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Consumption of Medicinal Plants among Patients with Diabetes in Eastern Mediterranean Regional Office Countries: A Systematic Review and Meta-Analysis

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SYSTEMATIC REVIEW and META-ANALYSIS

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ABSTRACT

Background: Diabetes mellitus is a chronic disease which affects all aspects of human life. Medical herbs have become increasingly popular as complementary therapeutic measures for patients with diabetes. Thus, the present research aims to explore the consumption of medical herbs in patients with diabetes in Eastern Mediterranean Regional Office (EMRO) countries through a meta-analysis. **Methods:** The following keywords were searched: medicine, medicinal plants, healing plants, medicinal herbs, use, usage, frequency of use, prevalence, diabetes patients, type 2 diabetes, adults with diabetes, and EMRO countries. The databases searched included Scopus, PubMed, Web of Science, and Google Scholar. **Results:** A total of 3,542 papers were found. After omitting repeated or irrelevant papers, 70 papers were retained. An analysis of the abstract and full text of papers led to the retention of 35 papers. A great variance was found regarding the rate of consuming medical herbs in the papers (16.8-97.7%). The relative frequency of consuming medical herbs was 38% (95% CI: 33-44). Moreover, the most prevalent herbs were fenugreek (19%), cinnamon (18%), black seed (14%), white lupinus (13%), and olive (13%) with a 95% confidence interval. About 70% of patients (95%CI: 62-79) did not inform their physician of their herbal medicine consumption. **Conclusion:** In light of the present findings, it can be concluded that patients with diabetes use a wide range of medical herbs. Thus, health specialists and physicians need to be aware of the possible synergic or moderating effect of herbal medicine on the therapeutic measures taken for diabetes.

Keywords: *Systematic review; Diabetes mellitus; Complementary therapies; Plants; Medicinal*

Introduction

The World Health Organization (WHO) estimated that more than 400 million people worldwide have diabetes (Association, 2013). The International Diabetes Federation also estimated

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the total number of diabetic patients in 2040 to be about 690 million (Saeedi *et al.*, 2019). Poor management of this disease can cause serious and even fatal problems such as cardiovascular diseases, renal disease, neuropathy, and retinopathy (Nentwich and Ulbig, 2015, Singla, 2022). Diabetes mellitus is a chronic disease in carbohydrate metabolism which increases the level of blood glucose in the long run (Poretsky, 2010). The prevalence of diabetes type II is significantly high in Eastern Mediterranean Regional Office (EMRO) countries (Mirahmadizadeh *et al.*, 2020) located near the Persian Gulf, as well as several other countries such as Tunisia, Libya, Egypt, Morocco, Sudan, Lebanon, Palestine, and Pakistan. Thus, an important goal in EMRO countries (as in many other countries worldwide) is to lower the population of patients in forthcoming years (World Health Organization, 2006). Controlling blood sugar requires self-care behaviors such as diabetic self-management. Self-management involves adherence to prescribed medicine and clinical procedures, adoption of a healthy lifestyle, and a healthy diet for a given disease (Mirahmadizadeh *et al.*, 2020).

In recent years, with the advent of advanced therapeutic measures and new medications, patients have welcomed medical herbs besides the commonly prescribed medicines to control their disease (Azaizeh *et al.*, 2003, Baldé *et al.*, 2006, Guarrera, 1999). Some patients used medical herbs as the only cure for their disease, while others used them together with other common medicines (Amaeze *et al.*, 2018, Özkum *et al.*, 2013). As related studies have revealed, patients have different reasons for their preference for medical herbs, including failure to control the disease with common medicines, adverse effects, high cost, and limited access. Moreover, belief in the efficiency of medical herbs has added to the growing popularity of medical herbs among patients (Aydin *et al.*, 2008, Ondicho *et al.*, 2016). Many studies have been conducted on the effectiveness of medicinal herbs in controlling diabetes, which can further point to the significance of consuming these medicines in controlling the disease (Ernst, 2005, Lu *et al.*, 2019, Mozaffari-Khosravi *et al.*, 2009).

Due to the ever-increasing willingness of patients with diabetes to use complementary medicine, many studies have also been conducted to explore its prevalence in different countries (Amaeze *et al.*, 2018, Ching *et al.*, 2013, Da-Yong and Ting-Ren, 2019). In a review conducted in EMRO, the prevalence rate of complementary and alternative medicine was reported to be 37% among patients with diabetes. This review only explored complementary and alternative medicine in general ,and did not investigate the rate of consuming medical herbs as one of the most common complementary medicines (Adib-Hajbaghery *et al.*, 2021). Thus, considering the significance of EMRO countries in the population of diabetic patients, it is essential to explore the most common herbal medicines in these countries. As a result, the present research aims to explore the prevalence of consuming medical herbs in EMRO countries in a purposive and structured manner.

Materials and Methods

The present meta-analytic and systematic review was designed in accordance with the guidelines for systematic reviews and meta-analyses (Moher *et al.*, 2015). This systematic protocol was developed according to PRISMA guidelines (#CRD42020142463).

Search strategies: To identify studies pertaining to herbal medicine, related countries, and frequency of use features in patients with Type 2 diabetes, the authors systematically searched PubMed, Web of Science, Scopus, Google Scholar and Information Foundation databases for significant articles published through April 30, 2021. The references of the downloaded articles were also reviewed to identify additional studies. Search terms were as follows: medicinal plants, healing plants, medicinal herbs, use, usage, frequency of use, prevalence, diabetes patients, type 2 diabetes, adults with diabetes, EMRO countries.

Inclusion criteria: The researchers included published papers (cohort studies, cross-sectional

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reports) which provided available data about demographic information, medicinal herb use, and related EMRO countries features in patients with Type 2 diabetes. The statistical population was defined above 18, and no language limit was set. The studies which did not report original data and had no relevant outcome were excluded.

Paper selection: Screening and selecting the relevant papers were done by two researchers independently (henceforth abbreviated as Namiranian N and Afkhami Ardekani M). The screening process was hierarchical and included reading the title, abstract, and full text of papers. Thus, the relevant papers were found step by step. The most relevant papers were retained at the end after the irrelevant papers were excluded. Additionally, the relevant references in each paper were scrutinized to be included in the final retained papers.

Data extraction and quality assessment: The required data were extracted regarding the features of studies, the prevalence of using medicinal herbs, and types of medicinal herbs consumed by patients with diabetes. The qualitative analysis was done by three independent authors (Afkhami Ardekani M, Heydari S and Zareipour M). In case there was a disagreement in scoring an item, the final decision was made by the first author. The instrument used for the qualitative analysis of papers was derived from the related literature on complementary and alternative medicine (James *et al.*, 2018). The papers were finally categorized into three groups: high-quality (7-10), moderate-quality (3-7), and low-quality (0-3). In the instrument used, the papers were evaluated according to their methodology, participants, and an accurate conceptualization of complementary medicine in methodology. If a paper was assigned to the low-quality group, its results were not included in the analysis. The scoring system is summarized in **Table 1**.

Data analysis and synthesis: The frequency of consuming medical herbs by patients with diabetes was extracted from related papers as reported in percentages. The rate of consuming medical herbs was then derived from the literature at a 95% confidence interval. A meta-analysis was conducted to explore the rate of consuming herbs in EMRO countries via a random effects model (Moher *et al.*, 2015). The assumption was that the effect size (relative frequency) would vary between different studies, so a fixed effect model was deemed inappropriate (James *et al.*, 2018); Steel, & Adams). Data analysis was performed using the comprehensive meta-analysis software (version 2.2.064). The I^2, T^2 and Q indices were used to test the heterogeneity of the papers. The first index indicates statistical significance, while the other two show the effect size of heterogeneity. An inverse method was used to estimate variance and weights in each paper. P-values below 0.05 were considered statistically significant.

Results

A total of 3,542 papers were initially analyzed in this study, and ultimately, 35 papers met the inclusion criteria, with details summarized in **Figure 1**. After qualitative analysis, papers were divided into three groups: 17 papers were assigned to the high-quality group, 18 to the moderate-quality group, and none to the low-quality group. The detailed analysis results can be found in **Table 2**.

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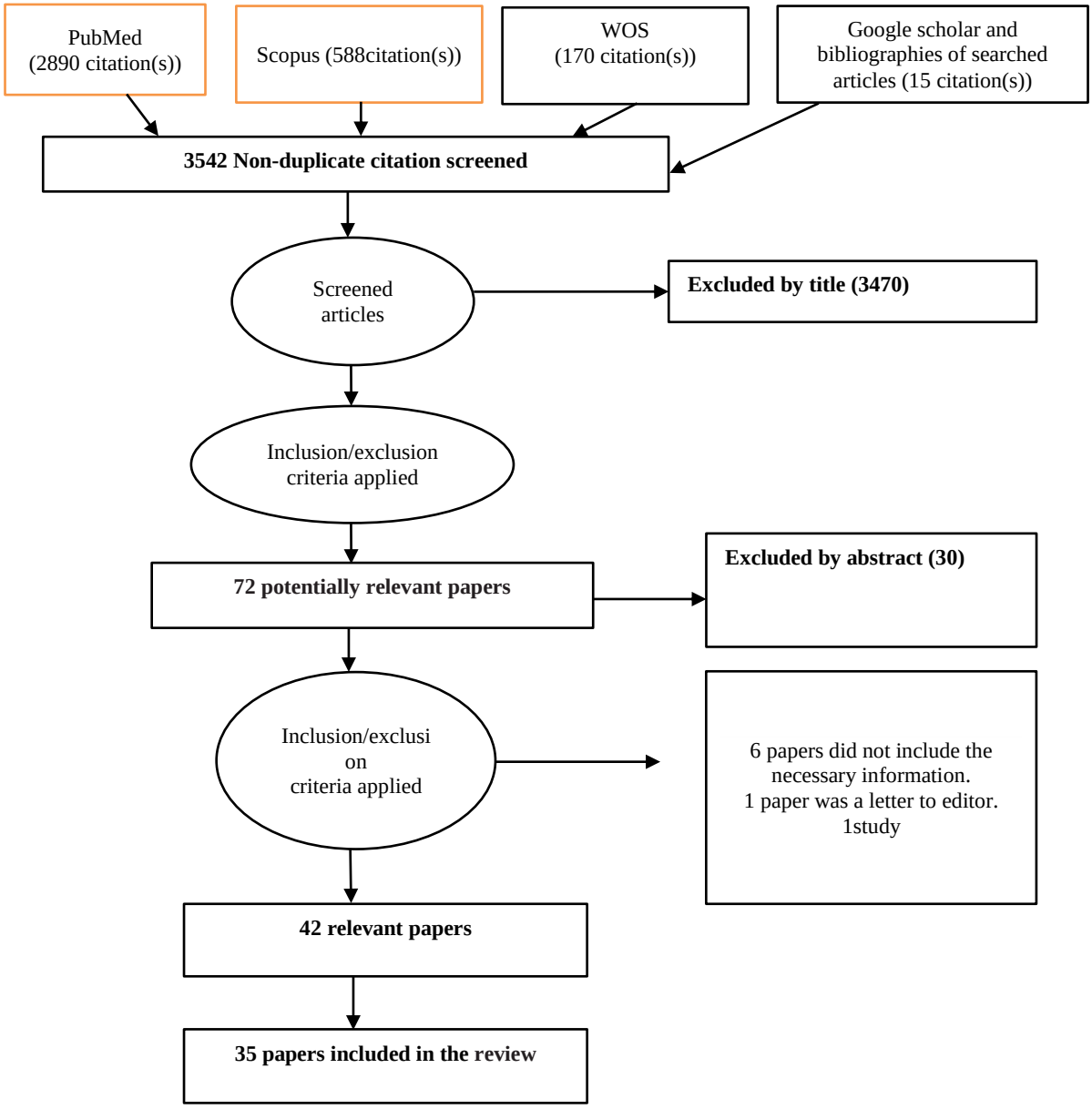

Figure 1. Paper screening and selection procedure.

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Features of papers: Papers were from 23 countries, 8 from Saudi Arabia, 1 from Bahrain, 1 from Egypt, 1 from Lebanon, 1 from Palestine, 1 from Libya, 8 from Iran, 1 from Oman, 4 from Morocco, 1 from Tunisia, 3 from Jordan, 1 from Pakistan, 1 from United Arab Emirates, 1 from Sudan and 2 from Iraq. The majority of the studies were conducted in Iran and Saudi Arabia.

Overall, 15,751 diabetic patients participated in this study, with 6,189 using medical herbs to control their disease. Participants were often found in diabetes clinics and healthcare centers, most of whom acquired their knowledge of medical herbs from family and friends.

Table 1. The quality scoring system.

Dimensions	Items		Point awarded
Methodology	Representative sampling strategy	Yes	1
		No	0
	Sample size>500	Yes	1
		No	0
	Response rate >75 %	Yes	1
		No	0
	Low recall bias	Yes	1
		No	0
Participants' characteristics	Age	Yes	1
		No	0
	Inclusion of both genders	Yes	1
		No	0
	Residence location	Yes	1
		No	0
	Socioeconomic status	Yes	1
		No	0
	Health status	Yes	1
		No	0
CM use/definition	CM use/definition	Yes	1
		No	0

Frequency of consuming medical herbs: The frequency of consuming medical herbs ranged from 16.8% to 97.7% in the papers. The highest prevalence of medical herb consumption was reported in 2 papers from Iran, being 97.7% and 88.4%, respectively (Al-Kindi *et al.*, 2011, Eddouks *et al.*, 2002, Salih and Al-Asadi, 2012). The next highest rate was found in studies from Morocco and Oman, 80% and 79%, respectively (Al-Kindi *et al.*, 2011, Eddouks *et al.*, 2002). The lowest frequency of consuming medical herbs was found in studies from Oman and Iraq, with rates of 16.6% and 17.3% (Al-Kindi *et al.*, 2011, Salih and Al-Asadi, 2012). These features are summarized in **Table 3**. The overall prevalence of these medicinal herbs, as the analysis showed, was 38%, 95%CI: 33-44, **Figure 2**). The estimated Q was 1,676 with a degree of freedom of 34 and a $P<.0001$. Moreover, $T^2=0.53$ and $I^2=97$ indicated that about 97% of the observed variance in the papers was true. This suggested a wide range of divergence in the prevalence of consuming medical herbs in the papers (16.8-97.7%). As can be observed in **Figure 3**, significant heterogeneity could be seen among the papers.

The Rate of informing physicians regarding consuming medical herbs: **Table 3** presents the extent to which diabetic patients informed their physician of their rate of consuming medical herbs. The relative frequency of not informing physicians about their herb consumption was 70 (95% CI, 62-79%).

Prevalent herbs: The most prevalent herbs were fenugreek (19%, 95% CI, 14-26%), cinnamon (18%, 95% CI, 11-27%), black seed (14%, 95% CI, 10-20%), white lupinus (13%, 95%CI, 6-24%), olive (13%, 95% CI, 7-23%), and ginger (12%, 95% CI, 7-20%). Details on the other medical herbs and the frequency of their use (Talaei *et al.*, 2019) are included in **Table 4**.

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Table 2. Characteristics of the included papers.

Author, year	Methodology				Participants					CM definition	Score (0-10)
	Representative sampling method	Sample size>500	Response rate >75 %	Low recall bias	Age	Gender	Residence location	Socioeconomic status	Health status		
(Al-Garni *et al.*, 2017)	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No	6
(Ali and Mahfouz, 2014)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	9
(Alqathama *et al.*, 2020)	Yes	No	Yes	No	Yes	Yes	No	No	Yes	Yes	6
(Alsanad *et al.*, 2018)	No	No	Yes	No	Yes	Yes	No	No	No	Yes	4
(Talaei *et al.*, 2019)	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	7
(Boufous *et al.*, 2017)	No	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	6
(Eddouks *et al.*, 2002) .	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	7
(Jafari *et al.*, 2021)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	7
(Khuttar and Jallab, 2020)	No	No	yes	yes	yes	yes	yes	No	No	No	5
(Otoom *et al.*, 2006)	No	No	Yes	yes	yes	yes	yes	No	No	Yes	6
(El-Dahiyat *et al.*, 2020)	Yes	Yes	Yes	NO	Yes	Yes	Yes	Yes	Yes	Yes	9
(Radwan *et al.*, 2020)	Yes	No	Yes	yes	yes	yes	yes	yes	yes	yes	9
(Al-Rowais, 2002b)	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	5
(Al Saeedi *et al.*, 2003)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	7
(Awad *et al.*, 2008)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	7
(Khalaf and Whitford, 2010)	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	5
(Ali-Shtayeh *et al.*, 2012)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	7
(Al-Kindi *et al.*, 2011)	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	6
(Wazaify *et al.*, 2011).	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	7
(Salih and Al-Asadi, 2012)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	9
(Khalil *et al.*, 2013)	Yes	NO	Yes	Yes	Yes	Yes	No	No	No	Yes	6
(Algothamy *et al.*, 2014)	NO	No	Yes	Yes	Yes	Yes	No	No	No	No	4
(Naja *et al.*, 2014)	NO	No	Yes	No	Yes	Yes	Yes	No	Yes	No	5
(Alami *et al.*, 2015)	NO	NO	Yes	Yes	Yes	Yes	Yes	NO	Yes	No	6
(Hashempur *et al.*, 2015)	NO	NO	Yes	Yes	Yes	Yes	Yes	NO	Yes	Yes	7
(Azizi-Fini *et al.*, 2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	9
(Kamel *et al.*, 2017)	NO	NO	NO	Yes	Yes	Yes	NO	NO	Yes	No	4
(Al-Eidi *et al.*, 2016)	Yes	NO	Yes	Yes	Yes	Yes	No	No	Yes	No	6
(Yousofpour *et al.*, 2016)	Yes	NO	Yes	NO	Yes	Yes	Yes	Yes	Yes	Yes	8

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(Ashur *et al.*, 2017)	NO	Yes	Yes	NO	Yes	Yes	Yes	Yes	Yes	No	7
(Sheikhrabori *et al.*, 2017)	Yes	NO	yes	NO	Yes	Yes	Yes	Yes	Yes	yes	7
(Othman *et al.*, 2013)	Yes	NO	yes	yes	yes	yes	Yes	Yes	Yes	No	8
(Jawed *et al.*, 2019)	No	NO	yes	yes	yes	yes	NO	Yes	Yes	No	6
(Sabery *et al.*, 2019).	Yes	NO	yes	yes	yes	yes	yes	yes	yes	yes	9
(Jouad *et al.*, 2001)	NO	Yes	Yes	NO	yes	yes	yes	NO	NO	NO	5
(Wazaify *et al.*, 2013).	Yes	NO	Yes	Yes	yes	yes	yes	NO	NO	Yes	8

Table 3. Features of the included papers in the reviews.

Author /year	Country	Sample size(RR)	Mean age±SD	Mean duration	Prevalence (%)	The main herb used	Physician's awareness of usage
(Al-Rowais, 2002b)	Saudi Arabia	300(98.6)	51.99±15.66	Not reported	17.4	Myrrh:45%, black seed:19.3%, helteet:13.7%, , Fenugreek:13.7% 9.8aloes:11.8%,artemesia:	27%
(Eddouks *et al.*, 2002)	Morocco	320	Not reported	Not reported	800	Ammi visnaga, artemesia herba alba, fenugreek, marrubium vulgare, nigella sativa	Not reported
(Al Saeedi *et al.*, 2003) .	Saudi Arabia	1039 (89.5)	Not reported	5Years<287 787>5Years	30.1	Fenugreek(6.1%),chinaberry (5.1%) rhazia strica(4.8%)	Not reported
(Otoom *et al.*, 2006)	Jordan	300(-)	Not reported	10.5 ± 6.9	31.0	Fenugreek (22.9%), lupinus albus (14.6%), garlic(11.5%), onion (9.8%),eucalyptus (9.4%),	80%
(Khalaf and Whitford, 2010)	Bahrain	402(63%)	Not reported	Not reported	64.0	Garlic (36%), bitter melon(31%) cinnamon (30%) and fenugreek (27%).	45%
(Ali-Shtayeh *et al.*, 2012)	Palestine	1883(-)	79.6%>40	Not reported	51.9	Fenugreek(19.6%), rosemary (13.5%),olive (13.4%), teucrium capitatum lamiaceae) (11.4%), and cinnamomum (10.8%)	32%
(Al-Kindi *et al.*, 2011).	Oman	146(100)	Not Reported	8.48±6.5	79.0	Harmel:10%,fenugreek:8% , black seeds and nigella sativa:6%	13%
(Wazaify *et al.*, 2011).	Jordan	1000(100)	Not Reported	Not reported	16.6	Green tea:20.5, aniseed:19.9%, ginger:18.7%,chamomile:18.1%,sage:15.6, fenugreek (10.8)	15.7%
(Salih and Al-Asadi, 2012).	Iraq	884(89.6)	50.9±13.1	Not reported	17.3	Cinnamomum:12.4%,black seed:11.1%,garlic:6.5%,alo vera:3.9%, enugreek:3.3%	5.9%
(Khalil *et al.*,	Egypt	1100(100)	Not	Not reported	41.7	White lupine:42.9%,fenugreek:42.5%	21%

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2013)			Reported			onion:34.4%,nigella sativa:7.8%	
(Othman *et al.*, 2013).	Tunisia	200	Not Reported	10.5 ± 6.9	23.0	Gum arabic(louben) (71.7%),fenugreek (28.3%) of white artemisia (21.7%) and marrube (%١٠.٩)	Not reported
(Wazaify *et al.*, 2013).	Jordan	226(93.1)	Not reported	Not reported	32.1	Not reported	Not reported
(Algothamy *et al.*, 2014).	Saudi Arabia	228(86)	Not Reported	Not reported	24.6	Fenugreek (57.1%),black seed(44.6%), myrrh(42.9%), Garlic(32.1%)	33.9%
(Naja *et al.*, 2014)	Lebonon	333(94.6)	60.29±11.89	Not reported	37.0	Not reported	7%
(Ali and Mahfouz, 2014)	Sudan	600	49%(41-50)	Not reported	58.0	Fenugreek (29.1%), black seed (21.6%) cinnamon (16.8%) and olive (15.7%)	
(Alami *et al.*, 2015).	Morocco	279	50±17	7	54.8	Sage (n=62),fenugreek(n=36),olive(n=34) artemisia herba-alba(n=32), origanum compactum(n=28),rosemary (n=14)	Not reported
(Hashempur *et al.*, 2015)	Iran	239	51.9 ±15.6	Not reported	97.7	Cinnamon:50.1,ginger:30.2,fenugreek:18.8	Not reported
(Azizi-Fini *et al.*, 2016).	Iran	500(87.7)	56.88±10.7	10.24±7.10	54.0	Cinnamon:120(24.7),nettle 59 (12.2), fenugreek 48 (9.9),walnut 36 (7.5),garlic 33 (6.8), green tea 30 (6.2) chicory 29 (6.0),ginger 28 (5.9	38.1%
(Kamel *et al.*, 2017).	Saudi Arabia	300(71.3)	51.6 ± 10.6	6.5 ± 4.6	62.0	black seeds (27%), myrrh (20.3%), fenugreek (15.2%), and aloe (10.8%).	38.3%
(Al-Eidi *et al.*, 2016)	Saudi Arabia	302(100)	40-60	Not reported	30.4	Not reported	Not reported
(Yousofpour *et al.*, 2016).	Iran	270(100)	56.2±10.1	9.8±7.3	36.6	nettle (n=48), fenugreek(n=24), barberry(n=13), cinnamon(14), and green tea(11)	36.4%
(Al-Garni *et al.*, 2017)	Saudi Arabia	310(100)	57.58±8.50	64.8%(5-10)	25.8	Ginger (11.6%), black seed (10%), cinnamon (5.5%), fenugreek (2.9%), garlic (2.9%)	Not reported
(Ashur *et al.*, 2017).	Lybia	523(100)	54.43±10.03	Not Reported	59.9	Frankincense:19.3%,olive leaves:11.9% green tea:26.6%,onion:18.9%,garlic:16.8%	Not reported
(Boufous *et al.*, 2017)	Morocco	358	Not Reported	Not Reported	35.9	Nigellasativa, fenugreek, artemisia huguetii L., garlic	Not reported
(Sheikhrabori *et al.*, 2017).	Iran	294(100)	47.87 + 11.89	6.38 + 4.76	88.4	Chamomile(39.5%),green tea:17.74	44.2%
(Jawed *et al.*, 2019)	Pakistan	400(100)	51.5 + 14.8	Not Reported	48.0	Not reported	Not reported

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(Talaei *et al.*, 2019)	Iran	421(100)	38.0 ± 20.6	Not reported	70.9	Not reported	57.8%
(Skalli *et al.*, 2019)	Morocco	334(100)		61.2%(16-30)	53.6	Fenugreek (15.4%), sage (13.3%) and olive (10.8%).	Not reported
(Sabery *et al.*, 2019).	Iran	296(100)	Not Reported	Not Reported	71.6	Fenugreek	Not reported
(Alsanad, 2020)	Saudi Arabia	98	51-60(39%) 41-50(30.6%)		33.6	Olive leaf (21.2%), green tea (21.2%), cinnamon (21.2%), black seeds (15.2%), and fenugreek (15.2%).	49%
(El-Dahiyat *et al.*, 2020)	Jordan	500(80)	Not Reported	Not Reported	76.2	Not reported	Not Reported
(Alqathama *et al.*, 2020)	Saudi Arabia	309(96.4)	46–60(51.3%)	10>56.4% 1-5:21%	24.8	Cinnamon (23.1%), ginger (19.2%), fenugreek (9.3%)	29.6%
(Radwan *et al.*, 2020)	United Arab Emirates	244(80)	55.8±12.5	61.9≤year ١1 38.1≤10	24.6	Not reported	88.1%
(Khuttar and Jallab, 2020)	Iraq	100(100)	51.04 ±16.90	9.61 ±6.88	53.0	Herbal tea 20 (37.7 %), cinnamon 28 (52.8 %) olive oil 6 (11.3 %), nigella sativa 10 (18.9 %), ginger 7 (13.2 %)	3.8%
(Jafari *et al.*, 2021)	Iran	1000	49.08±8.03	42.3%(6-10)	21.9	Not reported	58.6%

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Table 4. The most common medicinal herbs and their prevalence in EMRO countries.

Medical herb		Prevalence and range (%)	n. of studies	The country with the highest consuming rate
English name	**Scientific name**			
Fenugreek	Triognella foenum	19(14-26)	20	Saudi Arabia, Iran, Egypt, Jordan, Iraq, Morocco, Sudan, Palestine, Tunisia
Black seed	*Nigella sativa L.*	14(10-20)	16	Saudi Arabia, Libya, Egypt, Iraq, Jordan, Morocco, Palestine
Cinnamon	Cinnamomum zeylanicum blume.	18(11-27)	14	Saudi Arabia, Iran, Iraq, Morocco
Ginger	Zingiber officinale rose	12(7-20)	8	Saudi Arabia, Iran, Iraq, Morocco, Sudan, Palestine
Garlic	Allium sativum L. (liliaceae)	9(4-19)	12	Saudi Arabia, Iran, Egypt, Jordan, Iraq, Morocco, Sudan, Palestine
Aloe	Aloe vera (L.) Burm. f. (Xanthorrhoeaceae)	9(3-22)	9	Saudi Arabia, Libya, Iraq, Morocco, Palestine, Tunisia
lupine	Lupinus albus L. (Fabaceae)	13(6-24)	9	Saudi Arabia, Libya, Egypt, Jordan, Morocco, Palestine
Green tea	*Camellia sinensis* (*L.*) Kuntze	10(4-20)	10	Saudi Arabia, Libya, Iran, Sudan, Palestine
Olive	Olea europaea L	13(7-23)	10	Saudi Arabia, Libya, Iraq, Jordan, Morocco, Iran, Palestine
Onion	Allium ceppa	8(3-17)	11	Saudi Arabia, Libya, Egypt, Jordan, Morocco, Palestine
Sage	Salvia officianalis	9(5-14)	8	Tunisia, Saudi Arabia, Morocco, Palestine, Iraq

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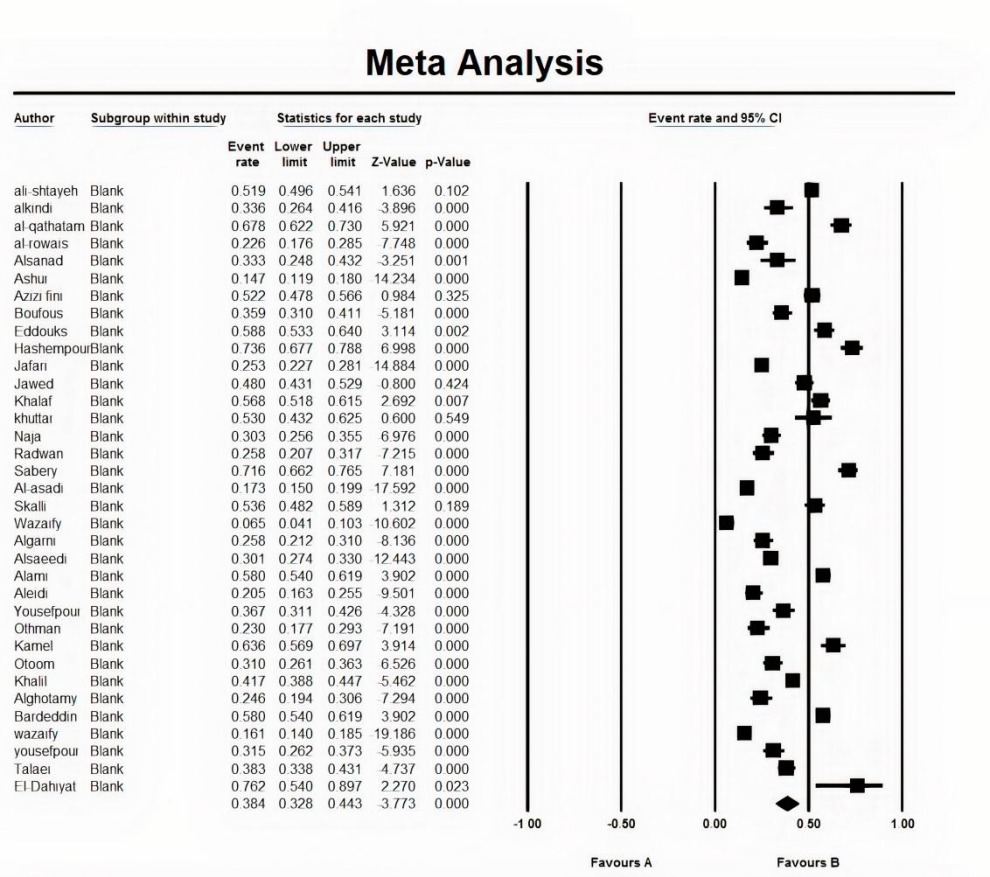

Figure 2. Funnel plot of the rate of consuming herbal medicine in EMRO countries.

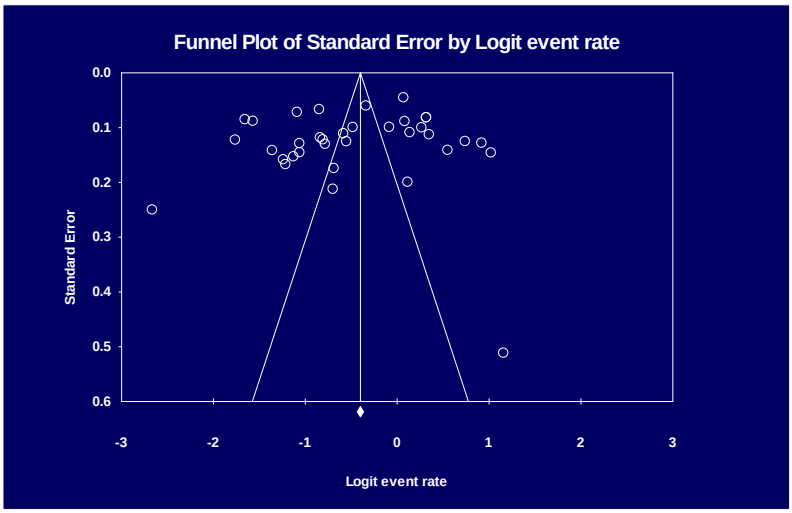

Figure 3. Funnel plot of standard error by logit event rate.

Discussion

The aim of this research was to explore the prevalence of consuming medical herbs in EMRO countries. The results showed that the prevalence rate ranged between 16.6% and 97.7%. Based on meta-analysis, the prevalence rate was 39%. A wide range of factors can affect the result. For instance, in Saudi Arabia, Al-Rowais (Al-Rowais, 2002b) reported a rate of 17.4% among diabetic

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patients, while Kamel (Kamel *et al.*, 2017) reported a rate of 62%. These results were consistent with the findings ofa review from South African countries, with a rate of 77% in Tanzania and 12.7% in Kenya (James *et al.*, 2018). The widely varying consumption rates can be attributed to variables such as the duration of the affliction, education, place of residence, and even the location of the interview that diverged across studies. In several studies, age and education were correlated with the consumption of medical herbs (El-Dahiyat *et al.*, 2020, Otoom *et al.*, 2006) . This finding was not reported in any other study or was not statistically significant (Alsanad, 2020, Jafari *et al.*, 2021, Radwan *et al.*, 2020) . The location of the interview was another factor which could affect the self-report of medical herb consumption. In studies with participants selected from hospital clinics, the rate of consuming medical herbs was low. However, in the body of research related to diabetic patients, a higher rate of consuming medical herbs was reported. This finding can be due to the patient's health and adherence to medical advice, which requires further research (Al-Rowais, 2002a, Al Saeedi *et al.*, 2003, Alsanad, 2020). Different sample sizes, inclusion criteria, data collection methods, and the duration of consuming medical herbs (lifelong, within the past year, or for a certain time before the research) were among other factors which can account for different research findings. In several studies, the rate of consuming medical herbs was explored with only one question ("Have you consumed medical herbs within the past year?) (Al Saeedi *et al.*, 2003, Awad *et al.*, 2008, Hikaambo *et al.*, 2022, Otoom *et al.*, 2006). Using only one question to determine the extent to which a patient used medical herbs within the past year can cause a recall bias. The present study aimed to explore the prevalence of consuming medical herbs in EMRO countries.

A review of consuming medical herbs in Arabic countries showed that about 60-80% of people used local medical herbs to control and treat diseases. Thus, they experience physical and mental effects too, and the effectiveness of some of the herbs had not even been proven (Ali-Shtayeh *et al.*, 2012). A high percentage of patients consumed medical herbs without any physician's advice. The reasons for this could be ineffective physician-patient communication, no recommendation by the physician, underestimation of consuming medical herbs by the physician, and the fear of blame by the physician (Al-Kindi *et al.*, 2011). Therefore, patients should be made aware of the effectiveness, adverse effects, and indications of medical herbs with the help of physicians (Boufous *et al.*, 2017). Physicians must also consider the role of culture, traditions, and values in patients' tendency to consume medical herbs and other complementary and alternative medicines (Wazaify *et al.*, 2011). Considering the popularity of medical herbs, healthcare systems and organizations need to take them seriously and take necessary measures to increase the effectiveness of therapeutic methods. The present research showed that the most common medical herbs in the target countries were fenugreek, black seed, and cinnamon. These medicines have also been prevalent in South Asian countries (Al-Asadi and Salih, 2012). The effectiveness of fenugreek, black seed (James *et al.*, 2018), ginger (Talaei *et al.*, 2019) , olive oil, and cinnamon (Khalil *et al.*, 2013) has also been confirmed in meta-analytic studies. However, several studies have reported that their consumption has been followed by increased sensitivity to insulin. Therefore, consuming these medicines alone to cure a disease should be done with care.

This study had several strengths. In order to include cross-sectional studies, the researchers considered an approximate use of medicinal herbs to reform prevalence, providing the opportunity to estimate the prevalence of medicinal herbs in all relevant studies. All the published literatures on the topic were comprehensively reviewed and three independent reviewers were asked to select and evaluate the quality of the studies. All of information used in analysis came from high quality and average publications. Limitations in this review should also be taken into account as below. Most of the study information came from publications, incomplete reporting of health status.

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Thus, some studies did not report the sequence generation of randomization.

Conclusions

Willingness to consume medical herbs is high in EMRO countries, as it is in many other countries. Therefore, consuming these herbs requires special attention. Belief in the harmlessness and effectiveness of medical herbs in controlling diseases is one of the reasons for their popularity. Moreover, local herbs were the most frequently consumed ones. About half of diabetic patients consumed these herbs on a daily basis to control diabetes. There is no comprehensive information on the exact percentage of patients who consumed these herbs alone or in combination with prescribed medication. As patients often do not inform physicians about consuming medical herbs, physicians need to be aware of the risks. Thus, more research is suggested on the prevalence of medical herbs to raise physicians' awareness of therapeutic measures and the significant role they can play in managing the disease. A better control of the disease can help promote the quality of care and the quality of patients' life.

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Conflict of interest

The authors declared no conflict of interest.

Authors' contributions

Fattahi Ardakani M, Namiranian N, and Afkhami Ardekani M designed the study. Zareipour M, Fattahi Ardakani M, and Heydari S contributed to gathering data, Fattahi Ardakani M, Zareipour M, Heydari S, wrote manuscript and analyzed the data. All authors read and approved manuscript for publication.

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