Original Research Article

Knowledge, Attitude, and Utilization of Traditional Medicine for Type 2 Diabetes among residents of St. Cuthbert's Mission, Guyana

ABSTRACT

Aim: This study sought to determine the knowledge, attitude and utilization of traditional medicine for Type 2 Diabetes among residents of St. Cuthbert's Mission, Guyana.
Methodology: The study utilized a descriptive cross-sectional study design following prior informed consent. A systematic random sampling was used to select households.
Results: A total of 318 participants were involved in 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. Type 2 Diabetes affected 40.3% of the study participants. Almost 50.4% of participants with diabetes used traditional medicine to control the symptoms. About 83% of participants had good attitude. A significant association was recorded among participants using traditional medicine with their age and gender.
Conclusion: 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.

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

1. INTRODUCTION

Biodiversity plays an important role in ecosystem functions and provide supporting, provisioning, regulating, and cultural services. These services are essential for human wellbeing. However, at present there are few studies that link changes in biodiversity with changes in ecosystem functioning to changes 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 plants 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 beings 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 Iwokrama Forest, Kaieteur, Kanuku National Park.

There is still a tremendous gap about the knowledge that local communities have about the use of native biodiversity in treatment of diabetes. Jagessar & Kingston, (2015) 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 grey literature studies of bioactive principles for treatment of diabetes however can be found in the native biodiversity of plants from Guyana but none of them published in scientific literature. Studies on exotic plants in Guyana such as *Momordica charantia* (Family: *Cucurbitaceae* and commonly known as Karilla) have also been published [6, 7]. Studies have been done in Guyana focusing the successful effect of its natural products like honey, *Ocium sanctum* and *Calotropis gigantean* leaves for antimicrobial properties [8, 9].

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" [10].

2. MATERIALS AND METHODS

A community based cross-sectional study design was used to assess knowledge, attitude, and utilization of the residence of Pakuri towards traditional medicine (TM) used to treat and manage diabetes mellitus. Being Pakuri, the center of the Arawaks (Lokono), it also served the objective of analyzing the acculturation process of the Arawak indigenous communities of Guyana in terms of the utilization of native species of the local biodiversity within TM.

2.1 Study Area

The study was conducted in Pakuri (previous 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.

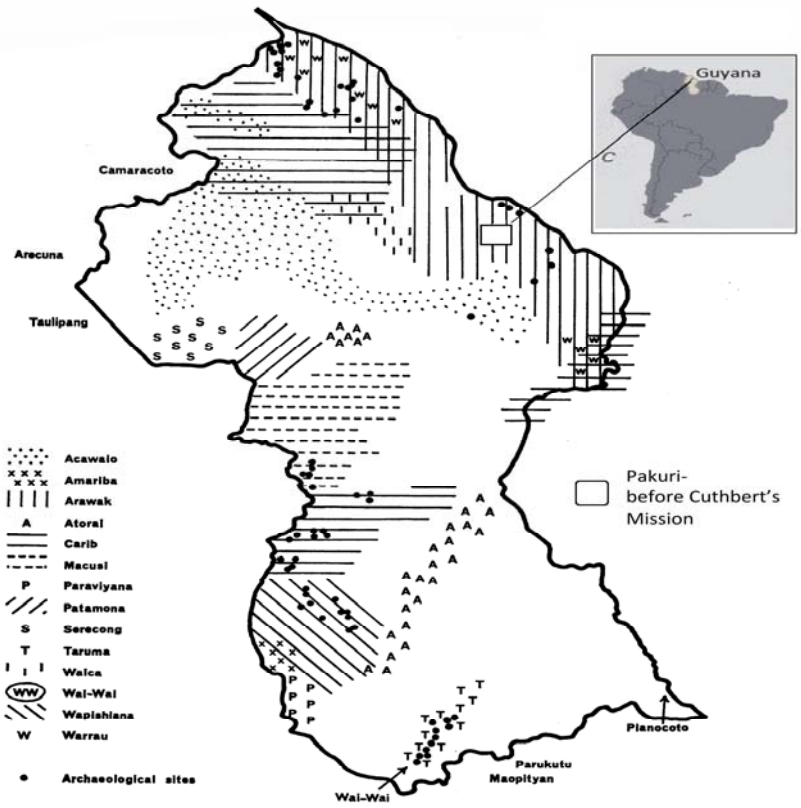


Figure 1. Study Area, modified after Brothwhell (1967)

Pakuri is said to be the "cultural capital" amongst the remaining Arawak Amerindian settlements that according to the map of Brothwell (1967) dominated the coastal areas of Guyana (Figure 1) [11].

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 [12]

Many of the native and exotic species of medicinal plants used in Guyana for diabetes are listed in the table 1.

Table 1. Species useful for diabetes in Guyana (DePhillips 2004)[13]

Family	Species	Column1	Column2	Column3	Column4	Column5	parts of the plant used
Apocynaceae	Catharanthus roseus (L.) G. Don (Lochnera rosea (L.) Rchb.)						flowers
	Geissospermum argenteum Woodson						bark
	Geissospermum laevis (Vell.) Miers						bark
Araceae	Montrichardia arborescens (L.) Schott (Caladium arborescens (L.) Vent.)						leaves
Aristolochiaceae	Aristolochia staheli O.C. Schmidt						stem
Asteraceae	Bidens pilosa L.						whole plant
	Bidens cynapiifolia Kunth						whole plant
Boraginaceae	Heliotropium indicum L.						whole plant
Caesalpiniaceae	Senna occidentalis (L.) Link						whole plant
	Senna obtusifolia (L.) Irwin & Barneby (Cassia obtusifolia L.)						whole plant
Caricaceae	Carica papaya L.						fruit juice
Cucurbitaceae	Momordica charantia L. (Momordica balsamina sensu Descort., non L.)						Leaves, fruit, stem,
Dilleniaceae	Pinzona coriacea Martius & Zucc. (Pinzona calineoides Eich.)						whole plant
Dilleniaceae	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	Eucalyptus camaldulensis Dehnh.						leaves
Myrtaceae	Syzygium cumini (L.) Skeels						leaves
Phytolacaceae	Microtea debilis Swartz						whole plant
	Phytolacca rivinoides Kunth & Bouche						stem, leaves
Portulacaceae	Portulaca mucronata Link						whole plant
Simaroubaceae	Quassia amara L.						bark
Verbenaceae	Stachytarpheta cayennensis (L.C. Rich.) Vahl						whole plant, leaves

2.2 Study sample

All the 200 households in Pakuri were the source population of the study. 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.

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 together 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.

3. RESULTS AND DISCUSSION

A total of 318 participants were included in the study based on inclusion and exclusion criteria. Of these, 60.1% were females and 39.9% were males. Majority of the participants, 30.5%, were found in the >60 age group followed by the 50-59 age group with 28.9% with the age group 20-29 having the least number of participants, 7.2%.

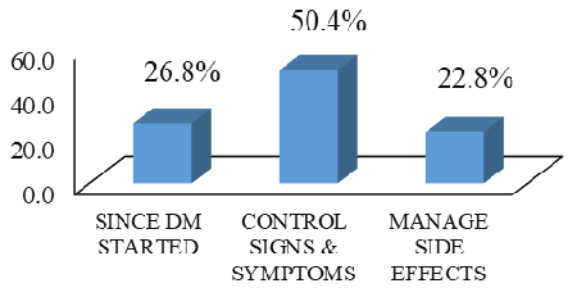
The study also recorded higher percentage (57.9%) of participants with secondary education and 37.7% received up to a primary education while only 4.4% acquiring tertiary education. From the total participants 61% were married, 23.3% single while 1.9%, 5.3% and 8.5% were separated, divorced or widowed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

Table 2: Demographic Data

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
MARTITAL 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.)	
YES	128 (40.3)	0.001

The mean (±) value knowledge score was 85.1 ± 16.8. The data shows that 50.9% (n=162) of the study participants were found to have good knowledge about TM and 49.1% (n=156) had poor knowledge (Table 3). Even though, half of the study participants had good knowledge of TM, other studies would have shown the opposite (Agbaje & Babatunde, 2005) [13]. This can be due to more information sharing and renewed interest in TM as an alternative to avoid the side effects of conventional medicine.

Figure 2: When was TM use started?



Only 40.3% (n=128) of the study participants were affected by Type 2 Diabetes. With 49% (n=155) having a family history of diabetes.

Table 3: KAP Results

	Mean ± SD
Knowledge	85.1 ± 16.8
Attitude	76.1 ± 11.6
Knowledge Grade	**n (%)**
POOR	156 (49.1)
GOOD	162 (50.9)
Attitude Grade	**n (%)**
POOR	51 (16.0)
GOOD	264 (83.0)

Of this, 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 (Fig. 2). Table 4 shows the list of species from traditional medicine 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%) (Fig. 3).

The mean value for attitude of participants was found to be good. As 83% of participants were considered as having good attitude while 17% (n=54) had poor attitude towards traditional medicine. Even though majority of the study population is considered to have good knowledge and attitude towards TM with age and gender being (women) highly associated with its use, there seems to be gaps within the use of traditional medicine since most plants/herbs being used, is not native to Guyana. From the list of native species of Guyana biodiversity listed in the literature as useful for diabetes, the Arawaks (Lokono) participants only mentioned *Momordica charantia*. Most of the elements of TM known by the population are exotic species, which is evidently showing the loss of knowledge about local biodiversity given the process of acculturation.

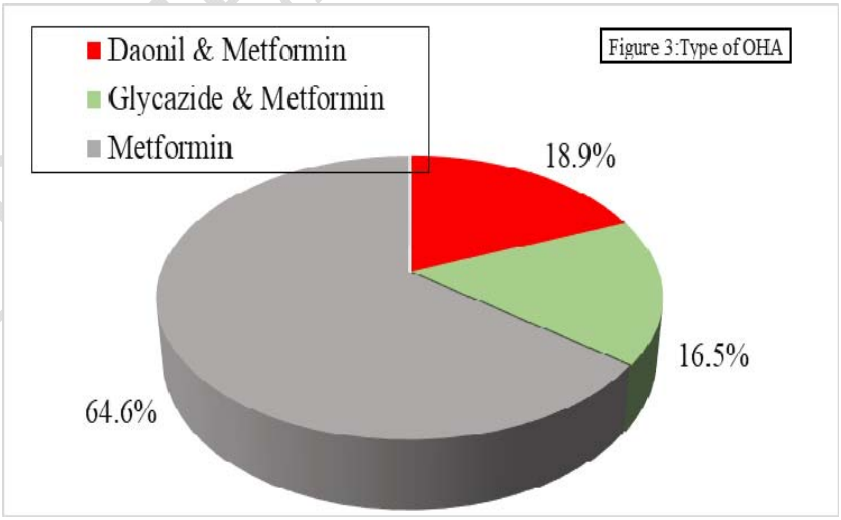


Figure 3:Type of OHA

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 majority of the participants towards traditional medicine.

In this study, 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 and gender of the population (p value = 0.02). Educational status, marital status and employment status were found to have no association with use of traditional medicine.

Table 4: Method of Utilization of the various plant species

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	Mouth	Eaten	Twice daily	Home garden
Cinnamon	Cimmamomum verum	Bark	Fluid	Mouth	Tea	Once daily	Market
Dandelion	Taraxacum officinale	Root and Leaves	Fluid	Mouth	Tea	Once daily	Home garden
Garlic	Allium sativum	Bulb	Fluid	Mouth	Tea	Once daily	Market
Ginger	Zingiber officinale	Root	Fluid	Mouth	Tea	Once daily	Market
Karela	Momordica charantia	Fruit	Fluid	Mouth	Water	Once daily	Home Garden
Mauby	Colubrina elliptica	Bark	Fluid	Mouth	Water	Once daily	Market
Neem	Azadirachta indica	Leaves	Fluid	Mouth	Tea	Once daily	Market
Pawpaw	Asimina triloba	Leaves	Fluid	Mouth	Tea	Once daily	Home garden
Pear	Persea americana	Leaves	Fluid	Mouth	Tea	Twice daily	Home garden
Sand bitters	Unxia camphorata	Leaves	Fluid	Mouth	Boiling with water	Twice daily	Home garden
Rose of the Mountain	Brownea latifolia	Leaves	Fluid	Mouth	Tea	Once daily	Home garden
Tumeric	Curcuma longa	Root	Fluid	Mouth	Tea	Once daily	Market
Zeb grass	Commelina cayennensis	Leaves	Fluid	Mouth	Boiling with water	Twice daily	Home garden

4. CONCLUSION

The study indicates that knowledge about medicinal plant and its usage is vanishing especially among Arawaks (Lokono) due to influences of urbanization. Therefore, efforts are needed to revive and coordinate the use of medicinal plants/herbs at the level of Ministry of Public Health and Ministry of Indigenous People's Affair. It must be noted that TM is becoming increasingly popular as the need for alternative medicines is on the rise. Most of the population shows interest to have education regarding the benefit and adverse effects of TM and as such should not be ignored. To add, botanical inventories in the different vegetation types with the description of uses and phyto-constituents can serve as the library to regain access to native species knowledge and especially for the use of TM in diabetes, the second most important disease in Guyana and the world.

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.

REFERENCES

1. Millennium Ecosystem Assessment. *Ecosystems and Human Well Being: Biodiversity Synthesis.* Washington, DC.: World Resources Institute. 2005
2. Conference of the parties to the Convention on Biological Diversity. 13th Meeting. December 2016. Mexico
3. Funk, V., Hollowell, T., Berry, P., Kelloff, C., & Alexander, S. Checklist of the Plants of the Guiana Shield (VENEZUELA: Amazonas, Bolivar, Delta Amacuro; GUYANA, SURINAM, FRENCH GUIANA). *SMITHSONIAN INSTITUTION; Contributions from the United States National Herbarium; Volume 55*, 5-11. 2007
4. Hammond, D. Forest conservation and managment in the Guiana Shield . In D. Hammond, *Tropical Forests of the Guiana Sheild* (pp. 481-520). CABI Publishing. 2005
5. Jagessar, R., & Kingston, S. The Status of Diabetes in Guyana, It's herbal and synthetic drug treatments . *World Journal of Pharmacy and Pharmacuetical Sciences. 2015; 4* (7), 149-165.
6. Ahmad, N., Ahmad, Z., Zohrameena, S., Hasan, N., & Zishan, M. (2016). Momordica Charantia: For Traditional Uses and Pharmacologocal Actions. *Journal of Drug Delivery and Therapeutics*. 2016; *6* (2).
7. Singh, J., Cummings, E., Manoharan, G., Kalasz, H., & Adeghate, E. Medicinal Chemistry of the anti-diabetic effects of Momordica charantia: active constituents and modes of actions . *Open Med Chem*. 2011; *5*, 70-77.
8. Bansavatar, C., Kurup, R., & Ansari, A. (2015). Antimicrobial Properties of Ocimum sanctum and Calotropis gigantea Leaves. *Microbiology Research Journal International*. 2015; *8*(4), 532-539.
9. Atiya Diane N'djelekulu1, Rajini Kurup and Abdullah Adil Ansari. Antibacterial and Physico-chemical Properties of Local Honey in Guyana. British Journal of Medicine & Medical Research. 2015; 8(7): 564-569
10. Conference of the parties to the Convention on Biological Diversity. 3rd Meeting. Sepetmber, 1996. Argentina
11. Brothwell D. R. The Amerindians of Guyana: a biological review. The Eugenics review. 1967; 59(1), 22-45.
12. Corrie, D. (2019) https://lastrealindians.com/lokono-arawak-tribal-nation-of-pakuri-territory-cultural-capital-of-the-tribe-by-damon-corrie/
13. DeFilipps, RA. Medicinal Plants of the Guianas (Guyana, Surinam, French Guiana). Funk, V., Hollowell, T., Berry, P., Kelloff, C., & Alexander, S. (2007). Checklist of the Plants of the Guiana Shield (VENEZUELA: Amazonas, Bolivar, Delta Amacuro; GUYANA, SURINAM, FRENCH GUIANA). *SMITHSONIAN INSTITUTION; Contributions from the United States National Herbarium; Volume 55*, 5-11. 2004
14. Agbaje, E., & Babatunde, E. A KAP study of the attitude and practice of tradiitonal medicine in a contemporary Nigerian community. *Central African Journal of Medicine*. 2005; *51* (5-6), 58-62.