Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/18324
DOI URL: http://dx.doi.org/10.21474/IJAR01/18324

RESEARCH ARTICLE

KNOWLEDGE, ATTITUDE, AND PRACTICE OF COMPLEMENTARY AND ALTERNATIVEMEDICINE USAGE AMONG PATIENTS WITH TYPE II DIABETES MELLITUS INEASTERN PROVINCE, SAUDI ARABIA2022-2023

Muna Ahmed Alnasser[1], Wala'a Abdulrazzaq Alduhileb[2], Safiah Bader Al-Eid[3] and Sumayya Abdullah Al Senan[4]

1. Saudi Board of Family Medicine Family Medicine Senior Registrar.
2. Saudi Board of Family Medicine Family Medicine Consultant.
3. Saudi Board of Family Medicine Family Medicine Senior Registrar.
4. Saudi Board of Family Medicine Family Medicine Senior Registrar.

Manuscript Info

Manuscript History
Received: 26 December 2023
Final Accepted: 28 January 2024
Published: February 2024

Key words:-
Complementary and Alternative Medicine, Type 2 Diabetes, Knowledge, Attitude, Practice, Saudi Arabia

Abstract

Introduction: Complementary and Alternative Medicineisbeing used along with evidence-based medicine among diabetic patients. In Saudi Arabia, itwas widely utilized among diabetic patients, and this was coupled with the high prevalence of diabetes.This study aimed to assess the knowledge, attitude, and practice of complementary and alternative medicine among diabetic patients in Eastern Province of Saudi Arabia.

Methods: This is a cross-sectional study conducted among patients with type 2 diabetes attending primary healthcare centers in Eastern Province between the years 2022 to 2023. A self-administered questionnaire translated from English into Arabic was distributed.

Results: Total of 381 diabetic patients, 54.1% were females and 46.2% were aged between 41 to 60 year-old. Poor knowledge of the basic facts of complementary and alternative medicine was found in 50.1% of the patients while 17.3% had moderate knowledge and the remaining 32.5% hada good knowledge level. Regarding the attitude, 40.7% showed positive attitudes, 48.6% neutral, and only 10.8% considered having negative attitudes. The prevalence of patients who were using complementary and alternative medicine products for the treatment of diabetes was 40.9%.

Conclusion: Despite the lack of knowledge among diabetic patients regarding the basic facts of complementary and alternative medicine, a considerable proportion of them were using it and were seen to have an optimistic attitude regarding its beneficial effects. Identifying opportunities to foster the balanced use of complementary and alternative medicinethrough evidence-based guidelines and patient-centered approaches is warranted.

Introduction:-

Complementary and Alternative Medicine (CAM) is being used along with evidence-based medicine among patients with chronic diseases like diabetes mellitus type II (DM II) [(1)]. Alternative medicine is defined as any type of

Corresponding Author:- Muna Ahmed Alnasser
Address:- Saudi Board of Family Medicine Family Medicine Senior Registrar.

treatment used as a substitute of evidence-based medicine. While complementary medicine is any intervention used together with evidence-based medicine [2]. There are six categories of (CAM): The first category is traditional alternative medicine which include: acupuncture, homeopathy, naturopathy, and Chinese medicine. The second category is body therapies, examples include: chiropractic and osteopathic medicine, massage, body movement therapies, and yoga. The third category is diet and herbs which include: dietary supplements, herbal medicine, and nutrition. The fourth one is external energy and its example includes: electromagnetic therapy. The fifth category is mind therapies that include: meditation, biofeedback, and hypnosis. The last and the sixth category is incorporating the senses like music, visualization, and guided imagery. DM II is a chronic disease commonly diagnosed in adults who have a background of insulin resistance for a long time which might eventually end up with insulin deficiency that affects blood glucose levels in those patients. Diabetes can be attributed to several factors such as an unhealthy diet, a sedentary lifestyle,physical inactivity,andgenetic factors in some cases.There are 4,275,200 cases of DM in Saudi Arabia which represents 18.3% of the nation total adult's population[3]. A systematic review published in 2016 concluded that the prevalence of DM II in Saudi Arabia is 32.8% and the predicted prevalence will be 35.37% in 2020 and 40.37% in 2025 [4].

DM II is characterized by symptoms of hyperglycemia such as polyuria, polydipsia, and polyphagia [5] but most of people are asymptomatic before being diagnosed with DM II [6].DM II can be diagnosed by one of the following criteria "Fasting plasma glucose ≥126 mg/dL (7.0 mmol/L) ,A1C ≥6.5 percent (47.5 mmol/mol) ,two-hour plasma glucose ≥200 mg/dL (11.1 mmol/L) during an OGTT,random plasma glucose ≥200 mg/dL (11.1 mmol/L) in the presence of symptoms" [7]. Two abnormal readings are needed to diagnose DM II,or one abnormal reading is enough in the presence of the symptoms of hyperglycemia. Currently, there is no cure for DM II but it can be managed with lifestyle modifications likea healthy diet, exercise, oral hypoglycemic medications like biguanide, SGLT2 inhibitors, DDP4 inhibitors, sulfonylureas, thiazolidinediones, as well as injectable non-insulin like GLP-1 receptor agonist and insulin therapy.

It has been noticed that several diabetic patients seen in family medicine clinics show interest in using CAM. In a study conducted in USA and UK, it was found that 40% of the population use CAM [8,9]. Another study in the USA highlighted that the frequency of CAM usage is a long way higher than formerly reported [10]. Moreover, a follow-up national survey in the USA stated that between 1990 and 1997, alternative medicine expenditures and use increased substantially, owing primarily to an increase in the percentage of patients seeking alternative therapies [11]. In addition, 80% of the population in developing countries are using CAM as part of their healthcare management as mentioned by WHO [12]. While in Saudi Arabia the prevalence of CAM usage is about 70% [13].

Complementary and alternative medicine is relatively popular in Saudi Arabia based on a cultural background that supports its use [14]. The Saudi national center for CAM, which was established in 1429 A.H. with a vision to be a reference for CAM usage in Saudi Arabia, they published a CAM guideline to follow to ensure safe practice. Also, a guideline from the Ministry of Health for regulations of complementary and alternative medicine has been established [15]. Among type 2 diabetic patients, CAM consumption is increasing as concluded by a study conducted in 2015 which reviewed the correlation between DM II and CAM[16].

An interview study of 293 patients was done in a tertiary hospital in Pakistan and concluded that there is a positive attitude toward CAM among Pakistani diabetic patients aged 60 years and older. Most participants indicated that the use of CAM is mainly due to their loss of trust in pharmaceutical companies and the long waiting period between follow-up appointments [17]. Recently, the University of South China published a systematic review demonstrating the effect of curcumin,"which is the primary substance in turmeric", in improving insulin resistance as well as total cholesterol and triglyceride levels[18]. Moreover, National University Hospital in Korea published that postprandial blood glucose levels were lowered by red ginseng supplementation in patients with type 2 DM[19].

Another cross-sectional study was done in Thailand which aimed to investigate the contributing factors of CAM use in Thai diabetic patients revealed that most diabetic patients use mindfulness approaches. In addition, the study showed that the use of CAM is significantly associated with female gender, farmers, and recently diagnosed diabetic patients [20]. However, a recent systematic review published in the UK in 2021 showed that CAM use is not associated with specific gender nor the duration of diabetes [21]. Additionally, another recent systematic review found that meditative movements had positive effects in improving fasting blood glucose, HgA1c, as well asblood lipid levels in patients with type 2 DM [22]. Further researches have been done in Malaysia and Indonesia. They drew their results

that the local culture is the main reason supporting the use of CAM. In addition, most patients did not tell their family physicians about their use of CAM [23,24].

In 2020, El-bayoumy studied the utilization of herbal medicine among Kuwaiti citizens who are known to have DM II and found that 30% of them used herbs and the majority had bad glycemic control and a higher rate of diabetes-related complications. In 2018, a study published in the United Arab Emirates found that out of 244 participants, 39.3 % supported the use of CAM. The most common types of CAM were herbs and spiritual healing. Those participants were encouraged to use CAM by family members' recommendations., whereas only minority were using CAM following the doctor's advice [25]. On the other hand, a study done in Bahrain to examine the prevalence of CAM usage in diabetic patients concluded the high rate of CAM utilization among diabetic patients, mostly cinnamon and garlic [26]. In 2017, a meta-analysis revealed that garlic supplementation has a positive impact on blood glucose control in 1-2 weeks as well as high/low-density lipoproteins in 12 weeks [27].

A systematic review of 36 articles was done in Saudi Arabia and yielded that most patients use spiritual beliefs while herbs, honey, and dietary products were practiced as well but to a lesser extent [28]. Additionally, 54.2% of patients who used herbs reported no side effects and 64.5% noticed an improvement in glycemic control [29]. On the other hand, in 2022 a study was done in Jazan and reported that there is a concerning need for educating diabetic patients about safety, drug interactions, and herb-herb interactions as many diabetic patients report side effects after usage. Another prespective cross-sectional study done in Riyadh among 400 patients aged 10-39 concluded that most of them use CAM, mostly honey, and more than 40% of them counsel their healthcare workers before its use [13]. A similarstudy was done in Riyadh also revealed the predictors of using CAM were unemployment, age of more than 51 years, and reading about the effectiveness of CAM [30]. In contrast, a study done in Jeddah which found negative aattitudes, low levels of knowledge, and practice of herbal medicine among patients with type II DM [29]. However, the use of CAM as a topical treatment for diabetic foot disorders is fairly common among diabetic patients in Jeddah which was concluded in another study [31].

Even though some patients believe that CAM is a natural therapy, however, CAM is associated with poor glycemic control, a higher rate of diabetes-related complications, and poor cardio-metabolic outcomes [32]. In addition, patients tend not to adhere to their medications as they believe that CAM is more effective and had faster effects than pharmacological treatments [33]. As mentioned in the literature review in Saudi Arabia, CAM is widely utilized among diabetic patients, and this is coupled with a high prevalence of diabetes [28]. A recent study done in Qassim in 2022 compared the use of CAM in chronic disease patients, andfound those with diabetes and hypertension were having a high prevalence of CAM usage. However, the study was done in all chronic disease patients and was not restrictive to patients with DMII[33]. Therefore, considering the high use of CAM among Saudi citizens, it is important to conduct further researches in this field to address CAM practices and their associated-safety effects. Aiming to raise awareness about the use of complementary and alternative medicine for illness prevention and health promotion as the knowledge of health care providers need to be expanded in this area. Accordingly, theaim of the current study is to assess knowledge, attitude, and practice of using CAM among diabetic patients in Eastern Province as there is no published data was found up to the researchers' knowledge in this region. Although there are published studies in the other provinces of the kingdom with controversial outcomes. Most of them concluded that there is a positive attitude toward using CAM, whereas, one study in Jeddah showed a negative attitude toward its use.

Research Question:
What is the knowledge, attitude, and practice of complementary and alternative medicine among patients with DM II in Eastern Province?

Research Aim:
To assess knowledge, attitude, and practice of complementary and alternative medicine among patients with DM II in Eastern Province

Research Objectives:-

1. To assess the knowledge of complementary and alternative medicine among patients with type II DM in Eastern Province.
2. To measure the attitude of complementary and alternative medicine among patients with type II DM in Eastern Province.

3. To determine the practice of complementary and alternative medicine among patients with type II DM in Eastern Province.
4. To measure the associated factors with CAM knowledge, attitude, and practice.

Methodology:-

Study design
Analytical cross-sectional study.

Study population and setting
Type II DM Saudi patients attending Primary Health Care Centers in Eastern Province (Khobar, Dammam, and Qatif) in 2022-2023.

Inclusion criteria
Any Saudi, male or female patients, diagnosed as having type II diabetes for at least 1 year, visiting primary health care center, aged 18 years and above were included in the study.

Exclusion criteria
Patients who did not satisfy the eligibility criteria like those with other types of DM (GDM, type 1 DM, and drug-induced DM) were excluded from the study. Pregnant women who are known to have type 2 DM were excluded from our study.

Study variables
Independent variables:Socio-demographic characteristics, clinical characteristics, who recommend the use of CAM to the participants.

Dependent variables:
Knowledge, attitude, and practice of CAM.

Sampling Technique and Methods
Multistage cluster random sampling. In the first stage, 10 centers were included from 3 different clusters (Khobar, Dammam, and Qatif). In the second stage, Saudi patients with type II DM who follow up with GPs or family physicians were selected randomly to fill up the questionnaire through scanning a barcode or by writing using paper forms.

Sample size
The Minimum recommended sample size is 377 calculated by using the Raosoft formula with a 5% margin of error, 95% confidence level, 20,000 estimated population size, and 50% response distribution. Adding 20% non-response the sample size was 452.

Data collections method
A validated questionnaire taken from a previous study was used[17]. Some modifications were done by the current researchers. Some changes were done in clinical characteristics including adding lifestyle modifications and non-insulin injectable therapy to the management part as well as more choices in HbA1c like HbA1c from 7% to 9%, more than 9%, and I don't know. In the knowledge part five questions were added "Do you know what is complementary medicine?" ," Do you know any examples of complementary medicine?", "Do you know what is alternative medicine?", " Do you know any examples of alternative medicine?", " Do you know about Saudi National Center for CAM?". In addition, one option was added in the practice part " CAM not recommended by others". The questionnaire was translated from English to Arabic and compared with the original form. Content validity was done by reviewing the questionnaire by 12 medical experts in the field of family medicine including 2 diabetologists. Internal consistency was measured by Cronbach's alpha to check for reliability. The questionnaire was distributed among type II DM patients who came to follow up with their GPs or family physicians in PHC centers in Khobar, Dammam, and Qatif. It was available in a code format and paper-form. The questionnaire consists of 5 main parts as follows:

Part I is socio-demographic characteristics which contains 6 questions (gender, age, marital status, education, employment, andsmoking status).

Part II asks about clinical characteristics and has 5 questions (duration of diabetes, medications used, complications, medical co-morbidities, and glycemic control).
Part III contains 6 questions to measure CAM knowledge ("Have you heard of Complementary and Alternative Medicine before?", " Do you know what is complementary medicine?", " Do you know any examples of complementary medicine?", " Do you know what is alternative medicine?", " Do you know any examples of alternative medicine?", "Do you know about the Saudi natioCenternter for Complementary and Alternative Medicine?").
Part IV have 11 questions assessing the attitude using the Likert scale ("Complementary and Alternative products are effective", "Complementary and Alternative Medicine products are safe", "Before using Complementary and Alternative Medicine, it should be discussed with your physician", "We can combine Complementary and Alternative Medicine products withT2DM Medications", "Complementary and Alternative Medicine products have fewer side effects", "Complementary and Alternative Medicine products can help in controlling diabetes", "Long appointment interval between follow up associated with using Complementary and Alternative Medicine", "Complementary and Alternative Medicine products are available and cheaper", 'Lack of trust in pharmaceutical drugs increase using of Complementary and Alternative Medicine", "Poor physician-patient communication associated with using Complementary and Alternative Medicine", "Doctor can suggest using Complementary and Alternative Medicine".
Part V which is the last part, identifies the type of CAM practice being used and it has 8 questions. "Have you ever used Complementary and Alternative Medicine for T2DM?", " Have you ever used Complementary and Alternative Medicine for a condition other than DM?", "Do you combine Complementary and Alternative Medicine with T2DM medications?", "Will you use Complementary and Alternative Medicine products again?", "Are you satisfied with the Complementary and Alternative Medicine products?", "Do you discuss with thephysicians about Complementary and Alternative Medicine products?".

Pilot study
In order to test the reliability of the questionnaire, a pilot study was done by selecting type II diabetic patients who followed up in other PHC centers and were not included in the main study. Cronbach's alpha for theknowledge part was 0.7, for attitude was 0.7, and for practice was 0.8. Based on the outcome of the pilot study, modifications to the questionnaire were done accordingly.

Data analysis
The data were analyzed by using the SPSS program version 26. All continuous data were presented in mean, median, and standard deviation. In addition, all categorical data was calculated by percentage and frequency. A P-value of less than 0.05 was considered significant.

Data coding
The knowledge of patients regarding CAM has been assessed using a 6-item questionnaire, where "yes" is coded with 1 and "no" is coded with 0. The total knowledge score has been calculated by adding all 6 items. A score ranging from 0 to 6 points has been generated. A higher score indicates higher knowledge about CAM. By using 50% and 75% to determine the level of knowledge, participants were considered as having poor knowledge if the score was less than 50%, moderate level if the score was 50% to 75%, and good knowledge if the score was above 75%.

The attitude of the patients regarding CAM has been assessed using an 11-item questionnaire, where a 5-point Likert scale ranging from "strongly disagree" coded with 1 to "strongly agree" coded with 5 as the answer options. The 11 items had been summed up to obtain the overall attitude score. A score ranging from 11 to 55 points has been generated, indicating that the higher the score the higher the attitude toward CAM. Similar cutoff points were applied (50% and 75%) to determine the level of attitude, if the score of less than 50% points was considered as having a negative attitude, 50% to 75% was considered neutral, and above 75% was considered as positive attitude level. For practice, the question "Have you ever used CAM for T2DM?" was considered an absolute indicator of the overall practice of patients regarding CAM.

Data storage
Data are anonymous. The hard and soft copies were kept confidential by the Principal Investigator. The researchers will discard the data after publishing.

Study limitation
As our study is an analytical cross-sectional study, this type of study has some limitations in evaluating the temporality and causality of observed relationships with no follow-up of the sequence of events.

Ethical consideration
The following ethical considerations were adopted in this research. Qatif, Dammam, and Khobar IRB and administrative approval were taken. Consent was taken from the author of the previous questionnaire. Informed consent was obtained from all participants. All data were kept confidential. Conflict of interest was avoided.

Study Reporting and Implementation
A scientific paper will be written at the end of the study for publication in national and international journals.

Budget
All expenses are self-sponsored by the research team members.

Results:-
We distributed 452 questionnaires, and 381 were received, giving an overall response rate of 84.3%.

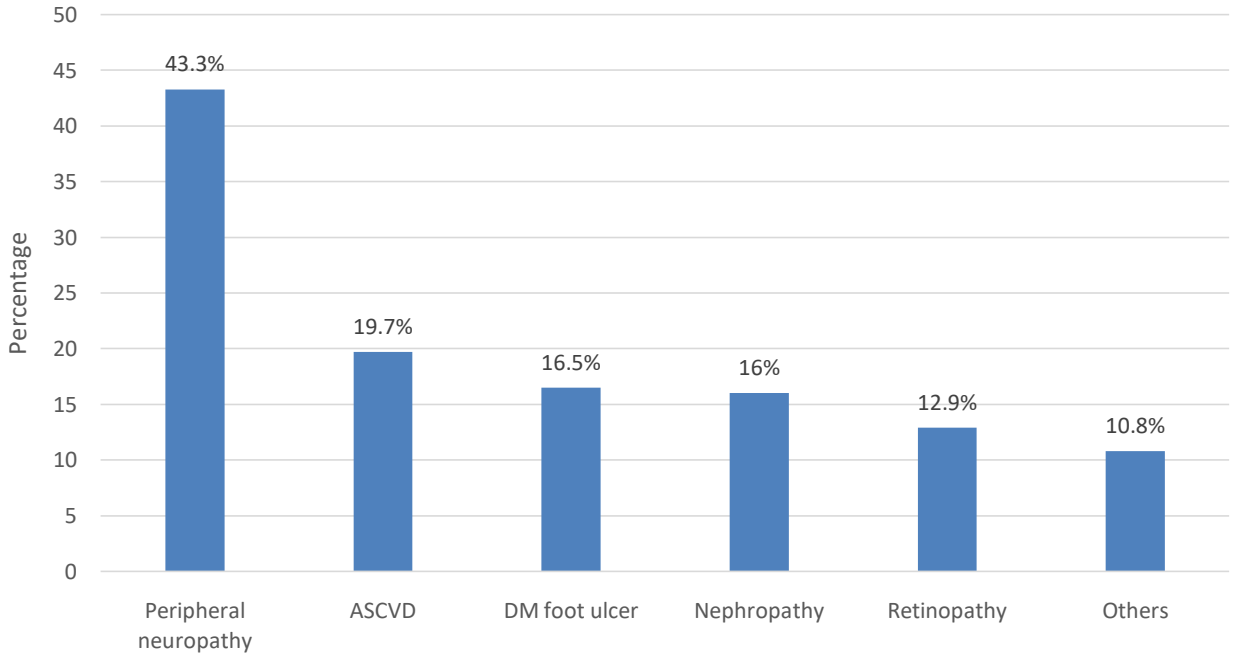
Table 1:- Socio-demographicand clinical characteristics of patients with type 2 DM$^{(n=381)}$

Study Data	**N (%)**
Age group	
18 – 40 years	101 (26.5%)
41 – 60 years	176 (46.2%)
>60 years	104 (27.3%)
Gender	
Male	175 (45.9%)
Female	206 (54.1%)
Marital status	
Single	43 (11.3%)
Married	251 (65.9%)
Divorced	39 (10.2%)
Widowed	48 (12.6%)
Educational level	
Illiterate	42 (11.0%)
Primary school	35 (09.2%)
Secondary school	52 (13.6%)
High school	135 (35.4%)
Bachelor's degree	100 (26.2%)
Postgraduate	17 (04.5%)
Employment	
Employed	155 (40.7%)
Unemployed	151 (39.6%)
Retired	75 (19.7%)
Smoking status	
Smoker	88 (23.1%)
Non-smoker	246 (64.6%)
Ex-smoker	47 (12.3%)
Duration of DM	
<5 years	109 (28.6%)
5 – 10 years	131 (34.4%)

>10 years	141 (37.0%)
Management used for T2DM	
Lifestyle modificatons	59 (15.5%)
Oral hypoglycemic drugs	167 (43.8%)
Non-insulin injection therapy	32 (08.4%)
Insulin	34 (08.9%)
Combonation therapy (oral and injection)	89 (23.4%)
HbA1c level	
<7%	94 (24.7%)
7% - 9%	155 (40.7%)
>9%	56 (14.7%)
I don't know	76 (19.9%)

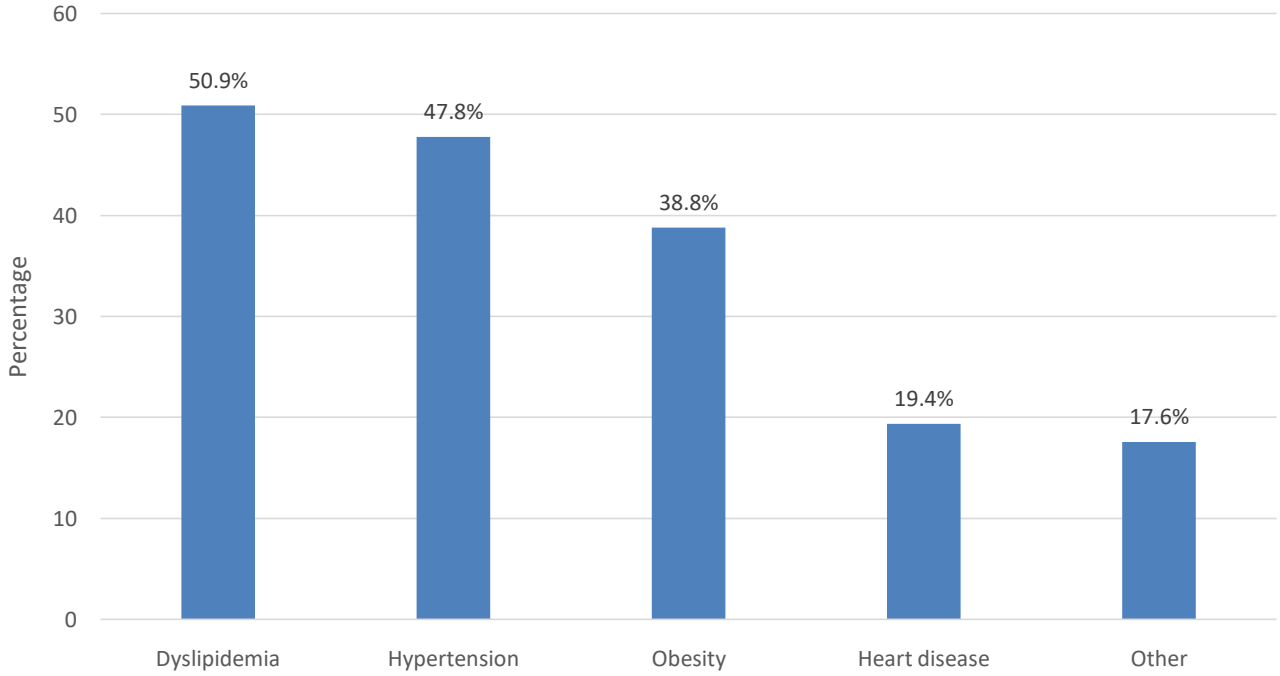
Table 1 presentsthe socio-demographic characteristics and clinical characteristicsof the patients. Almost half of the participants were aged between 41 to 60 year-old(46.2%) with more than half of them being females (54.1%). Two-thirds of the patients weremarried and one-thirdwere high school graduates. Patients who were employed constitute 40.7%. The proportion of smokers among the participants was 23.1%. Regarding the duration of diabetes, 37% of patients had more than 10 years of duration, and the most commonly used management for T2DM was oral hypoglycemic drugs (43.8%). In addition, 40.7% had a 7% to 9% HbA1c level.

Figure 1:- Complicationsin patients with type 2 diabetes.



In Figure 1, the most common complications reported by the participantsin T2DM were peripheral neuropathy (43.3%), followed by ASCVD (19.7%), and diabetic foot ulcer (16.5%).

Figure 2:- Patients-associated comorbidities.



In Figure 2, the most common associated comorbiditiesin diabetic patientswere dyslipidemia (50.9%) followed by hypertension (47.8%) and obesity (38.8%).

Table 2:- Assessment of knowledge, attitude, and practice toward CAM [(n=381)]

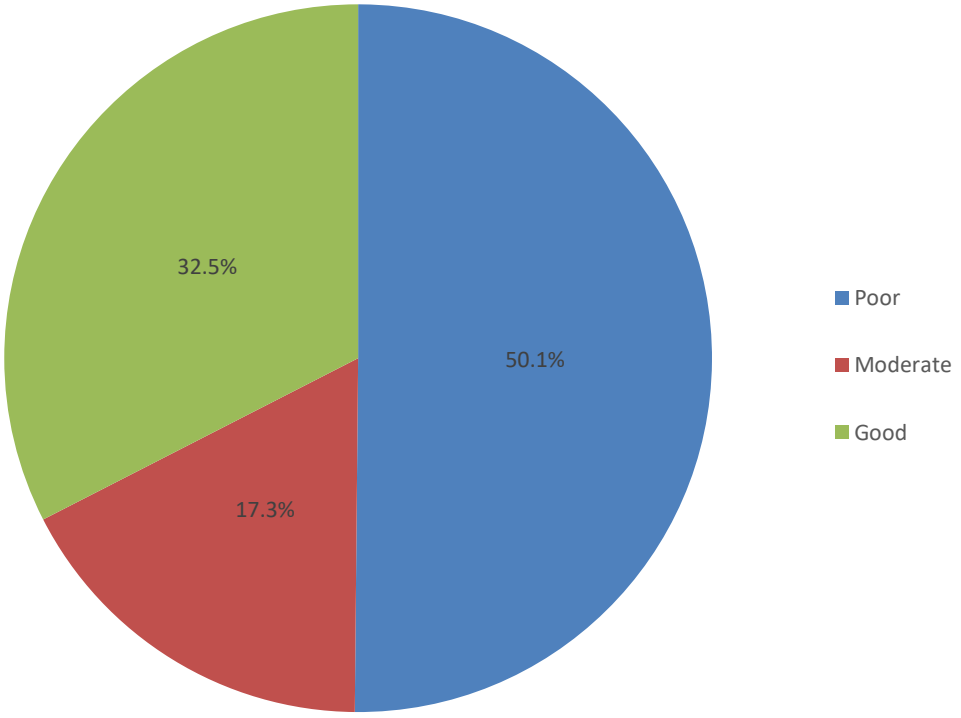
Knowledge statement	**Yes (%)**
Have you heard of CAM before?	213 (55.9%)
Do you know what is complementary medicine?	200 (52.5%)
Do you know any examples of complementary medicine?	172 (45.1%)
Do you know what is alternative medicine?	168 (44.1%)
Do you know any examples of alternative medicine?	153 (40.2%)
Do you know about Saudi National Center for CAM?	62 (16.3%)
Total knowledge score (mean ± SD)	**2.54 ± 2.31**
Attitude statement	**Mean ± SD**
Before using CAM, it should be discussed with your physician	4.03 ± 1.15
Long appointment intervals between follow up associated with using CAM	3.61 ± 1.19
CAM products are effective	3.60 ± 1.07
CAM products are safe	3.54 ± 1.06
Lack of trust in pharmaceutical drugs increases the useof CAM	3.53 ± 1.23
CAM products can help in controlling diabetes	3.50 ± 1.06
CAM products have fewer side effects	3.38 ± 1.14
Poor physician-Patient communication associated with using CAM	3.37 ± 1.27
We can combine CAM products with T2DM Medications	3.32 ± 1.19
CAM Products are available and cheaper	3.25 ± 1.26
Doctor can suggest using CAM	3.12 ± 1.21
Total attitude score (mean ± SD)	**38.3 ± 9.59**
Practices statement	**Yes (%)**
Do you discuss with a physician about CAM products?	202 (53.0%)
Are you satisfied with the CAM products?	170 (44.6%)

Will you use CAM products again?	158 (41.5%)
Have you ever used CAM for T2DM? †	156 (40.9%)
Have you ever used CAM for a condition other than DM?	147 (38.6%)
Do you combine CAM with T2DM medications?	118 (31.0%)

Attitude statement has a category range from "strongly disagree" coded with 1 to "strongly agree" coded with 5.
† Absolute question representing overall practice toward CAM.

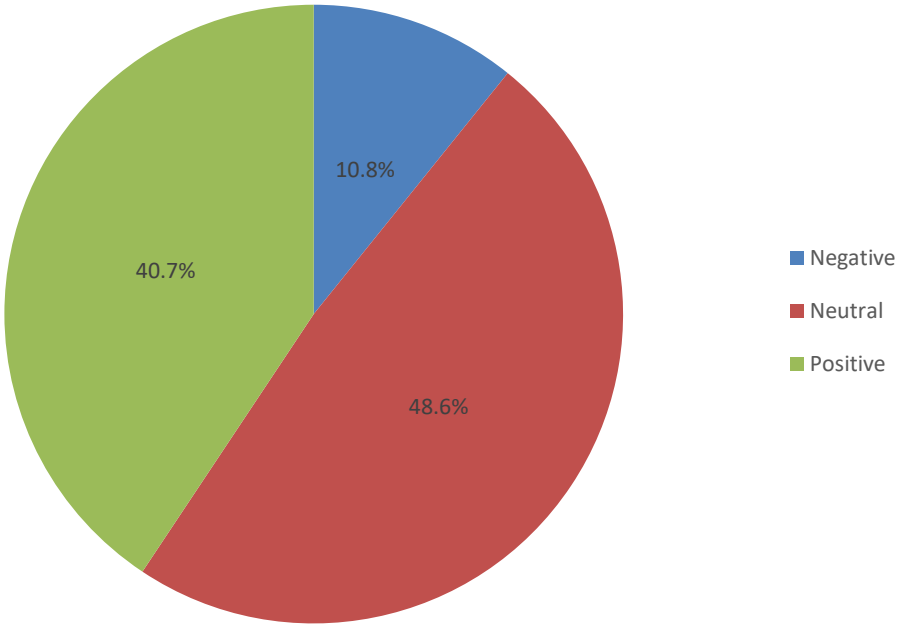
The assessment of knowledge, attitude, and practice toward CAM isgiven in Table 2. More than half (55.9%) of the patients had heard of CAM while 52.5% knew the meaning of complementary medicine. Approximately 45.1% were aware of examples of complementary medicine. The proportion of patients who knew alternative medicine is 44.1% and those who were aware of any examples of alternative medicine was 40.2%. Only 16.3% were aware of Saudi National Center for CAM. Based on the above statements, the overall mean knowledge score was 2.54 (SD 2.31). Regarding the attitude toward CAM, the top 3 statements with the highest ratings were "Before using CAM, it should be discussed with your physician" (mean score: 4.03), "Long appointment intervals between follow-up associated with using CAM" (mean score: 3.61) and "CAM products are effective" (mean score: 3.60). The total mean attitude score was 38.3 (SD 9.59). In terms of practice, the prevalence of patients who used CAM for the treatment of type 2 DM was 40.9% while the prevalence of patients who ever used CAM for conditions other than DM was 38.6%. Patients whocombined CAM with type 2 DM medications were reported by 31%. The proportion of patients who will use CAM products again was 41.5%. Satisfaction with CAM products was reported by 44.6%. In addition, 53% indicated that they discussed CAM products with their physicians.

Figure 3:- Level of knowledge about CAM.



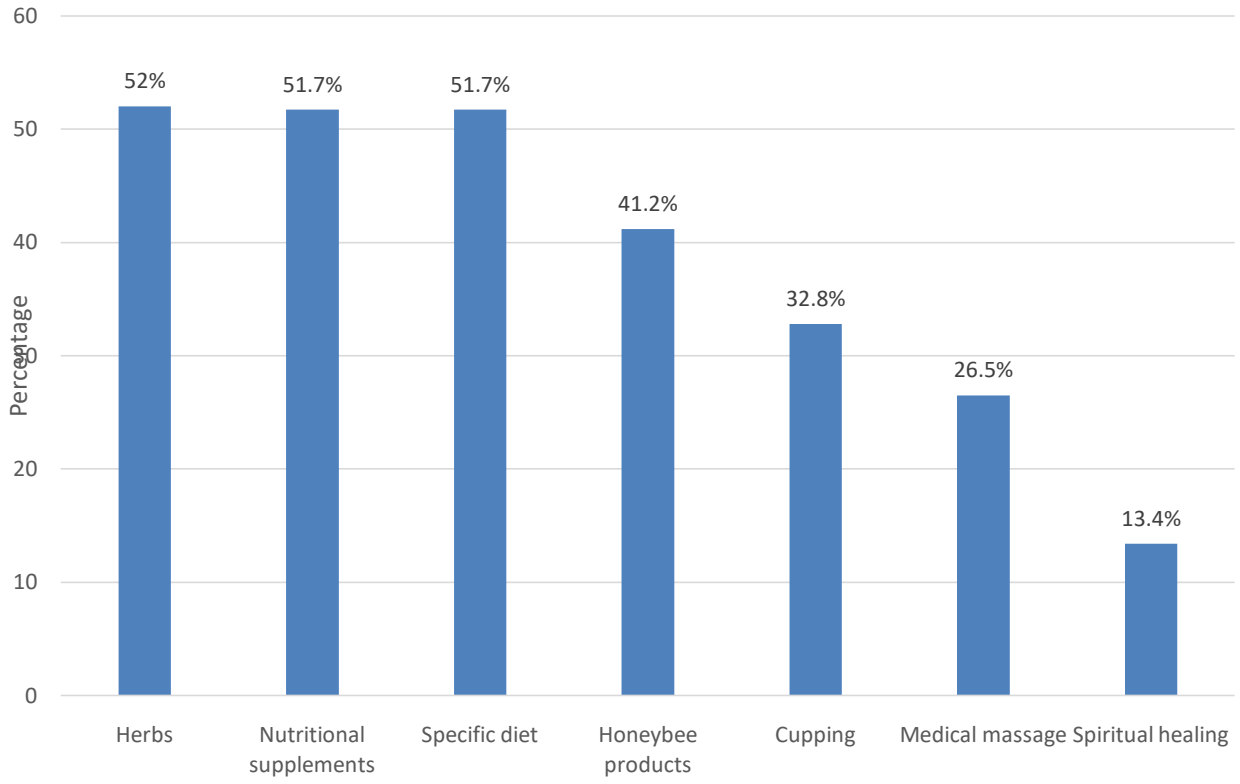
In Figure 3, half of the patients hadpoor knowledge of CAM (50.1%), 17.3% had moderate knowledge and almost one-third had good knowledge level (32.5%).

Figure 4:- Level of attitude about CAM.



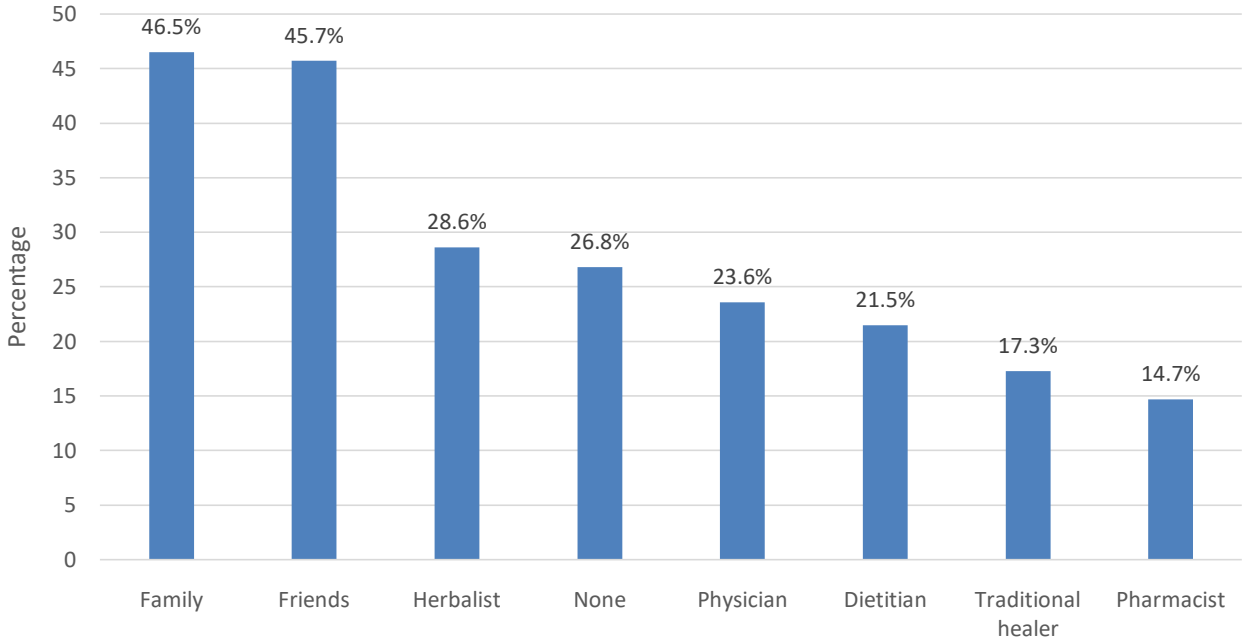
In Figure 4, less than half of the participants were considered as having a positive attitude toward CAM (40.7%), 48.6% were neutral, and only 10.8% of them were considered as having a negative attitude level.

Figure 5:- Type of CAM being used.



In Figure 5, the most common type of CAM being used by the patients were herbs (52%), followed by nutritional supplements (51.7%) and specific diet (51.7%) while spiritual healing was the least to be used among them (13.4%).

Figure 6:- Sources of CAM recommendation.



In Figure 6, the most commonly known sources of CAM recommendation were family (46.5%), followed by friends (45.7%) and herbalists (28.6%).

Figure 7:- Correlation between the knowledge score and attitude score.

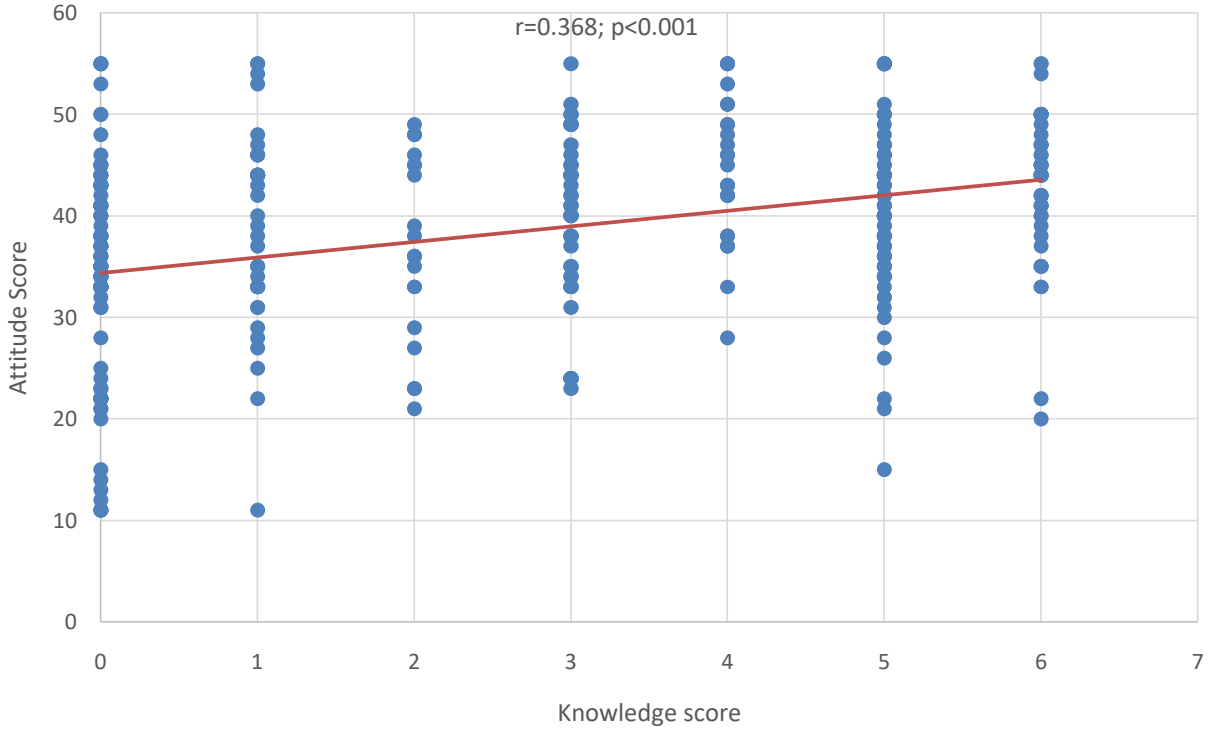


Figure 7 shows that there was a positive significant correlation observed between the knowledge score and attitude score (r=0.368), indicating that the increase in the score of knowledge was correlated with the increase in the score of attitude.

Table 3:- Differences in the scores of knowledge and attitude in relation to the sociodemographic, clinical characteristics, and practice of the patients with type 2 DM in using CAM[(n=381)]

Factor	Knowledge Score (6) Mean ± SD	H/Z-test; P-value	Attitude Score (55) Mean ± SD	H/Z-test; P-value
Age group				
18 – 40 years	2.50 ± 2.36	H=2.320; P=0.314	39.1 ± 10.3	H=2.341; P=0.310
41 – 60 years	2.72 ± 2.34		38.3 ± 8.77	
>60 years	2.78 ± 2.31		37.4 ± 10.3	
Gender				
Male	2.82 ± 2.36	Z=1.991; P=**0.047 ****	37.9 ± 10.1	Z=0.360; P=0.719
Female	2.31 ± 2.24		38.5 ± 9.16	
Marital status				
Unmarried	2.25 ± 2.22	Z=1.611; P=0.107	31.1 ± 10.3	Z=1.426; P=0.154
Married	2.69 ± 2.34		37.8 ± 9.21	
Educational level				
High school or below	2.23 ± 2.25	Z=3.773; P<**0.001 ****	38.1 ± 10.2	Z=0.181; P=0.857
Bachelor or higher	3.25 ± 2.29		38.7 ± 8.15	
Employment				
Employed	2.81 ± 2.36	H=5.062; P=0.080	38.3 ± 9.15	H=5.904; P=0.052
Unemployed	2.19 ± 2.20		39.4 ± 9.62	
Retired	2.68 ± 2.35		36.1 ± 10.2	
Smoking status				
Smoker/Ex-smoker	2.71 ± 2.31	Z=0.979; P=0.328	39.9 ± 9.65	Z=2.906; P=**0.004 ****
Non-smoker	2.45 ± 2.30		37.3 ± 9.47	
Duration of DM				
<5 years	2.83 ± 2.40	H=2.423; P=0.298	38.8 ± 8.60	H=3.242; P=0.198
5 – 10 years	2.54 ± 2.30		39.3 ± 8.69	
>10 years	2.32 ± 2.22		36.9 ± 10.9	
HbA1c level				
<7%	2.83 ± 2.45	H=2.638; P=0.267	35.5 ± 10.4	H=11.364; P=**0.003 ****
7% - 9%	2.39 ± 2.25		38.6 ± 9.16	
>9%	2.93 ± 2.29		40.4 ± 9.28	
Associated comorbidity ‡				
Hypertension	2.80 ± 2.29	Z=2.299;P=**0.021****	39.4 ± 9.78	Z=2.635;P=**0.008****
Dyslipidemia	2.51 ± 2.28	Z=0.104;P=0.917	39.2 ± 9.17	Z=1.863;P=0.062
Ischemic heart disease	3.15 ± 2.32	Z=2.461;P=**0.014****	41.3 ± 8.77	Z=3.028;P=**0.002****
Obesity	2.49 ± 2.26	Z=0.259;P=0.795	39.9 ± 7.59	Z=2.183;P=**0.029****
Other	2.93 ± 2.16	Z=1.691;P=0.091	40.9 ± 9.17	Z=2.329;P=**0.020****
Use of CAM for T2DM				
Yes	3.88 ± 1.95	Z=9.651; P<**0.001 ****	42.8 ± 7.24	Z=7.763; P<**0.001 ****
No	1.61 ± 2.06		35.1 ± 9.80	
Satisfaction with CAM products				
Yes	3.42 ± 2.17	Z=6.799; P<**0.001 ****	43.3 ± 7.12	Z=9.540; P<**0.001 ****
No	1.83 ± 2.17		34.2 ± 9.40	
Discussed CAM products withthe physician				
Yes	2.72 ± 2.29	Z=1.606;	39.9 ± 8.63	Z=3.111;

No	2.34 ± 2.32	P=0.108	36.4 ± 10.3	P=**0.002 ****

‡ Variable with multiple response answers.
[a] P-value has been calculated using Kruskal Wallis H-test.
[b] P-value has been calculated using Mann Whitney Z-test.
** Significant at p<0.05 level.

When measuring the differences in the scores of knowledge in relation to the socio-demographic, clinical characteristics, and the practice of diabetic patients in using CAM (Table 3), it was found that a higher knowledge score was correlatedto male gender (Z=1.991; p=0.047), having a bachelor or higher degrees (Z=3.773; p<0.001), having associated comorbidities such as hypertension (Z=2.299; p=0.021), and ischemic heart disease (Z=2.461; p=0.014), use of CAM for T2DM (Z=9.651; p<0.001) and satisfaction with CAM products (Z=6.799; p<0.001). Regarding attitude, a higher attitude score was more associated with being smokers/ex-smokers (Z=2.906; p=0.004), having more than 9% HbA1c levels (H=11.364; p=0.003), having associated comorbidities such as hypertension (Z=2.635; p=0.008), ischemic heart disease (Z=3.028; p=0.002), obesity (Z=2.183; p=0.029) and other comorbidities (Z=2.329; p=0.020), use of CAM (Z=7.763; p<0.001), satisfaction with CAM products (Z=9.540; p<0.001) and receiving advice from a physician regarding CAM products (Z=3.111; p=0.002).

Table 4:- Relationship between the use of CAM for T2DM according to the socio-demographic, clinical characteristics and satisfaction with CAM products[(n=381)]

Factor	**Use of CAM**		**X2**	**P-value**
	Yes **N (%)** **(n=156)**	**No** **N (%)** **(n=225)**		
Age group				
18 – 40 years	38 (24.4%)	63 (28.0%)		
41 – 60 years	70 (44.9%)	106 (47.1%)	1.728	0.422
>60 years	48 (30.8%)	56 (24.9%)		
Gender				
Male	79 (50.6%)	96 (42.7%)	2.359	0.125
Female	77 (49.4%)	129 (57.3%)		
Marital status				
Unmarried	64 (41.0%)	66 (29.3%)	5.603	**0.018 ****
Married	92 (59.0%)	159 (70.7%)		
Educational level				
High school or below	101 (64.7%)	163 (72.4%)	2.568	0.109
Bachelor or higher	55 (35.3%)	62 (27.6%)		
Employment				
Employed	63 (40.4%)	92 (40.9%)		
Unemployed	59 (37.8%)	92 (40.9%)	0.822	0.663
Retired	34 (21.8%)	41 (18.2%)		
Smoking status				
Smoker/Ex-smoker	71 (45.5%)	64 (28.4%)	11.731	**0.001 ****
Non-smoker	85 (54.5%)	161 (71.6%)		
Duration of DM				
<5 years	44 (28.2%)	65 (28.9%)		
5 – 10 years	51 (32.7%)	80 (35.6%)	0.543	0.760
>10 years	61 (39.1%)	80 (35.6%)		
HbA1c level				
<7%	34 (25.8^)	60 (34.7%)		
7% - 9%	68 (51.5%)	87 (50.3%)	4.374	0.112
>9%	30 (22.7%)	26 (15.0%)		
Associated comorbidity ‡				
Hypertension	92 (59.0%)	90 (40.0%)	13.294	**<0.001 ****

Dyslipidemia	92 (59.0%)	102 (45.3%)	6.859	**0.009 ****
Ischemic heart disease	43 (27.6%)	31 (13.8%)	11.188	**0.001 ****
Obesity	66 (42.3%)	82 (36.4%)	1.333	0.248
Other	32 (20.5%)	35 (15.6%)	1.562	0.211
Satisfaction with CAM products				
Yes	113 (72.4%)	57 (25.3%)	82.716	**<0.001 ****
No	43 (27.6%)	168 (74.7%)		
Discussed CAM products withthe physician				
Yes	90 (57.7%)	112 (49.8%)	2.317	0.128
No	66 (42.3%)	113 (50.2%)		

‡ Variable with multiple response answers.
§ P-value has been calculated using Chi-square test.
** Significant at p<0.05 level.

The chi-square test was used in Table 4 to measure CAM practice and its relation to sociodemographicphic, clinical characteristics, and satisfaction with CAM products. Based on the results, it was found that the prevalence of patients who were using CAM is significantly more common among unmarried patients (X2=5.603; p=0.018), smokers/ex-smokers (X2=11.731; p=0.001), patients who had other comorbidities such as hypertension (X2=13.294; p<0.001), dyslipidemia (X2=6.859; p=0.009) and ischemic heart disease (X2=11.118; p=0.001), and patients who had higher satisfaction level with CAM products (X2=82.716; p<0.001).

Discussion:-

This study evaluates the knowledge, attitude, and practice (KAP) of patients with type 2 DM toward the use of CAM. The outcome of this study will underscore its importance given the rise of CAM consumption. The patient's understanding, and attitudes regarding chronic medical diseases are crucial factors in managing their chronic illnesses. This shows how crucial public health education initiatives are for chronic diseases like diabetes. The existing level of knowledge, attitude, and beliefs of diabetic patients about herbal products was evaluated in order to develop a diabetes education program. The findings of this study demonstrated the prevalence of herbal self-medication.

Knowledge toward CAM

The knowledge of the patients regarding the basic facts of CAM was deficient. According to our results, despite that more than half (55.9%) had heard of CAM, however, their knowledge about its exact meaning and examples was insufficientmight be because only 30% of the sample had a high level of education (26% had a bachelor's degree and 4% had a postgraduate degree). In addition, only 16.3% of the patients were aware of the existence of the Saudi National Center for CAM. Based on this result, the overall mean knowledge score was 2.54 (SD 2.31) out of 6 points with approximately half of the patients (50.1%) considered as having poor knowledge levels, 17.3% were moderate and the rest were good (32.5%). These findings are consistent with the study of Kamel et al[)], wherein most of the diabetic patients demonstrated unsatisfactory knowledge, attitude, and beliefs regarding herbal medicine use. The reason behind this similarity was the demographic characteristics of diabetic patients were the same in both studies, most patients were female with low educational levels whose ageswere between 40-60. The author emphasized the importance of awareness to address these gaps. Contradicting these findings, Sari et al [(23)], reported that CAM consumersdemonstrated better knowledge and attitudes toward CAM adding that CAM users will not adhere to their physicians'adviceif they instructed them not to use CAMbecause they thought that CAM is safe, available, and inexpensive as well as they believed that CAM improved their physical health and helped in controlling their diabetes.

The significant factor of knowledge

Several factors came out to have a positive association with knowledge. Data in this study indicate that increased knowledge can be significantly predicted among male patients, who have better education, useCAM for T2DM, have satisfaction with CAM products, and have associated comorbidities such as hypertension and ischemic heart disease. To our knowledge, this is the first study in the Eastern Province of Saudi Arabia that discussed the influence of knowledge in terms of socio-demographic factors. Thus, more investigations are warranted to establish their true effects

Attitude toward CAM

The attitude of diabetic patients towardthe use of CAM was seen to be better than their knowledge. According to our results, out of 5 score points, the ratings in all attitude statements were more than 3 points indicating positive attitude levels. The ratings were notably higher in the statements such as "CAM should be discussed witha physician before using" (mean score: 4.03), "Long appointments intervalswere associated with CAM use" (mean score: 3.61), "Effectiveness of CAM products" (mean score: 3.60), "CAMis safe" (mean score: 3.54), and "they can help in controlling diabetes" (mean score: 3.50). Based on our criteria, the overall attitude of T2DM patients toward the use of CAM was positive (40.7%), 48.6% had neutral attitude and only 10.8% were negative (total mean score: 38.3; SD 9.59, out of 55 points), the highest score for the overall attitude was neutral mostly due to their level of knowledge which was deficient. Furthermore, nearly half of the participants showed a positive attitude toward CAM, and this is due to their belief that CAM is effective and safe. The level of attitude among Pakistani diabetic patients toward CAM therapies seems to be in accordance with our study[17]. Accordingly, they mentioned that 77% of patients would discuss CAM with their physicians before consuming the products, however,the majority of them revealedminimal side effects (57.5%) as well as high effectiveness in controlling blood sugar (49%).T2DM patients reported that they use CAM products along with T2DM medications (49%)while only 8% reported that they will use CAM even though they did not receive any advice from their doctors. In contrast, a study done in Jazan revealed most respondents cited that affordability and accessibility are the top factors for using CAM though many diabetic patients experienced negative effects after using the products. However, their study did not publish the type of CAM used by diabetic patients because the purpose of their study was to evaluate the pattern and reason for using CAM as well as perceptions of the safety and effectiveness among people with diabetes in the Jazan region [34].

The significant factor of attitude

Increased attitudelevels were more likely demonstrated by diabetic patients who were smokers/ex-smokers, had uncontrolled HbA1c levels, used CAM for the treatment of T2DM, had higher satisfaction with CAM products, had consulted their physicians for CAM use, and those with associated comorbidities such as hypertension, ischemic heart disease, and obesity. We also noted a significant correlation between knowledge and attitude suggesting that the increase in knowledge was correlated with the increase in attitude. That is, each indicator is dependent on the other. In our further investigations, none of the previous papers managed to investigate the link between attitudes toward CAM among the sociodemographic variables and knowledge. Thus, our findings provided initial insightfor further studies.

Practice toward CAM

A significant proportion of our patients were CAM users with approximately 40.1% using CAM for the treatment of T2DM. This prevalence is within the range as discussed in the literature with a prevalence range from 30% to 64% of CAM used[13,17,23-26,29,32]. The global prevalence of CAM consumption for the treatment of diabetes was 51% [21] which was also comparable with our result. However, in Riyadh [28], the prevalence of patients who used traditional treatment was only 21.9%. The less consumption of CAM is likely attributed to the differences in the study subjects as the previous study was about patients who visited an ophthalmologist for eye care who may have been less interested in CAM therapies as compared to diabetic patients. Moreover, in a recent study that evaluated the use of CAM in patients with chronic diseases in Qassim in 2022, it was discovered that 51% of diabetic patients and 36% of hypertensive patients had used at least one type of CAM. A possible reason for the high prevalence of CAM use was patients were interviewed online at their convenience where they could disclose their CAM use. Additionally, most common CAM used was spiritual therapy like prayers and Holy Quran, compared to other CAMs, patients will be less afraid to disclose their use of spiritual treatment to healthcare professionals.The trial, however, was not limited to patients with T2DM and included all patients with chronic diseases, and their sample size was 208 due to COVID-19 restrictions[33].

Details of CAM practices

Other than using CAM for the treatment of T2DM, 38.6% of our patients expressed that they used CAM for a condition not related to T2DM because patients were estimated to have multiple comorbid conditions. While 31% use CAM along with their DM medications because they are dissatisfied in some way with conventional treatment. Patients tend to discuss CAM products with their physicians (53%) and they expressed great satisfaction with their benefits (44.6%) wherein 41.5% stated that they will use CAM products again in the future. In Riyadh [13], nearly half of the patients (45.7%) visiting primary care centers indicated that CAM therapy cannot be consumed without advice coming from a medical practitioner, however, approximately three-quarters of the patients said that the CAM products had been used for the treatment of at least 3 health conditions. On the contrary, among Israeli patients [16],

only 11 out of 26 CAM users discussed their use of CAM with their physicians while 19 out of 26 CAM consumers detected possible drug-herb interactions. Physician advice is necessary prior to the use of CAM due to potential adverse effects when combined with DM medications. Hence, patients' awareness and adherence to the treatment plan are advised.

The significant factor of practice

CAM users were more likely to be single, smokers/ex-smokers, hadexpressed satisfaction with CAM, and had associated comorbidities such as hypertension, dyslipidemia, and ischemic heart disease. On the other hand, various papers reported the link between the use of CAM in terms of gender and age [13,17,20,25-26]. In our study, however, gender and age were not relevant factors of CAM use which contradicted previous publicationsbut mirrored the studies done byAlzahrani et al [21] as well as Kamel et al [29].On the other hand, Raja et al[17], relates CAM practice to complications of diabetes, poor glycemic control, lack of patient-doctor relationship, lack of trust in pharmaceutical products, CAM products' low cost, and belief that CAM products have can help in diabetes with fewer side effects. This concurred with the study of Sari et al [23].They documented that the factors that best predict the use of CAM products were the belief that CAM therapies were safe, their availability and low cost, the belief that CAM products could aid with diabetes control, and the belief that CAM products could help maintain physical health.

Sources of CAM information

A good consideration for the improvement of KAP in CAM therapies was the sources of CAM information. In our study, based on multiple response answers, the most commonly known source of CAM recommendation was family (46.5%), followed by friends (45.7%), and herbalists (28.6%). Other sources of CAM information toa lesser extent were physicians (23.6%), dietitians (21.5%), traditional healers (17.3%), and pharmacists (14.7%). We can draw the conclusion that family appears to be the most significant factor when it comes to choosing CAM. Given that the Saudi community is primarily composed of close-knit families, this is to be anticipated. We can suppose that because of the strength of these bonds, family members' opinions are trusted to a great extent. Although healthcare providers should be the primary resource for information on CAM, there have been previously documented causes for CAM non-disclosure, including the fear of a negative response from doctors, and the fact that doctors work within a biomedical framework, they are uninformed about CAM[35]. Family and friends had also been indicated as the most trusted sources of CAM information as reported by Alzami et al [13] as well as Radwan et al [25]. However, in a study by Alyousefiet al [28], the most prominent source of knowledge about traditional treatment was the Internet (66.9%) and Social Media (13.3%) which did not coincide with our results.This can be explained by the majority of our participants aged above 40 who could berelactant in using the Internet.Moreover, in a study by Farooqui et al, family and healthcareproviders were the most popular resources for CAM recommendations[33].

Types of CAM used

The most common type of CAM being used by the patients were herbs (52%) due to their availability and affordability, followed by nutritional supplements (51.7%) and specific diet (51.7%) while spiritual healing is the least to be used among them (13.4%). In contrast, a study carried out in the southern region of Saudi Arabia, spiritual therapies were the most popular CAM used by study participants[36]. In addition, spiritual therapies are consistently the most prevalent CAM type mentioned in a study done in Qassim, regardless of the comorbid condition. The simplicity of administration, lower cost, insignificant side effects, and lack of concern for interactions may all contribute to patient interest in spiritual therapies[33].

Conclusion:-

Despite the lack of knowledgeamong T2DM patients regarding the basic facts of CAM, a considerable proportion of them were using it and were seen to have an optimistic attitude regarding its beneficial effects. Furthermore, increased utilization of CAM products was seen more frequently among T2DM patients with associated comorbidities and those who showed great satisfaction with its benefits. Given the rise in the utilization of CAM products, awareness about their use is necessary. Proper awareness of CAM usage is vital to ensure the optimization of treatment care and medication adherence. Further efforts arenecessary to improve healthcare providers' and patients' perceptions toward CAM utilization in diabetes. Identifying opportunities to foster the balanced use of CAM through evidence-based guidelines and patient-centered approaches is warranted.

References:-

1. Kwak G, Gardner K, Bolaji B, Franklin S, Aung M, Jolly PE (2022). Knowledge, attitudes and practices among healthcare professionals regarding complementary alternative medicine use by patients with hypertension and type 2 diabetes mellitus in Western Jamaica. Complement Ther Med [Internet]. 2021;57(102666):102666. Available from: https://pubmed.ncbi.nlm.nih.gov/33460742/
2. UpToDate. doctors and editors at UpToDate: Patient education: Complementary and alternative medicine (The Basics); 2021 Dec 14 Available from https://www-uptodate-com.
3. International Diabetes Federation Mena Members. Saudi Arabia 25/02/2020 Available from: https://idf.org/
4. Meo SA(2022). Prevalence and future prediction of type 2 diabetes mellitus in the Kingdom of Saudi Arabia: A systematic review of published studies. J Pak Med Assoc [Internet]. 2016;66(6):722–5. Available from: https://pubmed.ncbi.nlm.nih.gov/27339576/
5. Uptodate. Silvio E Inzucchi, MD ,BeatriceLupsa, MD Clinical presentation, diagnosis, and initial evaluation of diabetes mellitus in adults;2021 Oct 29 Available from https://www-uptodate-com.
6. UpToDate [Internet]. Uptodate.com. [cited 2023 May 16]. Available from: https://www.uptodate.com/contents/type-2-diabetes-overview-beyond-the-basics?search=diabetes%20mellitus%20type%202%20patient&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1
7. UpToDate [Internet]. Uptodate.com. [cited 2023 May 16]. Available from: https://www.uptodate.com/contents/screening-for-type-2-diabetes-mellitus?search=screening%20for%20diabetes&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1
8. Barnes PM, Bloom B, Nahin RL(2022). Complementary and alternative medicine use among adults and children: United States, 2007. Natl Health Stat Report [Internet]. 2008;(12):1–23. Available from: https://pubmed.ncbi.nlm.nih.gov/19361005/
9. Posadzki P, Watson LK, Alotaibi A, Ernst E(2022). Prevalence of use of complementary and alternative medicine (CAM) by patients/consumers in the UK: systematic review of surveys. Clin Med [Internet]. 2013;13(2):126–31. Available from: https://pubmed.ncbi.nlm.nih.gov/23681857/
10. Odegard BR, Ferguson MR, Naja F, Ayoub J, Banna J(2022). A qualitative investigation of the perceptions of complementary and alternative medicine among adults in Hawai'i. BMC Complement Med Ther [Internet]. 2022;22(1):128. Available from: https://pubmed.ncbi.nlm.nih.gov/35525969/
11. Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, et al(2022). Trends in alternative medicine use in the United States, 1990-1997: Results of a follow-up national survey. JAMA [Internet]. 1998;280(18):1569. Available from: https://pubmed.ncbi.nlm.nih.gov/9820257/
12. News and Notes. Public Health Report. May-June 2002 .117: 299-302. Available from https://journals.sagepub.com/
13. Alazmi AS, Alhamad J(2022). Attitudes and practices of complementary and alternative medicine among patients attending primary care center in Saudi Arabia: A prospective cross-sectional study. J Family Med Prim Care [Internet]. 2020;9(10):5177–82. Available from: https://pubmed.ncbi.nlm.nih.gov/33409184/
14. Khalil MK, Al-Eidi S, Al-Qaed M, AlSanad S(2022). Cupping therapy in Saudi Arabia: from control to integration. Integrative Medicine Research. Nih.gov. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6160619/
15. Saudimoh S, Www M. Professional Registration: Preparing a register of Complementary and Alternative Medicine Practitioner in the database of the National Center to facilitate the professional follow-up on Practitioner while introducing them to the standards and ethics of the health professions in theKingdom [Internet]. Gov.sa. Available from: https://www.moh.gov.sa/en/Ministry/Rules/Documents/Regulations-of-Complementary-and- Alternative-Medicine.pdf
16. Koren R, Lerner A, Tirosh A, Zaidenstein R, Ziv-Baran T, Golik A, et al(2022). The use of complementary and alternative medicine in hospitalized patients with type 2 diabetes mellitus in Israel. J Altern Complement Med [Internet]. 2015;21(7):395–400. Available from: https://pubmed.ncbi.nlm.nih.gov/26052873/
17. Raja R, Kumar V, Khan MA, Sayeed KA, Hussain SZ, Rizwan A(2022). Knowledge, attitude, and practices of complementary and alternative medication usage in patients of type II diabetes mellitus. Cureus. Nih.gov. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6783209/
18. Zhang T, He Q, Liu Y, Chen Z, Hu H(2022). Efficacy and safety of curcumin supplement on improvement of insulin resistance in people with type 2 diabetes mellitus: A systematic review and meta-analysis of randomized controlled trials. Evid Based Complement Alternat Med [Internet]. 2021;2021:4471944. Available from: https://pubmed.ncbi.nlm.nih.gov/34484389/

19. Oh M-R, Park S-H, Kim S-Y, Back H-I, Kim M-G, Jeon J-Y, et al(2022). Postprandial glucose-lowering effects of fermented red ginseng in subjects with impaired fasting glucose or type 2 diabetes: a randomized, double-blind, placebo-controlled clinical trial. BMC Complement Altern Med [Internet]. 2014;14(1):237. Available from: https://pubmed.ncbi.nlm.nih.gov/25015735/
20. Wanchai A, Phrompayak D(2022). Use of complementary and alternative medicine among Thai patients with type 2 diabetes mellitus. J Integr Med [Internet]. 2016;14(4):297–305. Available from: https://www.sciencedirect.com/science/article/pii/S2095496416602637
21. Alzahrani AS, Price MJ, Greenfield SM, Paudyal V(2022). Global prevalence and types of complementary and alternative medicines use amongst adults with diabetes: systematic review and meta-analysis. Eur J Clin Pharmacol [Internet]. 2021;77(9):1259–74. Available from: https://pubmed.ncbi.nlm.nih.gov/33686454/
22. Xia T, Yang Y, Li W, Tang Z-, Huang Q, Li Z, et al(2022). Meditative movements for patients with type 2 diabetes: A systematic review and meta-analysis. Evid Based Complement Alternat Med [Internet]. 2020:5745013. Available from: http://dx.doi.org/10.1155/2020/5745013
23. Sari Y, Anam A, Sumeru A, Sutrisna E(2022). The knowledge, attitude, practice and predictors of complementary and alternative medicine use among type 2 diabetes mellitus patients in Indonesia. J Integr Med [Internet]. 2021;19(4):347–53. Available from: https://pubmed.ncbi.nlm.nih.gov/33972194/
24. Siew Mooi C, ZainulAmiruddin Z, Fuziah P, Mehrdad J(2022). Complementary alternative medicine use among patients with type 2 diabetes mellitus in the primary care setting: a cross-sectional study in Malaysia. BMC Complement Altern Med [Internet]. 2013;13(1):148. Available
25. from: https://pubmed.ncbi.nlm.nih.gov/23802882/
26. Radwan H, Hasan H, Hamadeh R, Hashim M, AbdulWahid Z, HassanzadehGerashi M, et al(2022). Complementary and alternative medicine use among patients with type 2 diabetes living in the United Arab Emirates. BMC Complement Med Ther [Internet]. 2020;20(1):216. Available from: http://dx.doi.org/10.1186/s12906-020-03011-5
27. Khalaf AJ, Whitford DL(2022). The use of complementary and alternative medicine by patients with diabetes mellitus in Bahrain: a cross-sectional study. BMC Complement Altern Med [Internet]. 2010;10(1):35. Available from: http://dx.doi.org/10.1186/1472-6882-10-35
28. Wang J, Zhang X, Lan H, Wang W(2022). Effect of garlic supplement in the management of typediabetes mellitus (T2DM): a meta-analysis of randomized controlled trials. Food Nutr Res [Internet]. 2017;61(1):1377571. Available from: http://dx.doi.org/10.1080/16546628.2017.1377571
29. Alrowais NA, Alyousefi NA(2022). The prevalence extent of Complementary and Alternative Medicine (CAM) use among Saudis. Saudi Pharm J [Internet]. 2017;25(3):306–18. Available from: https://pubmed.ncbi.nlm.nih.gov/28344484/
30. Kamel FO, Magadmi RM, Hagras MM, Magadmi B, AlAhmad RA(2022). Knowledge, attitude, and beliefs toward traditional herbal medicine use among diabetics in Jeddah Saudi Arabia. Complement Ther Clin Pract [Internet]. 2017;29:207–12. Available from: https://pubmed.ncbi.nlm.nih.gov/29122263/
31. Al-Eidi S, Tayel S, Al-Slail F, Qureshi NA, Sohaibani I, Khalil M, et al(2022). Knowledge, attitude and practice of patients with type 2 diabetes mellitus towards complementary and alternative medicine. J Integr Med [Internet]. 2016;14(3):187–96. Available from: https://pubmed.ncbi.nlm.nih.gov/27181125/
32. Bakhotmah BA, Alzahrani HA(2022). Self-reported use of complementary and alternative medicine (CAM) products in topical treatment of diabetic foot disorders by diabetic patients in Jeddah, Western Saudi Arabia. BMC Res Notes [Internet]. 2010;3(1):254. Available from: https://pubmed.ncbi.nlm.nih.gov/20925956/
33. Handley MA, Quan J, Chao MT, Ratanawongsa N, Sarkar U, Emmons-Bell S, et al(2022). Use of complementary health approaches among diverse primary care patients with type 2 diabetes and association with cardiometabolic outcomes: From the SF bay collaborative research network (SF bay CRN). J Am Board Fam Med [Internet]. 2017;30(5):624–31. Available from: https://pubmed.ncbi.nlm.nih.gov/28923815/
34. Farooqui M, Alreshidi H, Alkheraiji J, Abdulsalim S, Alshammari MS, Kassem L, et al(2022). A cross-sectional assessment of complementary and alternative medicine (CAM) use among patients with chronic diseases (CDs) in Qassim, Saudi Arabia. Healthcare (Basel) [Internet]. 2022;10(9):1728. Available from: https://pubmed.ncbi.nlm.nih.gov/36141338/
35. Meraya AM, Ahsan W, Albratty M, Alhazmi HA, Najmi A(2022). Perception of individuals with diabetes about efficacy and safety of complementary and alternative medicines (CAM) in the Jazan region, Saudi Arabia. Evid Based Complement Alternat Med [Internet]. 2022; 2104056. Available from: https://pubmed.ncbi.nlm.nih.gov/35571737/

36. Robinson A, McGrail MR. Disclosure of CAM use to medical practitioners: a review of qualitative and quantitative studies. Complement Ther Med [Internet]. 2004 [cited 2023 Apr 23];12(2–3):90–8. Available from: https://pubmed.ncbi.nlm.nih.gov/15561518/
37. Alghamdi M, A. Mohammed A, Alfahaid F, Albshabshe A(2022). Herbal medicine use by Saudi patients with chronic diseases: A cross-sectional study (experience from Southern Region of Saudi Arabia). J Health Spec [Internet]. 2018;6(2):77. Available from: https://go.gale.com/ps/i.do?id=GALE%7CA533499541&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=1658600X&p=HRCA&sw=w&userGroupName=anon%7Ee9a28693.