Knowledge, attitude and utilization of traditional medicine for type 2 diabetes mellitus among residents of Pakuri (St. Cuthbert's Mission) in Guyana

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ABSTRACT

Aim: This study was designed to determine the knowledge, attitude and utilization of traditional medicine for Type 2 Diabetes (T2DM) among residents of Pakuri (St. Cuthbert's Mission) in Guyana.
Methodology: The study utilized a descriptive cross-sectional study design following prior informed consent form the village council, the Ministry of Indigenous Peoples' Affairs and individual participants. Systematic random sampling was used to select households.
Results: Three hundred and eighteen (318) participants were recruited for the study. The mean (±SD) knowledge score was 85.1 ± 16.8 with 50.9% of the study participants having good knowledge in traditional medicine for diabetes. 83% of participants had good attitude. DM affected 40.3% of the study participants, of this, more than half of the participants used traditional medicine to control their symptoms. Significant association was seen with age, gender, education and marital status among participants using traditional medicine for diabetes.
Conclusion: It is concluded that the use of traditional medicine is becoming increasingly popular and as such, efforts need to be made to revive and coordinate the use of medicinal plants/herbs by the Ministry of Public Health and Ministry of Indigenous People's Affair. In addition, conclusive evidence on the contribution of the traditional medicine on the final outcome of management of T2DM could not be reach since the study was not controlled.

Key words: *Alternative Medicine*, *Complementary Medicine, Indigenous Knowledge on Traditional Medicine, Type 2 Diabetes,*

1. INTRODUCTION

Biodiversity plays an important role in ecosystem functions and it also provides supporting, provisioning, regulating, and cultural services to most countries in the world. These services are essential for human wellbeing. Currently, only few studies link changes in biodiversity with changes in ecosystem functioning to alterations in human wellbeing. Worldwide, plants biodiversity are used for a multitude of reasons, most notably, for food, shelter and medicines. It is worth noting that countless modern medicines have been patented from plants. Within the tropics, an estimated 25,000-30,000 plant species have been used in traditional medicines [1].

The Convention of biodiversity today accepts the important health services of biodiversity and the provision of drugs to treat diseases worldwide [2]. In Guyana, the knowledge of phytochemical and pharmacological studies of local plant biodiversity for the treatment of diabetes mellitus used by acculturated Arawaks (Lokono) indigenous communities is poorly known. Effective bio-prospecting for new drugs using local biodiversity need to consider the proper implementation of the Nagoya Protocol regarding the rights of indigenous communities [2].

The Guiana Shield region is considered among the highest biodiversity regions in the world with several species of all living plants being endemic. There are over 13,367 species of vascular plants with nearly 40% being endemic [3]. This region is considered a spectacular work of nature because it holds the world's largest undisturbed tropical rain forest [4], as well as known protected areas including, in Guyana, some internationally well known, such as the Iwokrama Forest, the Kaieteur and the Kanuku National Park.

There is still a tremendous gap about the knowledge that local communities have about the use of native biodiversity in the treatment of diabetes. Jagessar & Kingston, for instance refers to the use of several plant species commonly found in riparian forests ecosystems of Guyana as a natural treatment for diabetes [5]. Few studies of bioactive principles native plants in Guyana for treatment of diabetes can be found but none of them published in scientific literature. However, extensive work on *Momordica charantia* (Family: *Cucurbitaceae* and commonly known as Karela) for its antidiabetic properties has been published [6, 7]. dePhillips (2004) would have identified several plants within the Guiana shield with antidiabetic properties (Table 1) [8]. Worth noting, several studies have also been done to assess the antimicrobial properties of natural products like honey, *Ocium sanctum* and *Calotropis gigantean* leaves [9, 10].

Although traditional medicine plays an important role in the Guyanese society, knowledge about the extent and characteristics of traditional healing practices and practitioners is limited and has frequently been ignored in the national health system. The 1992, United Nations Convention on Biological Diversity (CBD) recognized "close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources" and that Governments "subject to national legislation, respect, preserve, and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity". The CBD also recommends the "approval and involvement of the holders of such knowledge, innovations and practices" and encourages "the equitable sharing of the benefits arising from the utilization of such knowledge, innovations, and practices" [11]. Considering the potential use of local plant-based medicines in Guyana, this study was designed to determine if indigenous residents of Pakuri (St. Cuthbert's Mission) in Guyana have a fairly good understanding of knowledge, attitude and utilization of traditional medicine to treat their T2DM.

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Table 1. Species useful for diabetes in the Guiana Shield (DePhillips 2004)[8]

Family	Species	Part of Plant used
Apocynaceae	*Catharanthus roseus* (L.) G. Don (*Lochnera rosea* (L.) Rchb.)	Flowers
	Geissospermum argenteum Woodson	Bark
	Geissospermum laeis (Vell.) Miers	Bark
Araceae	*Montrichardia arborescens* (L.) Schott (*Caladium arborescens* (L.) Vent.)	Leaves
Aristolochiaceae	*Aristolochia stahehi* O.C. Schmidt	Stem
Asteraceae	*Bidens pilosa L.*	Whole plant
	Bidens cynaiifolia Kunth	Whole plant
Boraginaceae	*Heliotropium indicum* L.	Whole plant
Caesalpiniaceaea	*Senna occidentalis* (L) Link	Whole plane
	Senne obtusifolia (L.) Irwin & Barneby (*Cassia obtusifolia* L.)	Whole plant
Caricaceae	*Carica papaya* L	Fruit Juice
Cucurbitaceae	*Momordica charnatia* L. (*Momordica balsamina* sensu Descort., non L)	Leaves, fruit, stem
Dilleniaceae	*Pinzona coriacea* Martius & Zucc. (*Pinzona calineoides* Eich.)	Whole plant
	Tetracera volubilis L	Sap
Ebenaceae	*Diospyros discolor* Willd	Leaf
Euphorbiaceae	*Euphorbia neriifolia* L	Leaf
Fabaceae	*Cajanus cajan* (L) Millsp	Leaf, flower
Meliaceae	*Azadirachta indica* A. Juss.	Leaf
Menispermaceae	*Telitoxicum* sp.	Wood
	Tinospora crispa (L) Miers	Stem
Siparunaceae	*Siparuna guianensis* Aublet	Leaf, bark
Moraceae	*Artocarpus altilis* (Parkinson) Fosberg	Leaves
Myrtaceae	*Eucalytus camaldulensis* Dehnh	Leaves
	Syzgium cumini (L) Skeels	Leaves
Phytolacaceae	*Microtea debilis* Swartz	Whole plant

	Phytolacca rivinoides kunte & Bouche	Stem, Leaves
Portulacaceae	*Portulaca mucronata* Link	Whole Plant
Simaroubaceae	*Quassia amara* L	Bark
Verbenacese	*Stachytarpheta cayennensis* (L.C Rich.) Vahl	Whole Plant, Leaves

2. MATERIALS AND METHODS

A community based cross-sectional study design was employed to assess knowledge, attitude and utilization of the residence of Pakuri (St. Cuthbert's Mission) in Guyana towards traditional medicine (TM) used to treat and manage diabetes mellitus. The study took place over a four-week period.

2.1 Study Area

The study was conducted in Pakuri (St. Cuthbert's Mission) located at 6.36^0 LN, 58.08 LW; the current population is of 200 households, where approximately 1800 persons are currently living.

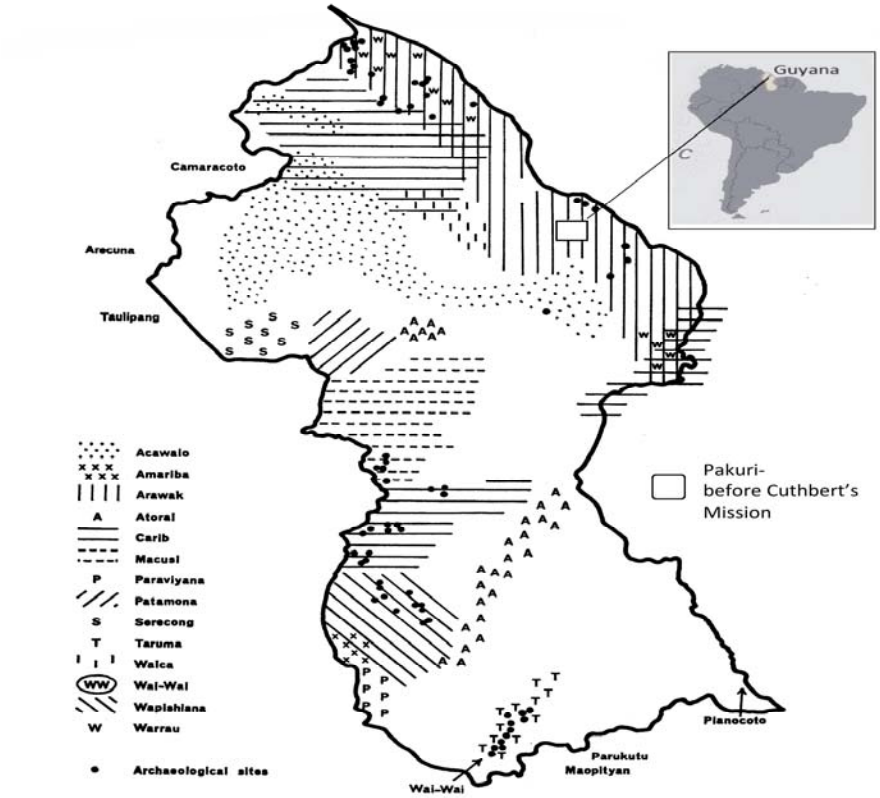

Figure 1. Study Area, modified after Brothwhell (1967)

Pakuri was said to be the "cultural capital" amongst the remaining Arawak Amerindian settlements (Figure 1)[12]. The name of the town was given for the abundance of the species named Pakooru *Platonia insignis* from the Botanical Family Guttiferae, an important forestry species with high

exploitation since colonial times[13].

2.2 Study sample

Households within Pakuri (St Cuthbert's Mission) were the source population for the study. However, systemic random sampling was used to recruit specific households. The study population included individuals aged greater than 18 years and living for at least six months in the community. The sampling units were households, while the study units were adult individuals available in the household during the interview. Prior consent from the village council and Ministry of Indigenous Peoples' Affairs was given before to study commenced. In addition, informed consent was given from each study participant before being included in the study.

Sample Size Calculation

N = population size

z = z-score

e = margin of error

p = standard of deviation

$$\frac{\frac{Z^2 \cdot p(1-p)}{e^2}}{1 + \left(\frac{Z^2 \cdot p(1-p)}{e^2 N}\right)}$$

Sample size was determined to 317 participants

2.3 Sampling Procedure

A systematic random sampling technique was used to select households. The first household was selected from the list of initial 6 households by lottery method. Then every 6th household was selected and adults in the household were interviewed.

2.4 Data collection

Data were collected using structured interviewer-administered questionnaire adapted from standardized questionnaires used by international organizations and published articles in peer-reviewed journals.

2.5 Data analysis

Data were first entered in MS Excel and analyzed in SPSS version 20.0. The results were presented using simple frequencies with percentages in appropriate tables to display the descriptive part of the result. True and False questions were asked for each respondent regarding harmful TMs, side effects of TMs, and importance of training about TMs. The number of questions for which the respondent gave correct responses was counted and scored. This score was then pooled and the mean score was computed to determine the overall knowledge of respondents; respondents who score greater than or equal to the mean value were grouped to have good knowledge and those who score less than the mean value poor knowledge level. The attitude of the respondents was assessed using yes or no questions focusing on the history of training about TM, recommending these methods to the others, effectiveness of methods for applied cases, interest to learn TCM, and choice of training methods. All data were expressed as actual mean number and as mean percentage with standard deviation (SD). A value of $p<0.05$ was taken as significant.

3. RESULTS AND DISCUSSION

The study recruited 318 participants based on systematic random sampling. Of these, 60.1% were females and 39.9% were males. The majority of the participants, (30.5%) were found in the >60 age group, followed by the 50-59 age group with 28.9% and with the age group 20-29 years having the least number of participants (7.2%). These results clearly shows that as people age they are more susceptible to diabetes.

The study recorded 57.9% of participants with secondary education, 37.7% with a primary education and only 4.4% acquiring tertiary education. From the total participants, 61% were married, 23.3% single, while 1.9%, 5.3% and 8.5% were separated, divorced and widowed, respectively. Approximately 55% of the participants were employed (having jobs with the Government) while 45% were unemployed (Table 2). It should be noted here that even though person were considered unemployed (not having a job with the Government), the majority of these participants were pensioners. In addition, some participants, who were not employed by the Government, undertook farming of cash crops as means of sustaining themselves. Some participants also had small shops in which they commercialize goods and services.

Table 2: Demographic data of all participants. Values are given as actual number and percentages with *p values (significant).

Gender	n (%)	p-value
Female	191 (60.1)	
Male	127 (39.9)	0.00*
Age Group		
20-29	23 (7.2)	
30-39	45 (14.2)	
40-49	61 (19.2)	
50-59	92 (28.9)	
>60	97 (30.5)	0.00*
Education		
Primary	120 (37.7)	
Secondary	184 (57.9)	
Tertiary	14 (4.4)	0.00*
Marital status		
Single	74 (23.3)	
Married	194 (61.0)	
Separated	6 (1.9)	
Divorced	17 (5.3)	
Widowed	27 (8.5)	0.00*
Employment status		
Employed	175 (55.0)	
Unemployed	143 (45.0)	0.07
Diabetes status		
No	190(59.7)	
Yes	128 (40.3)	0.001*

The mean (±) SD value of knowledge score was 85.1 ± 16.8. The data showed that 50.9% (n=162) of the study participants were found to have good knowledge about the use of traditional medicine and 49.1% (n=156) had poor knowledge (Table 3). Even though, half of the study participants had good knowledge of traditional medicine a study done by Agbaje and Babatunde showed only 44.7% of the study participants were considered as having good knowledge [14]. This can be due to more information

sharing and renewed interest in TM as an alternative to avoid the side effects of conventional medicine. The results also show that only 40.3% (n=128) of the study participants were affected by T2DM. With 49% (n=155) having a family history of diabetes. In addition, differences in sample size can account for the variations.

Table 3: Data showing the knowledge, attitude and practice (KAP) results in the study. Data are expressed as mean percentage ± SD

Variable	n (%)	95% CI	p value
Knowledge Grade			
Poor	156 (49.1)	43.4-54.7	
Good	162 (50.9)	45.3-56.6	0.70
Attitude Grade			
Poor	52 (16.4)	12.5-20.9	
Good	66 (83.6)	79.1-87.5	0.00
	Mean ± SD		
Knowledge	85.1±16.8	83.3-86.9	
Attitude	76.1±11.6	74.8-77.4	

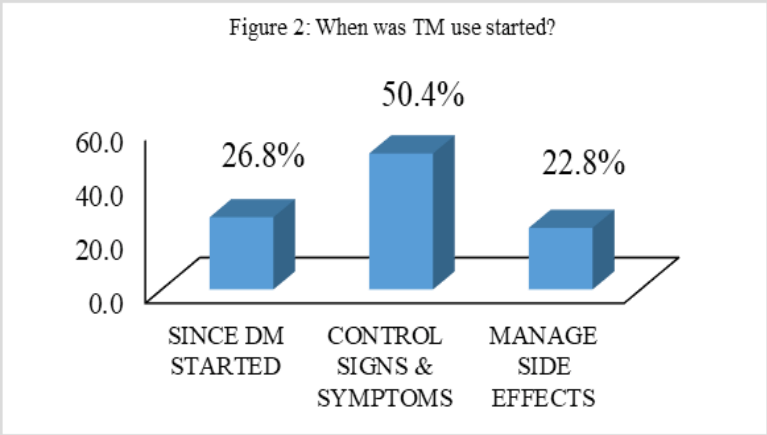

Figure 2: Bar charts showing the inception of T2DM, use of traditional medicine (TD) to treat/control T2DM following the onset of the diabetic symptoms and use of TH to treat diabetes-induced side effects. Data are mean percentage

Of the person affected by diabetes, 50.4% (n=66) started using TM to control signs and symptoms, 22.8% (n=29) started using traditional medicine as a way to manage side effects and only 26.8% (n=33) started using since being diagnose with Type 2 Diabetes (Figure 2). The results clearly shows that traditional medicines have a tremendous beneficial cost-effective effects in the treatment of both the symptoms and side effects, thereby, preventing long–term complications of T2DM among the participants.

Table 4 shows a list of plants/herbs used for treating and managing diabetes identified by the participants. The most widely used traditional medicine was seen as karela (*Momordica charantia*), Cinnamon (*Cimmamomum herun*) and Neem (*Azadirachta indica*), which were used in the form of infusion of the leaves. Participants also used TM along with several Oral Hypoglycemic Agents (OHA). The most widely used OHA was Metformin (64.6%), which was also used in combination with Daonil (18.9%) and Glycazide (16.5%) (Figure 3). Participants have also reported that prepare the plants in different dosage forms and administer then by mixing with water, tea and in some instances honey or without any mixing (Table 4). Several studies have also reported similar practices [15, 16].

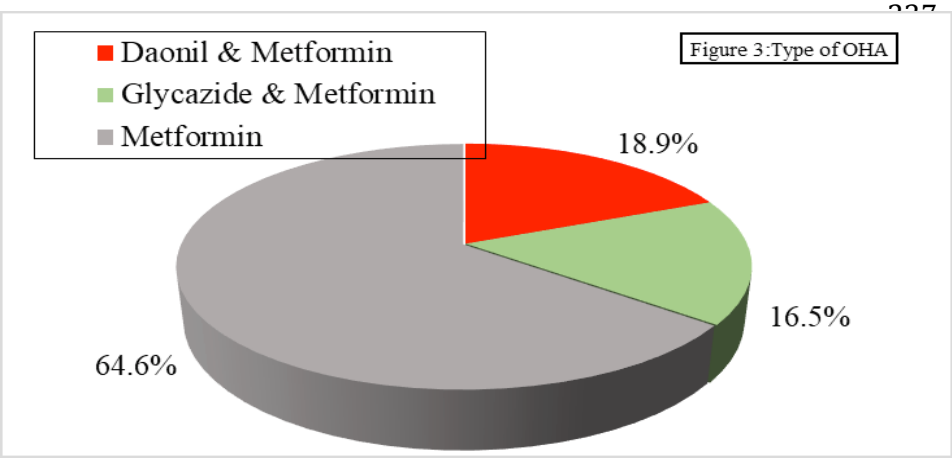

Figure 3: Pie chart showing the current oral hypoglycemic agents (OHA) used by participants in combination with traditional medicine in this study. Significantly, more participants were prescribes with metformin (64.6%) compared to combination of glycoside and metformin (16.5% and daonil and metformin (18.9%).

The present study also revealed that the mean value for attitude of participants was significant ($p<0.001$) and found to be good. As 83% of participants were considered as having good attitude while 17% (n=54) had poor attitude towards traditional medicine. In this study, an association between independent variables and KAP scores on TMs was calculated using Pearson's Chi square. It was found that the use of TM was significantly associated with the age, gender, education and marital status of the population (p value = 0.00). However, there seems to be gaps within the use of traditional medicine, which is probably due to the fact that most plants/herbs being used is not native to Guyana. From the list of plants/ herbs identified by the Arawaks (Lokono) participants the only native plant mentioned was *Momordica charantia*. Most of the elements of TM known by the population are of exotic species not native Guyana, which is evidently showing the loss of knowledge about local biodiversity given the process of acculturation.

This study also indicated that more than two-thirds (89.3%) of the participants had no previous training on the benefits and adverse effects of traditional medicine, but would have gotten information from relatives and friends. However, (100%) of participants showed interest to acquire education in this regard. This emanated from the good attitude that was seen from the majority of the participants towards traditional medicine.

Table 4: A list of anti-diabetic plants and method of utilization of the various plant species used by residents of Pakuri

Local Names	Scientific Names	Part of Plant	Dosage form used	Route of Administration	Method of Preparation	Frequency	Source of Plant
Aloe	*Aloe vera*	Leaves	Semi-solid	Oral	Eaten	Twice daily	Home garden
Cinnamon	*Cimmamomum verum*	Bark	Fluid	Oral	Tea	Once daily	Market
Dandelion	*Taraxacum officinale*	Root and Leaves	Fluid	Oral	Tea	Once daily	Home garden
Garlic	*Allium sativum*	Bulb	Fluid	Oral	Tea	Once daily	Market
Ginger	*Zingiber officinale*	Root	Fluid	Oral	Tea	Once daily	Market
Karela	*Momordica charantia*	Fruit	Fluid	Oral	Water	Once daily	Home Garden

Mauby	*Colubrina elliptica*	Bark	Fluid	Oral	Water	Once daily	Market
Neem	*Azadirachta indica*	Leaves	Fluid	Oral	Tea	Once daily	Market
Pawpaw	*Asimina triloba*	Leaves	Fluid	Oral	Tea	Once daily	Home garden
Pear	*Persea americana*	Leaves	Fluid	Oral	Tea	Twice daily	Home garden
Sand bitters	*Unxia camphorata*	Leaves	Fluid	Oral	Boiling with water	Twice daily	Home garden
Rose of the Mountain	*Brownea latifolia*	Leaves	Fluid	Oral	Tea	Once daily	Home garden
Tumeric	*Curcuma longa*	Root	Fluid	Oral	Tea	Once daily	Market
Zeb grass	*Commelina cayennensis*	Leaves	Fluid	Oral	Boiling with water	Twice daily	Home garden

4. CONCLUSION

In conclusion, the results from this study indicate that knowledge about medicinal plants and their usage in treating and managing diabetes is vanishing, among the Arawaks (Lokono) due to influences of urbanization. Therefore, strong efforts are required to revive and coordinate the use of medicinal plants/herbs at the level of Ministry of Public Health and Ministry of Indigenous Peoples' Affair in Guyana. It must also be noted that the use of traditional medicine is becoming increasingly popular as the need for alternative medicines is on the rise. Majority of the population showed interest in being educated on the benefits and adverse effects of traditional medicine and as such, this should not be ignored. To add, botanical inventories on herbal medicines to treat diabetes should be done on the different vegetation types of the community, with the description of uses and phyto-constituents which can serve as the library to regain access to the knowledge of native species to treat diabetes cost-effectively as compared to orthodox medicines since diabetes is the second most debilitating disorder in Guyana and is becoming a leading cause of death worldwide.

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COMPETING INTEREST

Each author declare that there is no conflict of interest

AUTHORS' CONTRIBUTION

Cecil Boston and Rajini Kurup were involved in the conceptualization of the research project and participated in study design, methodology, data analysis, interpretation and final draft of the paper. Judith Rosales was involved in the data analysis and interpretation and final draft of the paper. Jaipaul Singh was involved in data interpretation and proof reading the final draft.

ETHICAL APPROVAL

Formal letter of approval was obtained from the Village Council and the Ministry of Indigenous People's Affair. Each participant of the study was informed about confidentiality. Each participant of the study agreed to participate voluntarily. Participants were allowed to discontinue the interview when they needed. All participants of the study declared their willingness to participate and approved by their verbal consents.

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