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Relationship between Complementary use of Herbal Medicines and Diabetes Mellitus Treatment Outcomes: A Cross-Sectional Study in Two Tertiary Healthcare Facilities in Jos Metropolis

Shalkur DAVID[1]
Department of Clinical Pharmacy
University of Jos, Nigeria

Christiana Oluwadamilola ONI[2]
Department of Clinical Pharmacy
University of Jos, Nigeria

Byenchit EJILA[3]
Pharmacy Department
College of Health Technology Pankshin
Plateau State, Nigeria

Peter Naankut ALPHONSUS[4]
Panlat Pharmacy Zarmangada Jos
Jos Plateau State, Nigeria

Meshak Simeon Alex DAYOL[5]
Department of Quality Control
Plateau State Drugs and Medical Management Agency Jos, Nigeria

Abstract:- In Nigeria, the use of herbal medicines to complement diabetes treatment is common, though their impact on treatment outcomes is not well understood. This cross-sectional questionnaire study, conducted in Jos metropolis, Nigeria, assessed the prevalence of herbal medicines use among 141 diabetes patients and its relationship with treatment outcomes. Most of the study participants were females (60.3%) with a family history of diabetes (70%). The findings showed that 58.9% of participants used herbal remedies like *Moringa oleifera*, *Vernonia amygdalina* and *Allium sativum* to complement treatment for diabetes mellitus without guidance from conventional clinicians. There were higher incidences of hospitalizations and hypoglycemia in the group that complemented their treatments with herbal medicines (*P* <0.05). However, fasting blood glucose levels remained unaffected (*P* > 0.05). The study highlights the common use of herbal medicines in Nigeria and underscores both the prospect for herbal medicine integration and the challenges of poor clinical data to inform ration use.

Keywords:- *Diabetes Mellitus, Herbal Medicine, Diabetes Treatment Outcomes, Nigeria*

I. INTRODUCTION

Diabetes mellitus is a serious health problem in Nigeria. The condition is a complex disorder marked by chronic high blood sugar due to issues with insulin production or action, affecting carbohydrate, lipid, and protein metabolism. Diabetes mellitus can lead to severe symptoms and complications, including microvascular damage (such as nephropathy, retinopathy, and neuropathy) and macrovascular issues (like atherosclerosis, stroke, and heart disease [1, 2]. The prevalence of diabetes mellitus is increasing in Nigeria. According to the International Diabetes Federation (IDF), the global prevalence of diabetes mellitus has significantly increased, with an estimated 536.6 million cases reported worldwide in 2021. This represents a 10.5% global prevalence, up from 211.2 million cases in 1990. In Africa, Nigeria has the second-largest estimated prevalence of diabetes mellitus (15%) translating to 3.6 million people living with the condition in 2021, up from 3.1 million in 2011, and this number is expected to grow by 134% from 2000 to 2045 [3**]**. Effective management and prevention strategies are crucial to addressing the burden of diabetes and its complications [4].

Effective treatment of diabetes mellitus is challenging in Nigeria. Conventional treatments for diabetes mellitus include patient education, medical nutrition therapy, regular exercise, oral hypoglycemic agents as well as insulin. [5] However, these treatments may be inaccessible or unaffordable in resource-poor settings like Nigeria. [6] Therefore, some patients turn to herbal medicines as alternative or complementary treatments for diabetes. For example, in two cross-sectional surveys in the Southern part of Nigeria, half of the patients with diabetes accessing conventional healthcare also self-medicated with herbal remedies with high non-disclosure of use to clinicians. [7, 8] As such, further research is needed to fully understand the safety and efficacy of herbal medicine in managing diabetes mellitus and to ensure that these products are used responsibly. [9]

The Whole Health Organization (WHO) and the Nigerian government have recognized the potential benefits of herbal medicine, especially in managing prevalent

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conditions like diabetes mellitus. [10, 11] Herbal medicine, as defined by the WHO [10], encompasses various plant-derived products used for their therapeutic properties. These products, which include herbs, herbal materials, preparations, and finished products, contain active ingredients known as phytochemicals such as saponins, flavonoids, glycosides, tannins, alkaloids, and terpenoids, which are believed to have medicinal effects. Herbal medicine in Nigeria is deeply ingrained in cultural practices, and many people with diabetes use it as a complementary or alternative treatment. This approach is not only a nod to traditional healing practices but also aligns with a broader trend of integrating traditional and modern medicine to enhance healthcare outcomes. [8]

While herbal medicine may offer a promising complementary approach to diabetes mellitus management, it is important to note that the toxicological assessment of these products is not always rigorously conducted, particularly in developing countries. As such, further research is needed to fully understand the safety and efficacy of herbal medicine in managing diabetes mellitus and to ensure that these products are used responsibly. [9] Despite the widespread use of herbal medicine in Nigeria, there is limited research on its effectiveness in diabetes management. This study aims to investigate the relationship between herbal medicine use and diabetes treatment outcomes in Jos North, Nigeria. The study describes the prevalence of herbal medicine use, identifies the specific herbal remedies being utilised and compares the efficacy of complementary herbal medicines to conventional treatments on diabetic treatment outcomes. The findings of this study will provide a clear picture of how prevalent the use of herbal medicine is in the management of diabetes by patients in the Jos metropolis and offer insights into how well the complementary use of herbal remedies performs relative to conventional treatments.

II. METHODS

➢ *Study Setting and Design*

This study was conducted at two tertiary healthcare facilities in Jos metropolis, namely the Jos University Teaching Hospital (JUTH) and Plateau State Hospital (PSH) in Plateau State, Nigeria. These institutions offer a range of medical services, including specialized clinics for managing diabetes mellitus. To investigate the prevalence and impact of herbal remedies among diabetic patients, a cross-sectional questionnaire design was utilized. This approach aimed to collect data on the types of herbal remedies used, their prevalence among patients, and the clinical outcomes associated with their use.

➢ *Study Population and Sample Size*

The study population consisted of 214 adults (≥ 20 years of age) of either sex with diabetes mellitus (diabetes type 1 and 2) accessing care in the study sites. Diabetic patients who were present in the study sites during the study period and who gave informed consent were enrolled in the study. Participants who were frail or in obvious discomfort due to diabetes or any other health problem were excluded from the study. The required sample size for the study was estimated by using the formula:

$$N = Z^2P(1 - P)/d^2 \quad (1)$$

Where:

N = required sample size;
Z = statistic corresponding to 95% level of confidence = 1.96;
P = assumed prevalence of herbal medicine use; d = margin of error or precision.

Assuming a 16.2 % prevalence (P) of herbal medicine used for treating diabetic mellitus, [12] a 95% CI (Z = 1.96) and a prevalence estimate within a 5% error margin (d), an approximate number of 214 adults across the 2 study sites was considered for this study.

➢ *Study Tool and Procedures for Data Collection*

The study utilized a semi-structured questionnaire adapted from existing literature. [8, 13] The questionnaire was organized into four sections: 1) Demographic and Disease-Related History, capturing variables such as age, gender, education, occupation, religion, and marital status. It also covered family history of diabetes mellitus and history of diabetes complications; 2) Treatment Patterns: This section focused on various treatment approaches including conventional medicine, herbal medicine, dietary adjustment, and lifestyle modification. The client's disclosure and clinician's guidance on herbal medicine use were also covered in this section; 3) Type of Herbal Remedy: the specific herbal remedies used by participants for diabetes management were captured; and 4) Diabetes Treatment Outcomes: This section captured data on hospitalization history, episodes of hypoglycemia, and fasting blood glucose levels of the participants. The questionnaire's relevance and face validity were verified by two academic and two hospital pharmacists.

From May 2024 to July 2024, research assistants administered the questionnaire through interviews with consenting participants. Diabetes treatment outcomes were extracted from patient records. A systematic sampling technique was used, with participants selected alternately as they arrived at the study sites. Participants who visited more than once during the study period were excluded from further selection. Data collection continued until a total of 214 completed questionnaires were obtained.

➢ *Data Analysis*

Data captured from the study was analyzed with the aid of the statistical package for social sciences (IBM-SPSS®) version 25. Descriptive statistics were generated for demographics of community pharmacies, community pharmacists, the proportion of herbal medicines usage for diabetes mellitus treatment and commonly utilised herbal medicines. The Chi-square test and the independent student t-test were used to compare diabetes treatment outcomes between participants who complimented their treatment with herbal medicines to those who used only conventional

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medicines. $P < 0.05$ was set for inference of statistical significance.

➢ *Ethical Considerations*

Ethical approval for the study was sought and obtained from the ethics and research committees of both Jos University Teaching Hospital (NHREC/JUTH/05/10/22) and Plateau Stae Specialist Hospital (PSSH/ADM/ETH. CO/2015/O04) before commencing data collection. Participation in the study was voluntary, indicating respect for participants' autonomy. Participants were provided with all necessary information about the study to make an informed decision about their involvement.

III. RESULTS

➢ *Demographic Characteristics and Diabetes-Related History*

Table 1 provides an overview of the demographic and diabetes-related history of the study participants. The majority of the study participants were females (60.3%), aged 62 years and above (37.4%). Most of the participants were married (85.5%) and of the Christian religious faith (69.2%). One-third of the study participants had tertiary education (37.9%) and were civil servants (31.3%). The duration of diabetes diagnosis varied, with the majority having diabetes for 1-5 years (37.4%) or 11-15 years (29.0%). The study participants reported a high prevalence of family history of diabetes mellitus (70.1%) and reported diabetes-related vision complications affecting 50% and neuropathy at 17.8%.

➢ *Diabetes Treatment Pattern in the Study Participants*

The treatment pattern of the study participants is shown in **Table 2.** Nearly all participants used conventional medicine (97.7%) with lifestyle modifications (97.7%) and dietary modifications (82.2%). The prevalence of complementary herbal medicine use in the study participants was 58.9%. When asked if they disclosed their use of herbal medicine to clinicians only 1.6% and 38.1% of those who used herbal remedies disclosed it to the physicians and pharmacists respectively. Nonetheless, when asked if the clinicians provided any guidance following the disclosure of herbal medicine use, only 2.4% answered in the affirmative.

➢ *Types of Herbal Medicines Utilised*

The specific herbal remedies used by study participants are shown in **Fig 1**. Among the participants who admitted to using herbal medicine to complement diabetic treatments, Moringa **(***Moringa oleifera*) leaf (85.5%), Bitter leaf (*Vernonia amygdalina*, 73 %) and garlic (*Allium sativum*, 63.5%) were the most commonly utilised.

➢ *Relationship between Complementary Herbal Medicines Usage and Diabetic Treatment Outcomes*

Table 3 presents the diabetes mellitus treatment outcomes of study participants. Participants using both conventional and herbal medicine had higher rates of hospitalization compared to those using only conventional medicine ($P < 0.05$). Similarly, the report of hypoglycemia episodes was significantly higher among those using both types of medicine compared to those using only conventional medicine ($P < 0.05$). There was no significant difference in mean blood glucose levels between participants using both conventional and herbal medicine and those using only conventional medicine ($P > 0.05$**).**

IV. DISCUSSION

➢ *Herbal Medicine use in Diabetes Mellitus*

The results of this study indicate that a majority of participants complemented their diabetic treatments with herbal remedies. This aligns with previous research indicating high usage of herbal medicines among people with diabetes mellitus. [14] For instance, studies conducted in Southern Nigeria reported a 50% prevalence of complementary herbal remedy use in individuals with diabetes. [7, 8] This contrasts with the lower prevalence (16.2%) reported by Oreagba and colleagues, **[**12**]** which may be attributed to differences in study populations and the broader scope of conditions examined in Oreagba's study

The high prevalence of herbal medicines usage observed in this study should be weighed against the risks as highlighted by Olagunju and colleagues [15] who noted the potential for liver toxicity with some herbal preparations. This study's findings present the magnitude of self-medication with herbal remedies in the study setting, warranting attention from the stakeholders to promote rational and safe use of medicines. Clinicians need to always enquire about herbal medicines use history from patients with diabetes to provide the needed guidance for the safe use of the products. However, the limited clinical data on herbs can hinder the capacity of clinicians to provide informed guidance to clients on herbal remedies as it is evident in the present study in which the proportion of instances where clinicians offered guidance about herbal medicine when required by clients was low. This trend calls for increased research and the provision of current summaries in the form of clinical guidance on herbal remedies to assist clinicians in guiding clients.

➢ *Common Herbal Remedies for Diabetes Mellitus*

The present study highlights the common use of specific herbal remedies among participants with diabetes mellitus, including Moringa Moringa (*Moringa oleifera*) leaf, Bitter leaf (*Vernonia amygdalina*), and Garlic (*Allium sativum*). These findings are consistent with previous research in the Southern part of Nigeria, where these herbs, along with others such as scent leaf, plantain, and neem leaf, were also reported as popular for managing diabetes. [7, 8]] Moringa leaf identified in the present study was also noted in a Tanzanian study among a diabetic population. [16] In contrast, other herbal remedies such as Cinnamon leaf, Ginger, Fenugreek, and Amaranth leaf were commonly used in Saudi Arabian and Tanzanian studies. [13, 16] The differences in herbal remedy use across regions may be attributed to cultural and geographical factors influencing local practices and traditions.

The integration of herbal medicine with conventional treatments in this study is supported by literature suggesting the potential benefits of certain herbs. For instance, Moringa

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leaf is shown to lower blood glucose in some animal studies and limited clinical studies. [17-19] Bitter leaf is demonstrated to have promising antidiabetic effects in animal studies. [20]. A meta-analysis of clinical studies indicates that garlic has sustained effects on blood glucose and lipid profile. [21, 22] Thus, these patients may be trying to improve their glycemic control through complementary therapies. However, the literature points out important challenges with herbal medicines such as lack of standardization, risk of contamination, and possible adverse interaction with conventional drugs, including the risk of hypoglycemia which need to be addressed. [23]

- *Relationship between Complementary use of Herbal Medicine and Diabetic Treatment Outcomes*

The study observed higher rates of hospitalization and hypoglycemia among participants using both conventional and herbal medicines compared to those using only conventional medicines. This finding contrasts with some literature suggesting that combining herbal and conventional therapies might improve diabetes outcomes. [23, 24] The increased incidence of hypoglycemia among those using both types of medicine could be due to the additive blood glucose-lowering effects of herbal remedies when used alongside conventional medications. This underscores the need for careful monitoring of blood glucose levels when combining treatments.

V. CONCLUSION

In conclusion, while herbal remedies, especially Moringa leaf, Bitter and Garlic, are widely used by patients with diabetes, their integration with conventional treatments should be approached with caution. This study underscores the importance of rigorous research to clarify the benefits and risks of combining these therapies, aiming to ensure safe and effective diabetes management. Future studies should focus on assessing how combined therapies affect diabetes outcomes over time, and investigating how herbal remedies interact with conventional medications and affect blood glucose levels.

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Table 1 Demographics of Study Participants (N=214)

Variable	Attribute	Frequency	Percentage
Gender	MalM Male	85	39.7
	FGGJ Female	129	60.3
Age (in years)	29-39	2	0.9
	40 40 40-50	56	26.2
	51-61	76	35.5
	62+	80	37.4
Marital Status	Married	183	85.5
	Divorced	1	0.5
	Widowed	30	14.0
Education	Informal	44	20.6
	Primary	62	29.0
	Secondary	25	11.7
	Tertiary	83	38.8
Religion	Christianity	148	69.2
	Islam	66	30.8
Occupation	Civil Servant	67	31.3
	Business	53	24.8
	Farmer	28	13.1
	Artisan	32	14.9
	Unemployed	34	15.9
Duration of diabetes diagnosis (in years)	< 1		27.1
	1-5		37.4
	6-10		4.7
	11-15		29.0
	16-20		1.9
Diabetes mellitus family history	Yes	150	70.1
	No	56	26.2
History of diabetes complications [a]	Vision complications	107	50
	Neuropathy complications	38	17.8
	Amputation complications	2	0.9
	Others complications	3	1.4

[a] = Multiple-choice option

Table 2. Diabetes Treatment Pattern among Study Participants (N=214)

Variable		Frequency (%)	
		Yes	No
Treatment[a]	Conventional medicine	209 (97.7)	5 (2.3)
	Oral conventional medicine	187 (87.4)	27 (12.6)
	Oral medicines plus insulin	115 (53.7)	99 (46.3)
	Insulin alone	25 (11.7)	189 (88.3)
	Dietary modifications	176 (82.2)	37 (17.3)
	Lifestyle modifications	194 (90.7)	18 (8.4)
	Use of herbal medicine	126 (58.9)	88 (41.1)
Disclosure (n=126)	Physician	2 (1.6)	124 (98.4)
	Pharmacist	48(38.1)	78 (61.9)
	Clinician provided guidance on herbal medicine use	3 (2.4)	123 (97.6)

[a] = multichoice option

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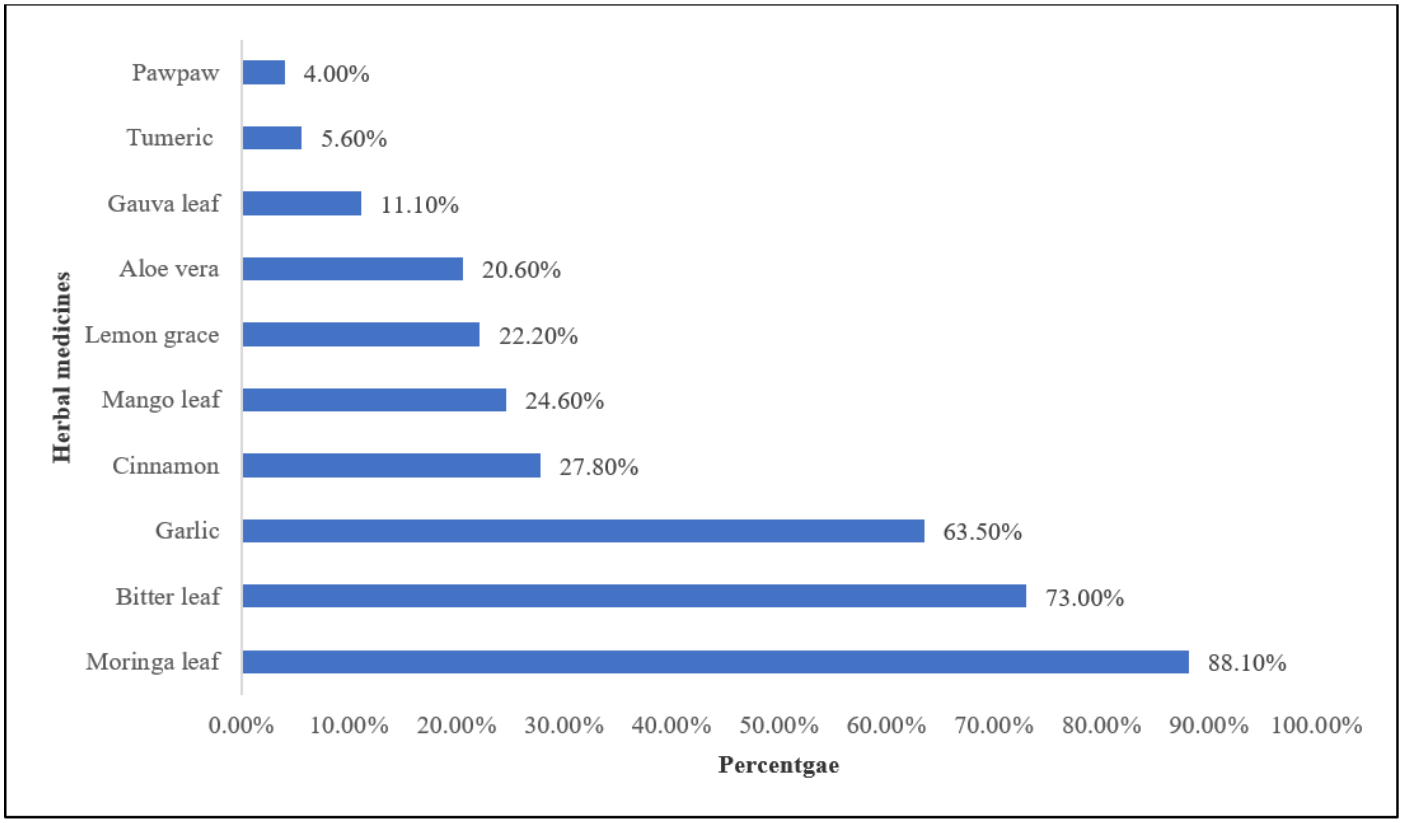

Fig 1 Distribution of Herbal Medicines usage by Study Participants (n=126)

Table 3 Comparison of Diabetes Treatment outcomes between Conventional and Herbal Medicines

Variable	**Attribute**	**Frequency (%)**		***P***
		Conventional medicine	**Conventional + herbal medicine**	**value**
Experienced hospitalisation	Yes	33 (37.5)	66 (52.4)	**0.032**
	No	55 (62.5)	60 (47.6)	
Experienced hypoglyceamia*	Yes	0 (100)	28 (22.2)	**0.000**
	No	88 (100)	98 (77.8)	
Fasting blood glucose	Mean	9.10	9.53	0.133
	Standard deviation	2.12	1.97	

Bold *P* value indicates a significant difference in outcome between groups ($P < 0.05$)
*= Fisher's Exact test was used because one cell has a count < 5