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DETERMINATION OF FACTORS INFLUENCING STUDENTS' MEDICINAL PLANTS USE

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ABSTRACT

The environment and cultural behavior of individuals have a significant influence on their consumption of medicinal plants. This study was carried out to determine whether faculties, formal education, consumption habits, socio-economic and demographic characteristics affected medicinal plant consumption of university students in addition to these two important variables. A total of 445 students studying at 15 faculties of Ataturk University were administered through a face-to-face interview in 2016. Results of the study revealed that students' consumption of medicinal plants was affected positively by being a third-year student; being from TRA region of North East Anatolia; consuming mint lemon, and rosehip tea; consumption of medicinal plants by one or more family members; educational level of the student's father; having a social security, and for health reasons. Whereas factors such as staying with family; being a student of a health faculty; formal education; doing sports, and consuming fruit juice had a negative effect on the consumption of medicinal plants.

KEYWORDS:
Consumption of medicinal plants, cultural habits, Erzurum, health, Tobit model

INTRODUCTION

The use of plant science for the treatment of people in Anatolia dates back to 12th and 13th centuries [1]. However, self-treatment by plants is as old as the history of humanity [2]. Plants are usually needed for the health of humans, other plants, and animals, and also many plants are used for medicine, cosmetic, beverage, cleaning staff, and other purposes [3, 4, 5]. Nevertheless, medicinal plant use in countries is related to flora availability. Turkey is one of the richest countries regarding its native flora with 12000 species, equivalent to the entire European continent [6]. Therefore, field works made in Turkey has a substantial place in the world literature. Countries which have rich plant flora use this advantage in international trade. About 350 plant species are thought to be imported and exported throughout the world [7]. These plants attract consumers regarding health and create considerable consumer demand.

Interest in conventional medicine particularly for treatment of cancer, diabetes, and such important illnesses is growing day by day, while in cases of costly treatments and for flu and unimportant illnesses, medicinal plant use is extensive [8]. Particularly, in the majority of undeveloped countries, medicinal plant use is more common, where the use of medicinal plant increases up to 90-100% [9]. In developing countries, traditional medicine or use of medicinal plants depends on the environment in which people live and the cultures by which they are impressed [10, 11]. Some consumers have shifted towards alternative or complementary medicine for reasons such as the curing effect of medicines on the one hand, and other problems they cause in the long run as side effects on the other hand. Usually, they are unable to find exact solutions, or it takes too much time even when a solution is possible [12].

Positive statements of scientists on medicinal plants in recent years have increased the market share of medicinal plants and related products by increasing the demand for them [13]. However, it is still controversial whether the experiences of medicinal plant experts with these plants are efficient for the treatment of some diseases [14, 15]. The number of medicinal herb sellers is around 6000, and most of them consist of people with low level of education [13]. Therefore, scientists inform the society on the means of mass media that unconscious and overuse of medicinal plants do more harm than good and that it is necessary to use them consciously. Today most people are not knowledgeable enough about the fact that medicinal plants are helpful as long as they are used consciously and sufficiently.

This study aims to determine the factors influencing students' consumption of medicinal plants. Also, the study investigates whether the level of education is effective in the use of medicinal plants in addition to cultural and regional factors.

MATERIALS AND METHODS

Materials. Data for this study was collected from 445 students in the main campus of Ataturk University through face to face interviews in 2016. Both primary and secondary was used for the study. Secondary data was sourced from related literature, internet sources and country level statistics.

Methodology. A Tobit model was used to analyze the data. Limdep 5.0 software was employed to analyze the model.

Sampling Method. The equation used to determine the sampling size is given below [16];

$$n = \frac{Np(1-p)}{(N-1)\sigma_{px}^2 + p(1-p)} \quad (1)$$

At this moment;
n : Sampling size,
N: Number of current students in the central campus of Ataturk University (29600),
P :Rate of conscient students (50%),
σ_{px}^2 :Variance (0.000650771),
r : Deviation (5%),
$Z_{\alpha/2}$: z or t scale value=1.96,
Variance: $(r/Z_{\alpha/2})^2$=0.000650771
According to the preliminary study carried out in October 2015, there were about 29600 students studying in the central campus of Ataturk University, and the sampling size was calculated as 380 by 95% confidence interval and 5% error margin. Given that some questionnaires may have missing information; the number of questionnaires was raised to 400 by 5%. Moreover, the sampling size was found less than 10 in some faculties, so the number was increased to 10 questionnaires. As a result, 445 questionnaires were used in the study.

Statistical Methods Used in the Study. Likert scale. First developed by Rensis Likert, Likert scale is a scale of attitudes and behaviors ranked by people. Respondents are asked to make some decisions and statements on an agreement level [17, 18, 19]. The scale may be 3, 5, or 7-point type [20]. For example, in 5-point type, which is commonly used, it is ranked as 1, never; 2, rarely; 3, sometimes; 4, often; and 5, always [21]. In this study, 5-point Likert type was used to evaluate students' demand for medicinal plants.

Factor analysis. Factor analysis is an analysis method that sums up features of multiple variables with certain information loss [22, 23, 24]. The primary purpose of this analysis is to name and interpret variables with the least loss of information [21]. Considering the agreement points of Likert Scale, variables that are treated with factor analysis generate coefficients according to common features [25, 21]. In this study, the coefficient obtained from factor analysis was treated in Tobit model as an independent variable.

Tobit analysis . Tobit model was developed by Tobin [26]. It is used to identify relationships between a nonnegative dependent variable and a set of independent variables. Unless there are nonconsumers in the sampling, data evaluation by Tobit model reveals significant results [27]. Tobit method may also consider censored dependent variables [28, 29]. The model is used to determine the extensive effect of demographic factors on consumption [29, 30]. The formula of Tobit model is as shown below:

$$y_i^* = \beta x_i + u_i \text{ i=1,…, n} \quad (2)$$

At this moment, x_i is an to explanatory variable β is an unknown coefficient and ε_i is error term. The correlations also include random effects. y_i^* shows unobservable latent variables [31].

$$y_i = \begin{cases} 0, & \beta x_I + \varepsilon_i < 0 \\ y_i^*, & \beta x_I + \varepsilon_i > 0 \end{cases} \quad (3)$$

If y_i^* the function is equal to or less than zero, then y_i is unobservable. So the function is equal to zero and if the function y_i is greater than zero, y_i will be equal to y_i^* and this equality, $\varepsilon_i \cong N(0, \sigma^2)$, gives the explanation of the tobit model [31, 27].

FINDINGS AND DISCUSSION

Socio-Economic and Demographic Characteristics of the Consumers. Table 1 demonstrate average monthly expenditure of students for accommodation 195.22 TRY, minimum 0 TRY, and maximum 800 TRY, as for watching TV, the average is 1.90 hours, the minimum is 0 and maximum is 10 hours. Average internet use of students is 4.94 hours; minimum is 0 and maximum is 12 hours. Facebook and twitter connection of students are 2.67 hours minimum is 0 and maximum is 10 hours. Average sleep duration of respondents is 7.62 hours; minimum is 4 and maximum is 11 hours. Yearly going to hospital average is 3.57 times, minimum 0 and maximum 36. Weighted General Point Average (WGPA) of students is 2.64 of 4, minimum 1.13 and maximum 4.00.

TABLE 1
Selected Characteristics of respondent students

Factors	Mean	SE	Min	Max
Accommodation expenses (TRY/month)	195.22	183.31	0.00	800.00
Watching TV (hours/day)	1.90	1.85	0.00	10.00
Internet use (hours/day)	4.94	3.16	0.00	12.00
Spending time on Facebook and Twitter (hours/day)	2.67	2.70	0.00	10.00
Sleep duration (hours)	7.62	1.42	4.00	11.00
Frequency of hospital visits (times/year)	3.57	3.80	0.00	36.00
WGPA	2.64	0.48	1.13	4.00

* SE: Standard Error, Min: Minimum, Max: Maximum

TABLE 2
Some socio-economic and demographic features of students and parents

Factors	Mean	Se	Min	Max
Educational status (formal:1 and evening:2)	1.29	0.46	1	2
Class level (2-3-4)	2.90	0.79	2	4
Number of household (person)	5.16	1.67	1	13
Gender of respondent (male:1 and female:2)	1.60	0.49	1	2
Age of respondent (years)	21.53	1.98	18	31
Education of respondent (years)	14.98	0.98	12	19
Height of respondent (meter)	1.69	0.09	1.50	1.96
Weight of respondent (kg)	62.73	12.33	40.00	114.00
Income of household (TRY)	2974.36	1753.9	800	10000
Average expenditure of student (TRY)	670.94	385.87	100	4000
Residence of a student in Erzurum Province (University dormitory: 1, Private dormitory: 2, Sharing a flat with friends:3 and Staying with family:4)	2.62	1.26	1	4
Age of mother (years)	47.00	5.59	38	68
Age of father (years)	51.07	5.75	38	70
Education of mother (years)	6.78	4.03	0	22
Education of father (years)	9.30	4.19	0	22

* Se: Standard Error, Min: Minimum, Max: Maximum

As a result of a random selection process, 29% of the students were from evening education, while 71% were from formal education. Furthermore, the number of students from 2nd, 3rd and 4th classes were close to each other, though the number of students from 2nd and 3rd classes was slightly more. 163, 162 and 120 students from 2nd, 3rd, and 4th classes respectively were interviewed. While the average household population was 5.16, minimum and maximum populations were 1 and 13 respectively. The sampling of the study consisted of 40% males and 60% females. The average age of the respondents was 21.53 and ranged from 18 to 31. Average education duration of respondents was 14.98 years (minimum 12 and maximum 19). The average height of the students was 1.68m (minimum height 1.50m and maximum height 1.90m). The average weight of the students was 62.73 kg (minimum 40 kg and maximum 114 kg). Average households income was 2974.36 TRY. Minimum and maximum incomes were 800 TRY and 10000 TRY, respectively. Monthly average expenditure of students was 670.94 TRY, while minimum expenditure was 100 TRY and maximum was 4000 TRY. The reason why the minimum expenditure was so low was that those individuals lived together with their families. As for 4000 TRY maximum expenditure, the underlying reason was that those students either worked as an officer or they were employed in private sector. The residence of the students was 2.62 on average. Minimum and maximum values were one and four respectively, which means almost 40% of students stayed with their families. The average age of the students' mothers was 47. Minimum and maximum ages were 38 and 68. Also, mothers of two students were not alive. The average age of students' fathers was 51.07 and minimum, and maximum ages were 38 and 70, respectively. 8 of the fathers had passed away. The average duration of education for mothers was 6.78 years (minimum 0 and maximum 22 years), whereas it was 9.30 years for fathers (minimum 0 and maximum 22).

Correlation between Medicinal Plant Use and Demographic Factors. Some demographic, economic, social variables and independent variable were analyzed by using Tobit model. Description of variables, means, and standard deviation are given in Table 3.

TABLE 3
Variables used in Tobit model for medicinal plant use

Abbreviation	Description of Variables	Mean	Sd.
MEDPLAN	Medicinal Plant Use If Yes: 1, No: 0	0.56	0.49
HEALTHF	Faculty Category Health Faculty: 1, Others: 0	0.049	0.21
FEDUCAT	Formal Education: 1, Secondary Education: 0	1.29	0.46
THREECL	3rd Class Student: 1, Others: 0	0.36	0.48
HOUSEH	Number of Households (1-13 persons)	5.16	1.67
MOTHEDU	Education of Mother (years)	6.78	4.03
MOTHJOB	If Mother works: 1, Not: 0	5.63	0.34
FATHEDU	Education of Father (years)	9.30	4.19
GENDER	Male: 1, Female: 0	0.40	0.49
AGE	Age of Student (18-31 years)	21.53	1.98
EDUCAT	Education of Student (years)	14.98	0.98
INCOME	Income of Student (TRY/month)	626.27	0.98
REGION	Region Categorical, Northeast Anatolia Region (Erzurum, Agri):1, Others: 0	0.50	0.49
MINTLEM	Mint-Lemon Consumption: 1, If Not: 0	0.76	0.42
FRUITJU	Fruit Juice Consumption: 1, If Not: 0	0.79	0.40
SAGETEA	Sage Tea Consumption: 1, If Not: 0	0.42	0.49
ROSETEA	Rose Hip Tea Consumption: 1, If Not: 0	0.55	0.49
CIGARE	Cigarette Consumption: 1, If Not: 0	0.31	0.46
RESIDEN	Residing with family: 1, Others: 0	0.36	0.48
F2	Factor Analysis Coefficient, (Medicinal Plant Preference)	0.00001	0.99
INTNET	Internet Use (hours/day)	4.94	3.15
SPORT	Doing Sport Duration (hours/day)	0.32	0.78
NORMBMI	Normal Body Mass Index: 1, Others: 0	0.35	0.47
CHRONIC	Chronic Illness: 1, If Not: 0	0.08	0.28
SLEEP	Daily Sleep Duration (hours/day)	7.62	1.42
WGPA	Weighted General Point Average	2.64	0.48
FAMLYMP	Medicinal Plant User In Family: 1, If Not: 0	0.63	0.56
SSI	Health Insurance. Social Security Institution: 1, Others: 0	0.52	0.49
BOOKREA	Book Reading Habit: 1, If Not: 0	0.79	0.40
FRIENDN	Close Friend Number of Student (person)	0.80	0.39

Sd: Standard deviation

TABLE 4
Effective factors on medicinal plant use

Variables	Tobit Analysis		Marginal Effects	
	Coefficient	Standard Error	Coefficient	Standard Error
CONSTANT	-1.41**	0.58	-	-
HEALTHF	-0.43***	0.15	-0.33***	0.11
FEDUCAT	-0.15**	0.06	-0.11**	0.05
THREECL	0.14**	0.06	0.10**	0.04
HOUSEH	0.01	0.02	0.001	0.01
MOTHEDU	0.01	0.01	0.001	0.01
MOTHJOB	-0.04	0.09	-0.03	0.07
FATHEDU	0.01*	0.01	0.01*	0.01
GENDER	-0.07	0.06	-0.05	0.05
AGE	0.001	0.02	0.001	0.01
EDUCAT	0.01	0.03	0.01	0.02
INCOME	0.001	0.001	0.001	0.00
REGION	0.12*	0.07	0.09*	0.06
MINTLEM	0.29***	0.08	0.22***	0.06
FRUITJU	-0.22***	0.07	-0.17***	0.06
SAGETEA	-0.04	0.07	-0.03	0.05
ROSETEA	0.11*	0.06	0.08*	0.05
CIGARE	-0.10	0.07	-0.07	0.05
RESIDEN	-0.13*	0.08	-0.10*	0.06
F2	0.15***	0.03	0.11***	0.02
INTNET	0.01	0.01	0.01	0.01
SPORT	-0.001*	0.00	-0.001*	0.001
NORMBMI	-0.03	0.06	-0.02	0.04
CHRONIC	-0.08	0.09	-0.06	0.07
SLEEP	0.02	0.02	0.01	0.02
WGPA	0.07	0.06	0.06	0.05
FAMLYMP	1.16***	0.08	0.87***	0.05
SSI	0.09*	0.06	0.07*	0.04
BOOKREA	-0.05	0.07	-0.03	0.05
FRIENDN	-0.02	0.07	-0.01	0.05

* $\alpha=0.10$ ** $\alpha=0.05$ *** $\alpha=0.01$

Tobit Analysis and Marginal Effects of Factors influencing Medicinal Plants Use. Marginal effects of factors influencing medicinal plant use are given in Table 4. Marginal effects of statistically significant variables in the table were commented. During the investigation of factors affecting medicinal plant use of students, it was determined that 56% of the students consumed medicinal plants for some reasons and demographic variables did not show a difference regarding medicinal plant use, a finding that is in parallel with the related literature. Cetin [32] reported that more people tried medicinal plants or alternative medicine compared to the past, and that demographic variable did not significantly affect these facts. Also, in a study carried out on medical students by Ameade et al. [33], it was stated that demographic factors did not influence medicinal plant and alternative medicine use. On the other hand, Mollee et al. [34] remarked that region was a significant variable in the use of medicinal plants, unlike gender.

The students of health faculty were found to consume 33% less medicinal plants than the students of other faculties. Moreover, this was significant at $p<0.01$. Education level increased students' confidence in medicinal treatment methods. However, it decreased students' interest in alternative medicine and other methods. Ameade et al. [33] found similar results in their study carried out on 2nd, 3rd, and 4th class medical students. Besides, it was determined that 60% of medical faculty students not use medicinal plants and 63.6% of them considered herbal tea a medicinal plant in the first place. According to the study of Araz et al. [35] which was conducted on nursing students, herbal tea was the most preferred alternative treatment method other than conventional medicine methods.

Medicinal plant use of formal students was 11% less than evening students. This finding was found to be statistically significant ($p<0.05$). Because many evening students work during the day and study in the evenings, they get more tired, and this may cause them to consume herbal tea. On the other hand, in the evening students may not have time to go to the hospital because of their busy schedule, and this might make them consume more medicinal plants. Another factor leading evening students to consume more medicinal plant was age. Evening students were older than formal students, and their consumption habits were different. Ari and Yilmaz [36] had a different approach and determined that medicinal plants be beneficial to eliminate tiredness and similar problems of office workers. Cetin [32] revealed that as conventional medicine became harder to reach, individuals shifted towards medicinal plants. The findings of Mollee et al. [34] were similar to the results of this study. They found that individuals aged over 50 whose health index decreased consumed more medicinal plants. Another study considering age for medicinal plant use was carried out by Alzweiri et al. [37]. This study found that as individuals get older medicinal plant use increased as well. However, age intervals of both studies were higher when compared to this study.

Junior students' use of medicinal plants was 10% higher than that of the other students. It was statistically significant at $p<0.05$. Students needed time for adapting to this different culture and region. When they were junior students, recognition of the environment, promotion of the relationships among friends, and participation in some social activities helped them to acquire certain habits. While these habits were generally bad habits such as smoking, alcohol consumption, etc., sometimes they could be about herbal teas thanks to the information about medicinal plants given in some courses that students were taking. While students' use of medicinal plants showed a constant increase until third grade, it indicated a bit of decrease in fourth grade. The marginal benefit in the consumption level of the junior students was 0 as it was in the law of diminishing returns. Abdelmalek et al. [38] expressed this situation as follows: there were three pharmacy programs on plants and medicinal plants for junior pharmacy students, for this reason, they had more information about medicinal plants than other students.

As the education level of the students' fathers increased by one year, students' use of medicinal plants increases by 1%, which was found to be statistically significant at $p<0.10$ level. While the demographic factors were not influencing the use of medicinal plants, cultural and regional features influenced their consumption. Two points were influential in this situation. One of them was that being from the TRA region (Erzurum-Agri subregion) increased medicinal plant preference by 9%, which was statistically significant at $p<0.10$. The other was the consumption of medicinal plants by one of the family members, which increased the use of medicinal plants by 87%. It was also determined to be statistically significant at $p<0.01$. The finding of the current study that regional and cultural features were influential in the use of medicinal plants was in line with the findings of other studies. These studies were conducted inside and outside Turkey [39, 32, 10, 9, 38, 36, 34].

The medicinal herbal tea preference of students who had already been consuming medicinal herbal teas was 11% more. It was statistically significant at $p<0.10$. As mint and lemon tea consumption of students rose, the use of medicinal herbals increased by 22%. It was also found to be statistically significant at $p<0.10$. Students consuming rose hip tea preferred medicinal plants 8% more than those who did not consume it, which was statistically significant at $p<0.10$. Increase in students' consumption of 1 unit juice reduced the use of medicinal herbals by 17%. It was also determined

to be statistically significant at $p \leq 0.10$.

Staying with family reduced the preference for medicinal plants by 10%, which was statistically significant at $p \leq 0.10$. It was because when individuals staying with their families got sick, parents usually took them to the hospital as the first choice. Also, when students stay with their family, they usually consume black tea instead of herbal tea. It is known that black tea is consumed more than water in the region. Ameade et al. [33] and Ari and Yilmaz [36] stated that herbal tea was the most preferred medicinal plant. Okigbo et al. [8] pointed out that individuals preferred medicinal herbal tea when they did not feel well, especially when they got the flu. In the study, the influence of medicinal herbal tea consumption on students' use of medicinal plants was more than expected. Medicinal herbal teas are both a part of medicinal plants group and are also easy to reach when students are sick.

Having social security increased student's medicinal plant consumption by 7%, which was statistically significant at $p \leq 0.10$. A major reason of this was that students preferred medicinal herbals due to their low cost and that they were used as a traditional treatment method when they got sick because of students' low level of income and residence in rural regions. As Cetin [32] stated, in difficulty treatment and its cost directed receiving individuals to medicinal plants as one of the alternative medical treatment methods.

Doing sports reduced the use of medicinal plants by 0.1% for every extra hour. It was found to be statistically significant at $p \leq 0.10$. Doing sports makes people healthier, and as a result, the frequency of hospital visits goes down. Also, individuals doing sports usually prefer cold fizzy drinks or energy drinks. Researchers state that children and young people doing sports usually prefer some cold drinks to quench their thirst [40, 41, 42].

RESULTS AND SUGGESTIONS

The use of medicinal plants, which is highlighted with the means of mass media as providing solutions to health problems, has increased in recent years. Even though there is a general belief towards the favorable outcomes of medicinal plants in the treatment of some diseases, it is essential to use the appropriate plant at the right time at the right amount by considering directions of medicinal plant experts. Information about medicinal herbs is usually obtained from the seller called as "Aktar" and how much information these people have about medicinal plants is arguable.

This study on university students is thought to be effective in training more conscious and healthier individuals in the following years. While demographic factors were found to be insignificant in the use of medicinal plants in general; environmental, regional, and cultural factors were found to be important as it is the case in most of the studies about the use of medicinal plants. Also, it was found that it was meaningful for students to gain experience in medicinal plants during their education and training. For this reason, it is necessary to provide informative activities by relevant experts in every faculty and every semester so that students can learn the benefits of medicinal plants and use them properly.

The most important factor in the use of medicinal plants by the university students was getting sick. The use of medicinal plants in like flu diseases increases due to such reasons as financial problems and lack of free time. Students mostly consume mint-lemon and rose hip tea in such cases.

Doing sports, being a student in a health faculty, and receiving a formal education affected students' medicinal plant use adversely. The positive attitudes of these students towards traditional medicine reduced their medicinal plants used as alternative medicine. The fact that students receiving evening education worked during the day and attended classes in the evening lowered the possibility of hospital visits. For this reason, they used medicinal plants more than regular students. In addition to these, another factor reducing the use of medicinal plants was that students were generally healthy. Nutrition and sports were two important points in the wellness of the students. It is generally known that the probability of catching such as flu, cold, etc. diseases for individuals who keep a balanced diet and do sports is low.

Finally, students with social security consumed more medicinal plants compared to the others. The reason for that was because families with this social security were in lower economic classes and mostly lived in the countryside. Therefore, students coming from such families traditionally more preferred medicinal plants, they are more affordable. In order to raise awareness, students should be provided necessary information about the importance of going to the hospital and about the benefits and possible damages of medicinal plants as an alternative treatment.

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