

Pattern of garlic use among Ethiopian immigrants in the United States

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OBJECTIVE: To determine sociodemographic factors that affect the use of garlic among Ethiopian immigrants in the United States of America (USA).

METHODS: A cross-sectional survey was carried out to determine the pattern of garlic use among 355 Ethiopian immigrants in the USA. Descriptive statistics were utilized to characterize the sample regarding gender, age, education, income and length of residency in the USA. Binary logistic regression analysis was used to determine which factors were associated with use of garlic. Multivariate logistic regression was utilized to evaluate which characteristics predicted use of garlic after adjusting for other variables.

RESULTS: A binary logistic regression analysis showed that gender,

education and annual family income were predictive of garlic use. Females were about 2.2 times more likely to use garlic than males. Survey participants with some college or associate degree level education had 2.3 times greater odds of using garlic than those with only high school education. Participants with household incomes greater than \$100,000 are 0.36 times less likely to use garlic than those with incomes in the range \$0 to \$50,000. Similar pattern was observed in a multivariate analysis.

CONCLUSION: Characteristics such as gender, education and income have significant association with garlic use and can be helpful for predicting which socio-demographic groups of Ethiopian immigrants are more likely to use garlic.

Key Words: CAM; Ethiopian immigrants in the USA; Garlic; Socio-demographic characteristics

INTRODUCTION

Garlic, *Allium sativum*, is a pungent-tasting plant in the family Liliaceae and is one of the oldest cultivated plants that is used for as a food ingredient and medicine. It is native to Middle Asia and may have originated from West China. Its use was well documented by many ancient civilizations such as the Chinese, Romans, Egyptians and Greeks. Evidence suggests that garlic has been cultivated as far back as over 5,000 years ago (1). Today, the US Department of Agriculture states that no other vegetable exhibits a sustained demand in growth as large as garlic. From 1980 to 1990, per capita consumption of garlic increased from 1.3 pounds to 3.3 pounds, respectively (2). The total value of garlic exports from the US exceeded \$20 million as of 2017 (3). Prices have varied over time from \$24.49 per centum weight (cwt) in 2004 to \$76.70 per cwt in 2015 (4). Globally, China is the largest producer of garlic, accounting for 70 percent of total garlic exports. Much of the increase in demand of garlic can be attributed to the promotion of health benefits (3). Traditionally, garlic has been used for various health problems such as Alzheimer's, cancer, ringworm, obesity and high cholesterol. Currently, there are numerous studies which document the health benefits of garlic. Scientific data shows that sulfur compounds formed when garlic cloves are chopped, crushed, or chewed, cause the benefits associated with garlic. These compounds (allicin, diallyl disulfide and sallyl cysteine) exert potent biological effects (5). Garlic is widely used for its blood pressure lowering properties. Two randomized controlled trials have compared garlic to a placebo in patients with hypertension (6). Both studies indicate that garlic has a blood pressure lowering effect. A 2014 study found garlic to be useful for the common cold, and a 2016 meta-analysis demonstrated an inverse association between garlic intake and cancers of the upper digestive tract (7,8). Laboratory evidence suggests that garlic also has antibacterial and antiviral properties (9). In contrast, patients are advised to be cautious of the possible adverse effects associated with garlic consumption, most notably platelet aggregation (5). Each culture and ethnic group maintains a unique set of values and traditions that are often maintained with each generation. These traditions have a significant impact on health behaviors and patients'

compliance with health care interventions. Unfortunately, there is little evidence describing how underserved minority groups use complementary and alternative medicine (CAM). Data from the 2007 National Health Interview Survey (NHIS) shows that 50.3% of American Indians, 39.9% Asians, 25.5% African-Americans and 23.7% Hispanic-Americans used CAM therapy in the previous 12 months (10). A survey of CAM use among Ethiopian immigrants in the USA indicated that about 57.5% of the surveyed population used CAM, with garlic being the most commonly used herb. Nearly 55% of these CAM users failed to disclose their usage to their health care provider (11). Prior to this study, the extent and pattern of garlic use among Ethiopian immigrants in the USA has not been reported. In this paper, we describe the use of garlic in this population and the socio-demographic factors that influence and determine its use.

METHODS

A cross-sectional study design was utilized to evaluate factors that predict garlic use among Ethiopian immigrants in the USA. Participants were recruited using SurveyMonkey®, online websites such as People to People (P2P) Inc, USA, and through flyers distributed among Ethiopian communities around the metropolitan Washington DC area. The data collection was completed between April to August of 2016. Initially, a pilot survey designed to gather information regarding the use of complementary medicine was administered to a group of randomly selected Ethiopians. Feedback from these participants was used to develop the final version of the survey for data collection. The study was approved by the Institutional Review Board of Howard University. The primary dependent variable was the use self-reported use of garlic. Independent variables included gender, age, education, annual family income, and length of residency in the U.S. Descriptive statistics included means and percentages for continuous and categorical variables respectively. Simple and multiple logistic regression analyses were conducted to evaluate the predictors of garlic use. Both adjusted and unadjusted odds ratios (ORs) for logistic regression models with 95% confidence interval were reported. All analyses were performed using the Statistical Package for Social Sciences (SPSS) for Windows version 23 at an alpha level of 0.05.

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RESULTS

Descriptive statistics for overall sample

A total of 355 participants were recruited in the study. Approximately 40% of the overall sample was between 18 to 40 years old and nearly 44% of the sample was 41 to 60 years old. The majority of respondents (60.6%) were male. Nearly 58% of the sample had a household income of at least \$50,000. Over 62% of the sample had at least a bachelor's degree. Over half (52.2%) of the participants had been in the U.S. for at least 15 years (Table 1).

Descriptive statistics for those using garlic

There were 164 individuals in the study who self-reported use of garlic which represented over 46% of the sample. At least 40% of the respondents in each age group used garlic. When evaluated according to gender, nearly 39% of the males and almost 58% of the females reported using garlic. Among those with family income less than \$100,000, more than half of respondents reported using garlic, however, less than 30% of those with family incomes over \$100,000 reported using garlic. When evaluated according to education level, the use was most frequent among those with some college education or an associate degree. Approximately 45% of the respondents in each residency category reported using garlic.

In the bivariate analysis, gender, education, and annual family income were predictive of garlic use (Table 2). Females had 2.15 times higher odds of using garlic than males (95% CI=1.39-3.33 and $p = 0.001$). Participants with some college education or an associate degree had 2.31 times higher odds of using garlic compared to those who have no higher than a high school education (95% CI=1.09-4.90 and $p = 0.030$). Participants with annual household incomes above \$100,000 had 0.36 times less odds of using garlic compared

TABLE 1

Demographic and social characteristics of Ethiopian immigrant respondents using garlic*

Variables	Overall sample using CAM	Number using garlic (n=164)	Prevalence of garlic use
	Frequency (%)	Frequency	(%)
Age			
NR	3 (0.8)	3	100
18 to 40	140 (39.4)	62	44.3
41 to 60	156 (43.9)	76	48.7
Above 60	56 (15.8)	23	41.1
Gender			
NR	5 (1.4)	2	40
Male	215 (60.6)	84	39.1
Female	135 (38.0)	78	57.8
Annual family income			
NR	10 (2.8)	2	20
\$0 - \$50,000	140 (39.4)	75	53.6
\$50,001- \$100,000	100 (28.2)	56	56
Over \$100,000	105 (29.6)	31	29.5
Education level			
NR	6 (1.7)	1	16.7
<12 th grade to high school/GED	45 (12.7)	15	33.3
Some college to Associate degree	83 (23.4)	45	54.2
BA/BS ³ or higher	221 (62.3)	103	46.6
Length of stay in US			
NR	6 (1.7)	2	33.3
Less than a year to 5 years	60 (16.9)	27	45
6-15 years	103 (29.0)	52	50.5
>15 years	186 (52.2)	83	44.6

*NR= Not Reported; GED = General Equivalency Diploma; BA/BS = Bachelor of Arts/Bachelor of Science

TABLE 2

Binary logistic regression of predictive factors of garlic use among Ethiopian immigrants to the USA

Sociodemographic characteristics	OR (95% CI) for garlic use	P*
Gender		
Male	1 (referent)	
Female	2.15 (1.39-3.33)	0.001*
Age		
18 to 40	1 (referent)	
41 to 60	1.21 (0.77-1.91)	0.413
Over 60	0.90 (0.47-1.66)	0.711
Education		
Less than 12 th grade to high school diploma or GED	1	
Some college or associate degree	2.31 (1.09-4.90)	0.030*
Bachelors or master's degree	1.75 (0.89-3.43)	0.105
Annual family income		
\$0 to \$50,000	1 (referent)	
\$50,001 to \$100,000	1.08 (0.65-1.80)	0.773
Above \$100,000	0.36 (0.21-0.62)	<0.001*
Length of stay in U.S.		
Up to 5 years	1 (referent)	
6 to 15 years	1.22 (0.65-2.31)	0.537
Over 15 years	0.99 (0.55-1.77)	0.959

AOR=Adjusted Odds Ratio; CI=Confidence Interval; GED=General Equivalency Diploma; U.S.=United States; * p -values<0.05 are significant.

to those with annual household income range of \$0-\$50,000 (95% CI=0.21-0.62 and $p<0.001$).

In a multivariate regression analysis, females had 2.43 times higher odds of using garlic than males after adjusting for other variables (95% CI=1.49-3.95 and $p<0.001$). Participants between ages 41- 60 had 2.23 times greater odds of using garlic than those between ages 18-40 years, adjusted to all other variables (95% CI=1.24-4.00 and $p = 0.007$). Participants with some college education or an associate degree had 2.55 times higher odds of using garlic compared to those with no more than a high school diploma after adjusting for other variables (95% CI= 1.11-5.84 and $p = 0.027$). Respondents with a bachelor's or master's degree had 4.07 times higher odds of using garlic than those with no more than a high school education (95% CI= 1.74-9.53 and $p = 0.001$). Respondents with incomes greater than \$100,000 had 0.20 times the odds of using garlic compared to those with annual household incomes up to \$50,000 after adjusting for other variables (95% CI= 0.1-0.41 and $p<0.001$) (Table 3).

DISCUSSION

Allium sativum, commonly called garlic, is a well-known plant used for both as a food ingredient and medicine for centuries in all cultures and countries. Some of the health-related illnesses garlic is believed to have benefits for include cancer, obesity, hyperlipidemia, hypertension, and Alzheimer's disease. In Ethiopia, as in many other countries, garlic has been an important cash crop, and its economic significance is also quite considerable. Medicinally, it is used for several health complaints, such as common cold, malaria, cough, lung TB, hypertension, wounds, sexually transmitted diseases, asthma and parasitic infections (12). Many Ethiopians who immigrate to the USA adopt a new style of living and culture to fit into the society. However, some of the cultures and habits may persevere, despite changes within the immigrant populations. One issue, for example, is the use of traditional or herbal medicine in managing their health-related problems. The pattern of garlic use was the focus of this study. Garlic is rated as the most commonly used herb among the 355 survey participants. A total of 167 participants (57.5%) reported they used garlic within at least the past 5 years. We analyzed demographic factors as potential predictors of frequency

TABLE 3
Multivariate logistic regression of predictive factors of garlic use among Ethiopian immigrants to the USA

Sociodemographic characteristics	AOR (95% CI) for garlic use	p*
Gender		
Male	1 (referent)	
Female	2.43 (1.49-3.95)	<0.001*
Age		
18 to 40	1 (referent)	
41 to 60	2.23 (1.24-4.00)	0.007*
Over 60	1.67 (0.78-3.57)	0.187
Education		
Less than 12 th grade to high school diploma or GED	1 (referent)	
Some college or Associate degree	2.55 (1.11-5.84)	0.027*
Bachelors or Master's degree	4.07 (1.74-9.53)	0.001*
Annual family income		
\$0 to \$50,000	1 (referent)	
\$50,001 to \$100,000	0.68 (0.37-1.27)	0.227
Above \$100,000	0.20 (0.1-0.41)	0.000*
Length of time in U.S.		
Up to 5 years	1 (referent)	
6 to 15 years	1.57 (0.76-3.26)	0.224
Over 15 years	1.00 (0.47-2.15)	0.992

AOR=Adjusted Odds Ratio; CI=Confidence Interval; GED=General Equivalency Diploma; U.S.=United States *p-values<0.05 are significant.

of garlic use among the study participants. The factors included age, gender, educational and income levels, and length of stay in the US. Except length of stay, all other factors were found to be significant predictors of use. Length of stay in the USA was categorized into the following three groups: up to 5 years; 6-15 years; and over 15 years. There was no significant difference in the rate of garlic use among these groups. In contrast, gender was found to be one the predicting factors. Females had 2.15 times higher odds for using garlic compared to males. Even after adjusting for other variables, females still had 2.43 times greater odds of using garlic than males. Although not specifically tied to garlic, this finding is also consistent with results from other studies when compared with general use of traditional medicine. For example, Shih and colleagues reported that women had a higher average traditional medicine use frequency than men (1.55 visits vs. 1.04 visits, p<0.001) [13]. The difference remained significant even after excluding gender-specific diseases (1.43 visits vs. 1.03 visits, p<0.001). They also reported that the average traditional medicine use frequency was significantly higher in women than in men across all age groups (13). In a multivariate analysis, participants older than 40 years of age had more than twice higher odds of using garlic. The concomitant use of prescription medications and herbal products by older adults is also common in the US, as well as in other countries (14). In general, older age tends to engender health problems, and thus a trend may be seen to seek more therapeutic options. However, the major issue in using herbs in the elderly is the potential for herb-drug interactions, and hence may pose a problem in this population. In a multivariate analysis, the level of education played a significant role in the frequency of garlic use in our study. Participants with some college education or associate degree had 2.55 times greater odds of using garlic compared to those with no more than a high school diploma after adjusting for other variables. The odds ratio was found to be even higher for those with bachelor's or higher degrees. Respondents with a bachelor's or master's degree had a 4.07 times higher odd of using garlic compared to those with no degree. Similarly, a study that included over 25,000 survey respondents from 50 States and the District of Columbia reported education to be significantly associated with a higher use of herbal medicine use (p<0.001) (15). More education may result in having greater knowledge of CAM therapies, such as herbs and other modalities, as well as having the ability to pay for them. On the other hand, lack of formal education may entail greater use of traditional herbal remedies due to

limited access to, less ability to pay for, or less willingness to use conventional medical care (16). Financial resources, whether income or health insurance status, can affect individuals' relative access to conventional care and the ability to pay for supplements. The bivariate analysis of our data showed that participants with annual household income above \$100,000 had 0.36 times the odds of using garlic in comparison to those with an annual household income equal to, or less than \$50,000.

LIMITATIONS OF STUDY

The study relied on data derived from self-reported information; thus, respondents may have over- or under-reported use of garlic. In addition, the survey did not differentiate between garlic use as part of diet during food preparation and garlic supplements for medicinal use in tablet or capsule formulations. The frequency of garlic use by each survey participant was not also determined in our study.

CONCLUSION

A bivariate logistic regression analysis showed that gender, education and annual family income were predictive of garlic use. Females were about 2.2 times more likely to use garlic than males. Survey participants with some college or associate degree level education had 2.3 times greater odds of using garlic than those with only high school education. Participants with household incomes greater than \$100,000 are 0.36 times less likely to use garlic than those with incomes in the range \$0 to \$50,000. Similar pattern was observed in a multivariate analysis.

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