



Complementary and alternative medicine use and its associated factors among hypertensive patients in Debre Tabor General Hospital, Ethiopia

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ABSTRACT

Background: Hypertensive patients have been using complementary and alternative medicine (CAM) to meet their primary healthcare needs within Ethiopia. The use of plant-based medicine is not only common rather it is also a culturally accredited practice, among the people of Ethiopia. However, studies conducted on the prevalence and correlates of herbal medicine (HM) use among hypertensive patients are lacking. Thus, this study aimed to assess CAM use and its associated factors among hypertensive patients.

Methods: An institutional-based cross-sectional study was conducted on 450 hypertensive patients, visiting the hypertensive care service of Debre Tabor General Hospital from November 1 to December 28, 2020. Interview-guided self-administered questionnaires were used for data collection. Statistical Package for the Social Sciences (SPSS) software version 24.0 was used for data analysis. Univariate and multivariate logistic regression was computed to identify associated factors of CAM use (age, sex, religion, residence, marital status, educational level, monthly income, presence of HTN complication, duration of HTN, and family history of HTN).

Results: Out of the 450 hypertensive patients, 275 (67.8%) participants used complementary and alternative medicine. Herbal medicines used among hypertensive patients were *M. stenoptela* 105 (62.9%), *O. lamiifolium* 81 (48.5%), *C. aurea* 62 (37.1%), *R. nepalensis* 44 (26.3%), *M. piperata* 36 (21.6%), *H. abyssinica* 24 (14.4%), *T. schimperi* 19 (11.4%), *R. abyssinicus* 15 (9.0%), and *T. foenumgraecum* 9 (5.4%). Majority of CAM users 202 (73.5) did not discuss with health professionals about their CAM use. Families and friends 91 (33.1%) were the frontline source of information about CAM use. In a multivariate analysis, female gender patients over 45 years old, rural residence, higher educational level, high average monthly income, presence of complications, greater than 5 years duration of hypertension (HTN), and having a family history of HTN were the independent predictors of CAM use.

Conclusion: The prevalence of CAM use among hypertensive patients was high 275 (67.8%). Factors associated with CAM use are similar to those observed in previous studies, but further research is required to further clarify the opportunities and challenges correlated to CAM use in Ethiopia.

1. Introduction

Hypertension (HTN) or high blood pressure is a chronic medical condition in which the blood pressure in the arteries is elevated [1]. The prevalence of HTN is higher in low and middle-income countries than in higher-income countries. Besides this, the number of people affected also exceeds those of high-income countries [2,3]. According to the world health organization (WHO), one-third of the world's population suffers from hypertension and the incidence has been increasing at a

rapid rate due to lifestyle modification [4].

CAM includes domains of healing resources interrelated to beliefs and health practices that differ from conventional medicine. Whereas complementary medicine is used in conjunction with standard conventional medical practice, alternative medicine is used as a substitute for conventional medicine [5]. Herbal medicine is the art or practice of using herbs and herbal remedies to maintain health and to prevent, alleviate, or cure the disease [6]. As studies emerge more patients with chronic health diseases are choosing to use CAM [7], but the findings are

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not completely understood [8–10]. The common factors associated with CAM use comprise socio-demographic characteristics of hypertensive patients, cultural and complex psycho-social factors. Patients with chronic disease may choose to use CAM since they are dissatisfied with modern medications [10,11]. Patients with chronic disease (hypertension, diabetes mellitus, and cancer) also find CAM attractive since it is in agreement with their religious health and personal values [12–15].

Globally, medicinal plants have been used as a source of medicine and 80–85% of populations rely on these medicinal plants using the extracts or their active components as a traditional medicine to meet their primary health care needs [16]. The use of plant-based treatment of HTN is very common among low and middle-income countries due to their low cost and easy availability than modern drugs [44]. Several medicinal plants such as *H. sabdariffa* [17], *A. remota* [18], *H. abyssinica* [19], *B. abyssinica* [85], *M. stenopetala* [46], *C. nucifera* Linn [20], and some others have been used for the management of HTN.

In Ethiopia, the use of plant-based medicine is an innate culturally accredited practice [21]. The use of plant-based medicine by patients with chronic diseases like hypertension and cancer have been studied in-depth in different parts of Ethiopia [21–23]. However, studies on the prevalence and correlates of HM use among hypertensive patients are lacking. Thus, this study aimed to assess CAM use and its associated factors among hypertensive patients in Debre Tabor General Hospital, Debre Tabor, Ethiopia.

2. Methods

2.1. Study design

Institutional based cross-sectional study was conducted from November 1 to December 28, 2020 in the hypertensive care service of Debre Tabor General Hospital, located in Debre Tabor town, South Gondar zone, Northwest Ethiopia. The diabetic care service is one of the hospital's outpatient department clinics which gives service to many hypertensive patients.

2.2. Study participants and sampling

A convenience sample of adult hypertensive patients (age ≥ 18 years) visited the adult hypertensive care services of Debre Tabor General Hospital. During the study, 450 participants were included in the present study within a one-month data collection period. The sample group excluded from this study were people who had HTN for one year, pregnant women, and people who suffer from mental health illnesses.

2.3. Data collection process

A data abstraction format was designed based on previous studies [23–28]. An interview-directed self-administered questionnaire was used for data collection by two trained health professionals. Initially, the questionnaire was prepared in English and translated into the local language (Amharic) then back to the English language to ensure consistency. A pre-test was done two weeks before the actual data collection on 30 participants who were not included in the final analysis. The final questionnaire constitutes 25 items that were divided into two main sections. The questionnaire comprised two core sections. The first section contains questions about the socio-demographic characteristics (age, sex, religion, marital status, education, residence, monthly income, educational level, occupation status and clinical status of the patients, duration of the disease, and family history of hypertension). The second part intended to evaluate the level of CAM use, information source, and discussion with healthcare professionals (HCPs) regarding CAM use. The type of CAM was grouped as biological-based CAM such as herbal medicine (HM), animal products diet, honey, and natural products e.g. minerals and vitamins; manipulative and body-based CAM like exercise, relaxation, and massage; and mind/body interventions such as fasting,

prayer, “Tsebel” (holy water) and listening to music. The use of HM among hypertensive patients was evaluated by questions such as type of HM used, parts used, and method of preparations. For quality assurance, the principal investigator was continuously supervising the data collectors for completeness and consistency and the records were cross-checked. The data collectors were appropriately skilled in the data collection tool before data collection. During data gathering, two trained health professionals were recruited and supervised by two Master of Science (MSc) graduate health professionals. One-day training was given to them on the objectives of the study, the contents of the questionnaire, and the issues related to confidentiality.

2.4. Data analysis

SPSS (Armonk, NY, USA) software version 24.0 was used for data analysis. Descriptive statistics such as frequency counts and percentages of respondent characteristics were used for data presentation. The univariate and multivariate logistic regression analyses were computed to identify associated factors. Variable to be contained within the multiple regression model, it must be significantly correlated with the main outcome (CAM use) in the univariate analysis. Odds ratios and their corresponding 95% confidence intervals were determined. Statistical significance was set at a 95% confidence interval and a *P*-value of < 0.05 was regarded as statistically significant.

3. Results

3.1. Participant characteristics

Out of 475 participants, 450 completed the survey resulting in a 94.7% response rate. Of the 450 participants interviewed, 244 were male (54.2%), and 206 were female (45.8%) participants, with a mean age of 46.54 ± 12.6 years. Most of the participants (64.0%) were Orthodox Christians, (59.8%) married, 59.1% were permanent residents of urban areas, (66.0%) had a family history of HTN, and (57.3%) had complications. The socio-demographic and disease characteristics of study participants are summarized in Table 1.

3.2. Determinants of CAM use

According to the multivariate logistic regression analysis, the odds of CAM use among rural residents are 2.45 times higher than urban residents (AOR: 2.45, 95% CI: 1.54, 4.67). Male respondents were 2.01 times more likely to use CAM (AOR: 2.01, 95% CI: 1.23, 5.42) than female respondents. The odds of CAM use among participants with > 45 years of age were 3.01 times (AOR: 1.62, 95% CI: 1.50, 4.80) higher compared to participants with < 30 years of age. Illiterate participants were 1.98 times more likely to use CAM than those who attended university (AOR: 1.98, 95% CI: 1.70, 4.59). Participants who had an average monthly income of less than 1500 Ethiopian Birr (ETB) were 2.23 times more likely to use CAM than those who had an average monthly income of greater than 2500 ETB (AOR: 2.23, 95% CI: 1.45, 5.62). The odds of CAM use among participants with > 5 years duration of HTN were 3.01 times (AOR: 3.01, 95% CI: 1.51, 6.05) higher compared to patients with < 5 years duration of HTN. The odds of CAM use among patients who develop complications were 3.41 times higher than patients without HTN complications (AOR: 3.41, 95% CI: 1.15, 3.42). The odds of CAM use among participants with a family history of hypertension were 1.87 higher than participants without a family history of hypertension (AOR: 1.87, 95% CI: 1.24, 4.06) (Table 1).

3.3. Characteristics and prevalence of CAM use

The characteristics and prevalence of CAM use are summarized in Table 2. Among CAM users, 231 (84.0%) used CAM as a complementary treatment along with conventional medicine, while 17 (6.2%) used CAM

Table 1
Patient characteristics and factors associated with CAM use.

Variable	Frequency (%)	CAM use (n = 450)		AOR (95% CI)
		Yes (n)	No (n)	
Age (Years)				
<30	75 (16.7%)	33	42	1
31–45	177 (39.3%)	98	79	1.33 (0.93–5.75)
>45	198 (44%)	144	54	1.62 (1.50–4.80)
Sex				
Male	244 (54.2%)	188	65	2.01 (1.23–5.42)
Female	206 (45.8%)	97	99	1
Religion				
Orthodox	288 (64%)	182	106	1.11 (0.52–2.47)
Muslim	121 (26.9%)	69	52	0.73 (0.57–4.53)
Protestant	41 (9.1%)	24	17	1
Marital status				
Single	137 (30.4%)	76	61	1.61 (0.48–5.35)
Married	269 (59.8%)	176	93	0.77 (0.40–6.02)
Divorced	24 (45.3%)	12	12	1.36 (0.82–3.87)
Widowed	20 (4.4%)	11	9	1
Residence				
Urban	266 (59.1%)	145	119	1
Rural	184 (40.9%)	130	45	2.45 (1.54–4.67)
Educational level				
Illiterate	117 (26%)	47	70	1
Primary and secondary school	231 (51.3%)	151	80	1.02 (0.56–3.08)
University	102 (22.7%)	77	25	1.98 (1.70–4.59)
Monthly income				
<1500 ETB	177 (39.3%)	141	36	2.23 (1.45–5.62)
1501–2500 ETB	148 (32.9%)	90	58	1.54 (1.03–3.02)
>2500 ETB	125 (27.8%)	44	81	1
Duration of HTN				
<5	201 (44.7%)	81	120	1
>5	249 (55.3%)	194	55	3.01 (1.51–6.05)
Presence of HTN complication				
Yes	258 (57.3%)	201	57	3.41 (1.15–23.42)
No	192 (42.7%)	74	118	1
Family history of HTN				
Yes	297 (66.0%)	214	83	1.87 (1.24–4.06)
No	153 (34.0%)	61	92	1

as an alternative treatment along with conventional medicine. Families and friends were 91 (33.1%) the most frequently reported source of recommendation about CAM followed by traditional herbalists 86 (31.3%) and patients who used CAM 69 (25.1%). Most of the CAM users 84 (30.5%) reported dissatisfaction with modern medicine as the main reason for using CAM followed by belief in advantages of CAM 66 (24.0%), and accessibility (availability) 56 (20.4%). Likewise, the main reason for not using CAM among nonusers was because of being afraid of side effects 68 (51.1%) followed by lack of belief in its effectiveness 32 (24.1%) and Additional burden 22 (16.5%). The majority of CAM 122 (60.4%) didn't reveal CAM use for their HCPs due to fear of their HCPs 122 (60.4%) and lack of adequate information about CAM use 56 (27.7%). About 241 (87.6%) of CAM users haven't faced any side effects related to CAM use, and 143 (52.0%) of them were satisfied with the effect of CAM use (Table 2).

3.4. Patterns of CAM use

The use of CAM was reported by 275 (67.8%) hypertensive patients. The most frequent biological-based CAM products cited by participants were HM (67.5%), honey (44.1%), animal products (34.8%), diet (33.7%), and natural products like minerals and vitamins (56.3%). Additional CAM modalities reported were manipulative and body-based CAM (exercise, 50.9%), massage (26.5%), and relaxation (8.6%) as well as mind/body intervention like fasting (22.9%). The types and patterns of various CAM used by hypertensive patients are summarized in

Table 2
Prevalence and characteristics of CAM use among participants.

Variables	Frequency (%)
CAM use since diagnosis (n = 450)	
No	175 (38.9%)
Yes	275 (61.1%)
How do you use CAM?	
Complementary to modern medicine	231 (84.0%)
Alternative to modern medicine	17 (6.2%)
Both	27 (9.8%)
Who recommended you to use CAM? (n=275)	
Families and friends	91 (33.1%)
Traditional herbalist	86 (31.3%)
Patients who used CAM	69 (25.1%)
Health care professionals	17 (6.2%)
Others	12 (4.4%)
Reasons for CAM use (n=275)	
The tradition in the resident area encourages CAM use	41 (14.9%)
Belief in advantages of CAM	66 (24.0%)
Accessibility (availability)	56 (20.4%)
For the treatment of other medical conditions	19 (6.9%)
Dissatisfaction with modern medicine	84 (30.5%)
Others	9 (3.3%)
Reasons for not using CAM among nonusers (n=133)	
Additional burden	22 (16.5%)
Afraid of side effect	68 (51.1%)
The doctor did not recommend	11 (8.3%)
Lack of belief in its effectiveness	32 (24.1%)
Disclosure for health care professionals (HCPs)	
No	202 (73.5%)
Yes	73 (26.5%)
Reason for not disclosing (n=202)	
Fear of response of HCPs	122 (60.4%)
Not necessary	24 (11.9%)
Insufficient information on CAM	56 (27.7%)
Side effects (n=275)	
No	241 (87.6%)
Yes	34 (12.4%)
Satisfaction (n=275)	
Satisfied	143 (52.0%)
Average	91 (33.1%)
Dissatisfied	41 (14.9%)

Table 3
Types of CAM utilized by participants.

Type of CAM	Frequency (%)
Biological-based CAM	
HM	167 (60.7%)
Honey	56 (20.4%)
Animal products	43 (15.6%)
Diet	101 (36.7%)
Natural products like minerals and vitamins	88 (32.0%)
Manipulative and body-based CAM	
Exercise	119 (43.3%)
Massage	35 (12.7%)
Relaxation	12 (4.4%)
Mind/body intervention-based CAM	
Fasting	74 (26.9%)
Prayers	89 (32.4%)
Tsebel (holy water)	105 (38.2%)
Listening to music	8 (2.9%)

Table 3. The most commonly used plant-based preparations were Shiferaw (*Moringa stenoptela*) (62.9%), Damakase (*Ocimum lamifolium*) (48.5%), Digita (*Calpurnea aurea*) (37.1%), Tullet (*Rumex nepalensis*) (26.3%), Nana (*Mentha piperata*) (21.6%), Kosso (*Hagenia abyssinica*) (14.4%), Tosign (*Thymus schimperi*) (11.4%), Mekemeko (*Rumex abyssinicus*) (9.0%), and Abish (*Trigonella foenumgraecum*) (5.4%). Herbal medicines relevant to the management of HTN among participants are summarized in Table 4.

Table 4
Herbal medicines used for the management of hypertension among participants.

Scientific name	Family	Local name	Parts used	Method of preparation	Frequency (%)
<i>Moringa stenoptela</i>	Moringaceae	Shiferaw	Dried leaf	The leaf as tea is taken orally	105 (62.9%)
<i>Ocimum lamiiifolium</i>	Labiatae	Damakase	Leaf	Fresh leaf juice is taken orally	81 (48.5%)
<i>Calpurnea aurea</i>	Fabaceae	Digita	Seeds	The seed is crushed and sniffed through the nostrils	62 (37.1%)
<i>Rumex nepalensis</i>	Polygonaceae	Tullet	Fresh leaf	Fresh leaf is boiled and taken orally	44 (26.3%)
<i>Mentha piperata</i>	Lamiaceae	Nana	Leaf	The juice of the squeezed leaf is taken orally	36 (21.6%)
<i>Hagenia abyssinica</i>	Rosaceae	Kosso	Fresh flower and fruit	Fresh flower and fruit are boiled with little water taken orally	24 (14.4%)
<i>Thymus schimperi</i>	Lamiaceae	Tosign	Stem, leaf, Whole plant	Dried stem and leaf powder boiled with tea and is taken orally	19 (11.4%)
<i>Rumex abyssinicus</i>	Polygonaceae	Mekemeko	Root	The root is boiled with water and taken with milk	15 (9.0%)
<i>Trigonella foenumgraecum</i>	Fabaceae	Abish	Seed	Extract of the dried and powdered seed is taken orally	9 (5.4%)

3.5. Discussion

The use of CAM for the management of hypertension and other chronic diseases is reported worldwide [29,30]. This study aimed to assess the prevalence and correlates of CAM use among HTN patients who visited the HTN illness follow-up care clinic of Debre Tabor General Hospital, Ethiopia.

In this study, the prevalence of CAM use among HTN patients was (61.1%). This finding is consistent with studies conducted in Ethiopia (67.8%) [23], and in India (63.9%) [26], but it is higher than previous studies conducted in Ghana 19.5% [28], Nigeria 29% [24,27], Australia 48.5% [31], USA 40% [32], and South Africa 21% [33]. Nevertheless, similar studies conducted in Palestine 85.7% [34], and Morocco 80% [25], revealed a higher prevalence of CAM use among HTN patients. The differences in the prevalence of CAM use across different countries could be because of variations in the perceptions of CAM use, sociocultural background, and accessibility of conventional medical practice.

The most frequent biological-based CAM products reported by respondents were HM (67.5%), honey (44.1%), animal products (34.8%), diet (33.7%), and natural products like minerals and vitamins (56.3%). Additional CAM modalities reported were manipulative and body-based CAM (exercise, 50.9%), massage (26.5%), and relaxation (8.6%) as well as mind/body intervention like fasting (22.9%). There has been a great deal of interest in the development and application of behavioral interventions in the management of hypertension. The main behavioral interventions that are recommended to reduce hypertension are dietary approaches and exercise [35].

Among the CAM users, 60.7% of hypertensive patients utilize HM which is consistent with studies conducted in Ethiopia 67.5% [23], and Nigeria 63% [27]. Moreover, the HMs reported such as Shiferaw (*Moringa stenoptela*) (62.9%), Damakase (*Ocimum lamiiifolium*) (48.5%), Digita (*Calpurnea aurea*) (37.1%), Tullet (*Rumex nepalensis*) (26.3%), Nana (*Mentha piperata*) (21.6%), Kosso (*Hagenia abyssinica*) (14.4%), Tosign (*Thymus schimperi*) (11.4%), Mekemeko (*Rumex abyssinicus*) (9.0%), and Abish (*Trigonella foenumgraecum*) (5.4%). Several studies have reported the antihypertension effect of these medicinal plants provides a base for authentic health claims regarding the medicinal plants [21,36–43]. The high prevalence of HM use in current studies can be explained by the large access to herbal medicine, progressive awareness of the population over the year about herbal medicine uses for HTN, and the study area rich in medicinal plants that cover primary health care. Moreover, mind/body interventions such as holy water, prayer, and fasting were used by an extensive percentage of CAM users, which is in agreement with similar studies conducted in Ethiopia [23]. The incorporation of religious beliefs for instance fasting, prayer, and holy water are daily practices that are public practice to all religions in Ethiopia. Most spiritual practices have the advantage of being cheap, easy, and safe to use through their usefulness is not convinced. In this study, most CAM users (52.0%) were satisfied with the perceived effect. This finding is lower in studies done in hypertensive patients (62.9%) [34], diabetic patients (71.7%) [44], and cancer patients (63.3%) [45]. However, these findings are higher in a study conducted in Ethiopia (48.4%) [23].

A multivariate analysis of female patients over 45 years old, rural

residence, those who attended university, participants who had an average monthly income of less than 1500 Ethiopian Birr, presence of complications, greater than 5 years duration of HTN, and having a family history of HTN were the independent predictors of CAM use. This result is consistent with previous studies conducted in Ethiopia [23], and Palestine [34]. In this study, male patients were 2.01 times as likely to use CAM (AOR: 2.01, 95% CI: 1.23, 5.42) than female patients. This finding is consistent with previous studies [23,46], while it is inconsistent with other similar studies [47–49].

In this current study, families and friends were (33.1%) more likely to be the source of recommendation for CAM followed by traditional herbalists (31.3%), and patients who used CAM (25.1%). These findings are consistent with studies conducted in Germany [50] and Ethiopia [23], where the most common sources of information for CAM came from family and friends who use traditional herbalists and patients who used CAM. This result is consistent with studies done on cancer patients [51], and hypertensive patients [23]. To avoid misuse of CAM, HCPS should emphasize their patients on CAM use.

3.6. Limitation of the study

As a limitation, the findings found concerning CAM use could not be representative since the current study is done in only one referral hospital; hence, a multicentered and larger-scale study that includes more diverse respondents is required to provide more precise results. As the study is cross-sectional and is dependent on self-reported assessment, under-reporting is more likely to occur. The current study was not assessing the attitude, and awareness of the participants towards CAM use. Even though respondents were invited to report their personal experience and opinion, and were further guaranteed the confidentiality and privacy of their responses, data collection was finalized in the waiting class of the hospital; hence, respondents may experience the social desirability bias and their responses are likely converted to satisfy their HCPS. Therefore, the prevalence of CAM use among hypertensive patients might be underestimated.

4. Conclusions

The study found a high prevalence of CAM use among HTN patients in Debre Tabor General Hospital along with a very low rate of disclosure to the HCPS. Commonly used HM among hypertensive patients were *M. stenoptela*, *O. lamiiifolium*, *C. aurea*, *R. nepalensis*, *M. piperata*, *H. abyssinica*, *T. schimperi*, *R. abyssinicus*, and *T. foenumgraecum*. Female gender, patients above 45 years old, rural residence, higher educational level, high average monthly income, presence of complications, >5 years duration of HTN, and having a family history of HTN were the independent predictors of CAM use.

CRediT authorship contribution statement

Zemene Demelash Kifle: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing –

original draft, Writing – review & editing. **Dawit Kumilachew Yimenu:** Conceptualization, Data curation, Methodology, Project administration, Resources. **Birhanu Berihun Kidanu:** Funding acquisition, Investigation, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no competing interests.

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Abbreviations

CAM	complementary and alternative medicine
HTN	hypertension
HCPs	healthcare professionals
HM	herbal medicines
SPSS	statistical package for the social sciences
AOR	adjusted odds ratio
WHO	world health organization

Ethics approval and consent to participate

This study was approved by the ethical committee of the school of pharmacy, the University of Gondar. Informed verbal and written consent was obtained from study participants before data collection. The purpose of the study was explained to the respondents in advance. Information collected from respondents was kept confidential.

Availability of data and materials

Most of the data is included in the manuscript. Additional can be found from the corresponding author based on reasonable request.

Consent for publication

Not applicable.

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References

- Kanda T, et al. Low birth weight trends: possible impacts on the prevalences of hypertension and chronic kidney disease. *Hypertens Res* 2020;43(9):859–68.
- Hoffman DJ. Use of beetroot juice extract for hypertension treatment in low-and middle-income countries. *J Nutr* 2020;150(9):2233–4.
- Organization WH. A global brief on hypertension. In: World Health Day. Geneva, Switzerland: WHO; 2013.
- Mendis S, et al. Global atlas on cardiovascular disease prevention and control. World Health Organization; 2011.
- Lichtenstein G, Waalen J. Distinguishing complementary medicine from alternative medicine. *Arch Intern Med* 2002;162(8): 943–943.
- Welz AN, Emberger-Klein A, Menrad K. Why people use herbal medicine: insights from a focus-group study in Germany. *BMC Compl Alternative Med* 2018;18(1): 1–9.
- Brauer JA, et al. Complementary and alternative medicine and supportive care at leading cancer centers: a systematic analysis of websites. *J Alternative Compl Med* 2010;16(2):183–6.
- Lewith GT. Complementary and alternative medicine: an educational, attitudinal and research challenge. *The Medical Journal of Australia* 2000;172(3):102–3.
- Lorenc A, et al. How parents choose to use CAM: a systematic review of theoretical models. *BMC Compl Alternative Med* 2009;9(1):1–12.
- Menniti-Ippolito F, et al. Use of unconventional medicine in Italy: a nation-wide survey. *Eur J Clin Pharmacol* 2002;58(1):61–4.
- Sutherland LR, Verhoef MJ. Why do patients seek a second opinion or alternative medicine? *J Clin Gastroenterol* 1994;19(3):194–7.
- Furnham A, Forey J. The attitudes, behaviors and beliefs of patients of conventional vs. complementary (alternative) medicine. *Journal of clinical psychology* 1994;50(3):458–69.
- Vincent C, Furnham A. Why do patients turn to complementary medicine? An empirical study. *Br J Clin Psychol* 1996;35(1):37–48.
- Moore J, et al. Why do people seek treatment by alternative medicine? *Br Med J* 1985;290(6461):28.
- Bishop FL, Yardley L, Lewith GT. A systematic review of beliefs involved in the use of complementary and alternative medicine. *J Health Psychol* 2007;12(6):851–67.
- Ehujoba AA, Odeleye O, Ogunyemi C. Traditional medicine development for medical and dental primary health care delivery system in Africa. 2005.
- Ajay M, et al. Mechanisms of the anti-hypertensive effect of Hibiscus sabdariffa L. calyces. *J Ethnopharmacol* 2007;109(3):388–93.
- Tafesse TB, et al. Antidiabetic activity and phytochemical screening of extracts of the leaves of *Ajuga remota* Benth on alloxan-induced diabetic mice. *BMC Compl Alternative Med* 2017;17(1):1–9.
- Kifle ZD, Yesuf JS, Atnafie SA. Evaluation of in vitro and in vivo anti-diabetic, anti-hyperlipidemic and anti-oxidant activity of flower crude extract and solvent fractions of *hagenia abyssinica* (rosaceae). *J Exp Pharmacol* 2020;12:151–67.
- Ibarrola D, et al. Hypotensive effect of crude root extract of *Solanum sisymbriifolium* (Solanaceae) in normo-and hypertensive rats. *J Ethnopharmacol* 1996;54(1):7–12.
- Wassie SM, et al. Knowledge, attitude, and utilization of traditional medicine among the communities of Merawi town, Northwest Ethiopia: a cross-sectional study. *Evid base Compl Alternative Med* 2015. 2015.
- Erku DA. Complementary and alternative medicine use and its association with quality of life among cancer patients receiving chemotherapy in Ethiopia: a cross-sectional study. *Evid base Compl Alternative Med* 2016. 2016.
- Asfaw Erku D, Basazn Mekuria A. Prevalence and correlates of complementary and alternative medicine use among hypertensive patients in Gondar town, Ethiopia. *Evid base Compl Alternative Med* 2016. 2016.
- Lee G, et al. Complementary and alternative medicine use in patients with chronic diseases in primary care is associated with perceived quality of care and cultural beliefs. *Fam Pract* 2004;21(6):654–60.
- Eddouks M, et al. Ethnopharmacological survey of medicinal plants used for the treatment of diabetes mellitus, hypertension and cardiac diseases in the south-east region of Morocco (Tafilaleet). *J Ethnopharmacol* 2002;82(2–3):97–103.
- Shafiq N, et al. Prevalence and pattern of use of complementary and alternative medicine (CAM) in hypertensive patients of a tertiary care center in India. *Int J Clin Pharm Ther* 2003;41(7):294–8.
- Osamor PE, Owumi BE. Complementary and alternative medicine in the management of hypertension in an urban Nigerian community. *BMC Compl Alternative Med* 2010;10(1):1–9.
- Kretchy IA, Owusu-Daaku F, Danquah S. Patterns and determinants of the use of complementary and alternative medicine: a cross-sectional study of hypertensive patients in Ghana. *BMC Compl Alternative Med* 2014;14(1):1–7.
- Sewitch MJ, Rajput Y. A literature review of complementary and alternative medicine use by colorectal cancer patients. *Compl Ther Clin Pract* 2010;16(1): 52–6.
- Littlewood RA, Vanable PA. Complementary and alternative medicine use among HIV-positive people: research synthesis and implications for HIV care. *AIDS Care* 2008;20(8):1002–18.
- MacLennan AH, Wilson DH, Taylor AW. Prevalence and cost of alternative medicine in Australia. *Lancet* 1996;347(9001):569–73.
- Eisenberg DM, et al. Trends in alternative medicine use in the United States, 1990–1997: results of a follow-up national survey. *Jama* 1998;280(18):1569–75.
- Hughes GD, et al. The prevalence of traditional herbal medicine use among hypertensives living in South African communities. *BMC Compl Alternative Med* 2013;13(1):1–8.
- Ali-Shtayah MS, et al. Complementary and alternative medicine (CAM) use among hypertensive patients in Palestine. *Compl Ther Clin Pract* 2013;19(4):256–63.
- Bacon SL, et al. Effects of exercise, diet and weight loss on high blood pressure. *Sports Med* 2004;34(5):307–16.
- Sileshi T, et al. Antihyperglycemic and subchronic toxicity study of *Moringa stenopetala* leaves in mice. *J Coastal Life Med* 2014;2:214–21.
- Tadesse M, Hunde D, Getachew Y. Survey of medicinal plants used to treat human diseases in Seka Chekorsa, Jimma Zone, Ethiopia. *Ethiopian Journal of Health Sciences* 2005;15(2).
- Getiye Y, Tolessa T, Engidawork E. Antihypertensive activity of 80% methanol seed extract of *Calpurnia aurea* (Ait.) Benth. subsp. *aurea* (Fabaceae) is mediated through calcium antagonism induced vasodilation. *J Ethnopharmacol* 2016;189: 99–106.
- Mesfin F, Seta T, Assefa A. An ethnobotanical study of medicinal plants in Amaro Woreda, Ethiopia. *Ethnobot Res Appl* 2014;12:341–54.
- Maryo M, Nemomissa S, Bekele T. An ethnobotanical study of medicinal plants of the Kembatta ethnic group in Enset-based agricultural landscape of Kembatta Tembaro (KT) Zone, Southern Ethiopia. *Asian J Plant Sci Res* 2015;5(7):42–61.
- Kifle ZD, Yesuf JS, Atnafie SA. Evaluation of in vitro and in vivo anti-diabetic, anti-hyperlipidemic and anti-oxidant activity of flower crude extract and solvent fractions of *hagenia abyssinica* (rosaceae). *J Exp Pharmacol* 2020;12:151.
- Amsalu N. *An Ethnobotanical Study of Medicinal Plants in Farta wereda*. South Gonder Zone of Amhara Region Ethiopia: Plant Biology and Biodiversity Management Addis. Ababa University; 2010.

- [43] d'Avigdor E, et al. The current status of knowledge of herbal medicine and medicinal plants in Fiche, Ethiopia. *J Ethnobiol Ethnomed* 2014;10(1):1–33.
- [44] Ali-Shtayeh MS, Jamous RM, Jamous RM. Complementary and alternative medicine use amongst Palestinian diabetic patients. *Compl Ther Clin Pract* 2012;18(1):16–21.
- [45] Ali-Shtayeh MS, Jamous RM, Jamous RM. Herbal preparation use by patients suffering from cancer in Palestine. *Compl Ther Clin Pract* 2011;17(4):235–40.
- [46] Elkins G, Rajab MH, Marcus J. Complementary and alternative medicine use by psychiatric inpatients. *Psychol Rep* 2005;96(1):163–6.
- [47] Bodeker G, Kronenberg F. A public health agenda for traditional, complementary, and alternative medicine. *Am J Publ Health* 2002;92(10):1582–91.
- [48] Gohar F, et al. Self-care and adherence to medication: a survey in the hypertension outpatient clinic. *BMC Compl Alternative Med* 2008;8(1):1–9.
- [49] Aziz Z, Tey N. Herbal medicines: prevalence and predictors of use among Malaysian adults. *Compl Ther Med* 2009;17(1):44–50.
- [50] Tautz E, et al. Use of complementary and alternative medicine in breast cancer patients and their experiences: a cross-sectional study. *Eur J Canc* 2012;48(17):3133–9.
- [51] Naja F, et al. Complementary and alternative medicine use and its association with quality of life among Lebanese breast cancer patients: a cross-sectional study. *BMC Compl Alternative Med* 2015;15(1):1–10.