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DIABETES MANAGEMENT: PHARMACY STUDENTS' KNOWLEDGE AND PERCEPTIONS OF HERBAL THERAPIES

King, Adeyinka[1] and Hailemeskel, Bisrat[2*]

[1]BS, Doctor of Pharmacy Student

[2]B. Pharm, MSc, Pharm.D., RPh, ABAAHP, Professor

Howard University College of Pharmacy

2300 4th Street, NW, Washington, DC 20059

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Corresponding Author: Hailemeskel, Bisrat

Address: 2300 4th Street N.W. Washington DC 2059.

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder that requires long-term pharmacologic therapy and lifestyle modification to maintain glycemic control and prevent complications. In addition to conventional treatments, many patients use herbal supplements such as cinnamon, fenugreek, *Gymnema sylvestre*, and bitter melon to help manage blood glucose levels. However, the level of knowledge and perception regarding these therapies among first professional-year pharmacy students remains unclear. The objective of this study was to evaluate their knowledge and opinions regarding the use of selected herbal products in diabetes management. **Method:** A survey-based study was conducted among pharmacy students, and responses were analyzed using statistical software (R version 4.5.2). Demographic characteristics were summarized using descriptive statistics. Knowledge-based responses were evaluated through a composite knowledge score, and opinion-based responses were assessed using Likert scale responses that were collapsed into broader categories for analysis. Statistical tests including analysis of variance (ANOVA), independent t-tests, and Spearman correlation were performed to identify potential relationships between knowledge scores, opinion scores, and demographic variables. **Results:** Forty students participated in the survey. Most participants were female (75%) and between 18–30 years of age. Over half reported pharmacy-related work experience, and most had earned at least a bachelor's degree

prior to entering pharmacy school. The overall mean knowledge score was 3.43 ± 3.01, indicating a low level of knowledge among participants. A statistically significant inverse correlation was observed between knowledge scores and opinion scores (Spearman ρ = −0.42, p = 0.010). These findings suggest that individuals with higher knowledge scores tended to express less favorable opinions regarding the use of herbal therapies for diabetes management. **Conclusion:** Pharmacy students demonstrated limited knowledge but generally favorable perceptions regarding herbal therapies in diabetes management. Enhanced education on complementary medicine may improve future pharmacist preparedness and patient counseling.

KEYWORDS: Diabetes mellitus, herbal supplements, pharmacy students, knowledge assessment, complementary medicine.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from impaired insulin secretion, insulin resistance, or both. Type 2 diabetes mellitus represents a major public health concern worldwide and is associated with complications such as cardiovascular disease, neuropathy, nephropathy, and retinopathy (American Diabetes Association, 2024). Management typically includes pharmacologic therapy, lifestyle modification, and ongoing monitoring of blood glucose levels.

In addition to prescribed medications, many patients use complementary and alternative therapies including herbal supplements. Herbal products such as cinnamon, fenugreek, *Gymnema sylvestre*, and bitter melon are commonly marketed for their potential glucose-lowering effects (Akilen et al., 2012; Allen et al., 2013; Kooti et al., 2016). While some studies suggest these herbal therapies may improve glycemic control, evidence supporting their clinical effectiveness remains inconsistent, and the quality of available research varies significantly (Kooti et al., 2016).

Review of Herbal Agents in Diabetes Management

Cinnamon: Cinnamon has been widely studied for its potential role in improving glycemic control. It may have modest effects on fasting blood glucose and insulin sensitivity, although findings across clinical studies remain inconsistent (Akilen et al., 2012; Allen et al., 2013).

Fenugreek: Fenugreek contains soluble fiber that may slow carbohydrate absorption and contribute to improved glycemic control. Clinical studies suggest reductions in fasting blood glucose and improved glucose tolerance, although variability in dosing limits consistent recommendations (Vajdi et al., 2024).

Gymnema sylvestre: *Gymnema sylvestre* may improve glycemic control in patients with type 2 diabetes, with evidence from systematic reviews and meta-analyses showing reductions in fasting blood glucose and HbA1c levels (Devangan et al., 2021).

Bitter Melon: Bitter melon has been studied for its potential hypoglycemic effects, with some evidence suggesting improvements in glucose uptake and blood sugar control, although results remain inconsistent compared to standard therapies (Cortez-Navarrete et al., 2023).

Pharmacists frequently encounter patients who use herbal supplements and must be able to provide evidence-based counseling regarding their safety and effectiveness. Previous survey-based studies have shown that pharmacy students often demonstrate favorable perceptions toward herbal products but variable levels of factual knowledge. Nwokochah et al. (2021) reported that first-year pharmacy students had positive opinions regarding herbal and dietary supplements, although important knowledge gaps remained. Similarly, Montague et al. (2024) found that students demonstrated moderate understanding of herbal remedies for stretch marks while still holding misconceptions regarding efficacy. Tadele and Hailemeskel (2025) also reported mixed levels of knowledge and generally favorable perceptions regarding herbal remedies used for sunburn treatment. These findings support the need for stronger education in complementary and alternative medicine within pharmacy curricula.

Despite growing public use of herbal supplements, relatively few studies have specifically evaluated pharmacy students' knowledge and perceptions regarding herbal therapies for diabetes management. Identifying these knowledge gaps is important to ensure future pharmacists are prepared to provide accurate patient counseling.

The objective of this study was to evaluate pharmacy students' knowledge and perceptions regarding herbal therapies used in diabetes management.

METHODS

This study used a cross-sectional survey design to evaluate pharmacy students' knowledge and opinions regarding herbal therapies used in diabetes management. The survey included

demographic questions, opinion-based questions, and knowledge-based questions related to commonly used herbal products such as cinnamon, fenugreek, *Gymnema sylvestre*, and bitter melon.

Survey responses were collected electronically from participants within the pharmacy program. Demographic information included gender, age group, prior work experience, type of work experience, and educational background prior to entering the pharmacy program.

The dataset was exported to Microsoft Excel and later imported into R statistical software for analysis. Non-data header rows were removed, and all variables were converted to numeric format where appropriate. Composite scores were created to summarize knowledge-based and opinion-based responses.

The knowledge score was calculated as the sum of responses to five knowledge-based questions, resulting in a possible score range from 0 to 5. The opinion score was calculated as the mean response to five opinion-based Likert scale questions.

Statistical analysis was performed using R version 4.5.2. Descriptive statistics were used to summarize demographic characteristics and survey responses. Analysis of variance (ANOVA) was used to examine associations between demographic variables and knowledge scores. Independent t-tests were performed to compare knowledge scores between genders. Spearman rank correlation analysis was conducted to evaluate the relationship between knowledge scores and opinion scores. Statistical significance was defined as $p < 0.05$.

RESULTS

The demographic characteristics of participants are summarized in Table 1. The majority of participants were female and between 18–30 years of age. Most respondents reported pharmacy-related work experience, and over three-quarters had earned at least a bachelor's degree prior to entering the pharmacy program.

Table 1: Demographic Characteristics of Participants (n = 40).

Variable	Category	n	%
Gender	Male	10	25.0
	Female	30	75.0
Age Group (years)	18–24	21	58.3
	25–30	15	41.7
Work Type	Pharmacy-related	20	52.6

	Non-pharmacy, health-related	9	23.7
	Non-healthcare	9	23.7
Highest Degree Earned	Pre-pharmacy/Other	1	2.4
	Pre-pharmacy certificate	6	14.3
	Associate degree	2	4.8
	Bachelor's degree	26	61.9
	Master's or higher	7	16.7

Opinion-Based Responses

Participants were asked to indicate their level of agreement with statements regarding the potential benefits of herbal products for diabetes management. Responses were originally collected using a Likert scale and were collapsed into broader categories by combining Strongly Agree with Agree and Strongly Disagree with Disagree to improve clarity in the analysis.

As shown in Table 2, many respondents expressed agreement that herbal products such as cinnamon, fenugreek, *Gymnema sylvestre*, and bitter melon may have beneficial effects on blood glucose control. However, fewer participants agreed with statements suggesting that herbal supplements could replace conventional pharmacologic therapy.

Table 2: Opinion-Based Responses on Herbal Agents in Diabetes Management (n = 36).

Statement	Disagree n (%)	Agree n (%)
Cinnamon reduces blood sugar	5 (13.9)	31 (86.1)
Fenugreek lowers blood sugar	4 (11.1)	32 (88.9)
Gymnema reduces sugar cravings	5 (13.9)	31 (86.1)
Bitter melon improves glycemic control	6 (16.7)	30 (83.3)
Cinnamon has antioxidant effects	3 (8.3)	33 (91.7)
Average response	**4.6 (12.8)**	**31.4 (87.2)**

Knowledge-Based Responses

Participants were also assessed on their knowledge of herbal therapies used in diabetes management. The results are summarized in Table 3. The overall mean knowledge score was 3.43 ± 3.01 (68.6%), indicating a low level of knowledge among respondents. Many participants correctly identified potential mechanisms and glycemic effects associated with several herbal products. However, knowledge regarding the limitations of these therapies and their appropriate role as complementary treatments varied among respondents.

Table 3: Knowledge-Based Responses on Herbal Agents in Diabetes (n = 35).

Knowledge Statement	N (%) with Correct Response	True n (%)	False n (%)
Cinnamon improves insulin sensitivity	31 (88.6)	31 (88.6)	4 (11.4)
Fenugreek slows carbohydrate absorption	25 (69.4)	25 (69.4)	11 (30.6)
Gymnema lowers blood sugar/HbA1c	30 (85.7)	30 (85.7)	5 (14.3)
Bitter melon increases insulin secretion	31 (88.6)	31 (88.6)	4 (11.4)
Herbs can replace medications/lifestyle	9 (25.7)	26 (74.3)	9 (25.7)
Average score	25.2 (71.6)	28.6 (81.7)	6.6 (18.3)
OVERALL SCORE	**3.43 ± 3.01**		

Significant Findings

Statistical analysis results are summarized in Table 4. No statistically significant associations were observed between knowledge scores and several demographic variables, including educational background and type of work experience. However, a statistically significant inverse relationship was identified between knowledge scores and opinion scores (Spearman $\rho = -0.42$, $p = 0.010$). This finding suggests that participants with higher knowledge scores tended to express less favorable opinions regarding the use of herbal therapies for diabetes management.

Across all opinion statements, most respondents selected "Agree," indicating generally favorable perceptions of herbal agents as adjuncts in diabetes management.

A statistically significant moderate negative correlation was observed, indicating that greater knowledge was associated with less favorable opinions toward herbal agents in diabetes management.

Table 4: Statistically Significant Findings.

Comparison	Test	Statistic	p-value
Knowledge score vs Opinion score	Spearman correlation	$\rho = -0.42$	0.010

DISCUSSION

The purpose of this study was to evaluate pharmacy students' knowledge and perceptions regarding herbal products commonly used for diabetes management. Overall, the results suggest that respondents possessed a low level of knowledge regarding these therapies.

The findings of this study are consistent with the literature reviewed in the Introduction. Similar to Nwokochah et al. (2021), our participants demonstrated favorable perceptions of herbal therapies despite limited knowledge. This pattern also aligns with Montague et al. (2024) and Tadele & Hailemeskel (2025), who found that students often express positive

attitudes toward herbal remedies even when their evidence-based understanding is incomplete. Likewise, the literature on herbal agents such as cinnamon, fenugreek, gymnema, and bitter melon shows mixed and inconsistent clinical results, which parallels the uncertainty reflected in students' knowledge scores. Overall, both the literature and our findings suggest that while interest in herbal therapies is high, knowledge gaps persist, reinforcing the need for enhanced curricular coverage of complementary medicine.

The lowest scores were observed for the item assessing whether herbal therapies can replace conventional treatment and for the question related to fenugreek's mechanism of action. These findings suggest that respondents may recognize potential benefits of herbal products while lacking clarity regarding their evidence-based role as adjunctive rather than replacement therapies.

Many participants were aware that herbal products such as cinnamon and fenugreek may influence glucose metabolism and potentially improve glycemic control. Knowledge regarding *Gymnema sylvestre* and bitter melon was also observed among several respondents. However, some participants appeared less certain about the appropriate role of herbal therapies within diabetes treatment, particularly in relation to their use alongside or in place of prescribed medications.

Participants generally expressed positive perceptions regarding the potential benefits of herbal products in diabetes management. Many respondents agreed that these therapies may help improve glycemic control or provide additional health benefits. Despite these favorable opinions, fewer participants indicated that herbal products could replace conventional diabetes treatments, suggesting awareness of the importance of standard medical therapy.

Interestingly, the study identified a significant inverse relationship between knowledge scores and opinion scores. Participants with higher knowledge scores tended to express less favorable opinions regarding herbal therapies. This finding may reflect greater awareness of limitations in current clinical evidence, potential safety concerns, and variability in the quality of herbal supplements.

These findings emphasize the importance of incorporating education on complementary and alternative therapies. Pharmacists frequently encounter patients who use herbal supplements or seek guidance regarding their safety and effectiveness. Ensuring that pharmacy students

develop strong evidence-based knowledge in this area will allow future pharmacists to provide appropriate counseling and support informed decision-making among patients with diabetes.

Limitations

This study has several limitations. The sample size was relatively small and limited to pharmacy students from a single institution, which may reduce generalizability. The use of self-reported survey data introduces the potential for response bias. Missing responses may have affected the statistical analysis, and the cross-sectional design limits the ability to establish causality.

CONCLUSION

This study evaluated pharmacy students' knowledge and opinions regarding herbal therapies used in diabetes management. The findings indicate that participants demonstrated a low level of knowledge while generally expressing favorable opinions toward the potential benefits of herbal products. A significant inverse correlation was observed between knowledge scores and opinion scores, suggesting that greater knowledge may be associated with more cautious perceptions of these therapies. Continued education on complementary and alternative medicine within pharmacy programs may help improve students' understanding of herbal supplements and their role in patient care.

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