Wound care knowledge, attitudes and practice among people with and without diabetes presenting with foot ulcers in Guyana

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Citation: Kurup R, Ansari AA, Singh J, Raja AV (2019) Wound care knowledge, attitudes and practice among people with and without diabetes presenting with foot ulcers in Guyana. *The Diabetic Foot Journal* 22(3): 24–31

Article points

1. Knowledge, attitudes and practice (KAP) impact foot health in people with diabetes.
2. KAP was assessed in people wtih and without diabetes who had a foot ulcer.
3. People with diabetes had better knowledge and attitudes but poorer self-care practices than people without diabetes.

Key words

- Attitude
- Diabetic and non-diabetic foot
- Guyana
- Knowledge
- Practice

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This study explored knowledge, attitudes and practice (KAP) among foot ulcer patients with and without diabetes who sought treatment at Georgetown Hospital in Guyana. In a cross-sectional study, conducted from November 2016 to February 2017, 130 patients completed questionnaires gauging their levels of KAP and barriers from undertaking effective foot care. Multivariate linear regression was used to examine the association between diabetes-related KAP and other covariates. Participants' were aged 55.5±16.0 years with a mean basal metabolic index of 28.8±4.3. A higher percentage of participants with diabetes were unemployed (*P*=0.02) and participants without diabetes were more likely to have received tertiary education. Knowledge and attitude scores were better in participants with diabetes. The time of foot ulcer onset, ulcer site, practice score, previous ulceration, amputation and peripheral arterial disease significantly contributed to a patient's diabetic status. The overall level of knowledge and attitude about wound care was better among the diabetic than the nondiabetic population, but the overall level of self-care practice was poor among those with diabetes.

Diabetes is a major metabolic disorder and a silent killer, with a high prevalence world wide (Forouhi and Wareham, 2014). It impacts 450 million people worldwide, or 8.8% of adults aged 20–79 years, and it is estimated that about 79% live in low- and middle-income countries (International Diabetes Federation [IDF], 2017). The increasing incidence of diabetes is reflected in the significant rise in associated complications, such as retinopathy, renal impairment, macrovascular complications including heart failure, and lower-limb amputations (World Health Organization, 2016). Mortality in people with diabetes is twice that of non-diabetics as a result of diabetes-related complications (Centers for Disease Control and Prevention, 2011).

Diabetic foot (DF) is the most common complication. It is severe and very costly to manage. Amputation is 10–20 times more common in people with diabetes. It is estimated that every 30 seconds, a lower limb or part of a lower limb is lost as a consequence of diabetes (International Diabetes Federation [IDF] and International Working Group on the Diabetic Foot, 2005; World Health Organization, 2016). In the United States alone, lower-extremity amputations (LEAs) comprise over 60% of non-traumatic amputations (Neder and Nadash, 2003). DF, therefore, confers a heavy economic, social and public health burden and has a huge impact on low-income communities. DF and LEAs have serious psychosocial, physical, functional and financial implications for the individual, his/her family members and caretakers (Scollan-Koliopoulos, 2004).

The global prevalence of diabetic foot complications (DFC) varies between 3% in Oceania and 13% in North America, with a global average of 6.4%; it is estimated that 9.1 million–26.1 million people develop DFCs each year (IDF, 2017; Zhang et al, 2017). DFCs, which more often affect older adults, can reduce a person's quality of life (Matricciani and Jones, 2015); however, self-management and lifestyle behaviour changes including physical activity,

dietary modification, blood glucose monitoring and adherence to medication improve quality of life among DF patients (Grady et al, 2011; Smalls et al, 2012). Complications can be prevented or reduced through the implementation of comprehensive foot care programmes that include professional treatment, foot self-care and properly fitting shoes (Matricciani and Jones, 2015). Reductions in hospitalisations and amputations can be achieved through regular lower limb screening and treatment protocols for the at-risk foot within healthcare facilities (Neder and Nadash, 2003; Lavery et al, 2006).

Diabetic foot health in Guyana

Guyana is an English-speaking country on the northern coast of South America bordering Suriname, Venezuela and the North Atlantic Ocean. It is situated near the equator and has a tropical climate; the Amazon rainforest spans the south of the country. Guyana is culturally and economically tied to the Caribbean nations and is classified as a Caribbean country (IDF, 2017). It is also the third poorest country in South America and frequently loses healthcare expertise due to emigration (World Bank, 2014; 2018). Low-income countries such as Guyana, which has a multiethnic population, could face the greatest difficulties due to DFCs (Kurup et al, 2018).

In the Caribbean, DFCs affect 10.9% of the whole population but almost 20% of the general adult population (Barcelo and Rajpathak, 2001; Solomon et al, 2008). They account for the majority of surgical bed occupancy: 75% in Barbados and 29% in Trinidad and Tobago (Walrond, 2001; Gulliford and Mahabir, 1998). Guyana has high rates of amputation related to DFCs, although the epidemiology is unknown. Until 2008, DFCs were the most common diagnosis on admission to Guyana's public hospital, with 42% of cases resulting in a LEA (Ostrow et al, 2007; Newark et al, 2008; Sibbald et al, 2008).

The purpose of this research was to determine wound care knowledge, attitude and practice (KAP) among patients with and without diabetes presenting at the out-patient clinic at Georgetown Hospital in Guyana, South America.

Table 1. Sociodemographic status of the study population.

Parameter	Non-diabetic foot, number (%)	Diabetic foot, number (%)	*P*-value
Gender:			0.50
Male	28 (46.7)	37 (52.9)	
Female	32 (53.3)	33 (47.1)	
Ethnicity:			0.51
Indo-Gyanese	27 (45.0)	34 (48.6)	
Afro-Gyanese	30 (50.0%)	34 (48.6)	
Amerindian	3 (5.0)	1 (1.4)	
Mixed	0 (0.0)	1 (1.4)	
Education:			0.002*
Primary	25 (41.7)	27 (38.6)	
Secondary	25 (41.7)	28 (40.0)	
Tertiary	10 (16.7)	3 (4.3)	
Illiterate	0 (0.0)	12 (17.1)	
Marital status:			0.002*
Single	16 (26.7)	6 (8.6)	
Married	29 (48.3)	31 (44.3)	
Separated	0 (0.0)	6 (8.6)	
Divorced	15 (25.0)	21 (30.0)	
Widowed	0 (0.0)	6 (8.6)	
Occupation:			0.02
Employed	28 (46.7)	19 (27.1)	
Unemployed	32 (53.3)	51 (72.9)	
Income:			0.003*
≤50,000	24 (40.0)	49 (70.0)	
50,000–100,000	35 (58.3)	20 (28.6)	
≥100,000	1 (1.7)	1 (1.4)	
Affected leg:			0.035
Left	25 (41.7)	38 (54.3)	
Right	35 (58.3)	28 (40.0)	
Both	0 (0.0)	4 (5.7)	
Severity of ulcer:			0.002*
Mild	48 (80.0)	36 (51.4)	
Moderate	12 (20.0)	28 (40.0)	
Severe	0 (0.0)	4 (5.7)	
Ulcer site:			0.00*
Toe	13 (21.7)	41 (58.6)	
Metatarsal/plantar	32 (53.3)	32 (45.7)	
Heel	15 (25.0)	2 (2.9)	
Precious ulcer:			0.00*
Present	36 (60.0)	12 (17.1)	
Absent	24 (40.0)	58 (82.9)	

*Significant difference

Methods

A survey was conducted from November 2016 to February 2017. It included patients presenting at the only tertiary facility in Georgetown, Guyana, and two community health centres under the tertiary hospital. All patients with foot ulceration attending

Table 2. Risk factors in people with and without diabetes.

Risk factors	Non-diabetic foot, number (%)	Diabetic foot, number (%)	*P*-value
Modifiable:			
Smoking	13 (21.7)	27 (38.6)	0.03
Alcohol use	33 (55.0)	42 (60.0)	0.50
Dyslipidaemia	24 (40.0)	28 (40.0)	1.00
Hypertension	25 (41.7)	32 (45.7)	0.64
Lack of regular exercise	22 (36.7)	47 (67.1)	0.0001*
Macrovascular:			
Peripheral vascular disease	16 (26.7)	34 (48.6)	0.01
Coronary artery disease	9 (15.0)	24 (34.3)	0.01
Microvascular:			
Retinopathy	0 (0.0)	10 (14.3)	0.000*
Nephropathy	10 (16.7)	22 (31.4)	0.03
Other:			
Recurrent ulceration	2	19.0	0.000*
Foot deformity	0	7.0	0.01
No annual eye checkups	30 (50.0)	50 (71.4)	0.03
Family history	50 (71.4)	38 (63.3)	0.32
Health education	29 (48.3)	42 (60.0)	0.18
Severity of diabetic foot infection			0.001*
Mild	13 (21.7)	41 (58.6)	
Moderate	32 (53.3)	12 (17.1)	
Severe	15 (25.0)	17 (24.3)	
Amputation	10 (16.7)	31 (44.4)	0.001*
Ulcer site:			0.00*
Toe	13 (21.7)	41 (58.6)	
Metatarsal/plantar	32 (53.3)	32 (45.7)	
Heel	15 (25.0)	2 (2.9)	

*Significant difference

the diabetic foot outpatient clinic or the wound dressing clinic during the study period were included if they had diabetes, were over 18 years, were new patients, were willing to participate and were available during the data collection period. Patients were excluded if they had gestational diabetes, were younger than 18 years, were inpatients, had physical and mental illness, were existing patients or did not answer all of the whole questionnaire. A non-probability purposive sampling technique was used. A diabetic foot ulcer was defined as an open wound or sore on the skin of diabetes patients that was slow to heal. A non-diabetic foot ulcer was defined as an open wound or sore on the skin of patients who did not have diabetes.

Participants were interviewed by a healthcare professional, who helped patients fill in the questionnaire. At the end of the interview, each questionnaire was verified and checked for any missing information. Information relevant to sociodemographic status and health issues was also compared with patient record books.

This study was approved by the Institutional Review Board of the Ministry of Public Health, Guyana and University of Guyana. Participants were informed about the study and their right to withdraw at any stage. Written informed consent was obtained from all patients before participation. All patient information was kept confidential.

Questionnaire

A questionnaire focusing on local sociocultural context was designed with input from experts working in relevant fields. A modified version of the Nottingham Assessment of Functional Footcare was used to assess foot care practices (Lincolin et al, 2007). The questionnaire was kept as simple as possible to aid its application in practice. A pilot test was performed to check the questions were clear and consistent and to determine the maximum time taken to answer by each question.

The questionnaire had five sections:

- Sociodemographic information (including medical history)
- Knowledge assessment, where knowledge was either awareness or understanding of the DF — 10 items (10 points maximum)
- Attitude assessment, where attitude was defined as a patient's approach, thinking or behaviour towards items related to the DF — five items (five points maximum)
- Practice assessment, which asked about patients' foot care practices — 10 items; two items had a Likert scale, with both scoring two points each maximum (14 points maximum)
- Barriers to care — 8 items (8 points maximum).

Sections had a minimum score of zero. For knowledge, attitude and practice (KAP), correct answers scored one and incorrect answers zero. Mean scores were used to allocate each patient into a group: good or poor. Patients who scored above the mean were considered to have good

KAP and those with a score below the mean were considered to have poor KAP. The same applied to the independent components of KAP.

Statistical analysis

Data from completed questionnaires were entered into Microsoft Excel and exported to SPSS version 23.0 for statistical analysis. Patients' sociodemographic and medical characteristics were represented using descriptive statistics. All continuous data were expressed as mean ± standard deviation, and categorical variables were expressed as numbers and percentages. Unpaired heteroscedastic *t*-tests were performed to compare mean knowledge and attitude scores, practice patterns and barriers preventing them from following the practices. *T*-test and one-way analysis of variance (ANOVA) were used to compare scores with practice patterns. Linear regression was performed on mean scores to identify possible predictors from among the variables in each group. All associations were considered significant at $\alpha>0.05$. The 95% confidence interval (CI) was calculated wherever appropriate.

Results

A total of 170 patients who attended the various clinics were assessed for inclusion in this study. Information was collected from 130 patients (76.5%) who met the inclusion criteria.

Sociodemographic status

Table 1 shows the sociodemographic status of the study populations. Participants' mean age was 55.5±16.04 years (95% CI 52.7–58.3). A larger proportion of the diabetes group was male (52.9% *versus* 46.7%; $\alpha=0.5$, $P=0.5$). The majority of patients were Afro-Guyanese or Indo-Guyanese. There was no difference in the ethnic make-up of the groups. There was, however, a significant between-group difference in marital status and education ($\alpha=16.9$, $P=0.002$ and $\alpha=15.3$, $P=0.002$, respectively). Almost four times as many non-DF (NDF) as DF patients had received tertiary education ($P=0.05$) (*Figure 1*). A higher percentage of DF patients was unemployed ($\alpha=5.3$, $P=0.02$). Seventy per cent of the DF group had an income of <50,000 compared to 40% of the NDF group.

Table 3. Participants' diabetes history (*n*=70).

Diabetes status	Number (%)	*P*-value
Age of onset:		0.400
<45 years	40 (57.1)	
>45 years	30 (42.9)	
Treatment type:		0.000*
OHA	43 (61.4)	
Herbal	7 (10.0)	
OHA and insulin	9 (12.9)	
Insulin	7 (10.0)	
Diet	4 (5.7)	
Run out of medicines:		0.004*
Many times	11 (15.7)	
A few times	25 (35.7)	
Never	34 (48.6)	
Duration of diabetes:		1.000
<10 years	35	
>10 years	35	

OHA = oral hypoglycaemic agents; *significant difference

Health status

Participants' mean basal metabolic index was 28.8±4.3; there was no difference between the groups (F=14.1, $P=0.58$). *Table 2* shows risk factors among DF and NDF patients. Peripheral vascular disease, coronary artery disease, retinopathy, nephropathy, smoking, previous amputation, exercise, previous ulcer, severity and ulcer site were significantly associated with foot ulcer development when compared to the other risk factors.

Factors affecting diabetes patients

Table 3 provides participants' diabetes history. Their mean HbA_{1c} was 61.5±14.5 mmol/mol (7.78±1.83%;

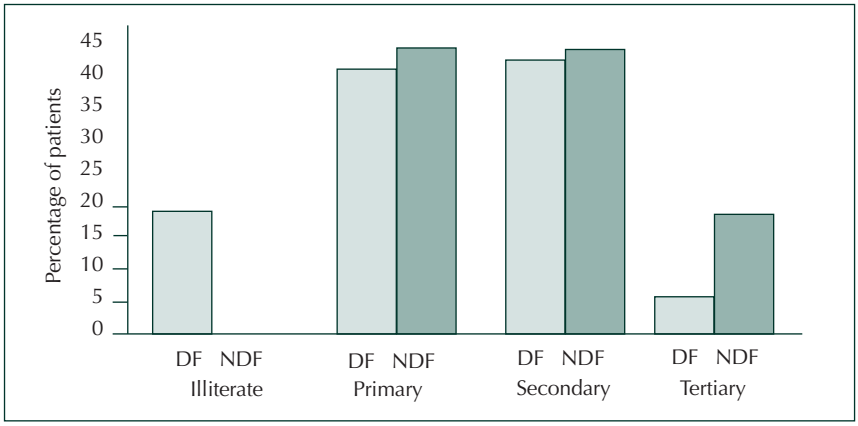

Figure 1. Educational status of diabetic foot and non-diabetic foot patients.

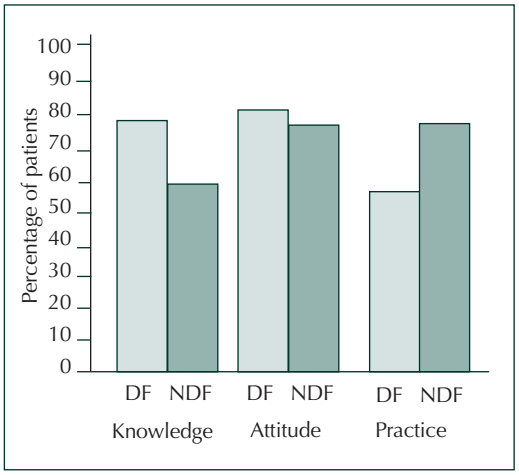

Figure 2. Percentages of diabetic foot (DF) and non-diabetic foot (NDF) patients with good knowledge, attitude and practice.

min–max = 34.4–114.2 mmol/mol [5.3–12.6%]), mean duration of diabetes was 9.51±4.5 years (min–max = 3–80 years) and mean ulcer duration was 2.2±0.2 months (min–max = 1–13 months). The majority (61.4%) were on oral hypoglycemic agents. Similar proportions were taking oral hypoglycemic agents plus insulin (12.9%), herbal treatments (10%) and insulin (10%). A small proportion controlled their diabetes with diet alone. There was a significance difference in medication adherence (*Table 3*).

KAP scores

The mean KAP scores in the DF group were 6.5±1.7 for knowledge, 4.6±1.0 for attitude and 9.5±1.8 for practice. They were 5.8±2.0 for knowledge, 4.1±1.1 for attitude and 10.6±2.0 for practice in the NDF group. Mean barrier score was 6.4±1.6 for the DF group and 6.7±1.7 for the NDF group. One way ANOVA showed significant between-group differences in mean KAP scores but not between KAP and barrier scores.

There was a significant correlation between patients' diabetic status and their knowledge (r=0.2, $P \leq 0.05$), attitude (r=0.2, $P \leq 0.05$) and practice (r=−0.3, $P \leq 0.01$) scores. Patients with DF had better knowledge and attitude scores than NDF patients (*Figure 2*). Interestingly, NDF patients demonstrated better foot care practice and a higher barrier level than DF patients (*Figure 3*).

Logistic regression revealed that between 55.1% and 73.6% of the variance in the dependant variables was explained by the independent variables. Using the Hosmer and Lemeshow test, the model correctly predicted the dependent value 89.2% of the time (α^2=4.7; $P \leq 0.79$). Time of ulcer onset, ulcer site, practice score, a history previous ulceration, amputation and peripheral artery disease were significantly associated with diabetic status (*Table 4*). As the time since the onset of foot ulceration increased, the probability of survival decreased (*Figure 4*).

Discussion

This is the first piece of research to examine the relationship between sociodemographics and KAP in Guyana. KAP about diabetes varied greatly depending on socioeconomic conditions

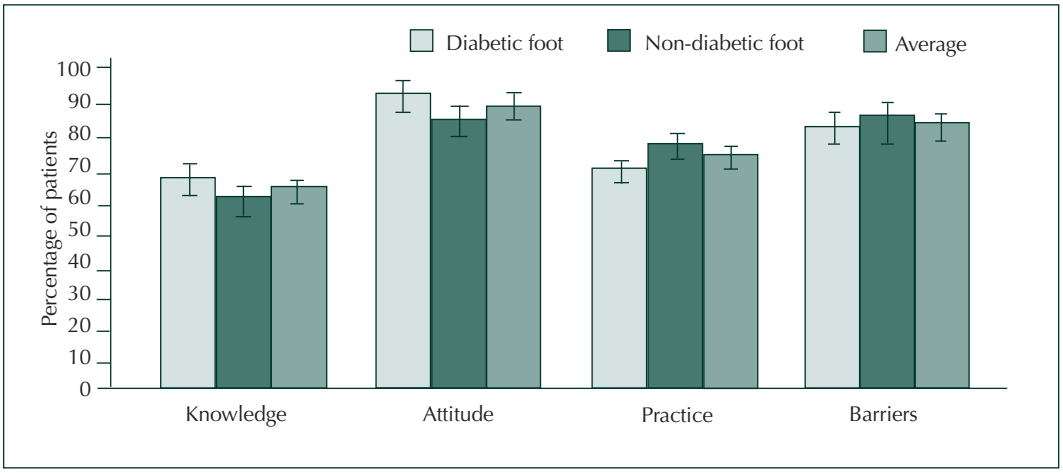

Figure 3. Percentage (95% confidence interval) knowledge, attitude, practice and barriers among diabetic foot and non-diabetic foot patients.

and attitudes. It is important to understand these variables if successful diabetes prevention and management strategies are to be designed. Good KAP are important in diabetic foot ulcer prevention. The current study showed that patients with diabetes had greater knowledge and a better approach than patients without diabetes. This could be due to the frequent counselling and advice given to patients with diabetes during clinic visits. Patients with diabetes did, however, demonstrate poor self-care practices, which may indicate they are not encouraged or motivated enough to take good care of their feet.

In the Caribbean, people with diabetes are predisposed to foot infections, which lead to significant morbidity and premature mortality in the region (Gulliford and Mahabir, 1998; Wilks et al, 1999; Walrond, 2001; Hennis et al 2002; Ferguson et al, 2010; Cawich et al, 2014). The IDF (2017) suggests comprehensive annual foot screening and examination be available to all people living with type 2 diabetes. This will enable risk factors to be identified and managed or addressed. The current study found a higher prevalence of smoking, alcohol consumption, hypertension, peripheral vascular disease, coronary artery disease and nephropathy among patients with diabetes. Therefore, it has been recommended that a flexible and patient-friendly schedule for diabetes education, which would offer education at patient's convenience, would be beneficial (Ward et al, 1999; Vileikyte et al, 2004). Certain interventions strategies on motivating healthy behaviours and treatment for withdrawal symptoms, cognitive behavioral disorder, uncontrolled desire for smoking and alcohol may prevent morbidity and mortality due to DFUs (Aboyans et al, 2011; Chellan et al, 2012). Although the patients with other comorbidities were referred to other specialties based on their findings/complains. However, the authors were unable to find if these comorbidities were well managed or not.

Peripheral neuropathy is the most common cause of diabetic foot ulceration (Reiber et al, 1999). In this study, high HbA_{1c} levels were recorded in the DF group. A recent study had highlighted the mean HbA1c to be 9.4% among Guyanese population, which was far higher than the American Diabetes Associations (ADA) established HbA1c criteria for pre-diabetes and diabetes (Kurup et al, 2019). This finding highlights the importance of routine diabetes foot screening especially within primary care settings. The fact that increased HbA_{1c} variability is very much associated with diabetic peripheral neuropathy (DPN) in type 2 diabetic patients and could be considered as a potent indicator for DPN (Su et al, 2018).

Similar to other studies, previous ulceration and amputation were identified as the major risk factors for consequent diabetic limb ulceration. Between 20% and 58% of patients develop an ulcer within a year after their initial ulcer has

Table 4. Logistic regression model of diabetic foot patients.

Independent variable	Coefficient for the constant (B)	Standard error	*P*-value	Exp(B)
Marital status	–0.13	0.2	0.400	0.9
Onset of foot ulcer	1.0	0.3	0.001*	2.7
Ulcer site	–1.1	0.4	0.002*	0.3
Previous ulcer	2.4	0.6	0.000*	11.4
Amputation	1.7	0.6	0.010	5.4
Peripheral artery disease	1.0	0.5	0.020	2.8
Practice score	–0.5	0.2	0.001*	0.6

*Significant difference.

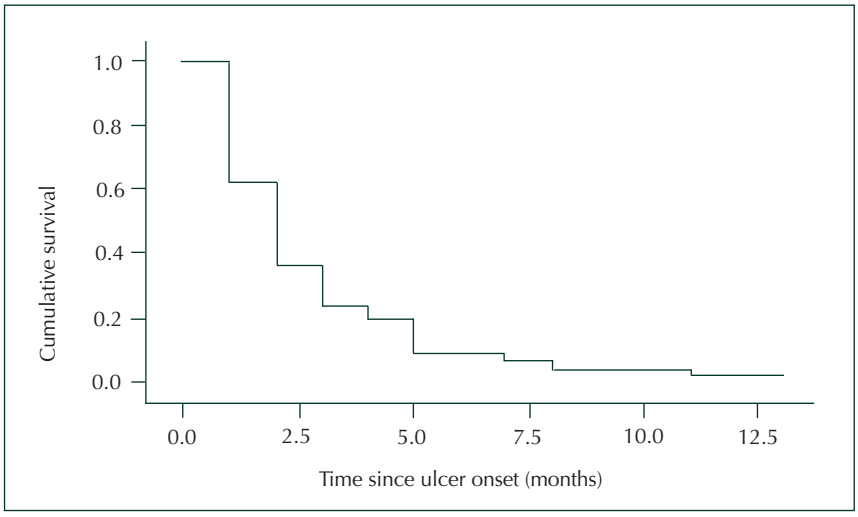

Figure 4. Kaplan Mayer survival rate following ulcer onset.

healed and previous amputation is an important contributing factor for ulcer recurrence (Wu and Armstrong, 2005; Merza and Tesfaye, 2003; Formosa et al, 2012).

People living with diabetes have better knowledge and attitude towards diabetes compared to people without diabetes (Rafique and White, 2000; Wee et al, 2002; Tham et al, 2004; Al Shafaee et al, 2008; Gul, 2010; Raj and Angadi, 2011). However, no studies exploring the relationship between KAP and patients with and without diabetes – especially from a Caribbean or Guyanese perspective – have been published.

The study identified some important risk factors for DFUs, including smoking, alcohol consumption, hypertension, peripheral vascular disease, coronary artery disease and nephropathy. Knowledge on associated risk factors is of principal importance for early intervention and better management of DFUs. There is a need to educate and create awareness about risks of diabetes and its complications, especially among diabetic foot populations. A study focusing on a larger diabetic population and a follow-up of the patients would provide an efficient tool in preventing DFU. Further, a strict guideline for regular HbA_{1c} testing among people with diabetes would be efficient in DFU prevention.

Conclusion

This study showed good knowledge of and attitude towards the DF but poor self-care practice among patients with diabetes. Patients receive information from healthcare professionals when attending clinics, however it seems that they are not sufficiently motivated to look after their feet well. There is a need for innovative tools to improve patient compliance and foot care practices. Proper guidance on the management of diabetes from diagnosis is crucial in preventing DFCs. ■

Acknowledgement: The authors thank all participants and clinic staff members for their support during the study.

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