



Utilization and expenditures on traditional and herbal medicines in Iran: 2009–2016

Enayatollah Homaie Rad^a, Mohammad Hajizadeh^b, Satar Rezaei^c, Anita Reihanian^{d,*}, Elham Ehsani-Chimeh^e, Ali Davoudi-Kiakalayeh^d

^a Social Determinants of Health Research Center, Guilan University of Medical Sciences, Rasht, Iran

^b School of Health Administration, Dalhousie University, Halifax, Canada

^c Research Center for Environmental Determinants of Health, Health Institute, Kermanshah University of Medical Sciences, Kermanshah, Iran

^d Guilan Road Trauma Research Center, Guilan University of Medical Sciences, Rasht, Iran

^e National Institute of Health Research, Tehran University of Medical Sciences, Tehran, Iran

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ABSTRACT

Aims: Although some studies have assessed traditional and herbal medicines (THM) in different regions in Iran, no study investigates the determinants of THM in Iran. This study, for the first time, examines factors affecting the utilization and expenditure on THM in Iran over the period between 2009 and 2016.

Method: The Iranian Household Income and Expenditures Survey (HIES) ($n = 310,617$) was used to measure and identify the main determinants of THM from 2009 to 2016. A Tobit model for the pseudo panel data was employed to examine the effect of household income, household wealth, household size, number of males in the household, number of literate members in the household and average age of household members on THM in Iran.

Results: The average monthly use of herbal medicine and traditional medicine among Iranian households were 0.0683 and 0.0015 times, respectively. Results suggested that socioeconomic characteristics of households significantly influenced the utilization of THM: wealthier households and households with a higher number of literate members had a higher consumption of herbal medicine compared to their respective counterparts. There were also positive associations between household income and expenditures and utilization of herbal medicine in Iran.

Conclusion: This study revealed lower utilization and expenditures on THM in Iran than the corresponding figures in some Asian countries. The results demonstrated a higher consumption of herbal medicine among socioeconomically advantaged households in Iran.

1. Introduction

Traditional medicine, as defined by the World Health Organization (WHO), encompasses knowledge, practices and skills based on beliefs, theories and experiences native to various cultures used in the maintenance and enhancement of health, diagnosis, prevention and treatment of both physical and mental conditions (World Health Organization, 2013). Medicinal plants have long been utilized in traditional medicine worldwide (Hao and Xiao, 2015; Supreme Council of the Cultural Revolution, 2013). Several parts of plants such as seeds, roots, leaves, berries, flowers have been utilized for medicinal reasons from pre-historic times worldwide. Some plants and herbs contain alkaloids

and other chemicals with different pharmacological effects that can be used in traditional medicine (Che et al., 2017; Shebani et al., 2018).

Traditional and herbal medicine (THM) consists of a range of medical therapies that are primarily used outside the current healthcare settings. In several modern medicine centers, THM and modern medicine are now provided in an integrative healthcare approach (Al-Bedah et al., 2017). Traditional medicine is a major component of healthcare delivery in countries with strong historical and cultural influences. Unavailability of the conventional forms of medical therapies can also increase the role of traditional medicine in a healthcare system (White et al., 2017).

The increasing interest in THM in countries with available modern

* Corresponding author.

E-mail address: anita_reihanian@yahoo.com (A. Reihanian).

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Table 1

Average monthly utilization and expenditures on traditional and herbal medicines among households in Iran: 2009–2016 (US dollars, currency rate = 43,500).

Year	Herbal medicine			Traditional medicine		
	Unadjusted payments	Adjusted payments ^a	Number of Utilization	Unadjusted payments	Adjusted payments	Number of utilization
2009	0.9402	3.5998	0.0633	5.6874	18.7499	0.0014
2010	1.1665	3.5828	0.0702	9.2466	18.0060	0.0015
2011	1.4126	3.5080	0.0707	13.0568	18.8445	0.0019
2012	1.7706	3.5246	0.0767	11.0878	17.9499	0.0014
2013	2.2512	3.4985	0.0729	13.9530	17.2432	0.0011
2014	2.7430	3.4619	0.0656	15.2367	19.0494	0.0015
2015	3.0957	3.5514	0.0751	23.1272	18.7323	0.0015
2016	3.1469	3.1469	0.0522	18.4069	18.4069	0.0014
Average 2009–2016	2.0658	3.4842	0.0683	13.7253	18.3728	0.0015

^a Payments were adjusted to reflect 2016 prices.

medical therapies (Harris et al., 2012), (Posadzki et al., 2013) indicates the need to resort to alternative (complementary) healing modalities which cannot be found in conventional healthcare systems (Al-Bedah et al., 2017), (Pan et al., 2014). The users of THM prefer to have access to safe, cost-effective and regulated THM (Islahudin et al., 2017). Traditional Persian Medicine (TPM) is one of the branches of complementary medicine with deep roots in the history of medicine which provides a holistic outlook about diseases and health with more emphasis on preventive approach than therapeutic approach (Zargaran et al., 2014).

Plants have been used as the primary source of treatment strategy in traditional medicine. Several people use plant-based medicines and products to enhance their health conditions or treat their illnesses. According to the WHO, a large number of people use herbs or herbal products for their basic healthcare needs. Herbal medicine is a practice that uses herbs, herbal materials (e.g. plant parts) and products (processed and finished) to treat diseases and promote general health (Pan et al., 2014), (Sen et al., 2010). Owing to the acceptability, availability and minimal side effects, the use of herbal medicine as one element of alternative and complementary medicine is increasing in recent decades worldwide (Moore et al., 2015).

The existing literature demonstrated an increasing tendency towards THM. The consumption of THM was found to be associated with several socioeconomic and sociodemographic factors in different countries (Shih et al., 2017), (Duru et al., 2016). Although some studies (Qidari and Afshar, 2015) examined THM in different regions in Iran, the determinants of the consumption of THM in Iran are still poorly understood. This study, for the first time, aims to measure and identify the main determinants of utilization and expenditures on THM in Iran over the period between 2009–2016.

2. Methods

2.1. Data

The authors used data of Iranian household income and expenditures survey (HIES, $n = 310,617$) for the years between 2009 and 2016 (Iranian Statistical Center, 2017). The HIES is a national annual survey which was conducted by the Statistical Center of Iran in urban and rural areas of 31 provinces. The HIES collects information about sociodemographic, occupation, income and expenditures of household members. The survey also collects information on the utilization and payments for THM. Specifically, the survey contains information on whether or not the households used traditional (e.g., wet cupping) and herbal (e.g. echium, purgative manna and manna of hedysarum) medicine in the past month. Data on herbal medicine and traditional medicine were collected separately in the survey. In this study, herbal medicine is comprised of herbs utilized specifically for the treatment of diseases or reducing their complications. These herbs can be used instead of main chemical drugs as well as a complement to the chemical drugs. It also collects the overall payments for both traditional and herbal medicines in the past months.

2.2. Variables

Four dependent variables were used in this study: 1) the number of times that each household used traditional medicine in the past month, 2) monthly expenditure on traditional medicine, 3) the number of times that each household used herbal medicine in the past month, and 4) monthly expenditure on herbal medicine. Based on the availability of information collected in the HIES, the current income of the household, wealth status of the household, number of men in the household, the average age of the household members, household size and number of literate members of the household were used as explanatory variables of the utilization and expenditures of traditional and herbal medicines. The wealth status of households was constructed based on housing characteristics (bathroom, materials of the foundation and skeleton of the house and home surface area) and assets ownership (radios, television, cell phone, refrigerator, computer, dishwasher, central heating, washing machine, cooling systems, gas, electricity, drinking water, sanitation system). A modified principal component analysis (PCA) was used to

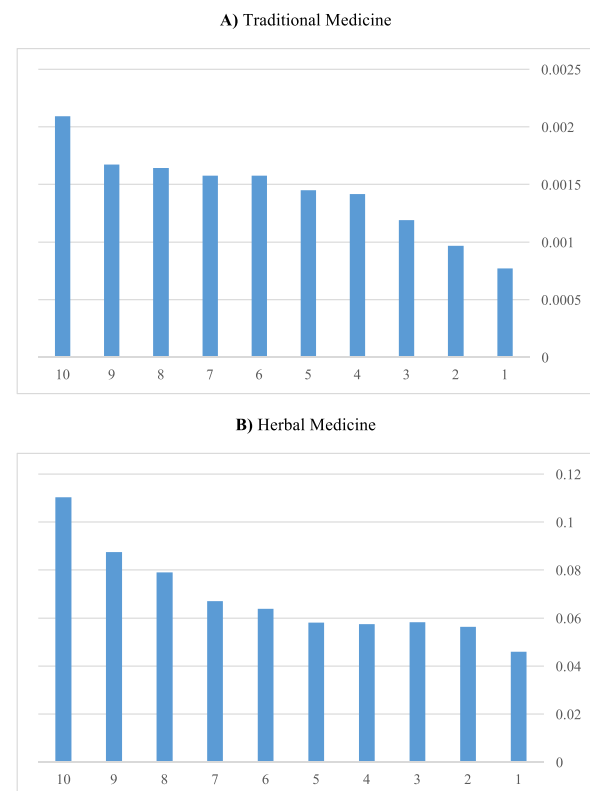


Fig. 1. Average number of herbal and traditional medicine use per month by ten socioeconomic status deciles (from the poorest to the wealthiest) in Iran in 2016.

Table 2
Results of pseudo panel data Tobit regression model for utilization of TM and HM.

	Herbal medicine utilization			Traditional medicine utilization		
	Coefficient	Std. Err.	p-value	Coefficient	Std. Err.	p-value
Income (1000 dollar)	0.0168	0.0052	0.001	0.0493	0.0528	0.350
Income squared	-0.00007	0.00004	0.094	-0.0040	0.0024	0.088
SES deciles						
SES 1 (poorest), Ref.						
SES2	0.1613	0.0386	0.000	0.1179	0.2707	0.663
SES 3	0.2084	0.0386	0.000	0.3268	0.2624	0.213
SES 4	0.1997	0.0388	0.000	0.4835	0.2579	0.061
SES 5	0.2106	0.0390	0.000	0.5380	0.2579	0.037
SES 6	0.3087	0.0387	0.000	0.5609	0.2588	0.030
SES 7	0.3633	0.0387	0.000	0.6008	0.2596	0.021
SES 8	0.5466	0.0384	0.000	0.6599	0.2609	0.011
SES 9	0.6495	0.0386	0.000	0.6643	0.2633	0.012
SES 10 (wealthiest)	0.9094	0.0391	0.000	0.9209	0.2644	0.000
Number of men in the household	-0.0470	0.0111	0.000	-0.0071	0.0667	0.915
Average age of the household members	0.0077	0.0005	0.000	0.0109	0.0035	0.002
Number of literate members of the household	0.0342	0.0099	0.001	0.01040	0.0597	0.862
Household size	0.0377	0.0107	0.000	0.09594	0.0644	0.136
Year-2009, Ref.						
Year-2010	0.1215	0.0446	0.006	0.2770	0.3114	0.374
Year-2011	0.2396	0.0449	0.000	0.1928	0.2944	0.513
Year-2012	0.2980	0.0440	0.000	-0.0466	0.3117	0.881
Year-2013	0.3348	0.0456	0.000	-1.2202	0.4080	0.003
Year-2014	0.1711	0.0437	0.000	-0.0058	0.3032	0.985
Year-2015	0.2670	0.0430	0.000	0.2017	0.3000	0.501
Year-2016	0.0332	0.0454	0.465	-0.0984	0.3019	0.745
Income2009 *Year-2009, Ref.						
Income2010*Year-2010	-0.0073	0.0070	0.295	-0.0459	0.0616	0.456
Income2011 *Year-2011	-0.0236	0.0077	0.002	0.0246	0.0556	0.659
Income2012*Year-2012	-0.0188	0.0074	0.011	0.0145	0.0599	0.809
Income2013*Year-2013	-0.0351	0.0081	0.000	0.0730	0.0710	0.304
Income2014*Year-2014	-0.0215	0.0071	0.002	0.0175	0.0567	0.758
Income2015*Year-2015	-0.0145	0.0069	0.037	-0.0312	0.0589	0.597
Income2015*Year-2015	-0.0324	0.0076	0.000	0.0282	0.0551	0.609
Constant	-4.4190	0.0598	0.000	-11.274	0.6287	0.000
R-square	0.0090			0.0113		
Log-likelihood	-90638			-3705		

Ref. = Reference category in the regression analysis.

calculate household wealth scores. The wealth scores were used to divide households into ten socioeconomic status (SES) deciles (from the poorest to the wealthiest).

2.3. Statistical analysis

A pseudo-panel data analysis was used to assess the determinants of utilization and expenditure of THM. Pseudo-panel data (Verbeek, 2008), (Hsiao, 2014) are constructed from seven repeated cross-sections of the HIES from 2009 to 2016. Due to zero-inflated data, the following Tobit regression model was used in the regression analysis (Al-Bedah et al., 2017):

$$y_{it} = \beta_1 + \beta_2 in_{it} + \beta_2 in_{it}^2 + \beta_4 ses_{it} + \beta_5 men_{it} + \beta_6 aga_{it} + \beta_7 lit_{it} + \beta_8 hhs_{it} + \beta_9 yr_{it} + \beta_{10} int_{it} + \mathcal{E}_{it},$$

where y is the outcome variable of interest, in is the yearly income of the households (1000 US\$), in^2 indicates the second-order of households' yearly income, ses denotes the socioeconomic status of the household, men is the number of men in the household, aga indexes the average age of household members, hhs is the household size, and lit is the number of literate members of the household. The yr is the dummy variables for survey years. The int denotes the interactions between income and years which are included in the pseudo panel model to account for any unexplained change over time effects. The Office of Research Ethics at Guilan University of Medical Sciences reviewed and approved the study (Ethics approval code: IR.GUMS.REC.1397.304). All the analyses were performed using STATA SE software version 15.1.

3. Results

Table 1 reports average monthly utilization and expenditures on THM among households in Iran over the study period. The average monthly number of herbal medicine usage varied between 0.0522 in 2016 and 0.0767 in 2012. The average number of monthly traditional medicine use also varied between 0.0005 in 2013 and 0.0019 in 2011. As shown in the table, the highest amount of adjusted herbal medicine expenditures was in 2015 (3.5514 US\$) and the lowest expenditures was in 2016 (3.1469 US\$). The highest adjusted spending on traditional medicine was in 2014 (19.0494 US\$ averagely) while the lowest spending was in 2013 (17.2432 US\$). Fig. 1 illustrates the utilization of traditional medicine from highest to lowest SES deciles in 2016. As illustrated in the figure, the utilization of both herbal medicine and traditional medicine increases with household SES.

Table 2 reports the effects of income, SES and other explanatory factors on the utilization of herbal medicine and traditional medicine over the period between 2009 and 2016. Based on the results, income had a positive relationship with the utilization of herbal medicine (coefficient = 0.0168, p -value = 0.001). The positive association found between income and traditional medicine use (coefficient = 0.0493, p -value = 0.334) did not reach statistical significance. SES had a positive relationship with both the utilization of herbal medicine and traditional medicine in Iran. Based on the coefficients on the SES deciles, it is evident that the utilization of herbal medicine and traditional medicine was significantly higher among higher SES (wealthier) households than the lowest SES (poorest) households. The utilization of herbal medicine was significantly lower in households with more male members. No

Table 3
Results of pseudo panel data Tobit regression model for expenditure on traditional and herbal medicine.

	Herbal medicine expenditures			Traditional medicine expenditures		
	Coefficient	Std. Err.	p-value	Coefficient	Std. Err.	p-value
Income (1000 dollar)	0.103	0.0304	0.001	1.3401	1.1416	0.344
Income squared	-0.0004	0.0002	0.080	-0.1110	0.0639	0.083
SES deciles						
SES 1 (poorest), Ref.						
SES2	0.9664	0.2329	0.000	3.6769	7.2700	0.613
SES 3	1.2733	0.2324	0.000	9.5562	7.0337	0.174
SES 4	1.3786	0.2333	0.000	12.5642	6.9515	0.071
SES 5	1.3794	0.2344	0.000	14.7145	6.9250	0.034
SES 6	2.0393	0.2324	0.000	15.0764	6.9552	0.030
SES 7	2.3462	0.2326	0.000	15.6911	6.9879	0.025
SES 8	3.4554	0.2303	0.000	17.9922	7.0010	0.010
SES 9	4.0678	0.2313	0.000	17.5921	7.0754	0.013
SES 10 (wealthiest)	5.6451	0.2337	0.000	25.2951	7.0782	0.000
Number of men in the household	-0.2805	0.0662	0.000	-0.0087	1.7818	0.996
Average age of the household members	0.0489	0.0032	0.000	0.2917	0.0949	0.002
Number of literate members of the household	0.2159	0.0593	0.000	0.6495	1.6026	0.685
Household size	0.2230	0.0641	0.001	2.2159	1.7290	0.200
Year-2009	0.6801	0.2660	0.011	7.2018	8.3469	0.388
Year-2010	1.3744	0.2668	0.000	5.6787	7.8905	0.472
Year-2011	1.6216	0.2595	0.000	-1.5540	8.3549	0.852
Year-2012	1.9064	0.2711	0.000	-33.2282	10.9248	0.002
Year-2013	0.9316	0.2589	0.000	-0.0080	8.1243	0.999
Year-2014	1.4470	0.2541	0.000	4.9300	8.0363	0.540
Year-2015	0.2319	0.2700	0.390	-2.4063	8.0915	0.766
Year-2016, Ref.						
Income2009 *Year-2009	-0.0420	0.0414	0.311	-1.2607	1.6525	0.446
Income2010*Year-2010	-0.1325	0.0451	0.003	0.5223	1.4965	0.727
Income2011 *Year-2011	-0.0863	0.0427	0.043	0.4532	1.5998	0.777
Income2012*Year-2012	-0.1927	0.0473	0.000	2.1097	1.8841	0.263
Income2013*Year-2013	-0.1069	0.0413	0.010	0.4447	1.5207	0.770
Income2014*Year-2014	-0.0624	0.0400	0.119	-0.6958	1.5684	0.657
Income2015*year-2015	-0.1838	0.0449	0.000	0.6956	1.4799	0.638
Income2015*year-2015, Ref.						
Constant	-26.7873	0.3490	0.000	-300.8519	16.1746	0.000
R-square	0.0079			0.0086		
Log-likelihood	-112540			-5002		

significant relationship was found between the number of males in the household and the utilization of traditional medicine. The average age of household members had a positive relationship with the utilization of herbal medicine and traditional medicine utilization. The number of literate persons in the household and household size was also positively associated with the use of herbal medicine.

Table 3 represents the effects of income, SES and other explanatory factors on herbal and traditional medicine spending among Iranian households. As reported in the table, income had a significant positive association with herbal medicine expenditures (coefficient = 0.1032, p -value = 0.001), but no significant relationship was found between income and spending on traditional medicine. The magnitude of coefficients on SES deciles increased from the poorest to the richest SES for both herbal and traditional expenditures. The coefficients on traditional expenditures are very large in wealthy households compared to the respective coefficients in herbal medicine expenditures.

4. Discussion and conclusion

The growing use and cost of THM is a global phenomenon (Yamashita et al., 2002), (Barnes et al., 2004), (Lim et al., 2005). The study suggested that the average number of herbal medicine and traditional medicine use among Iranian households over the study period were 0.0683 and 0.0015 per months, respectively. The adjusted average spending in herbal and traditional medicine expenditures over the study period was \$2.0658 and \$13.7253, respectively. The utilization of THM is much lower than that reported in some Asian countries (Yamashita et al., 2002), (Lim et al., 2005), (Ock et al., 2009) and developed countries (Hanssen et al., 2005), (Ernst and White, 2000). The results also suggest that the utilization rate of herbal medicine is not on the rise

in Iran. Some of the factors that may have been contributed to the lower utilization of THM in Iran are: 1) provision of these services by non-professional service providers in poor-quality centers, 2) the lengthy process of access and use of traditional medicine (e.g. if patients want to use leech therapy as a traditional medicine service, they must refer to the service provider at least twice) 3) availability of cheaper chemical drugs due to lack of patent, 4) mistrust on the effectiveness of THM in the country, 5) excessive prescription of medications by healthcare providers, and 6) lower accessibility to traditional medicine services in Iran (Supreme Council of the Cultural Revolution, 2013).

The study results demonstrate the impact of sociodemographic and socioeconomic factors of households on the use and spending on THM in Iran. Households with a higher number of females use more herbal medicine. In respect to demographic and socioeconomic factors, the average age of household members had a positive relationship with the utilization of herbal medicine and traditional medicine utilization. The findings also showed that the use of herbal and traditional medicines is influenced by the SES characteristics of households. The wealthier households had a higher consumption of THM. This finding is contrary to the general belief that poorer households are the primary consumers of these types of services. The number of literate members in the household also had a positive relationship with the use of herbal medicine. A positive association of herbal medicine use with larger household income indicates positive income elasticity of herbal medicine products in Iran.

Some studies have assessed THM use in Iran. A study in Mashhad showed that 83.7% of women used traditional or complementary medicine during pregnancy (Khadivzadeh and Ghabel, 2012). Another study showed that females in suburban areas used more traditional and alternative medicine than others (Abolhassani et al., 2012).

Furthermore, a study in diabetic patients showed that 88.4% of these patients used at least one complementary or traditional medicine during one year (Sheikhrabari et al., 2017).

THM has been practiced for centuries and has some proven benefits. Nevertheless, there are also exaggerated propagandas on traditional medicine as well as medicinal plant compounds (e.g. weight loss medicine). However, no guidelines are available on the utilization of THM in Iran. Physicians are not willing to prescribe THM as a complementary medicine (Cheraghali et al., 2004). THM generally are prescribed by traditional drugstores and traditional medicine service providers without the supervision of physicians (Ardalan et al., 2015; Ghorbanifar et al., 2014; Qidari and Afshar, 2015). Thus, government policymakers in Iran should take a greater interest in herbal and traditional therapies to protect THM users from unnecessary and unsafe therapies.

This study has some limitations, and the results must be interpreted with caution. Firstly, as a cross-sectional study, it is not possible to establish the relationship between the outcome variable and its determinants. Secondly, the data in the THM are self-reported; thus information available in the survey is subject to recall bias. Thirdly, as there is no data available on the utilization of different types of herbal as well as traditional medicine in the HIES, it was not possible to perform the analyses for different types of THM. With these caveats considered, this study indicated that the socioeconomic characteristics of households heavily influence the utilization of and spending on THM.

CRedit authorship contribution statement

Enayatollah Homaie Rad: Conceptualization, Methodology, Software, Data curation. **Mohammad Hajzadeh:** Data curation, Software, Supervision, Writing - review & editing. **Satar Rezaei:** Software. **Anita Reihanian:** Writing - original draft. **Elham Ehsani-Chimeh:** Visualization, Investigation. **Ali Davoudi-Kiakalayeh:** Supervision.

Declaration of Competing Interest

The authors of this article declare that there is no conflict of interest.

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