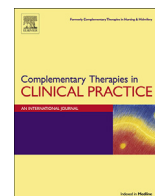




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## Complementary and alternative medicine (CAM) use among hypertensive patients in Palestine

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## A B S T R A C T

## Keywords:

Complementary and alternative medicine  
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Hypertension  
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Herb–drug interactions

**Purpose:** To explore the frequency of CAM use among hypertensive patients in Palestine, determine demographic characteristics that may increase the likelihood of CAM use and to find out how benefits were perceived by patients.

**Methods:** Across-sectional survey of patients attending outpatient hypertension clinics. The method was based on a semi-structured questionnaire.

**Results:** Of the 4575 hypertensive patients interviewed, 85.7% respondents used at least one type of CAM. Of the 3921 CAM users, 62.13% reported taking herbs. Most of these users were >50 years old, of low educational level, and had a family history of HTN, 62.9% claimed to have obtained the desired effect from taking these herbs; however, 68.1% did not disclose this fact to their health care providers, 83 plant taxa were reported by these patients, *Allium sativum* was the most commonly used herb.

**Conclusions:** The use of CAM, particularly herbal therapies for hypertension treatment, is highly prevalent in Palestine.

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## 1. Introduction

Hypertension (HTN) is one of the most common non-communicable adult diseases, affecting approximately 800 million people worldwide (4.5% of the current global disease burden) [1,2]. In recent years, chronic diseases (e.g., cardiovascular diseases) have been attributed to HTN, rendering it the major risk factor for such diseases. It is projected that HTN will increase in 2025 by 24% in developed countries and by 80% in developing countries where most people affected by HTN live [3]. Early onset and higher mortality rates for cardiovascular diseases are reported in developing countries [4]. The regional prevalence of HTN in Arab countries ranges from 26.1 to 32.2% [5]. In Palestine, the rate of reported HTN was 8.1% at age 40–49 years, 22.6% at 50–59 years, and 35.2% at 60 years and older [6]. HTN was reported to be the eighth leading cause of death in the country, accounting for 13 deaths per 100,000 people and 5% of all deaths [7].

In Palestine, as with many developing countries, complementary and alternative medicine (CAM) including the use of herbal medicinal plants plays an important role in primary health care [8].

Medicinal plants in particular are widely used in Traditional Arabic Palestinian Herbal Medicine (TAPHM) for health maintenance and to treat various illnesses including chronic diseases [9–11]. The use of CAM including plant-based medicines and dietary supplements for the treatment of HTN is widespread and increasingly practiced worldwide [1,12–16]. Herbal medicines are the most common form of treatment [1,13,17,18], but other CAM modalities (e.g., vitamin supplements and prayers) are used [19]. The use CAM in life-threatening and severe conditions including cancer has been well-documented [20,21], and the use of CAM in hypertension is increasingly being documented and studied [12]. Studies of the simultaneous use of herbal medicines with conventional therapy are limited [19,22]. These studies indicate that HTN patients use complementary therapies predominantly to cure or slow progression of disease [23]. With concurrent use with pharmaceutical drugs, biochemical interactions may increase or decrease the pharmaceutical or toxicological effects of either component [24,25]. This could result in potential health risks from the simultaneous use of herbal and conventional medicines [26,27].

## 2. Aims and objectives

Although there are a number of studies on CAM for other chronic diseases (e.g., cancer and diabetes) in Palestine [8–11],

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there has not been a study of CAM and Palestinian HTN patients. This study aims to evaluate the prevalence and factors related to the use of CAM including herbs by HTN patients who are concurrently undergoing conventional medical treatment. The aim is to determine the demographic details of the patients who may be more likely to use CAM and to identify any perceived benefits from CAM including the use of herbal therapy. The study seeks to identify the sources of information recommending the use of CAM including herbal therapies and the rationales for patient use of CAM. A major objective was to ascertain whether patients discussed their CAM use with their physicians.

### 3. Methods

#### 3.1. Subjects and recruitment

The study employed a cross-sectional survey of patients attending HTN outpatient departments at governmental hospitals, military medical clinics, and refugee camp clinics in 8 towns in the Palestinian territories (Jenin, Nablus, Tulkarm, Qalqilia, Tubas, Ramalla, Salfit, and Hebron). To ensure a representative cross-sectional sample of patients attending the HTN outpatient clinics, the interviews were conducted on different days and at different times. The study included males and females across different age groups.

Ethical approval was obtained prior to the study from the Institutional Review Board (IRB) at the Ministry of Health in Nablus. The patients expressing an interest in participating in the study were requested to sign a written consent form. The interviews were conducted by trained researchers from the Biodiversity and Environmental Research Centre (BERC), Nablus. The researchers were trained in questionnaire administration and interviewing skills. Prior to proceeding with the interview, the participants were informed about the nature of this study and assured that all information would remain confidential and be used for research purposes only. The participants were not paid to take part in the study and were informed that they were free to decline to answer any questions. The next of kin (NOK) were interviewed if the patients were younger than 16 years of age or unable to interact. The study took place from October 2011 until Nov 2012. The vast majority of the questions had pre-formulated answers, and the main themes addressed by the questionnaire are represented in Table 1.

#### 3.2. Research sample

To evaluate the questionnaire, a pilot study was conducted with 50 randomly selected HTN patients. In this study, 4575 patients diagnosed with HTN were randomly selected at outpatient departments and participated in the study. The findings from the pilot study have not been included in the analysis of data for this study.

#### 3.3. Data analysis

The responses were coded and entered into the SPSS database for Windows, version 17, for statistical analysis. Multivariate analysis and 2x2 contingency tables were used to compare the groups. Chi-square and Fisher's exact tests were used to test for significant differences between the groups. An *a priori* level of significance was set at 0.05.

### 4. Results

#### 4.1. Demographics

Of the 4575 patients interviewed, 2584 were female (56.5%), and 1986 were male (43.5%) patients (5 missing) (Table 2). Table 2

**Table 1**

Main themes addressed by the study questionnaire.

1 Demographic details of the patient or next of kin (NOK) if the patient is <16 years of age	Gender, age group, marital status, education level, area of residence (city, village, refugee camp)
2 Disease details (obtained from patient file)	<ul style="list-style-type: none"> <li>- Having other chronic diseases: e.g., diabetes, cancer, others.</li> <li>- Duration of having HTN (in years).</li> <li>- Having any other chronic diseases.</li> <li>- Having other hypertensive members in the family.</li> <li>- Current treatment(s) of the patient (drug, dose, time and frequency of use).</li> </ul>
3 Information about use of CAM (herbs or herbal preparation, other CAM practices)	<ul style="list-style-type: none"> <li>- Use herbal plants for the treatment of HTN</li> <li>- Plant Part used, Forms of use (Raw, Cooked, Infusion, Decoction, paste, juice), Mode of Preparation, Administration, Dose, period of use,</li> <li>- Origin of the herbs (local, imported)</li> <li>- Do you use other kinds of CAM for HTN</li> </ul>
4 Source of information	<ul style="list-style-type: none"> <li>- Friends, family member, physician, pharmacist, herbalist, media (TV, radio, hard-copy), other (e.g., internet, advertisements, text messages, etc)</li> </ul>
5 Purpose of the use of CAM	<ul style="list-style-type: none"> <li>- Curing disease, slow down progress of disease, relief of symptoms, reducing medication side effects.</li> </ul>
6 Outcomes	<ul style="list-style-type: none"> <li>- Did the patient achieve the sought effect?</li> <li>- Did the patient discuss the CAM use with the physician?</li> <li>- Did the patient experience any side effects from using herbal preparations, and what side effects he/she had experienced?</li> <li>- Did your physician ask whether you use other alternative medicine (specially herbs) beside medication for the treatment of HTN?</li> </ul>

summarises the demographic characteristics of the participants. The majority of the interviewees were above 50 years of age ( $n = 2942$ , 64.3%). A large percentage of the individuals of the study population were married ( $n = 3302$ , 72.5%). Approximately 22.6% ( $n = 1029$ ) had high school degrees, 26% ( $n = 1184$ ) achieved university degree level, and 51.4% ( $n = 2337$ ) were illiterate or had a primary educational level.

#### 4.2. Factors associated with CAM use among hypertensive patients

Of the 4575 participants, 85.7% ( $n = 3921$ ) used one or more types of CAM. This group (CAM users) consisted predominantly of females ( $n = 2227$ , 56.8%). The relationship between CAM use and respondents' demographic status is shown in Table 2. CAM users were more likely to be city residents (50.4%), to have other chronic diseases (67.3%), and to have other hypertensive members in the family (68.7%). A statistically significant association was identified between the users and non-users of CAM in place of residence (city > village > refugee camp) ( $p = 0.001$ ), having other chronic diseases (patients having other chronic diseases use CAM more) ( $p = 0.001$ ), and the presence of other HTN family members (patients with a family history of HTN used CAM more) ( $p = 0.000$ ). No statistically significant association was identified between the users and non-users of CAM in age ( $p = 0.845$ ), gender ( $p = 0.300$ ), marital status ( $p = 0.466$ ), educational level ( $p = 0.487$ ), and duration of HTN ( $p = 0.366$ ).

The examination of medical files and interviews found that all the hypertensive CAM users had used CAM with prescribed

**Table 2**

Socio-demographic data of the hypertensive patients participating in the study ( $n = 4575$ ). CAM users = 3921 (85.7%).

Variable	Using CAM				<i>p</i> Value*
	Yes	No			
	<i>n</i>	%	<i>n</i>	%	
<b>Gender</b> ( $n = 4571$ ) <sup>a</sup>					
Male	1691	43.2	296	45.3	0.300
Female	2227	56.8	357	54.7	
<b>Age group</b> ( $n = 4554$ ) <sup>a</sup>					
50	2523	64.7	419	64.3	0.845
≤50	1379	35.3	233	35.7	
<b>Marital status</b> ( $n = 4553$ ) <sup>a</sup>					
Single, divorced, widowed	1065	27.3	186	28.7	0.466
Married	2839	72.7	463	71.3	
<b>Educational level</b> ( $n = 4550$ ) <sup>a</sup>					
Illiterate, Primary school	1991	51	346	53.4	0.487
Secondary school	885	22.7	144	22.2	
University	1026	26.3	158	24.4	
<b>Residence</b> ( $n = 4565$ ) <sup>a</sup>					
City	1972	50.4	256	39.2	0.001
Village	1713	43.8	366	56.0	
Refugee camp	227	5.8	31	4.7	
<b>Chronic diseases presence</b> ( $n = 4575$ )					
No chronic Disease	1280	32.7	283	43.4	0.000
Other chronic disease	2638	67.3	369	56.6	
<b>Presence of other hypertension member in the family</b> ( $n = 4575$ )					
Yes	2694	68.7	400	61.2	0.000
No	1227	31.3	254	38.8	
<b>Duration of hypertension</b> ( $n = 4572$ ) <sup>a</sup>					
≤5	1968	50.2	341	52.1	0.366
>5	1950	49.8	313	47.9	

\**p* Value was determined by chi-square.

<sup>a</sup> Numbers do not add up to the total population size, as some data were missing.

medications such as tritace.co, hydrochlorothiazide, ramipril, and aspirin.

#### 4.3. CAM modalities used by patients with hypertension

Considering the types of CAM utilised by the HTN patients, a significant number of patients (2436/3921, 62.13%) used herbal preparations. The other types of CAM used by the HTN patients

included diet (1940/3921, 49.5%), exercise (1353/3921, 34.5%) and prayers (1219/3921, 31.1%). The types of CAM utilised by the hypertensive patients are presented in Table 3.

#### 4.4. Factors influencing herbal use among hypertensive CAM users

Of the 3921 hypertensive CAM user participants, 62.13% ( $n = 2436$ ) used plant-based products. All the subsequent values and percentages refer to this group of patients. A statistically significant association was identified between the users and non-users of herbal products in age ( $p = 0.001$ ), educational level ( $p = 0.000$ ), and the presence of other HTN family members ( $p = 0.001$ ) (Table 4). No statistically significant association was identified between the users and non-users of CAM herbal therapies in gender ( $p = 0.15$ ), marital status ( $p = 0.05$ ), residence ( $p = 0.492$ ), having other chronic diseases ( $p = 0.583$ ), and duration of HTN ( $p = 0.506$ ).

#### 4.5. Pattern of herbal preparation use among participants

The hypertensive CAM users who use herbal preparations consisted predominantly of females ( $n = 1363$ , 56%). The majority of this group obtained their herbal preparations from Palestine ( $n = 2337$ , 88.8%) and preferred to use the herbs in a cooked form ( $n = 2726$ , 111.9%) and raw ( $n = 1358$ , 55.7%) (Table 5).

The main sources of recommendations for herbal products were family ( $n = 1169$ , 49.8%) and friends ( $n = 914$ , 38.9%), followed by physicians and pharmacists ( $n = 511$ , 21.8%), the media ( $n = 380$ , 16.2%), and herbalists ( $n = 248$ , 10.6%). Approximately 50% of the herbal medicine users ( $n = 1151$ , 48.9%) believed that the herbal preparations would relieve symptoms of the disease. Other reasons included slowing the disease progression ( $n = 886$ , 37.6%), curing the disease (743, 31.5%), or reducing the side effects of prescribed medications ( $n = 308$ , 13.1%). The majority of herbal medicine users ( $n = 1493/2375$ , 62.9%) claimed to have obtained the desired effect from taking the herbs; the majority of them ( $n = 1617$ , 68.1%) did not report this fact to their health care providers (Table 5).

**Table 3**

Types of CAM utilized by hypertensive study population ( $n = 3921$ ).

CAM category <sup>a</sup>	Specific CAM treatment	Number of patients	%
Biological based therapies	Herbs	2436	62.1%
	Honey	958	24.4%
	Animal products	152	3.9%
	Diet	1940	49.5%
	Natural products (Vitamins & minerals)	243	6.2%
Energy therapies	Electromagnetic Fields	219	5.6%
	Therapeutic Touch	101	2.6%
Manipulative and body based therapies	Exercise	1353	34.5%
	Massage	553	14.1%
	Relaxation	821	20.9%
Mind/body intervention	Fasting	797	20.3%
	Prayers, reading holy book	1219	31.1%
	Listening to music	285	7.3%
	Magic	84	2.1%
Traditional oriental medicine	Bloodletting	137	3.5%
	Aromatherapy	116	3.0%
	Homeopathy	111	2.8%
	Acupuncture	94	2.4%
	Folk remedy	145	3.7%
	Cupping	249	6.4%
	Moxibustion	27	0.7%

<sup>a</sup> CAM areas as categorized by the National Center for Complementary and Alternative Medicine (NCCAM) ([http://shr.p.umd.edu/dept/primary\\_care/ICAM/CAM%20Therapies/categories.html](http://shr.p.umd.edu/dept/primary_care/ICAM/CAM%20Therapies/categories.html)). Retrieved 11 June 2013).

**Table 4**

Socio-demographic data of the hypertensive patients participating in the study using herbs ( $n = 2436$ , 62.13% of CAM users,  $n = 3921$ ).

Variable	Using herbs				p Value <sup>a</sup>
	Yes		No		
	n	%	n	%	
<b>Gender</b> (n = 3918) <sup>a</sup>					
Male	1073	44.0	618	41.7	0.150
Female	1363	56	864	58.3	
<b>Age group</b> (n = 3903) <sup>a</sup>					
>50	1522	62.7	1001	67.9	0.001
≤50	906	37.3	473	32.1	
<b>Marital status</b> (n = 3904) <sup>a</sup>					
Single, divorced, widowed	688	28.4	377	25.5	0.050
Married	1737	71.6	1102	47.5	
<b>Educational level</b> (n = 3902) <sup>a</sup>					
Illiterate, Primary school	1179	48.6	812	55.1	0.000
Secondary school	574	23.6	311	21.1	
University	675	27.8	351	23.8	
<b>Residence</b> (n = 3912) <sup>a</sup>					
City	1209	49.8	763	51.4	0.492
Village	1073	44.2	640	43.2	
Refugee camp	147	6.1	80	5.4	
<b>Chronic diseases presence</b> (n = 3918) <sup>a</sup>					
No chronic Disease	803	33	477	32.1	0.583
Other chronic disease	1631	67	1007	67.9	
<b>Presence of other hypertension member in the family</b> (n = 3921)					
Yes	1721	70.6	973	65.5	0.001
No	715	29.4	512	34.5	
<b>Duration of hypertension</b> (n = 3918) <sup>a</sup>					
≤5	1213	49.8	755	50.9	0.506
>5	1222	50.2	728	49.1	

<sup>a</sup>*p* value was determined by chi-square.

<sup>a</sup> Numbers do not add up to the total population size, as some data were missing.

**Table 5**

Pattern of use of medicinal herbs by hypertensive patients ( $n = 2436$ ).

Characteristic	Number of patients <sup>a</sup>	%
<b>In which form do you use herbs?</b>	Total 2436	
Cooked	2726	111.9
Decoction	56	2.3
Infusion	10	0.4
Juice	20	0.8
Raw	1358	55.7
<b>Where do you obtain this remedy?</b>	Total 2337	Missing 97
Palestine	2076	88.8
Abroad	79	3.4
Both	182	7.8
<b>Who recommended this remedy to you?</b>	Total 2347	Missing 87
Friend	914	38.9
Family member	1169	49.8
The physician, the pharmacist	511	21.8
The herbalist	248	10.6
Media (TV, radio, hardcopy)	380	16.2
Other (e.g., internet, advertisements, text messages, etc)	151	6.4
<b>Why do you take this remedy?</b>	Total 2356	Missing 78
Cure of disease	743	31.5
Slow down progression of disease	886	37.6
Relieve symptoms of disease	1151	48.9
Reduce side effect of medication	308	13.1
<b>Did you get the sought effect?</b>	Total 2375	Missing 59
Yes	1493	62.9
No	340	14.3
Don't know	542	22.8
<b>Did you discuss using such remedies with the doctor?</b>	Total 2376	Missing 58
Yes	759	31.9
No	1617	68.1

<sup>a</sup> The total number here was more than xxx, because some patients reported more than one answer.

#### 4.6. Herbs used as CAM in patients with hypertension in Palestine

The use of 83 plant taxa belonging to 40 botanical families was reported by  $\geq 3$  hypertensive patients, with Lamiaceae (9 species), Fabaceae (8 species), and Apiaceae and Rosaceae (6 species each) being the most common (Table 6). The most commonly used plants were: *Allium sativum* L. (Liliaceae) ( $n = 806$ , 33%), *Hibiscus sabdariffa* L. (Malvaceae) ( $n = 429$ , 18%), *Olea europaea* L. (Oleaceae) ( $n = 407$ , 17%), *Crataegus aronia* (L.) Bosc. ex DC. (Rosaceae) ( $n = 314$ , 13%), and *Anisum vulgare* L. (Apiaceae, Umbelliferae) ( $n = 229$ , 9%). Thirty-four plant species mentioned by  $\leq 2$  informants were used by this group of patients.

## 5. Discussion

Hypertension is an important public-health challenge because of its high frequency and associated risks of cardiovascular and kidney diseases [3]. Antihypertensive treatment is aimed at preventing such diseases by controlling high blood pressure [28]. The availability, cost and adverse effects of HTN conventional medications limit effective treatment [28]. Because of the limitations of antihypertension medications, some patients, principally in the developing countries, use CAM for a treatment modality with potential efficacy and few adverse effects [23].

A high percentage of CAM use (85.7%) was found in this study population, supporting the similar trend of CAM use throughout the world [1,14,19,29–31] as well as in Palestine [10,11,32]. The high level of CAM use indicates the patients' preference towards an integrative approach to HTN management.

The socio-demographic factors that were significantly associated and correlated with CAM use in this study include that having a family history of HTN has a significant correlation with CAM use ( $p = 0.000$ ), city dwellers are more likely to use CAM than village or refugee camp residents ( $p = 0.001$ ), and having other chronic diseases (patients having other chronic diseases used CAM more) ( $p = 0.001$ ). These findings are similar to those of previous studies [19,23] in which patients with a family history of HTN and other chronic diseases were more likely to use CAM than patients with no HTN family history and no other chronic diseases.

In contrast to other studies [19] in which females, married patients, well-educated and wealthy patients, and patients with longer duration of the disease were more likely to use CAM, no significant association was found between CAM use and age, gender, marital status, educational level, and duration of HTN in this study.

This study revealed that approximately 86% of the hypertensive patients used one or more types of CAM for HTN management, of which 62.1% used herbs, followed by those who used diet (49.5%), exercise (34.5%), prayers (31.1%), honey (24.4%), relaxation (20.9%), fasting (20.3%), and others. The percentages obtained in this study regarding the use of herbs are higher than those obtained in Palestine among cancer patients (60.9%) or diabetic patients (51.9%) [10,11], and higher than those reported in neighbouring Jordan among cancer (35.5%) or diabetic patients (16.6%) [33,34]. The patients using bloodletting (hijama) in our study is considerably lower than those reported in Jordan (20.4%) [23] and Saudi Arabia (61.4%) [35].

In Palestine, the vast majority of the population uses herbal medicine, indicating a deep rooted belief in the healing potential of plants [8,9,36,37]. Several population-based studies have demonstrated the widespread use of herbal medicine as the preferred CAM modality [10,11]. The number of herbs used by HTN patients in the present work (117 species, of which 83 were reported by 3 or more participants) was considerably higher than that reported previously in neighbouring Jordan (10 species) [23]. In this study,



**Table 6**Most frequently used CAM herbal preparations by hypertensive patients in descending order by number of informants (quoted by  $\geq 3$  patients).

Scientific name (Family) <sup>a</sup>	Common English name	Arabic name	No. of users	Parts used <sup>b</sup>	Form of use <sup>c</sup>	Mode of use <sup>d</sup>	Use for other chronic diseases <sup>e</sup>
<i>Allium sativum</i> L. (Liliaceae)	Garlic	Thoum	806	BL, AP	R,C,J	E,D, P,O,I	CA + DI
<i>Hibiscus sabdariffa</i> L. (Malvaceae)	Roselle	Karkadaih	429	FL, LE, SD, RT	C	O,I,D,P	DI
<i>Olea europaea</i> L. (Oleaceae)	Olives	Zaitoun	407	LE, FR	R,C	E,O,I	CA + DI
<i>Crataegus aronia</i> (L.) Bosc. ex DC. (Rosaceae)	Hawthorn	Za'roor	314	LE, ST, FL, FR	R,C	E,O,I	CA + DI
<i>Anisum vulgare</i> L. (Apiaceae)	Anise	Yansoon	229	AP, LE, FL, SD	R,C,B	O,I	CA + DI
<i>Matricaria aurea</i> (L.) Sch. Bip. (Asteraceae)	Chamomile	Babounej	209	AP, FL, LE	C	O,I	CA + DI
<i>Zingiber officinale</i> Rose (Zingiberaceae, Scilaminiae)	Ginger	Zanjabeel	204	AP, LE, FL, RT, FR	R,C	P,O	CA + DI
<i>Salvia fruticosa</i> Mill. (Lamiaceae)	Common Sage	Mariamieh	181	AP, ST, LE	C	D,P,O,I,D	CA + DI
<i>Rosmarinus officinalis</i> L. (Lamiaceae)	Rosemary	Hassalban	142	LE, AP	R,C	P,O,I	CA + DI
<i>Camellia sinensis</i> Link. (Theaceae)	Green Tea	Shai akhdar	135	LE, AP	R,C,J	O,I	CA + DI
<i>Majorana syriaca</i> (L.) Rafin. (Lamiaceae)	Wild Thyme	Za'tar	117	AP, LE, FL	R,C,IH	E,P,O,I	CA + DI
<i>Petroselinum sativum</i> Hoffm. (Apiaceae)	Parsley	Baqdoones	109	LE, AP	R,C,J	E,P,O,I	CA + DI
<i>Trigonella berythea</i> Boiss. & Blanche (T. foenum-graecum L.) (Fabaceae)	Fenugreek Seed	Hilbeh	108	SD	R,C	E,O,I	CA + DI
<i>Nigella ciliaris</i> DC. (Ranunculaceae)	Black Cumin	Qezha	91	SD	R,C,B	E,O	CA + DI
<i>Mentha spicata</i> L. (Lamiaceae)	Peppermint	Na'na'	81	AP, LE	R,C,J,B	E,P,O,I	CA
<i>Teucrium capitatum</i> (Lamiaceae)	Cat Thyme	Jedeh Subian	79	AP, LE	R,J,C,B	E,O,I	CA + DI
<i>Cerastium glomeratum</i> Thuill. (Caryophyllaceae)	Chickweed	Qarnieh	75	SD	R,C	E,D,O	—
<i>Cinnamomum zeylanicum</i> Blume. (Lauraceae)	Cinnamom Tree	Qerfeh	70	LE, BA	R,C	E,D,P,O,I	CA + DI
<i>Punica granatum</i> L. L. (Punicaceae)	Pomegranate	Rumman	57	SD, FR	R,C	P,O	CA + DI
<i>Psidium guajava</i> L. (Myrtaceae)	Guava	Jawafa	51	LE	R,C	P,O,I	CA + DI
<i>Musa sapientum</i> L. (Musaceae)	Banana	Mose	47	LE, FR	R,J	E,O	CA
<i>Hordeum vulgare</i> L. (Poaceae)	Barley	Shaeer	45	AP, LE, SD	C	O,I	CA + DI
<i>Foeniculum vulgare</i> Miller (Apiaceae)	Fennel	Shomar	40	AP, LE, RT, FR	R,C	E,O,I	CA + DI
<i>Allium cepa</i> L. (Liliaceae)	Onions	Basal	39	AP, LE, RT	R	E,O,I	CA + DI
<i>Origanum majorana</i> L. (Lamiaceae)	Sweet-Marjoram	Mardaqaoush	30	LE, AP, FL	C	O,I	CA + DI
<i>Amygdalus communis</i> L. (Rosaceae)	Almond	Louz Hilo	25	SD, FL, LE	R,C	E,O	CA + DI
<i>Lupinus albus</i> L. (Fabaceae)	Lupine	Tormos	25	SD	R,C	E,D,O,I	DI
<i>Pyrus malus</i> L. (Rosaceae)	Apple	Toffah	25	FR	R,C	E,P	CA + DI
<i>Camellia thea</i> (L.) Kuntze (Theaceae)	Tea	Shai	25	LE, AP	R,C,J	O,I	CA + DI
<i>Capsicum annuum</i> L. (Solanaceae)	Sweet Peppers	Felfel	24	FR	R	E,D	DI
<i>Morus nigra</i> L. (Moraceae)	Black mulberry	Toot	23	LE	C	P,O	DI
<i>Artemisia inculata</i> Delile (=A. herba-alba Asso) (Asteraceae)	White Wormwood	Sheeh	21	LE, AP	R,C	E,O,I	DI
<i>Arum palaestinum</i> Boiss. (Araceae)	Palestine Arum	Lufe	20	LE	R	D,O	CA
<i>Daucus carota</i> L. (Apiaceae)	Carrot	Jazar	18	RT, LE	R,C	E,P	CA
<i>Beta vulgaris</i> L. (Chenopodiaceae)	Sugar Beet	Shamander	16	LE, RT	R,C	E,P,O	—
<i>Brassica oleracea</i> L. (Brassicaceae)	Wild Cabbage	Malfof	16	LE	R,C	E,D,O	CA + DI
<i>Glycyrrhiza glabra</i> L. (Fabaceae)	Liquorice	Irqsoos	16	SD, LE, RT	C	P,O,I	—
<i>Linum pubescens</i> Banks & Sol. (Linaceae)	Pink Flax	Kittan	16	FR, SD	R,C	E,O	CA
<i>Sinapis arvensis</i> L. (Brassicaceae)	Mustard/Wild	Khaldal Barri	15	SD, LE	R,C,J	E,O	CA + DI
<i>Actinidia deliciosa</i> (Chev.) Liang & Ferguson (Actinidiaceae)	Kiwi fruit	Kiwi	13	FR	R	E	—
<i>Urtica pilulifera</i> L. (Urticaceae)	Roman Nettle	Qurrals	13	LE, AP	R,C	E,O	CA + DI
<i>Coffea arabica</i> L. (Rubiaceae)	Coffee	Bon	12	SD, LE	C	O,I	—
<i>Pyrus communis</i> L. (Rosaceae)	Pear tree	Ijas	12	LE, FR	R	D,O	—
<i>Diospyros kaki</i> Thunb. (Ebenaceae)	Persimmon	Kaka	11	FR	R	E	—
<i>Micromeria fruticosa</i> (L.) Druce (Lamiaceae)	Thyme	Za'tar Balat	10	LE, AP	R,C	E,O	—
<i>Opuntia ficus-indica</i> (L.) Mill. (Cactaceae)	Prickly-Pear	Saber	10	FR, ST	R,C	E,P,O	CI
<i>Sesamum indicum</i> L. (Pedaliaceae)	Sesame	Semsem	10	SD, RT, LE	R,C	E,D	CA + DI
<i>Vitis vinifera</i> L. (Vitaceae)	Grape	Inab	10	FR, LE	R	E,D,P,O	CA
<i>Cassia senna</i> L. (Fabaceae)	Senna	Sanamekeh	9	LE, SD	R,C	O,I	—
<i>Citrus limon</i> (L.) Burm. fil (Rutaceae)	Limon Tree	Laimoun	9	LE, FR	R,C	E,P,I	CA + DI
<i>Coridothymus capitatus</i> (L.) (Lamiaceae)	Capitate Thyme	Za'tar Farsi	9	LE, AP	R,C	O,I	CA + DI
<i>Ficus sycomorus</i> L. (Moraceae)	Sycamore	Jummaiz	9	RT, AP	R,C	E,O	—
<i>Juglans regia</i> L. (Juglandaceae)	Wallnut	Jows	9	LE, SD	R	E	—
<i>Ceratonia siliqua</i> L. (Fabaceae)	Carob	Kharoub	8	FR, SD	R,C	E,P	—
<i>Satureja thymbra</i> L. (Labiatae)	Savory	Zeitman	8	LE, AP	R,C,J	O	—
<i>Humulus lupulus</i> (Cannabaceae)	Hops	Oshbet Al-dinar	8	LE, AP	C	O	—
<i>Ziziphus spina-christi</i> (L.) Desf. (Rhamnaceae)	Christ's Thorn Jujube	Seder	8	LE	C	O	DI
<i>Citrus sinensis</i> (L.) Osbeck (Rutaceae)	Sweet Orange – Tree	Bortoqal	7	FL	C	P	—
<i>Cynara scolymus</i> L. (Asteraceae)	Artichoke	Ardishawki	7	SD, LE, RT	R,C	E,P,O	—
<i>Phoenix dactylifera</i> L. (Arecaceae)	Date Palm	Tamer	7	FR	R,C	E,O	CA + DI
<i>Citrullus lanatus</i> (Thunb.) Matsun & Nakai (Cucurbitaceae)	Watermelon	Batteekh	6	FR	R	E,O	DI
<i>Cucumis sativus</i> L. (Cucurbitaceae)	Cucumber	Khiyar	6	FR	R	E	—
<i>Cuminum cyminum</i> L. (Apiaceae)	Cumin	Kammoun	6	SD, FL, LE	R,C	E,O,I	CA
<i>Passiflora incarnata</i> L. (Passifloraceae)	Passion Flower	Pasiflora	6	FR, LE	R, C	E,O	DI
<i>Valeriana officinalis</i> (Valerianaceae)	Common Valerian	Nardin	6	RT	R,J,C	E,O	—
<i>Coriandrum sativum</i> L. (Apiaceae)	Coriander	Kozbareh	5	AP	C	O	DI
<i>Cydonia vulgaris</i> Pers. (Rosaceae)	Quince- Tree	Safarjal	5	SD	R	E	—
<i>Glycine max</i> (L.) Merr. (Fabaceae)	Soy bean	Foul Soya	5	SD, LE	R	D,O	—

(continued on next page)

Table 6 (continued)

Scientific name (Family) <sup>a</sup>	Common English name	Arabic name	No. of users	Parts used <sup>b</sup>	Form of use <sup>c</sup>	Mode of use <sup>d</sup>	Use for other chronic diseases <sup>e</sup>
<i>Ruscus aculeatus</i> L. (Liliaceae)	Broom, Knee Holly	Hassalban	5	AP	R	D	
<i>Solanum tuberosum</i> L. (Solanaceae)	Potato	Batata	5	TU	R,C	E,D	–
<i>Citrus paradise</i> Macfad. (Rutaceae)	Grapefruit	Laimoun Aljanneh	4	FR	R	E	–
<i>Eruca sativa</i> Miller (Brassicaceae)	Garden Rocket	Jarjeer	4	AP	R,C	E,O	CA
<i>Malva sylvestris</i> L. (Malvaceae)	Common Mallow	Khubbaizeh	4	LE, AP	R,C,J	E,D,O,I	CA
<i>Raphanus sativum</i> L. (Brassicaceae)	Radish	Fijel	4	RT	R	E	CA
<i>Aphanes vulgaris</i> (Alchemilla vulgaris L.) (Rosaceae)	Lion's Foot, Lady's – Mantle	Kaf Alasad	3	AP	R	E	–
<i>Cucumis melo</i> L. (Cucurbitaceae)	Melon	Shamam	3	FR	R	E	DI
<i>Syzygium aromaticum</i> (L.) Merr. and Perry. (Myrtaceae)	Clove	Kabsh Koronful	3	FL, LE, AP	C	PO	–
<i>Paronychia argentea</i> Lam. (Caryophyllaceae)	Silvery Whitlow-Wart	Maseh	3	SD	C	O	–
<i>Quercus calliprinos</i> Webb. (Fagaceae)	Palestine Oak	Sendian	3	LE	R		CA + DI
<i>Salix acmophylla</i> (Salicaceae)	Willow	Safsaf	3	FL	C	O,I	
<i>Tamarindus indica</i> L. (Fabaceae)	Tamarin	Tamer Hindi	3	AP	IC	J	–
<i>Trifolium alexandrinum</i> L. (Fabaceae)	Egyptian Clover	Berseem	3	SD, LE, AP	C	E, I,O	–
<i>Triticum aestivum</i> (Poaceae)	Wheat	Qamh	3	AP, GR	R	O	CA + DI

<sup>a</sup> Total number of plant species reported in this study was 117, of which 83 were reported by 3 patients or above, and 34 were mentioned by 1–2 informants.

<sup>b</sup> FL, flowers; AP, ariel parts; LE, leaves; RT, roots; SD, seeds; GR, grains; ST, stem; BL, bulb; TU, tuber; BA, Bark.

<sup>c</sup> B, Boiled; C, cooked; IC, infusion in cold water; IH, infusion in hot water; J, juice; R, raw.

<sup>d</sup> D, drinking; E, eating; I, inhalation; O, ointment; P, paste.

<sup>e</sup> CA, cancer; DI, Diabetes.

the most common herbal products consumed by the hypertensive patients included *A. sativum*, *H. sabdariffa*, *Olea europaea*, *Crataegus aronia*, and *Anisum vulgare*. Recent studies have indicated the anti-hypertension activity of these plants and provide a basis for the legitimate health claims concerning the plants [38–42]. Experimental and clinical studies have shown that extracts of *A. sativum* reduce cardiovascular risk including high blood pressure [38]. In vitro and clinical studies on *H. sabdariffa* demonstrated antihypertensive effects in prehypertensive and mildly hypertensive adults [39]. Using animal models, a specifically prepared olive leaf extract was found to show a dose dependant prophylactic effect against a rise in blood pressure induced by L-NAME (NG-nitro-L-arginine methyl ester) [40]. In a randomised, controlled trial on a *Crataegus* sp. extract, a significant difference in the mean diastolic blood pressure reduction was observed between the treatment and placebo groups [41,42].

Based on the wide spread use of herbal medicine among Palestinians for the treatment of a large number of ailments and diseases, it was not unexpected that the percentage of herbal medicines users would be high among HTN patients (approximately 62.1% in this study). Ease of accessibility, lower costs and social acceptability in the use of medicinal herbs in Palestine, as well as the long history and experience of traditional use of these herbs, encourage patients to have confidence in their healing effects [8]. In this study, 48.9% of participants reported using herbal medicines to relieve disease related symptoms, to slow progression of disease (37.6%), or to cure disease (31.5%). A small percentage of patients (13.1%) rationalised their use of herbal medicines as a means of reducing side effect of medication.

The socio-demographic factors that were significantly associated and correlated with using herbs as CAM in this study include age ( $p = 0.001$ ) (patients above 50 years old > patients 50 years old or younger), educational level ( $p = 0.000$ ) (less educated > well educated), and HTN family history ( $p = 0.000$ ) (patients with HTM family history > patients without). These findings are similar to previous studies [19,23] in which patients with HTN family history were more likely to use herbs as CAM than patients with no HTN family history. In contrast to other studies [19] in which well-educated and wealthy patients were more likely to consume herbal products as CAM than less educated patients, the less

educated patients were more likely to utilise herbal products than the well-educated patients.

Most CAM herbal medicine users (62.9%) were satisfied with the perceived effect. This percentage was lower in studies conducted in Palestinian diabetic patients (71.7%) [11], but was comparable to that reported in Palestine in cancer patients (63.3%) [10]. The percentage of herbal medicine use among HTN patients using CAM in this study (62.1%) was higher than those reported in Palestine among diabetic patients (51.9%) [11] and those reported in neighbouring Jordan among hypertension patients (7.6%) [23], but was lower than those obtained in Morocco among hypertension patients (67.5) [43]. The differences in the rate of herbal medicine use between these studies may be attributed to differences in the definitions of CAM, the research methodology used, and the cultural, geographical or socioeconomic variables, which can influence an individual's decision whether to use herbal medicines [33,44].

The majority of CAM herbal remedies (88.8%) used by the study cohort were purchased locally. This finding highlights the availability and acceptability of herbal therapies in the population. Family members, friends, health professionals, and the media were the main sources of influence towards herbal product consumption as CAM among the hypertensive patients in this study. Health professionals were not included as a source of influence in previous studies [45,46], but health professional were included as one of the major sources of encouragement for patients to use CAM in this study. The physicians at the outpatient clinics prescribed vitamin supplements predominantly at the request of the patients. An important implication of this study is that individuals with hypertension (all were on conventional therapy) reported using CAM as a complement rather than as an alternative to conventional treatment.

Being married, female, above 50 years old, not well educated, residing in a city, having other chronic diseases, and having an HTN family history appeared to be associated with a higher likelihood of using herbal medicines. The use of herbal medications is prevalent (>62%) among HTN patients who take prescription medications, particularly among the senior citizens in this study. Few clinical studies have systematically shown the potential herb–drug–disease interactions between herbs and medications, particularly with drugs that contain several herbs [14,47].

Herb–drug interactions are based on the identical pharmacokinetic and pharmacodynamic mechanisms as drug–drug interactions [48]. Herbal medicines may affect the drug absorption [49], metabolism [50], or excretion [51] of concomitantly administered cardiovascular drugs. An alarming result was that most patients (68.1%) had never disclosed the use of herbal remedies as CAM to their health care providers (e.g., physician or pharmacist), and the physicians had not routinely asked about such use. As a result, serious herb–drug interactions may be missed. This finding is in agreement with previous studies [10,11,19,23] in which comparable numbers of patients had not disclosed CAM use to their health care professionals. This finding indicates a lack of patient awareness of the dangers that may accompany the unsupervised concurrent use of medications and herbs raises questions regarding whether health professionals sufficiently explore their patients self-use of other forms of treatment. The self-administration of herbs in conjunction with conventional medicines without disclosure of the herbal remedies use to health care professionals may result in ineffective HTN management and adverse treatment side-effects [24,52].

Recent data indicate that potentially serious interactions exist between some of the most widely used herbal medicines by the HTN patients in the present work, e.g., *A. sativum* (garlic), *Crataegus aronia* (hawthorn), *Zingiber officinale* (ginger), *Camellia sinensis* (green tea), *Trigonella berythea* (fenugreek seed), and *Capsicum annum* (peppers) and widely used conventional pharmaceuticals including those used in cardiovascular disease therapy [14,19]. The disclosure of herbal remedies use by patients to health professionals is important for the assessment of patient needs, compliance, and efficacy of herbal remedies and for an important determination of whether there are potential drug interactions and adverse drug reactions [14,19]. Potentially serious consequences might be avoided by obtaining a more careful history about CAM use. It is strongly recommended that information on the use of herbal remedies as CAM be incorporated into clinical practice as well as patient and professional education, i.e., it should be incorporated into the medical and health sciences curriculum [14,44,52].

Although the use of herbal medicines is generally considered 'safe' because they are 'natural', the ingestion of such herbal preparations may negatively affect HTN, particularly in older patients treated with polypharmacy [23]. Co-morbidities and plant–drug interactions are additional factors to be strictly considered in the use of herbal medications as CAM [23].

## 6. Conclusions

The use of CAM, particularly herbal therapies for hypertension, is highly prevalent in Palestine. Age over 50 years, residence in the city, and having a family history of HTN appeared to be associated with a higher likelihood of using CAM. Some of the most widely used herbal medicines by HTN patients in this study are known to interact with widely used conventional pharmaceuticals, including those used in cardiovascular disease therapy. The disclosure of the use of herbal remedies by patients to health professionals is important for the professionals to assess whether there are any potential drug interactions and adverse drug reactions. Potentially serious consequences might be avoided by obtaining a more careful history of CAM use. It is strongly recommended that information about herbal use in conjunction with conventional medicines in HTN be incorporated into clinical practice as well as into patient and professional education.

### Conflict of interest statement

The authors have no conflicts of interest.

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