

Plants and fruits used for cholesterol treatment by the folk in Elazığ

Uğur Çakılcioglu & İsmail Türkoğlu

Department of Biology, Faculty of Science and Arts, Firat University, 23119 Elazığ, Turkey, e-mail: ucakilcioglu@yahoo.com

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Abstract: The plants and fruits used by the folk to reduce high cholesterol, one of the main causes of heart disease, are subject to this study. The research was conducted by a face-to-face interview technique with 300 individuals residing in the city of Elazığ. The participants were asked what part of the plant they use and how they prepare it, and their answers were recorded. Plants and fruits used were gathered accordingly, herbarium materials were prepared and scientifically named. Data in the survey were analyzed with SPSS 12.0 statistics software. Significance was evaluated by calculating the chi-square values.

Key words: cholesterol, Elazığ, medicinal plants, Turkey

Introduction

For about 50 000 years plants have been used for treatment purposes by the folk of Anatolia. Species of plants found in graves from the Paleolithic Age in Şanidar Cave (south of Hakkari) provide solid proof to this phenomenon (Solecki 1972).

Phytotherapy is administered by experienced persons called “folk healers” using herbal drugs. Folk drugs called healing herbs or fruits are used by a large section of the society in Turkey. These are generally plants that grow in the vicinity of the places where people live, and are given local names. It is noteworthy that, although the plants are named differently by the people living in a given area, the designations in different areas are the same.

It is necessary to know the local names of wild plants, which comprise an indispensable material for the drug industry. Besides, knowledge which diseases these plants are good for and for which purposes they are used also benefits the humanity. In our country raw drugs are generally obtained from natural plants (Bağcı 2000).

The number of herbal drugs is determined as 1900 by the World Health Organization (WHO) (Baytop 1999). Herbal drugs can be used only to treat mild diseases and as a supplement to medical treatment. A doctor should always be consulted about the severe conditions. However, the initial symptoms of some severe diseases are fairly weak. Therefore when symptoms are not cured shortly by phytotherapy (incessant abdominal pain, diarrhea, headaches, sweating, continuous cough, etc.), a doctor should be immediately consulted, as these may be the initial symptoms of a severe disease (Baytop 1999).

The present study explores plants and fruits used by the folk in Elazığ to reduce high cholesterol, one of the main causes of heart diseases. The way these plants and fruits were used has been also examined, and the ethnobotanic knowledge of the folk has been evaluated.

Cholesterol and heart diseases

Cholesterol is probably the best known steroid, as it is paired with atherosclerosis. Although it is extensively distributed to all body cells, cholesterol is found es-

pecially in the nerve tissue. It is one of the principal building blocks of the plasma membrane and plasma lipoprotein. Though it is not found in vegetable oils, it is present in animal fats (Murray & al. 1993).

The fundamental risk factor for the development of coronary artery diseases (CAD) or atherosclerosis (AT) is an increase of the plasma cholesterol level (Wald & Law 1995). CAD is among the major mortality causes in all countries of the world. It is known to be the primary cause of deaths in 45-year-old men and 65-year-old women in the United States (Hennekens 1998).

The serum level of high-density lipoprotein (HDL) cholesterol is known to be an independent marker of CAD (Gordon & al. 1989a; Foody & al. 2000) and recent approaches to increase HDL cholesterol level have been emphasized in primary and secondary prevention of CAD. There is solid evidence that administration of antioxidant vitamin cocktails together with lipid-reducing treatment depress the level of HDL cholesterol and have an unfavorable effect on the prevention of CAD (Brown & al. 2001; Cheung & al. 2001).

The most important step for emergence of AT is the low-density lipoproteins (LDL) modified by oxidation. LDL – which penetrate the vessel wall and are oxidized there – cause endothelial injury by stimulating the release of cytokines and inhibiting nitric oxide, and thereby accelerate atherosclerosis (Tokgözoğlu & Özer 1997; Rosenson 2004). There is an inverse relation between HDL level and cardiovascular disease (CVD). It has been demonstrated that an increase of 1 mg/dl in HDL cholesterol reduces the risk of coronary heart disease (CHD) by 2–3 % (Gordon & al. 1989b).

Materials and methods

The study was carried out from February 2005 to August 2006, using a face-to-face survey method with 300 individuals, who constituted a 0.1 % sample of the 366 839 residents of Elazığ (Turkstat 2000). The participants had high cholesterol levels and went to private hospitals for examination and private pharmacists to buy drugs. In the survey, the participants were asked how plants and fruits that are believed to lower cholesterol have been used, and their answers were recorded. The survey was evaluated using SPSS 12.0 statistics software package. Plain and cross tables were drawn, chi-square values were calculated, and their significance was examined.

The plants and fruits used by the people were identified in the Firat University Herbarium (FUH) and were registered as herbarium materials. Volumes 1–9 of *Flora of Turkey and the East Aegean Islands* (Davis 1965–1985) were used in plant identification.

Results and discussion

In the presentation of the results obtained during our research, demographical data about the participants are shown in Table 1. The species and family Latin names, as well as the species English and local names, and ways and frequency of consumption of the plants and fruits are presented in Table 2. The frequently used species are: *Citrus paradise* (70.0%), *Corylus avellana* (59.6%), *Linum usitatissimum* (36.5%), *Juglans nigra* (25.6%), *Citrus limon* (20.2%), and *Ceratonia siliqua* (8.4%).

Of all 300 individuals who participated in the survey, 203 (67.7%) still consume plants and fruits to lower their cholesterol, 28 (9.3%) had used to consume them, while 69 (23.0%) never did (Table 3). Of the 300 participants, 254 (84.7%) were familiar with the plants and fruits, whereas 46 (15.3%) were not. Of those who continue to consume plants and fruits, 180 (88.7%) had some knowledge about them, while 23 (11.3%) did not. Of those who used to consume them,

Table 1. Demographical data about the participants (n=300).

Demographical characteristics	Number	%	Demographical characteristics	Number	%
Age			Educational level		
30 and below	6	2.0	Literate	14	4.7
31–40	23	7.7	Primary school	129	43.0
41–50	68	22.7	Secondary school	37	12.3
51–60	108	36.0	High school	82	27.3
61 and above	95	31.7	University	38	12.7
Marital status			Consumption status		
Married	238	79.3	Still consuming	203	67.7
Single	10	3.3	Consumed before	28	9.3
Widowed	48	16.0	Never consumed	69	23.0
Divorced	4	1.3			
Residential status			Familiarity		
Rural	192	64.0	Familiar	254	84.7
Urban	108	36.0	Unfamiliar	46	15.3
Duration of residence			Employment status		
10 years and less	65	21.7	Employed	122	40.7
11 years and more	135	78.3	Unemployed	178	59.3

Table 2. Species/family Latin and species English /local names, ways and frequency of consumption of the plants and fruits*.

Species Latin name	Family name	English & local names	Way of consumption	Frequency of consumption	%
<i>Pistacia vera</i> L.	Anacardiaceae	Pistachio-Antepfıstıđı	Eaten dried.	7	3.4
<i>Petroselinum crispum</i> (Mill.) A.W.Hill	Apiaceae	Parsley-Maydanoz	Used in meals and salads. Its root is decocted.	5	2.5
<i>Phoenix dactylifera</i> L.	Arecaceae	Date-Hurma	Eaten raw.	1	0.5
<i>Cichorium</i> sp.	Asteraceae	Dandelion-Karahindiba	Its leaves are eaten as vegetable. The fresh plant is used in salads.	6	3.0
<i>Cynara scolymus</i> L.	Asteraceae	Artichoke-Enginar	Its meal is cooked.	12	5.9
<i>Helianthus annuus</i> L.	Asteraceae	Sunflower seed-Ayçekirdeđi, Günebakan	Its oil is used for cooking.	2	1.0
<i>Scorzonera semicana</i> DC.	Asteraceae	Scorzonera-Yemlik	Eaten raw. Its meal is cooked.	5	2.5
<i>Corylus avellana</i> L.	Corylaceae	Hazelnut-Fındık	Its oil is used for cooking. Eaten dried.	121	59.6
<i>Cucumis sativus</i> L.	Cucurbitaceae	Cucumber-Hıyar, Salatalık	Eaten raw and in salads.	2	1.0
<i>Ceratonia siliqua</i> L.	Fabaceae	Carob-Boynuz, Keçiboynuzu	Mashed and eaten either with yogurt or raw.	17	8.4
<i>Juglans nigra</i> L.	Juglandaceae	Walnut-Ceviz, Goz	Eaten dried.	52	25.6
<i>Melissa officinalis</i> L.	Lamiaceae	Lemon balm-Ođulotu	Decocted.	2	1.0
<i>Rosmarinus officinalis</i> L.	Lamiaceae	Rosemary-Biberiye, Kuşdili	Decocted.	2	1.0
<i>Thymus haussknechtii</i> Velen	Lamiaceae	Thyme-Dađkekiđi, Kekikotu	Decocted, infused.	13	6.4
<i>Allium cepa</i> L.	Liliaceae	Onion-Sođan	Used in meals and salads.	15	7.4
<i>Allium sativum</i> L.	Liliaceae	Garlic-Sarımsak, Sir	Eaten in meals, mashed and mixed with yogurt.	12	5.9
<i>Linum usitatissimum</i> L.	Linaceae	Flax-Keten	Its seeds are ground and eaten with yogurt.	74	36.5
<i>Ficus carica</i> L.	Moraceae	Fig-İncir	Eaten fresh or dried.	3	1.5
<i>Olea europaea</i> L.	Oleaceae	Olive-Zeytin	Its oil is used in cooking.	15	7.4
<i>Avena sativa</i> L.	Poaceae	Oats -Yulaf	Used as porridge.	8	3.9
<i>Hordeum vulgare</i> L.	Poaceae	Barley-Arpa	Boiled and consumed.	4	2.0
<i>Zea mays</i> L.	Poaceae	Corn-Mısır, Lazut	Boiled. Its flour is used in meals.	3	1.5
<i>Punica granatum</i> L.	Punicaceae	Pomegranate-Nar, Haner	The fruit and juice are consumed. Its rind is boiled.	4	2.0
<i>Amygdalus communis</i> L.	Rosaceae	Almond-Badem	Eaten dried.	8	3.9
<i>Crataegus orientalis</i> Pall. ex M. Bieb.	Rosaceae	Azarole-Alıç, Aluç	Fruit is eaten; flowers are decocted.	16	7.9
<i>Fragaria vesca</i> L.	Rosaceae	Strawberry-Çilek	Eaten fresh. Its leaves are decocted.	3	1.5
<i>Malus sylvestris</i> Mill.	Rosaceae	Apple-Elma, Say	Eaten with its peel. Its crust is decocted.	6	3.0
<i>Prunus domestica</i> L.	Rosaceae	Plum-Erik, Alunça	The fruit is eaten. Decocted.	2	1.0
<i>Rosa canina</i> L.	Rosaceae	Rose hip-Kuşburnu, İtburnu	Decocted, infused. Mashed and eaten as marmalade or jam.	9	4.4
<i>Citrus limon</i> (L.) Burm. f.	Rutaceae	Lemon-Limon	Juice is consumed; used in meals and salads.	41	20.2
<i>Citrus paradisi</i> Macf.	Rutaceae	Grapefruit-Greyfurt	Fresh juice is consumed.	142	70.0
<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	Tea-Çay	Decocted.	4	2.0
<i>Vitis vinifera</i> L.	Vitaceae	Grape-Üzüm, Öküzgözü	Eaten fresh or dried. Juice is consumed.	4	2.0
<i>Zingiber officinalis</i> Roscoe	Zingiberaceae	Ginger-Zencefil	Its powder is eaten with yogurt.	5	2.5

*Drawn in view of the individuals (203) who still use plants and fruits; the sum cannot be calculated as more than one plant or fruit is marked.

21 (75.0 %) had some knowledge about the plants and fruits, and seven (25.0 %) did not. As for those who have never consumed them, 53 (76.8 %) individuals were familiar with the plants and fruits, while 16 (23.3 %) were not. The results are statistically significant ($p < 0.05$ – Pearson Chi-Square: 7.801).

The study shows (Table 4) that of the 300 participants, 65 (21.7 %) have been residing in the city for 10 years or less, while 235 (78.3 %) have been residing in the city for at least 11 years. Of those residing in the city for 10 years or less, all (100 %) were familiar with the healing plants and fruits, whereas of those residing in the city for 11 years or more, 189 (80.4 %) were knowledgeable about the healing plants and fruits, but 46 (19.6 %) were not. This result is statistically significant ($p < 0.05$ – Pearson Chi-Square: 15.028).

Fifty-eight (89.2 %) people who have been residing in Elazığ for 10 years or less still consume plants and fruits to lower cholesterol, three (4.6 %) have used to consume them, while four (6.2 %) have never consumed them (Table 5). As for those who have been residing in Elazığ for over 11 years, 145 (61.7 %) still consume cholesterol-lowering plants and fruits, 25 (10.6 %) had previously consumed them, and 65 (27.7 %) have never consumed them at all. The consumption of cholesterol-lowering plants and fruits

increases with the increase of the participants' duration of residence. Results are statistically significant ($p < 0.001$ – Pearson Chi-Square: 17.920).

The educational level of the participants and their consumption of plants and fruits for the purposes of phytotherapy are compared in Table 6. According to that comparison, of the literate people among the 300 participants, seven (50 %) still consume plants and fruits to lower cholesterol, three (21.4 %) used to consume them, and four (28.6 %) have never consumed them. Of the primary school graduates, 99 (76.7 %) still consume plants and fruits to lower cholesterol, five (3.9 %) used to consume them, and 25 (19.4 %) have never consumed them. Of the secondary school graduates, 21 (56.8 %) still consume plants and fruits to lower cholesterol, three (13.5 %) used to consume them, and 11 (24.4 %) have never consumed them. Of the high school graduates, 53 (64.6 %) still consume plants and fruits to lower cholesterol, nine (11.0 %) used to consume them, and 20 (24.4 %) have never consumed them. Of the university graduates, 23 (60.5 %) still consume plants and fruits to lower cholesterol, six (15.8 %) had used to consume them, and nine (23.7 %) have never consumed them. Primary school graduates (48.8 %) outnumber the rest among the 203 individuals who still consume plants and fruits

Table 3. The consumption status of the individuals by their familiarity with plants and fruits used to lower cholesterol.

Familiarity/consumption status Crosstabulation		Consumption status			Total	
		Still consuming	Consumed before	Never consumed		
Familiarity	Yes	Count	180	21	53	254
		Familiarity	70.9%	8.3%	20.9%	100%
		Consumption status	88.7%	75.0%	76.8%	84.7%
	No	Count	23	7	16	46
		Familiarity	50.0%	15.2%	34.8%	100%
		Consumption status	11.3%	25.0%	23.2%	15.3%
Total	Count	203	28	69	300	
	Familiarity	67.7%	9.3%	23.0%	100%	
	Consumption status	100%	100%	100%	100%	

$X^2 = 7.801$

$P < 0.05$

Table 4. Familiarity of the individuals with plants and fruits used to lower cholesterol by duration of residence in the area.

Duration of residence/familiarity Crosstabulation		Familiarity		Total	
		Familiar	Unfamiliar		
Duration of residence	10 years and less	Count	65	0	65
		Duration of residence	100%	0,0%	100%
		Familiarity	25.6%	0.0%	21.7%
	11 years and more	Count	189	46	235
		Duration of residence	80.4%	19.6%	100%
		Familiarity	74.4%	100%	78.3%
Total	Count	254	46	300	
	Duration of residence	84.4%	15.3%	100%	
	Familiarity	100%	100%	100%	

$X^2 = 15.028$

$P < 0.001$

to reduce cholesterol; high school graduates (32.1 %) outnumber the rest among those who used to consume plants and fruits to reduce cholesterol; and primary school graduates (36.2 %) outnumber the rest among those who have never consumed them. The results are statistically insignificant ($p > 0.05$ – Pearson Chi-Square: 13.932).

As it is shown in Table 7, out of the 300 participants, 192 (64.0 %) lived in the county and villages, and 108 (36.0 %) in the city. Of the people residing in the county and villages, 139 (72.4 %) are still consuming plants and fruits that lower cholesterol, 13 (6.8 %) had used to consume them, while 40 (20.8 %) have never consumed them. Of the participants liv-

Table 5. The status of the individuals' consumption of cholesterol-lowering plants and fruits by duration of their residence in the area.

Duration of residence/consumption status Crosstabulation			Consumption status			Total
			Still consuming	Previously consumed	Never consumed	
Duration of residence	10 years and less	Count	58	3	4	65
		Duration of residence	89.2%	4.6%	6.2%	100%
		Consumption status	28.6%	10.7%	5.8%	21.7%
Duration of residence	11 years and more	Count	145	25	65	235
		Duration of residence	61.7%	10.6%	27.7%	100%
		Consumption status	71.4%	89.3%	94.2%	78.3%
Total		Count	203	28	69	300
		Duration of residence	67.7%	9.3%	23.0%	100%
		Consumption status	100%	100%	100%	100%

$X^2 = 17.920$ $P < 0.001$

Table 6. The education levels of the individuals by their status of consumption of plants and fruits used to lower cholesterol.

Education level/ consumption status Crosstabulation			Consumption status			Total
			Still consuming	Previously consumed	Never consumed	
Educational Level	Literate	Count	7	3	4	14
		Education level	50.0%	21.4%	28.6%	100%
		Consumption status	3.4%	10.7%	5.8%	4.7%
	Primary school	Count	99	5	25	129
		Education level	76.7%	3.9%	19.4%	100%
		Consumption status	48.8%	17.9%	36.2%	43.0%
	Secondary school	Count	21	5	11	37
		Education level	56.8%	13.5%	29.7%	100%
		Consumption status	10.3%	17.9%	15.9%	12.3%
	High school	Count	53	9	20	82
		Education level	64.6%	11.0%	24.4%	100%
		Consumption status	26.1%	32.1%	29.0%	27.3%
University	Count	23	6	9	38	
	Education level	60.5%	15.8%	23.7%	100%	
	Consumption status	11.3%	21.4%	13.0%	12.7%	
Total		Count	203	28	69	300
		Education level	67.7%	9.3%	23.0%	100%
		Consumption status	100%	100%	100%	100%

$X^2 = 13.932$ $P > 0.05$

Table 7. The residential status of the individuals by their status of consumption of plants and fruits used to lower cholesterol.

Residential status/consumption status Crosstabulation			Consumption status			Total
			Still Consuming	Previously Consumed	Never Consumed	
Residential status	Rural	Count	139	13	40	192
		Residential status	72.4%	6.8%	20.8%	100%
		Consumption status	68.5%	46.4%	58.0%	64.0%
	Urban	Count	64	15	29	108
		Residential status	59.3%	13.9%	26.9%	100%
		Consumption status	31.5%	53.6%	42.0%	36.0%
Total		Count	203	28	69	300
		Residential status	67.7%	9.3%	23.0%	100%
		Consumption status	100%	100%	100%	100%

$X^2 = 6.604$ $P < 0.05$

ing in the city, 64 (59.3 %) are still consuming plants and fruits that lower cholesterol, 15 (13.9 %) had used to consumed them, while 29 (26.9 %) have never consumed them. People residing in rural areas consume cholesterol lowering plants and fruits more frequently, than those living in the city. This is probably due to the rural residents' easier access to the plants and fruits. A significant correlation has been found between the residential status and the consumption status ($p < 0.05$ – Pearson Chi-Square: 6.604).

According to our literature review, thyme is used to lower cholesterol by the folk in Ankara's Gölbaşı district, too (Şimşek & al. 2001). Furthermore, rosemary, artichoke leaves, lemon juice and grape juice are also used to reduce cholesterol (Baytop 1999). Hazelnut, walnut, olive, grapefruit and lemon also lower cholesterol (Karadeniz 2004). Hazelnut, pistachio, walnut, and almond do not contain cholesterol, as they are dried fruits of vegetable origin and are rich in vitamins.

Many fruits and plants used by the folk contain vitamin C, which takes part in the reactions that facilitate lipid metabolism and affects cholesterol metabolism. The cholesterol-lowering effect of vitamin C is in decreasing the absorption of cholesterol by the intestines. There is a negative correlation between the level of vitamin C intake and plasma LDL level, and a positive correlation between the level of vitamin C intake and HDL level (Velioğlu 2000).

Garlic (*Allium sativum*) has been used for medical purposes for a long time. Chemicals responsible for the effect of garlic are organosulfur compounds, such as allicin and allylic sulfides. Allylic sulfides found in onion (*A. cepa*) and garlic stabilise the immune system, increase the discharge of carcinogens, stimulate enzymes that inhibit tumor cell reproduction, and reduce serum cholesterol levels (Bloch & Thomson 1995).

As opposed to polyunsaturated omega-6 fatty acids, omega-3 fatty acids found in high levels in fish oil, flax oil and canola oil were found to lower blood cholesterol levels, prevent accumulation of cholesterol in the arteries, have a positive effect on the serum triglyceride levels, and prevent clotting. It was established that monounsaturated fatty acids have a more favorable effects on the blood cholesterol level and cardiovascular diseases, as compared to saturated fatty acids (Mensik 1995).

Some authors (Sharma & al. 1979) reported that the presence of 1–3 % garlic powder in the mixed feed of egg chickens reduce egg cholesterol by 5.45 mg/g, 2.83 mg/g, and 4.1 mg/g, respectively after three weeks.

Conclusions

These scientific studies are important for confirming the folk information gathered by us. The fact that synthetic drugs are expensive and have side effects has increased the public demand in medicinal plants. Many drugs and agents used to lower cholesterol in our country are imported and bought with hard currency. Furthermore, these drugs have many side effects. Considering these factors, the plants used in Turkey, which is an agricultural country, can present an alternative to such drugs.

Biological activity studies are needed to understand what place the plants and fruits used to lower cholesterol occupy in treatment. Such studies will benefit further from ethnobotanic researches and studies into the raw drug materials that can lower cholesterol.

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