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Research Article

Traditional Medicine Use among Type 2 Diabetes Patients in KZN

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Background. Traditional medicine (TM) is widely used in both developing and developed countries to assist in the attempt to curtail the prevalence and increase in diabetes mellitus. Approximately 53% of South Africans use TM to prevent and treat their diseases. There is no conclusive evidence regarding the safety and effectiveness of TM versus prescribed medicine. The most common therapies used by diabetics in Africa include herbal treatments, nutritional products, spiritual healing, and relaxation techniques. Therefore, this study aimed to evaluate the use of TM in patients with T2DM who are on chronic therapy and living in KwaZulu-Natal. *Method*. This cross-sectional study was conducted at a district hospital, in which purposive sampling was used to recruit participants and data were collected using a structured questionnaire. Information collected included demographic data, information pertaining to home remedies/TM, and self-care practices employed by participants while using TM. Data were analyzed using Pearson's chi-squared test, t-test, and multivariate logistic regressions to determine predictors of TM usage. *Results*. Only 92 (27%) of 340 participants reported using TM, with Indians being the most frequent users (58.24%). Approximately, 83.72% ($n = 72$) used TM in conjunction with prescribed medication. Most participants (56.32%) acquired TM knowledge from family. The most frequently used TM was lemon and honey, *Aloe vera*, bitter gourd, green tea, and cinnamon. Traditional medicine use among African participants was 0.56 times (OR = 0.56, 95% CI = 0.34, 0.93) lower than Indian participants. There were no significant predictors for TM usage among the variables tested. *Conclusion*. A low prevalence rate of TM usage in T2DM patients was found. A significant correlation was noted between ethnicity and TM use. Large-scale studies are required to determine the additive and synergistic effects of TM in health care. Consideration should also be given to integrating TM into mainstream health care.

1. Background

Diabetes mellitus (DM) is a chronic disease, caused by insulin deficiency or resistance [1], and describes various distinct metabolic disorders, of which chronic hyperglycemia is the most common [2, 3]. Diabetes-induced complications, such as heart attack, stroke, kidney disease, amputations, poor vision, and nerve damage, are more likely to occur in hyperglycemic individuals [4]. The global prevalence of diabetes increased from 211.2 million in 1990 to 476 million, as reported in 2017 [5]. According to a 2021 IDF report, the global DM prevalence is 10.5% (536.6 million) [6]. In Africa, the highest estimated prevalence rates are found in South Africa (17.5%), followed by Nigeria (15%), United Republic of Tanzania (12.08%), Ethiopia (7.92%), and the Demographic Republic of Congo (7.92%), respectively [6]. Diabetic cases are classified into three categories, namely, type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), and gestational diabetes (GD). The more common types of DM, however, are T1DM and T2DM. T1DM results from the destruction of pancreatic beta cells by T cells of the immune system [3, 7, 8], whereas T2DM is characterized by defective insulin secretion by pancreatic β-cells and the inability of insulin-sensitive tissues to react appropriately to insulin [9]. Apart from clinical therapeutics, many DM patients have utilized traditional and complementary alternative medicine (TCAM) strategies to control and manage this disease [10].

Traditional medicine (TM) refers to practices based on the theories, beliefs, and experiences indigenous to different cultures, whereas complementary alternative medicine (CAM) refers to a broad set of healthcare practices that are

not fully integrated into the main healthcare system [11]. Worldwide, TM and CAM are frequently referred to as TCAM and are widely used in managing DM [12, 13]. Moreover, CAM is used interchangeably with TM, which may also be referred to as alternative or complementary medicine in various countries [14]. Almost 40% of those residing in the United States of America (USA) use TM in comparison with 52.79% living in South Africa [13]. Despite the wide acceptance of CAM, its safety and effectiveness versus prescribed medicine remains inconclusive [15]. Medagama and Bandara (2014) highlight that complementary medicine has fewer side effects and is widely used in conjunction with prescribed medicine, whereas alternative medicine often replaces prescribed medicine [16]. In sub-Saharan Africa, a 50–80% increase in the use of complementary medicine was reported [17]. The extensive use of TCAM in sub-Saharan Africa for the prevention and treatment of communicable and noncommunicable diseases [18] accounts for an almost two billion rand contribution towards the South African economy [19]. In Africa, herbal medicines, nutritional products, spiritual healing, and relaxation techniques are frequently used CAM therapies employed by diabetic patients [20]. A recent systematic review and meta-analysis confirm the use of acupuncture, mind-body therapies, religious and spiritual healing, and homoeopathic remedies among diabetics in various countries such as Saudi Arabia, Nigeria, Turkey, India, Lebanon, and USA [21].

A Malaysian study conducted among 240 diabetic patients showed 62.5% CAM use, with females being 1.8 times more likely than males to use CAM [22]. It was further asserted that biological therapy, based on the use of substances made from living organisms to treat disease and stimulate the body's immune system, was widely used (50%), followed by manipulative body-based systems (9.2%), energy system (8.8%), alternative medicine systems (4.6%), and the mind-body system (1.7%) [22]. Similarly, a Taiwanese cross-sectional survey reported extensive use of CAM in conjunction with prescribed medicines [23]. Before T2DM diagnosis, only 22.7% used CAM. Nevertheless, prevalence increased to 61% after diagnosis, with nutritional supplements reported as the most commonly used pre- and post-diagnosis resource [23]. Post-diagnoses, CAM modalities included nutritional supplements, Chinese herbal medicines, diet modifications, manipulative-based therapies, biofield therapy, bioelectromagnetic-based therapies, supernatural healing therapies, and mind-body therapies, whereas acupuncture, cupping, and scraping and aromatherapy remained the same pre- and post-diagnosis [23]. Alternately, a study conducted among 481 community members in Tanzania, 45 of whom were diagnosed with DM, indicated that the prevalence of TM use among the diabetic individuals was 77.1%, while the prevalence of TM and prescribed medicine concurrently was 37.6%. Several herbal TMs such as *Moringa oleifera, Cymbopogon citrullus, Hagenia abyssinica, Aloe vera, Clausena anisata, Cajanus cajan, Artemisia afra, and Persea americana* were identified to be utilized in the treatment of their DM [24].

The wide use of African traditional medicine (ATM) by almost 72% of the Black African population prior to the advent of orthodox medicine has been widely acknowledged [25]. Several studies confirm cinnamon, ginger, fenugreek, bitter gourd, ivy gourd, and crepe ginger as the more frequently used herbal remedies for DM [16, 26, 27]. In South Africa, the more popular DM herbal remedies include *Vernonia amygdalina* (bitter leaf), *Hypoxis hemerocallidea* (African potatoe), *Mimusops zeyheri*, *Catharanthus roseus* (Madagascar Periwinkle), and *Sutherlandia frutescens* (cancer bush) [28]. The biological and pharmacological effects of *Aloe ferox, Artemisia afra, and Leonotis leonurus* are extensively reported [29–31]. *Aloe ferox* improves carbohydrate metabolism and reduces obesity-induced glucose intolerance, whereas *Artemisia afra* and *Leonotis leonurus* demonstrate hypoglycemic and hypolipidemic effects [28].

Recent data confirm that most of the patient's knowledge regarding TCAM is obtained via family, friends, and social media, suggesting that many fail to consult with medical personnel regarding the use of TCAM in conjunction with T2DM medication [26, 32]. Medical concern exists regarding the efficacy of prescribed T2DM medication when patients opt to replace prescribed treatment with CAM modalities [33]. However, while several studies support TCAM use in conjunction with clinical treatment, due to its reduced side effects, cost-effectiveness, easier accessibility, and acceptability [22, 23], many patients prefer not to use TCAM because of the lack of scientific data to support its preparation, lack of proven effectiveness, dosage, and the risk of side effects [34]. Despite the prevailing clinical importance of TCAM usage in the management of DM, further studies investigating the impact of TCAM on DM control and management are warranted [27]. In Africa, it remains unclear how patients manage their diabetes in light of combining TCAM and clinical therapy [35, 36]. A paucity of information exists regarding the comparison of treatment approaches and methods used by DM patients due to various cultures and environments in South Africa, more specifically, KwaZulu-Natal, where DM is common among all race groups [37]. The highest prevalence of this disease is found within the Indian population (15.8%), followed by the African (4.8%) and White (3.5%) populations [38]. An evaluation of evidence-based practices may assist in the development of treatment approaches [37]. Therefore, this study aimed to evaluate the use of TM in patients with T2DM, who are on chronic treatment in KwaZulu-Natal.

2. Methodology

2.1. Study Design and Site. This cross-sectional study was conducted at a district hospital located in a suburb in the eThekwini Health District in Durban, which is located on the east coast of South Africa and is the largest city in the province of KwaZulu-Natal. The hospital is one of the four major hospitals in the Durban region, serving a population of over 1500 000 people, predominately the Indian and African groups from the middle to low socioeconomic strata, and who have no access to medical aid. Ethical approval was obtained from the Durban University of Technology (DUT)

Institutional Research Ethics Committee (IREC 112/19) and the KwaZulu-Natal Department of Health. Informed consent was obtained from all participants.

2.2. Study Population and Sample Strategy. Purposive sampling was used to recruit a total of 340 (equal numbers of Indian and African) participants between November 2019 and January 2020. The sample size was determined in consultation with a biostatistician, using regional prevalence data for T2DM, at 95% confidence interval and 80% power calculation. All outpatients 45 years and older, diagnosed with T2DM for five years and more, and who reported to the hospital for treatment were included. Participants were excluded if they were diagnosed with T2DM for less than five years, below the age of 45 years, and if they had participated in the pilot study.

2.3. Data Collection. Data were collected using a structured questionnaire that was adapted from Sivakumar [39]; Farinha et al. [40]; and Amaeze et al. [41]; thereafter, the questionnaire was piloted. The questionnaire was inclusive of demographic information including age, sex, level of education, and economic status. Additionally, information pertaining to the extent and use of home remedies/TM; participants' self-care practices while using TM; frequency of hospital visits; the joint use of TM and prescribed medication; reasons for TM use and comorbidities related to T2DM were included. The validity and reliability of the study were maintained by designing questions according to the principles defined by Zohrabi [42] and piloted before use.

2.4. Data Analysis. Data were analyzed using Stata version 12 (StataCorp). Descriptive statistics including frequency counts were obtained. The use of TM was stratified by gender, race, age, and relevant comorbidities. The Pearson chi-square and Student's t-test were conducted to determine the association between sociodemographic variables and TM usage. Multivariate logistic regression was used to determine predictors of TM usage, as well as the effects of the independent variables on the coexistence of comorbidities of T2DM. Odds ratios and the 95% confidence interval were calculated. A p value ≤ 0.05 was considered statistically significant.

3. Results

The sociodemographic and disease-related characteristics of the participants are shown in Table 1. Of 340 participants, 72% ($n = 244$) were female, with a mean age of 61 years (SD = 10.17). The majority of the participants presenting with T2DM were between 45 and 59 years (47.94%), followed by 60- to 75-year-olds (39.12%). Notably, of 340 participants, only 92 (27%) participants reported TM usage since diagnosis, with Indians being the more frequent users (58.24%). Traditional medicine usage was more prevalent among those with a secondary level of education (58.70%), followed by the unemployed (25%) and retired individuals (21.74%), respectively. Additionally, 91.21% of TM users reside in informal settlements.

The characteristics of the T2DM participants are shown in Table 2. Approximately 40% of all participants ($n = 135$) reported living with T2DM between 10 and 19 years. Interestingly, 56.21% of all participants reported no family history of DM. High blood glucose levels (HBGLs) were most frequently treated by medication only (39.27%), and the least used interventions for controlling HBGL were diet and exercise. Home monitoring of blood glucose levels was reported by 157 participants (48.61), while 27.06% ($n = 92$) reported the use of TCAM methods to manage HBGL. The self-care practices of all TM users ($n = 92$) are shown in Table 3. Approximately 36% of participants used TM for more than five years. Most respondents (52.81%) indicated that their frequency of TM usage was at least once a day, whereas 16.85% ($n = 15$) reported TM usage twice a day and 7.87% ($n = 7$) indicated that they use TM three times per day. There was an overwhelming belief among participants that TM usage controlled their HBGL (83.15%, $n = 74$). However, 20.22% ($n = 18$) felt that TM usage controls the HBGL and produces less side effects, whereas 21.35% reported having no other health problems. Moreover, 32.58% ($n = 29$) chose TM usage because of its affordability. Of 88 responses, 88.77% reported that TM is used for HBGL. It was disconcerting to note that 12 (13.95%) participants reported replacing their hospital prescription with TM usage, while 83.72% ($n = 72$) used TM in conjunction with hospital medication. Most participants (56.32%) acquired TM knowledge from family, 54.02% reported obtaining knowledge from friends, and 12.64% from nurses. The majority of the participants were satisfied with the TM they used (85.71%); however, 2.26% indicated that they did not have any perceived therapeutic effect, while approximately 12% of participants were not sure whether or not they experienced therapeutic effects from the TM. Interestingly, 89.77% reported that they would recommend TM to other patients diagnosed with T2DM. In this study, the most frequently used TM were *Citrus limonum* and *Apis cerana*, commonly known as lemon and honey (4.71%), *Aloe vera* and *Momordica charantia* usually called bitter gourd or karela (3.53%), *Camellia sinensis* also known as green tea (3.24%), followed by *Cinnamomum verum* (2.94%), *Murraya koenigii* or curry leaves (2.65%), and *Ocimum tenuiflorum*, also known as tulsi leaves (2.06%) (Table 4).

Traditional medicine usage, stratified by comorbidities before and after diagnosis of T2DM, is depicted in Table 5. Of the total 24 comorbidities investigated, a substantial increase in comorbidities was experienced before diagnosis rather than after diagnosis. The leading comorbidities before diagnosis were high blood pressure (32.92%), tooth decay and infection (25.39%), vision difficulty (23.43%), and cramps (15.92%). Post-diagnosis, the more common comorbidities experienced were dry mouth (82.25%), vision difficulty (77.02%), dizziness (76.14%), cramps (75%), and high blood pressure (66.45%). A statistically significant increase in participant numbers was noted post-diagnosis for numbness of hands (29 to 139), numbness of feet (33 to

Table 1: Demographic profile of type 2 diabetes mellitus patients stratified by traditional medicine use ($N = 340$).

Characteristics	Total n (%)	Traditional medicine use	
		Yes n (%)	No n (%)
Gender			
Male	96 (28.24)	23 (25.00)	73 (29.44)
Female	244 (71.76)	69 (75.00)	175 (70.56)
Race			
Indian	162 (48.36)	53 (58.24)	109 (44.67)
African	173 (51.64)	38 (41.76)	135 (55.33)
Age category (years)			
45–59	163 (47.94)	40 (43.48)	123 (49.60)
60–75	133 (39.12)	38 (41.30)	95 (38.31)
Above 75	44 (12.94)	14 (15.22)	30 (12.10)
Religion			
Hindu	67 (19.71)	24 (26.09)	43 (17.34)
Muslim	19 (5.59)	6 (6.52)	13 (5.24)
Christian	184 (54.12)	45 (48.91)	139 (56.05)
Other	70 (20.59)	17 (18.48)	53 (21.37)
Educational level			
No education	32 (9.44)	9 (9.78)	23 (9.31)
Primary	117 (34.51)	28 (30.43)	89 (36.03)
Secondary	180 (53.10)	54 (58.70)	126 (51.01)
Undergraduate	7 (2.06)	1 (1.09)	6 (2.43)
Postgraduate	3 (0.88)	0	3 (1.21)
Occupation			
Farmer/labourer	2 (0.59)	0	2 (0.81)
Domestic worker	15 (4.42)	4 (4.35)	11 (4.45)
Housewife	49 (14.45)	19 (20.65)	30 (12.15)
Unemployed	117 (34.51)	23 (25.00)	94 (38.06)
Retail	9 (2.65)	4 (4.35)	5 (2.02))
Retired	76 (22.42)	20 (21.74)	56 (22.67)
Pensioner	38 (11.21)	10 (10.87)	28 (11.34)
Other	33 (9.73)	12 (13.04)	21 (8.50)
Residence			
Informal settlement	309 (91.42)	83 (91.21)	226 (91.50)
Formal housing	29 (8.58)	8 (8.79)	21 (8.50)

* $p < 0.05$ was considered statistically significant. There were missing data in some categories.

149 after diagnosis), arthritis and joint pain (54 to 225), and swelling in feet and legs (25 to 124). These increases were similar, in regard to adverse changes in the sleep cycle (31 to 151) and depression (42 to 119). Of all TM users, 70 reported suffering from dry mouth, 62 reported arthritis and joint pain, 60 experienced cramps, 70 experienced dizziness, and 64 reported vision difficulty.

Gender, race, age, educational level, residence, and presence of DM comorbidities were among the factors tested as independent predictors for TM usage. The odds of TM use in female participants were 1.31 times (OR = 1.31, 95% CI = 0.75, 2.78) higher compared with male participants. Traditional medicine use among African participants was 0.56 times (OR = 0.56, 95% CI = 0.34, 0.93) lower compared with Indian participants. The odds of TM use among participants aged between 60 and 75 years (OR = 1.32, 95% CI = 0.78, 2.24) and above 75 years (OR = 1.42, 95% CI = 0.67, 3.01) were, respectively, 1.32 and 1.42 times higher than younger patients. There were no significant predictors for TM usage among the variables tested (Table 6).

Table 2: Clinical characterization and self-care activities among type 2 diabetes mellitus patients ($N = 340$).

	Total n (%)
Period of diagnosis (years) ($n = 340$)	
5–9	150 (44.12)
10–19	135 (39.71)
20–29	34 (10.00)
30–39	17 (5.00)
40–49	4 (1.18)
Family history of high blood glucose levels (HBGL) ($n = 338$)	
No	190 (56.21)
Yes	143 (42.31)
Don't know	5 (1.48)
Treatment of HBGL ($n = 331$)	
Medication only	130 (39.27)
Diet only	6 (1.81)
Diet and medication	21 (6.34)
Diet and exercise	1 (0.30)
Diet, medication, and exercise	27 (8.16)
Insulin	16 (4.83)
Medication and insulin	95 (28.70)
Diet, exercise, medication, and insulin	32 (9.67)
Diet and insulin	3 (0.91)
Frequency of hospital visits for treatment ($n = 323$)	
Once a week	5 (1.55)
Twice a week	4 (1.24)
Once a month	213 (65.94)
Twice a month	5 (1.55)
Twice a year	67 (20.74)
Four times a year	2 (0.62)
Other	27 (8.36)
BGL checked at home ($n = 323$)	157 (48.61)
Traditional medicine use ($n = 340$)	92 (27.06)

HBGL = high blood glucose level. BGL = blood glucose level. Some participants have not responded to all the questions, which accounts for the varying numbers (n).

4. Discussion

Our main findings demonstrate that almost one-third (27.06%) of our diabetic participants reported using home remedies/TM to manage their condition, with females identified as the more regular users. The CAM usage prevalence rates vary by country and region in patients with T2DM [43, 44]. Our findings are comparable with studies conducted in Libya, Saudi Arabia, USA, Lebanon, and India, countries that also yielded low prevalence estimates (29%, 26%, 26%, 38%, and 30%, respectively) [44–48]. In contrast, the prevalence estimates of CAM use among T2DM patients were higher in Tanzania (78%), Sri Lanka (76%), and Malaysia (63%) [16, 22, 24]. The varied prevalence rates of CAM usage by region can possibly be explained by the

Table 3: Traditional medicine use among type 2 diabetes patients ($N = 92$).

TM practices	Total n (%)
Duration of traditional medicine use ($n = 89$)	
<12 months	7 (7.87)
1 year	20 (22.47)
2–3 yrs	16 (16.85)
3–5 yrs	16 (16.85)
More than 5 yrs	32 (35.96)
Frequency of traditional medicine use ($n = 89$)	
Once a day	47 (52.81)
Twice a day	15 (16.85)
3 or more times a day	7 (7.87)
3 times a week	1 (1.12)
Once a month	2 (2.25)
Less frequent	6 (6.74)
Other	11 (12.36)
*Reasons for using traditional medicine ($n = 89$)	
Controls my high blood glucose levels	74 (83.15)
I experience fewer side effects when compared to my tablets	18 (20.22)
I do not have health problems	19 (21.35)
It's cheap	29 (32.58)
Traditional medicine used when my BGL is high ($n = 88$)	79 (88.77)
Traditional medicine used when my BGL is low ($n = 87$)	48 (55.17)
Satisfied with medication given by hospital ($n = 86$)	75 (87.21)
Hospital medication stopped when taking traditional medicine ($n = 86$)	
No	72 (83.72)
Yes	12 (13.95)
Sometimes	2 (2.33)
Traditional medicine used in conjunction with hospital medication ($n = 86$)	
No	14 (16.28)
Yes	72 (83.72)
*Source of information about traditional medicine ($n = 87$)	
Doctor	6 (6.90))
Pharmacy	1 (1.15)
Magazine	2 (2.30)
Family	49 (56.32)
Friends	47 (54.02)
People waiting in queue	4 (4.60)
Radio	4 (4.60)
Internet	3 (3.45)
Nurses	11 (12.64)
Perceived therapeutic effects from the use of traditional medicine ($n = 89$)	
No	2 (2.26)
Yes	77 (85.71)
Not sure	10 (12.03)
Recommend traditional medicine to others ($n = 88$)	
No	6 (6.82)
Yes	79 (89.77)
Not sure	3 (3.41)

Some participants have not responded to all the questions, which accounts for the varying numbers (n). *Participants have responded to more than one answer.

different perceptions of CAM use among various cultures and religions, as well as differences in study design and definition of CAM used per region [49, 50]. In this study, a higher prevalence of TM use was expected, especially among the African population. With the rising prevalence of DM among the African population, it was assumed that ATM would be frequently used by T2DM patients. The low prevalence observed in our study could possibly be explained by fear of the clinical staff and their reaction towards the use of home remedies/TM. The hospital setting may have also contributed to the possible lack of disclosure.

Our data also suggest that females are more frequent users of CAM compared with males, which is consistent with previous reports [23, 51, 52]. This may be attributed to females being more influenced by cultural beliefs, social beliefs, and relatives, along with other factors. A recent Dubai report, however, highlights males as frequent CAM users, indicating an inconclusive association between sex and CAM use [49]. An earlier study suggested that sex is not a

Table 4: Common home remedies used by study population ($N = 92$).

Scientific name	Common name	Total n (%)
Citrus limonum and Apis cerana	Lemon and honey	16 (4.71)
Aloe barbadensis miller	Aloe vera	14 (4.12)
Momordica charantia	Bitter gourd or karela	12 (3.53)
Camellia sinensis	Green tea	11 (3.24)
Cinnamomum verum	Cinnamon	10 (2.94)
Murraya koenigii	Curry leaves	9 (2.65)
Ocimum tenuiflorum	Tulsi leaves	7 (2.06)
Moringa oleifera	Drumstick leaves or moringa	7 (2.06)
Cyrtanthus obliquus and Lippia javanica	Imbiza	6 (1.76)
Vitis vinifera	Procydin	6 (1.76)
Zingiber officinale	Ginger	5 (1.47)
Allium sativum	Garlic	5 (1.47)
Cannabis sativa	Weed or marijuana	4 (1.18)
Azadirachta indica	Neem	3 (0.88)
Mangifera indica	Mango leaves	2 (0.59)
Hypoxis hemerocallidea	Zifozonke	2 (0.59)

significant factor in predicting CAM use in patients with T2DM [53]. A significant association was found with ethnicity, as Indians used TM more frequently in comparison with Africans. These results were anticipated because DM and CAM uses were reported among the Indian population in response to DM in previous reports [46, 52, 54]. Nevertheless, DM has presented a challenge among the African population in recent years. Similar results were obtained from a study conducted in Malaysia [22], where authors reported a deeply rooted multicultural nature and a religious influence in CAM use [22]. According to Raja et al. [32], despite the lack of statistically significant association between ethnicity and TM use, a significant association ($p \leq 0.001$) was noted with female gender, older age, lower education, unemployment, longer duration of diabetes, and diabetes-related complication [32].

Several participants in our study treated their HBGL with medication alone (39.27%) followed by medication and insulin (28.70%), while diet and exercise are not prioritized. These data are suggestive of poor diabetes education among respondents, especially since approximately 40% of participants in this study had a primary school level of education only, or no education at all. Furthermore, following a balanced diet can be expensive and the majority of our TM users (91.21%) lived in informal settlements, which may indicate that affordability could be a challenge. Collective DM management should include behavioral modifications such as diet plans, avoiding high-fat foods, increasing physical activity, glucose monitoring, and foot care [55]. In comparison, a study conducted in the Vellore region of Tamil Nadu reported a higher adherence to medication (79.80%), as well as good dietary behavior, physical activity, and regular blood sugar monitoring among diabetic patients [56]. Several other studies in Africa indicated an average of approximately 64% of medication adherence [57–60]; however, moderate compliance to diet plans ranging from 33% to 87% was observed [57, 61, 62]. Physical activity among T2DM patients varied between 29 and 46% [57, 63, 64], and only 15% of patients were able to monitor their blood glucose at home. Similarly, in our study, less than 50% of T2DM patients monitored their blood glucose at home. This may be attributed to the cost of test strips and needles. In addition, many participants were over 60 and may have a negative perception about monitoring their blood glucose levels. In these comparison studies, literacy and easier access to health-related activities may explain the differences in self-care practices. The results of our study suggest that self-management of diabetes is inadequate because even though patients depend greatly on prescription medication, they still require a quick healing remedy. Moreover, the self-management inadequacy is particularly due to the lack of physical activity and a healthy diet, both of which pose serious threats to good glycemic control.

A majority of the participants took their prescribed medication in conjunction with the home remedy/TM. Common reasons offered by participants for TM use were that it controls HBGL, while 32.58% of participants felt that TM was affordable; however, it is possible that the lack of TM use among some of the participants may be attributed to limited data on the efficacy and side effects of the TM. Ayurveda was reported to be the most common TM modality used by T2DM patients in India [65]. Similar results were obtained from other studies [42, 50, 63]. For example, bitter gourd (9.09%) and fenugreek seeds (8.18%) were identified as common TM modalities in India, since TM alternatives are more widely accepted in rural areas, compared with urban areas [65]. It is possible that similar scenarios apply to our study, since the majority of TM users reside in informal settlements.

The five most common TM used in our study were lemon and honey, aloe vera, bitter gourd or karela, green tea, and cinnamon. Bobiş, Dezmirean, and Moise [66] stated that honey has been proven to support hypoglycemia; however, the mechanism of this effect remains unclear. More than 200 substances make up honey, with fructose, glucose, and water being the three main components [66]. In an animal model of diabetes, fructose has been found to reduce blood glucose levels [67]. Additionally, honey might protect the pancreas, which secretes two glucose-regulating hormones known as insulin and glucagon, from oxidative stress [68, 69]. There

Table 5: Comorbidities stratified by T2DM diagnosis and traditional medicine use.

Comorbidities	Before diagnosis *n* (%)	After diagnosis *n* (%)	*p* value	Frequency of symptoms				No traditional medicine use *n* (%)	Traditional medicine use *n* (%)	*p* value
				Very often	Often	Seldom	Very seldom			
Tooth decay and infection	81 (25.39)	155 (47.84)	≤0.001*	12 (9.76)	35 (28.46)	47 (38.21)	29 (23.58)	121 (50.84)	34 (39.53)	0.072
Loss of teeth	42 (14.74)	170 (58.82)	0.090	9 (9.78)	28 (30.43)	40 (43.48)	15 (16.30)	130 (76.47)	40 (23.53)	0.201
Swollen bleeding gums	27 (10.15)	106 (39.85)	≤0.001*	6 (7.89)	22 (28.95)	29 (38.16)	19 (25.00)	86 (81.13)	20 (18.87)	0.032
Dry mouth	30 (10.27)	241 (82.25)	0.421	13 (9.63)	41 (30.37)	56 (41.48)	25 (18.52)	171 (70.95)	70 (29.05)	0.150
High blood pressure	105 (32.92)	206 (66.45)	≤0.001*	10 (7.75)	35 (27.13)	56 (43.41)	28 (21.71)	156 (75.73)	50 (24.27)	0.115
Chest pain	27 (10.04)	101 (38.40)	≤0.001*	6 (8.45)	16 (22.54)	34 (47.89)	15 (21.13)	77 (76.24)	24 (23.76)	0.472
Heart attack	26 (10.36)	44 (17.81)	≤0.001*	3 (11.11)	4 (14.81)	9 (33.33)	8 (29.63)	34 (77.27)	10 (22.73)	0.595
Arthritis or joint pain	54 (17.65)	225 (72.35)	≤0.001*	46 (32.39)	36 (25.35)	45 (31.69)	15 (10.56)	163 (72.44)	62 (27.56)	0.639
Coldness of feet	35 (12.50)	125 (44.17)	≤0.001*	21 (24.42)	22 (25.58)	33 (38.37)	9 (10.47)	91 (72.80)	34 (27.20))	0.998
Numbness of hands	21 (7.95)	139 (53.46)	≤0.001*	17 (21.25)	24 (30.00)	30 (37.50)	8 (10.00)	102 (73.38)	37 (26.62)	0.678
Numbness of feet	33 (11.83)	149 (52.84)	≤0.001*	24 (22.43)	29 (27.10)	36 (33.64)	18 (16.82)	107 (71.81)	42 (28.19)	0.522
Cramps	50 (15.92)	237 (75.00)	0.142	31 (20.67)	36 (24.00)	54 (36.00)	25 (16.67)	176 (74.58)	60 (25.42)	0.464
Dizziness	32 (10.53)	233 (76.14)	0.589	22 (15.38)	37 (25.87)	55 (38.46)	28 (19.58)	163 (69.96)	70 (30.04)	0.114
Vision difficulty	71 (23.43)	238 (77.02)	0.001	48 (32.21)	56 (37.58)	33 (22.15)	12 (8.05)	174 (73.11)	64 (26.89)	0.499
Problem in sleep cycle	31 (10.54)	151 (51.71)	≤0.001*	27 (24.11)	34 (30.36)	36 (32.14)	14 (12.50)	105 (69.54)	46 (30.46)	0.282
Depression	42 (14.05)	119 (40.20)	≤0.001*	12 (11.65)	15 (14.56)	53 (51.46)	23 (22.33)	85 (71.43)	34 (28.57)	0.624
Weight gain	28 (11.20)	59 (24.08)	≤0.001*	4 (7.41)	14 (25.93)	26 (48.15)	7 (12.96)	48 (81.36)	11 (18.64)	0.115
Swelling of legs and feet	25 (9.03)	124 (43.97)	0.001	17 (20.48)	29 (34.94)	26 (31.33)	11 (13.25)	91 (73.39)	33 (26.61)	0.805
Swelling in abdomen	6 (2.37)	39 (15.85)	≤0.001*	4 (13.79)	11 (37.93)	8 (27.59)	6 (20.69)	30 (76.92)	9 (23.08)	0.739
Hair loss	20 (7.69)	94 (36.72)	0.001	5 (8.93)	19 (33.93)	24 (42.86)	8 (14.29)	67 (71.28)	27 (28.72)	0.706
Slow wound healing	5 (2.07)	59 (24.48)	≤0.001*	3 (16.67)	5 (27.78)	7 (38.89)	3 (16.67)	42 (71.19)	17 (28.81)	0.532
Varicose veins	25 (10.04)	76 (30.65)	0.001	6 (17.65)	14 (41.18)	12 (35.29)	2 (5.88)	49 (64.47)	27 (35.53)	0.035
Anaemia	18 (7.29)	47 (19.50)	≤0.001*	1 (4.76)	5 (23.81)	10 (47.62)	4 (19.05)	33 (70.21)	14 (29.79)	0.478
Ulcers in the foot	8 (3.29)	27 (11.25)	≤0.001*	4 (28.57)	4 (28.57)	3 (21.43)	3 (21.43)	19 (70.37)	8 (29.63)	0.752

* $p \leq 0.005$; **a few patients did not know frequency; this was removed from analysis.

Table 6: Predictors of TM use among T2DM patients.

Predictors of TM use	OR (95% CI)
Gender	
Male	1.00
Female	1.31 (0.75–2.78)
Race	
Indian	1.00
African	0.56 (0.34–0.93)
Age category (years)	
45–59	1.00
60–75	1.32 (0.78–2.24)
Above 75	1.42 (0.67–3.01)
Religion	
Hindu	1.00
Muslim	0.92 (0.31–2.76)
Christian	0.76 (0.38–1.50)
Other	0.82 (0.32–2.08)
Educational level	
No education	1.00
Primary	0.86 (0.35–2.08)
Secondary	1.05 (0.45–2.44)
Undergraduate	0.36 (0.04–3.47)
Residence	
Informal settlement	1.00
Formal housing	1.09 (0.46–2.59)
Family history of HBGL	0.53 (0.33–0.86)
Comorbidities	
Tooth decay and infection	0.72 (0.42–1.24)
Loss of teeth	0.64 (0.37–1.12)
Swollen bleeding gums	0.66 (0.35–1.24)
Dry mouth	1.61 (0.76–3.42)
High blood pressure	0.69 (0.41–1.18)
Chest pain	0.92 (0.50–1.68)
Heart attack	0.96 (0.44–2.14)
Arthritis or joint pain	0.95 (0.54–1.67)
Coldness of feet	1.24 (0.71–2.18)
Numbness of hands	0.93 (0.53–1.62)
Numbness of feet	1.49 (0.84–2.64)
Dizziness	1.82 (0.95–3.49)
Vision difficulty	0.91 (0.50–1.66)
Problem in sleep cycle	1.66 (0.95–2.91)
Depression	2.14 (1.04–4.39)
Weight gain	0.79 (0.36–1.75)
Swelling of legs and feet	1.41 (0.79–2.51)
Swelling in abdomen	1.35 (0.56–3.25)
Hair loss	1.24 (0.69–2.24)
Slow wound healing	1.20 (0.61–2.35)
Varicose veins	1.87 (1.02–3.45)
Anaemia	1.54 (0.73–3.21)
Ulcers in the foot	1.67 (0.65–4.29)

are no hypoglycemic effects of aloe vera, with no conclusive evidence that supplementation with aloe vera prevents or improves metabolic disorders [70]. Yimam et al. [71] stated that aloe vera-derived extracts can lower cholesterol, prevent insulin resistance, and even prevent diabetes; however, there is still controversy surrounding these findings, making it difficult to draw definitive conclusions. Bitter gourd/karela is known for its distinctive taste and nutritional profile and is renowned globally as a vegetable containing vitamin A, C, thiamine, niacin, riboflavin, and minerals [72]. As a result of its bioactive molecules, bitter gourd exhibits some pharmacological properties, acting as a scavenger of free radicals and a hypoglycemic and hypolipidemic agent [73]. Evidence suggests that bitter gourd can be used for diabetes prophylaxis [74–76]. The presence of alkaloids, flavonoids, saponin, catechins, charantin, vicine, and polypeptide fractions in bitter gourd confirmed its hypoglycemic effect in *in vivo* studies [77]. According to Nei et al. [78], the risk of T2DM is 8% lower in people who drink green tea daily as it reduces mortality risk by 10% among patients with DM. The association between green tea consumption and T2DM risk, however, is still inconsistent [78]. Furthermore, green tea consumption was associated with a decreased risk of microvascular complications in diabetics such as diabetic nephropathy [78, 79]. The bioactive compounds in tea have the ability to influence signal pathways and key molecules involved in the regulation of insulin, blood sugar, and energy metabolism [79]. On the other hand, the biologically active substances in cinnamon mimic insulin-like properties, including activating insulin kinase, increasing glucose uptake, and autophosphorylating the insulin receptor [80]. A study conducted by Hong et al. [81] found that the cinnamon peel extract increases insulin sensitivity and raises glucose intake. Bitter apple, cinnamon, and ginger were reported as the more prevalent CAM used in Saudi Arabia [82], in contrast to green tea being used in Jordon [45], cinnamon in Iran [83], and fenugreek in Sudan [84]. The variations in prevalence rates for the use of different medicinal plants globally may be attributed to the ease of access to medicinal plants and the popularity of some medicinal extracts in cooking; for example, cinnamon is a common spice sold in most retail stores [52].

The results from this study showed no association between comorbidities and TM use, highlighting a low prevalence of TM use among T2DM patients with comorbidities. Our findings are corroborated by Vishnu, Mini, and Thankappan [48], in which they report that patients without any comorbidity were four times more likely to use CAM compared with patients with comorbidity. A higher prevalence of TM use was predicted in this study, and we postulated that the greater the prevalence of comorbidities, the greater the likelihood of TM use. Nevertheless, contrary results were obtained. This may be attributed to fear of disclosing TM use in a hospital environment or related to the cost of TM. Our findings suggest that most TM users were encouraged to utilize these medicines by family, followed by friends and nurses. This is similar to previous reports that relatives and friend are instrumental in shaping an individual's decision regarding the purchase and use of TM [48, 85–87]. It is important that friends and family are involved in diabetes education counseling regarding the efficacy and potential side effects of CAM use [22]. A small number of participants in the cohort included in this study use TM as referred by their healthcare professionals (6.06%), which corresponds with other reports [47, 88]. Radwan et al. [49] reported that only one in four patients inform their treating physician about the use of CAM, while Hernandez-Tejada et al. [88]highlight a lack of communication with

healthcare practitioners. It is possible that sharing their use of CAM is discouraged by fear, for example, fear of receiving a negative response from the healthcare provider, fear that the practitioner would withhold the provision of health care, fear that physicians would discourage CAM use, and a perception that the healthcare practitioner does need to know about their use of CAM.

The concurrent use of TM with prescribed medicines is documented in this study, as previously reported [89–91]. In addition to potentially undermining patient safety and health outcomes, the concurrent use of TM and allopathic medicines may result in serious adverse side effects and ineffectiveness of prescribed treatments due to drug-herb interactions [18, 92]. A study conducted in Pakistan reported that 41% of patients supported the combination of TM and prescribed medicine for T2DM and only 3% supported TM use alone [93]. Moreover, our study reports minimal dissatisfaction with prescribed medicines (17.24%), which was unexpected, since dissatisfaction with prescribed medication due to ineffectiveness or extreme side effects were the common reasons for using TM. The main reasons cited in this study for TM use were to control HBGL and to experience fewer side effects, which correspond to Ching et al. [22] and Chang, Wallis, and Tiralongo [23]. Other possible reasons for using TM could be convenience, its organic nature, and greater freedom and control in terms of their healthcare choices compared with standard care.

4.1. Study Limitations. While the study was conducted in a regional hospital in KZN, findings cannot be generalized to all areas where DM patients reside, particularly those with access to private health care. This is due to the population size in KZN, the sample size of the study, and the demographic profile of individuals with T2DM.

5. Conclusion

This study highlighted a low prevalence rate of TM usage (27.06%) in T2DM patients. Traditional medicine was predominately used among females, and there was a significant association between ethnicity and TM usage. Relatives and friends were the main source of TM information, while Ayurveda/herbal remedies were the most widely used type of TM. This study warrants the need for health education programs regarding the use of TM, emphasizing proper use, with regard to additive and synergistic effects. It is imperative for health authorities across Africa to evaluate and create a therapeutic space for TCAM, with regard to its role and potential use in health care. Consideration should be given to integrating TCAM into mainstream health care in a controlled manner.

Data Availability

The datasets generated and/or analyzed during this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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