (T2DM) is on the rise globally more than any other disease [1,2]. Diabetes Mellitus (DM) if unmanaged leads to a substantial cost in terms of maintaining quality of life and demand on health budgets [3]. Almost 10% (USD 760 billion) of global budgets goes towards the diagnosis, treatment and caring of diabetic patients so they can enjoy a better quality of health [4]. T2DM also known as adult-onset diabetes, was believed to only affect adults, but more recently, it has been reported among children and adolescents with all races being affected [5,6]. The International Diabetes Federation (IDF) estimates that by the year 2045 the global numbers for diabetes would reach 700 million persons if effective and efficient control and management strategies are not put in place soon [4].

T2DM is also one of the major causes of developing long-term complications [7]. At the macro-vascular level, the complications include ischemic heart disease, cerebrovascular disease and peripheral vascular disease, which often lead to morbidity and mortality [8,9]. At the microvascular level, the complications include vision impairment, kidney disease and neuronal damage, chronic kidney disease and lower limb amputations [9-11]. In 2014, 8.5% of adults aged 18 years and older had diabetes. In 2016, diabetes was the direct cause of 1.6 million deaths and in 2012 high blood glucose was the cause of another 2.2 million deaths [12]. Specifically, in high-income countries the premature mortality rate due to diabetes decreased from 2000 to 2010 but then increased in 2010-2016 [12]. In contrast, in lower-middle-income countries, the premature mortality rate

due to diabetes increased across both periods [12]. In developing countries, it is projected to be severely affected by an increase in prevalence of T2DM because of genetic predisposition and environmental factors [13]. At the time of diagnosis of diabetes 1 in 10 persons would have nephropathy and neuropathy and 1 in 20 would have retinopathy. Another study revealed diabetes risk allele in genetic predisposition score with a 3% increased risk of CVD [14]. It is worth noting and it is also a fact that Diabetes is a major cause of death and disability in the Caribbean [13] and Africa and Asia are said to share similar projections [15].

Within Guyana, more people died from complications resulting from T2DM compared to other diseases. For instance, from 2000 to 2004, 19,411 people died in Guyana and they included 1,487 diabetic patients with T2DM representing 16% of the deaths with equal number of males and females [16]. Globally, it is estimated that 70% of patients with T2DM aged ≥65 die from cardiovascular diseases (CVDs) [17] due in part to poor adherence [18] and the blood pressure in many patients with diabetes is only lowered when the systolic level is ≥160 mmHg, although the guideline target is ≤ 129 mmHg [18].

While self-care seems to be the perpetual next steps in diabetes management many patients are often given the responsibility to manage the disease on their own without the necessary tools to do so. Nevertheless, Once the behaviors are undertaken successfully research has positively correlated that complications can be reduced with quality of life being improved. Therefore, effective diabetes management through self-care requires sustainable healthier lifestyles changes [19]. Having good knowledge is not only predictor of effective knowledge but will help manage and reduce complications. Almost two-third of health-

related quality of life could be explained by health literacy and self-care behaviors [20]. This must be coupled with good attitudes and practices. A study found that the majority of their participants had good knowledge and attitudes but poor practices. Therefore, educational programs must be three dimensional in the way they are delivered [21]. Knowledge on self-care and monitoring plays a vital role in the management of T2DM. This study aims to assess the level of knowledge, awareness and perception about T2DM self-care among T2DM patients and use this information to determine whether the frequency of T2DM related complications can be influenced by the metabolic disorder.

2. MATERIALS AND METHODS

2.1 Description of the Subjects

This study was conducted at Georgetown Public Hospital Corporation (GPHC), an urban setting and the West Demerara Regional Hospital (WDRH), a rural setting in Guyana. A total of 200 patients with T2DM who met the following inclusion criteria were recruited via advertisement and telephone interviews (a) 18 years or older (b) Diagnosed with T2DM and (c) can understand English language. The study was advertised within the outpatient Diabetics clinics at each hospital. The advertisement was displayed on the notice boards and also provided to patients attending the clinic. Participants made initial contact with the attending nurse to participate in the study. The staff further explained the prospective participants the details about the study through the participant information sheet (PIS) which was also provided to the prospective participant.

2.2 Study Design

The research was conducted using a standard questionnaire to collect qualitative data. The only data collected were demographic and the diabetes awareness data. The questionnaire was developed, modified and validated at the University of Michigan Diabetes Research Centre (http://diabetesresearch.med.umich.edu/Tools_SurveyInstruments.php). The questionnaire contained structured questions, which allow for the easy assessment of a patient's T2DM self-care related knowledge. All interviews were completed remotely via telephone interviews.

2.3 Variables

The independent variable in this study was the level of knowledge of T2DM- self-care and the dependent variable was the occurrence of complications.

2.4 Data Analysis

All statistical analysis was done using the Statistical Package for Social Sciences (SPSS 24). The data collected was tallied according to the two assigned groups: control and experiment. Descriptive statistics (frequency) was used to summarize patients' socio-demographic data and evaluate distribution of responses. Chi-square was used to investigate association between predictors (factors) and knowledge level. Wilcoxon-Mann- Whitney and Kruskal-Wallis tests were performed appropriately to identify any association between patient characteristics and knowledge level. Statistical significance for all analyses was defined as a p value less than 0.05.

3. RESULTS AND DISCUSSION

A total of 200 participants with T2DM were enrolled into this study after giving informed consent. Of those 200 participants, 59.5% (119) were males, and 40.5% (81) were females.

3.1 Georgetown Public Hospital Corporation (GPHC)

A total of 100 T2DM patients from the Diabetic Foot Clinic (DFC) participated in the study, which included 50 controls without complications and 50 with complications, either macro-vascular or microvascular. Total of 52 (43.7%) males and 48 (59.3%) females consented to participate. The mean (±SD) age was 58.7 ± 9.3 with a minimum age of 36 and maximum age of 80. Only 29% of participants would have graduated high/secondary school, however a vast majority received some form of primary (35%) or high/secondary (35%) education with only 1% graduating college/university. More than half (56%) of the study population were married, and majority (50%) were Indo-Guyanese ethnicity. Only 12% were employed on a full-time basis, although majority was either unemployed (37%) or retired (35%) and small number of participants were disabled (8%) or worked part time (8%). Majority of participants lived in household with 3 or more persons whereas only 9% lived alone. Majority of the participants (98%) didn't have any form of insurance.
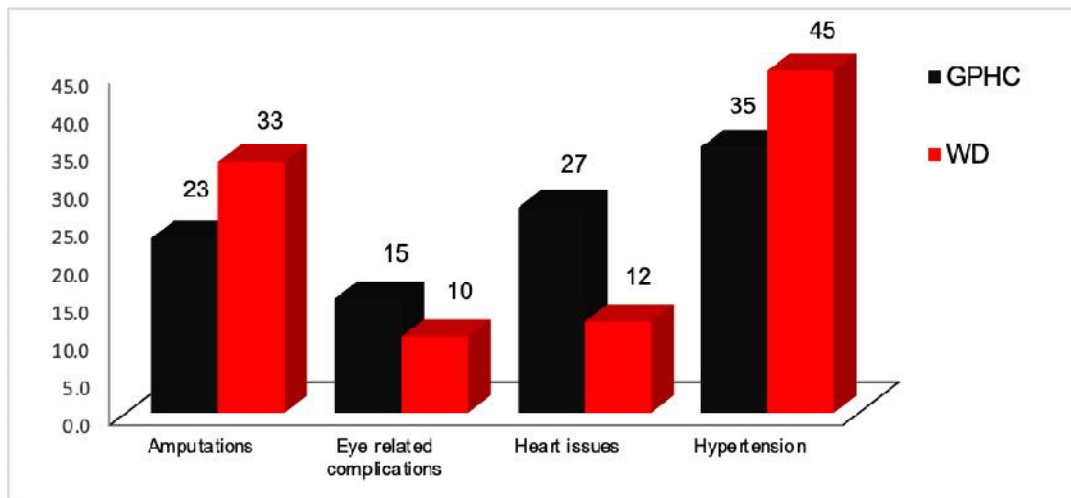
Fig. 1. Graphical presentation showing patient's response to different complications

The mean ± SD years for the duration of T2DM among study participants from this hospital was 2.3±0.7. When asked about the difficulty of having T2DM, 51% of participants reported having high difficulty with a mean ± SD of 7.6±2.1 (min- 3.0, max- 12.0). About 30.5% and 15.8% claimed to have the inability to earn more finances and to conduct household chores due to having T2DM respectively, though 25% would have seen a reduction in the ability to do physical activity.

3.1.1 Health status and understanding

Majority of participants would test their blood sugar concentration weekly and multiple times per day with only 46.6% recording the results on 9.1% only recording unusual results. Only 50% of participants considered themselves to have good health whilst only 15% and 2% considered very good and excellent, respectively. However, 30% stated fair health whereas 3% stated poor health. However, only 58.2% knew what HbA1c represents. Most participants (37.8%) stated that they need help handling their feelings about T2DM. It should also be noted that 82% stated that they need help taking special care of their feet, 92% exercise program and meal planning.

3.1.2 Complications

A large majority (99%) of respondents stated that they had never received any T2DM special education. However, 82% claimed that they were told the importance of taking care their feet and 92% were encouraged to have a meal plan and exercise regularly. Nevertheless, in regard to

exercise, 27% were having difficulties due to several reasons which included feeling pain. About 23% and 22% of participants reported having experienced low blood sugar 1-3 times and 4-6 times respectively, since being diagnosed with T2DM while 24% would have experienced severe low blood sugar 1-3 times since being diagnosed within the last month. The data revealed that 47% would have experienced high blood sugar. In this study, the proportion of complication of DM commonly known by T2DM patients at the GPHC clinic were amputation (23.0%), eye related complications (15.0%), heart issues (27.0%) and Hypertension (35.0%) Fig. 1.

3.2 West Demerara Regional Hospital (WDRH)

The sample consisted of 67% males and 33% females with majority 60% being Indo-Guyanese and 34% Indo-Guyanese whilst a mere 6% were of mix decent. The mean age was 57.7±9.1 (min-39.0, max- 81.0) and duration of having T2DM was 2.1±0.7 (min- 1.0, max- 3.0). Only 2% of the study population at WDRH were college/ university graduates and over half (53%) of the population were married and a large proportion was either unemployed (34%) or retired (38%). Similar trends were found at GPHC. Additionally, almost all (99%) of the respondents did not have any form of insurance and lived with 3 or more persons (75%). A total 55% stated that their life has become difficult since being diagnosed with T2DM. Majority complained of diminished ability to be active (30.2%) and decreased finances (27.1%).

Table 1. Relationship between socio-demographic characteristics and barriers to diabetes care

Socio demographic of the participants and barriers to diabetes care			
Variables	**High**	**Median**	**p-value**
Gender	**n (%)**	**(Min-Max)**	
Male	68 (57.1)	20 (14-25)	0.2
Female	38 (46.9)	20 (15-25)	
Educational level			
Primary school	22 (33.9)	20 (15-23)	0.001*
High school	44 (57.9)	20 (14-20)	
High school graduate	37 (66.1)	17 (19.5-25)	
College or technical school	-	-	
College graduate	3 (100)	22 (22-22)	
Graduate degree	-		
Ethnicity			
Afro-Guyanese	35 (44.3)	20 (17-25)	0.006*
Indo-Guyanese	61 (55.5)	20 (14-25)	
Chinese	-	-	
Portuguese	-	-	
European	-	-	
Amerindian	-	-	
Mix	10 (90.9)	20 (17-22)	
Marital Status			
Never married	24 (60.0)	20 (18-25)	0.4
Married	60 (55.1)	19 (14-25)	
Separated/Divorced	15 (41.7)	20 (15-25)	
Widowed	7 (46.7)	19 (18-23)	
Employment status			
Full time (>35 hrs/week)	16 (57.1)	19 (18-22)	0.4
Part time (<35 hrs/week)	8 (53.3)	20 (18-20)	
Unemployed	42 (59.2)	20 (17-25)	
Retired	32 (43.8)	19 (14-20)	
Disabled	8 (61.5)	19 (19-19)	
Insurance Plan			
Individual plan	0	-	0.03*
Group plan	-	-	
No plan	106 (53.8)	20 (14-25)	
Persons staying with			
Alone	7 (36.8)	22 (18-25)	0.2
1 person	7 (70.0)	20 (19-20)	
2 people	8 (42.1)	20 (14-20)	
3 people	35 (50.0)	19 (17-25)	
4 people	26 (53.1)	19 (18-20)	
>5 people	23 (69.7)	20 (17-23)	

*Significant

3.2.1 Health status and understanding

About 49% of respondents considered themselves to have good health, only 16% described their health status as very good and 2% stated being excellent. About 87% regularly test their blood sugar concentration but only 40% would record the results while 7% only record unusual results. Similar to the respondents at GPHC, 37% of respondents at WDRH stated they needed help in handling their feelings.

Participants stated that they need help in feet care (87%), exercise program (95%) and meal planning (95%).

3.2.2 Complications

None of the respondents stated that they would have received any diabetes education. However, a majority stated they received information on feet care (87%), exercise (95%) and meal plan (95%). Nevertheless, 37% suffered from low

blood sugar, 29% severe low blood sugar and 36% high blood sugar since being diagnose at least 1-6 times within the last month. In this study, the proportion of complication of DM commonly known by T2DM patients at the GPHC clinic were amputations (33.0%), hypertension (45.0%), eye related issues (10.0%) and heart disease (12.0%) (Fig. 1).

Table 2. Relationship between socio-demographic characteristics and adherence to self-care

Socio demographic of the participant's adherence to self-care/Understanding			
Variables	Good Knowledge (133)	Median	p-value
Gender	n (%)	(Min-Max)	
Male	80 (67.2)	66.7 (43.6-79.5)	
Female	53 (65.4)	66.7 (43.6-79.5)	0.8
Educational level			
Primary school	20 (30.7)	58.9 (43.6-66.7)	0.000*
High school	60 (78.9)	66.7 (43.6-66.7)	
High school graduate	50 (89.3)	66.7 (46.2-79.5)	
College or technical school	-	-	
College graduate	3 (100)	61.5 (61.5-61.5)	
Graduate degree	-	-	
Ethnicity			
Afro-Guyanese	55 (69.6)	66.7 (43.6-66.7)	0.3
Indo-Guyanese	69 (62.7)	64.1 (43.6-74.5)	
Chinese	-		
Portuguese	-		
European	-		
Amerindian	-		
Mix	9 (81.8)	61.5 (43.6-66.7)	
Marital Status			
Never married	34 (85.0)	66.7 (56.4-79.5)	0.02*
Married	66 (60.5)	64.1 (43.6-79.5)	
Separated/Divorced	21 (58.3)	61.5 (48.7-66.7)	
Widowed	12 (80.0)	66.7 (51.3-66.7)	
Employment status			
Full time (>35 hrs/week)	28 (100.0)	66.7 (61.5-66.7)	0.000*
Part time (<35 hrs/week)	15 (100.0)	66.7 (66.7-66.7)	
Unemployed	31 (43.7)	58.9 (43.6-79.5)	
Retired	48 (65.8)	61.5 (43.6-66.7)	
Disabled	11 (84.6)	66.7 (53.9-66.7)	
Insurance Plan			
Individual plan	0	46.2 (46.2-46.2)	0.01*
Group plan	-	-	
No plan	133 (66.5)	66.7 (43.6-79.5)	
Persons staying with			
Alone	18 (94.7)	66.7 (56.4-66.7)	0.000*
1 person	7 (70.0)	61.5 (43.6-61.5)	
2 people	5 (26.3)	58.9 (48.7-61.5)	
3 people	51 (72.9)	66.7 (43.6-79.5)	
4 people	38 (77.6)	66.7 (51.3-66.7)	
>5 people	14 (42.4)	58.9 (48.7-66.7)	

Significant

Table 3. Relationship between Socio-demographic characteristics and self-health and feelings

Socio demographic of the participants health and feelings		
Variables	**Good (71)**	**p value**
Gender	**n (%)**	
Male	37 (31.1)	
Female	34 (42.0)	0.1
Educational level		
Primary school	17 (26.2)	0.004*
High school	24 (31.6)	
High school graduate	30 (53.6)	
College or technical school	-	
College graduate	0	
Graduate degree	-	
Ethnicity		
Afro-Guyanese	31 (39.2)	0.7
Indo-Guyanese	36 (32.7)	
Chinese	-	
Portuguese	-	
European	-	
Amerindian	-	
Mix	4 (36.4)	
Marital Status		
Never married	13 (32.5)	0.2
Married	39 (35.8)	
Separated/Divorced	10 (27.8)	
Widowed	9 (60.0)	
Employment status		
Full time (>35 hrs/week)	9 (32.1)	0.000*
Part time (<35 hrs/week)	3 (20.0)	
Unemployed	42 (59.2)	
Retired	13 (17.8)	
Disabled	4 (30.8)	
Insurance Plan		
Individual plan	3 (100.0)	0.01*
Group plan	-	
No plan	68 (34.5)	
Persons staying with		
Alone	9 (47.4)	0.000*
1 person	0	
2 people	3 (15.8)	
3 people	31 (44.3)	
4 people	10 (20.4)	
>5 people	18 (54.6)	

Significant

3.3 General Knowledge Level of Overall Respondents

The general performance of the study population shows patients knowledge on the adherence to self-care, self-health feeling and barrier levels adherence to self-care (Tables 1-3). Although the general performance of respondents on the knowledge questions was high, the highest scores were obtained for items of (adherence to self-care practices) while the least scores were reported for items of self-health feelings. However, there is no statistical difference among patients between the two hospitals neither is there any statistical difference between the control or test groups.

Significant association was noted with barrier level of patients with the level of education (p=0.001), ethnicity (0.006) and insurance plan (0.03). Adherence to self-care showed a statistical significance association with patient's

level of education (p<0.0001), marital status (0.02), employment status (p<0.0001), insurance plan (0.01) and persons stay (p<0.0001). Statistically, significant association was noted among patient's self-health feeling with level of education (0.004), employment status (p<0.0001), insurance plan (0.01) and persons stay (p<0.0001).

4. DISCUSSION

Scientific knowledge concerning DM is an important and significant tool that should be used to educate persons with DM about self-care which would include adherence to diet and exercise, blood glucose monitoring and taking medication [22]. Self-care is important for the prognosis and proper glycaemic control in T2DM patients [23].

According to Nordstrom and colleagues the prevalence of T2DM was higher in men as compared to women which was associated with differences in visceral fat mass [24].

The importance of self-care practices, education and improved clinical care have been seen as the corner stone of improved quality of life among T2DM patients [25-30]. DM education is also essential in improving patients' attitudes, lifestyle changes and adequate therapy adhesion [31]. The sample population revealed that there was good knowledge among 66.5% of the study population with males accounting for the majority. This is still cause for concern since 33.5% is in need for improve knowledge about T2DM and self-care. It should be noted that the data revealed that almost all participants never received or attended any formal education programme about DM. Educational level has long played a role in the disease knowledge [32,33]. The incorporation of patient education and information sharing within public health policies are key in the primary and secondary prevention of DM [34]. A study done in Chennai, India concluded that higher the age, socio-economic status and level of education the higher the knowledge of DM [35]. A cross sectional study done in Brazil also found that knowledge correlate with the level of education (p=0.002) [36]. Additionally, it was also found that low education may influence low health literacy performance [37]. These finding are noteworthy since an established statistical correlation between knowledge and level of education. However, in the current sample majority of the population had some form of

primary or high/secondary schooling with fewer graduating high/secondary school and even fewer with any form of college/university education it might be prudent to say that factors such as motivation, coping and acceptance of the disease which were not investigated, could have influence such findings.

Complications of diabetes are linked to increase morbidity, mortality and higher health care cost [38]. Participants were knowledgeable of the following complications of DM: eye problems, kidney problems, foot problems, hardening of arteries and heart disease. Similar findings were seen in a study done in Pakistan [39]. Within this study a considerable portion of the study population suffered from diabetic foot and hypertension which showed no correlation to the level of knowledge of DM among the study population. A study conducted by Hoque, et al., found that heart disease was most prevalent (48.9%) followed by cerebrovascular disease (15.2%) and renal disease (13%) and to a lesser extent hypertension (5.4%) and eye disease (4.9%) [40]. Another study showed diabetic foot and hypertension were the most common [41]. Several studies also report diabetic foot and hypertension as common complications [42-44].

Lack of job, financial burden, lack of healthy food, limited access to health care facility all could act as a barrier in self-care and manage diabetes. Since people with diabetes require frequent monitoring and care to prevent any diabetes related complications [45].

Several issues need to be addressed in order to close the gaps that exist between knowledge and self-care practices among the T2DM population. This study would have highlighted key deficiencies within DM education and information sharing at both clinics. However, since more than 2/3 of the sample population had good knowledge that must now be translated into good practices with adequate and sufficient support from health care providers and family. This would require training of diabetes educators in diabetes management which should include counselling, nutrition and diet and other important areas. A holistic approach would serve to improve person's perception about the disease, diet and influence positive lifestyle changes that will ultimately have an impact on glycaemic control and reduce potential of developing complications.

5. CONCLUSION

T2DM can have a negative impact on patients and associated complications. This study showed high knowledge and associating self-care among 2/3 of the population, majority of those being males. It should also be noted that there is still a considerable number of participants who lack the requisite knowledge, and this will therefore negatively impact self-care. The lack of nutritionist and other specialized diabetes care education sessions focusing on diabetes self-care, diabetes management, diet and exercise and measures to prevent diabetes complications is needed in order to manage DM efficiently and therefore delay the development of complications all while lending to improving the quality of life and productivity with decreased cost of living. Diabetes self-efficacy theory enhancing interventions could emphasize in changing people's behaviors and practices towards self-care.

ETHICAL APPROVAL AND CONSENT

Before the questionnaire was answered, each respondent was required to give written consent over email. It was also conveyed to the respondents that their participation was entirely voluntary and if they wish to withdraw consent, they were free to do so within 7 days of signing the consent form.

The project obtained ethical approval from the Ethical Review Board in the Public Health Ministry in Guyana (formerly known as the Ministry of Health). Additionally, ethical approval was granted from the University of Central Lancashire.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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