

An Apple a Day Keeps the Doctor Away: A Cross-Sectional Study of Apple Consumption and Physician Visits in Kashmir Valley

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ABSTRACT

Objective: To examine the relationship between daily apple consumption and avoiding the doctor.

Design, Setting, and Participants: The present research is a cross-sectional study of the Kashmiri adult population. The sample has 120 adults who are 18 above 18 years. The respondents were selected based on apple consumption. There are two groups in the sample. The first group comprises the adults who consume full Apple a day or its equivalent of 149 g are and another set of respondents constitute people who do not consume Apple. The Apple consumption of all the respondents was reported during a 24 hour recall period.

Results: From the sample of 120 participants, 12.5% (15 adults) of the respondents were identified as Apple eaters and 87.5% (105) were identified as non-apple eaters. The Apple eaters have reported high educational qualifications as compared to non-apple eaters. The respondents who consume Apple daily have shown fewer tendencies towards smoking. The raw analysis of the data reveals that daily Apple eaters are more likely to keep away from doctor. The analysis after adjustments of socio-demographic and health-related characteristics reveals that association between apple consumption and keeping a doctor away is not statistically significant. The adjustment of the analysis shows that apple eaters are successful though marginally in avoiding prescription medications; however, no difference was found hospital stays or mental illness.

Conclusions and Relevance: The results does not empirically support the assumption: an apple a day keeps the doctor away; one difference noticed between apple eaters and non-apple eaters is that apple eaters have used less prescription medications.

Importance: Fruits are beneficial for health, and the apriori wisdom claims, “an apple a day keeps the doctor away.”

Keywords: Apple, health, consumed, prescription, visits.

INTRODUCTION

The origin of epigram, “An apple a day keeps the doctor away,” has its origins in Wales. “Eat an apple on going to bed and you’ll keep the doctor from

earning his bread” was the original epigram that first appeared in a publication in 1866. It was revised in the year 1913 in the current form. Medical practice in the 19th and 20th centuries was considered as

unpolished; the popular public sentiment was to keep the doctors away. The 21st century gave rise to new sentiments effectively replacing the old sentiments. As time progressed, Apple became a symbol of health and health and healthy habits [1-4]. The economic and health benefits of Apple prompted government and private organizations to portray apple as a symbol for health and wellness [5]. The media and other special interest groups invested heavily in the promotion of Apple effectively communicating the benefits of Apple which included high fiber content, minerals, and essential vitamins and flavonoids. Flavonoid is molecular compound that is said to be beneficial in prevention of cancer [6-9]. The consumption of Apple is associated with long-term benefits such as weight loss, prevention of asthma symptoms, reduction in cancer growth, prevention of neurologic issues and improved heart health. The literature on Apple largely supports that Apple is extremely beneficial for health yet a question still persists: daily consumption of apple actually keeps the doctor away? Or consumption of apple is associated with reduced health care use? The literature on Apple supports that claim that apple certainly improves health but it is not necessary that apple consumption leads to lower health care use [10-14]. As far as relationship between consumption of apple on a regular basis consumption and use of health care services is concerned, this area is yet to receive attention of researchers.

METHODS

In this study, the researchers have used an interview schedule to study the relationship between the daily consumption of an apple and the avoidance of health care services. The data is continuous, collected from a cross-sectional population using multistage probability technique. The questionnaire was administered to the Kashmiri population which consists of regional representative estimates of health measures and detailed information on diet.

Study Sample

The respondents of this study are Kashmiri adults above the age of 18 years. The researchers interviewed 150 adults. The overall un-weighted response rate for the survey was 82.4%. The data was collected using a 24-hour dietary recall questionnaire which is an instrument to collect comprehensive data of whatever is consumed in the 24-hour period. The information on preceding 24-hour period also pertains to amount of food consumed. Before inclusion of participants

in the sample, the participants were asked if the diet in the preceding 24-hour corresponds to usual diet and those participants who answered yes were included in the final sample. The participants who provided incomplete dietary information were also excluded from the sample; therefore bringing the effective sample size to 150.

Outcome Measures

Identification of apple eaters

The participants were classified as either apple eaters or non-apple eaters based on their consumption in the 24-hour dietary recall period. The cut-off value for apple consumption was set as 149 grams/day. The consumption of 149 grams of an apple every day corresponds to consumption of at least one small apple of 7.0 cm in diameter.

In the past studies, researchers assessed potential benefits of apple consumption from various forms that includes whole apple, apple juice and applesauce. The present study has analyzed consumption of raw apple compared to processed apple through sensitivity analysis. In the further refining of sample size, 15 participants were excluded from the study whose consumption was restricted to apple juice and applesauce. Therefore, the final sample has 120 respondents.

Avoidance of health care services

In the measurement of relationship between apple consumption and keeping the doctor away, the researchers have employed self-reported use of selected health care services based on their consumption status. While interviewing the participants, the interviewers asked the respondents questions such as number of doctor visits in the preceding year. The health care visit is related to their health concerns about (excluding hospitalizations). The responses varied across 6 categories ranging from none to 13 or more.

Covariates

The covariates for the study include socio-demographic characteristics (age, educational attainment, sex, and marital status, and annual family income), body mass index, , smoking status, self-reported health status and health insurance.

Statistical Analysis

The data analysis for the study was performed in Stata version 14. The researchers have developed complex survey design methods to collect the data. These methods account for a study participant's probability of selection and clustering of study participants within primary sampling units.

The comparisons in this study are made using statistical tools like *t* test for continuous data and χ^2 test for categorical data; logistic regression was used to model the relationship between daily apple consumption and successful avoidance of health care. The primary dependent variable is avoidance of more than 1 visit to a physician in the previous year; secondary dependent variables include avoidance of an overnight hospital stay, visit to a mental health professional, and prescription medication use. The primary independent variable is daily consumption of the equivalent of at least 1 small whole apple. The adjusted models includes sex, educational attainment (high school or less vs college or more), age (continuous), body mass index (within the normal range vs overweight, or obese), and health insurance type (private vs public or uninsured), and smoking status (nonsmoker vs current or former smoker). For all analyses, we used complete case analysis and set the significance at $P = .05$ (2-sided).

RESULTS

Characteristics of Apple Eaters

Table 1 provides the information about association between various variables of apple eaters and non eaters.

Apple Eating and Avoiding Health Care Services

Fig. 1. Represents distribution of the number of physician visits in the past one year among apple eaters' compared to non-apple eaters. The analysis prior to adjustment reveals that apple eaters are more likely to keep themselves away from the doctor. The participants of the study who are daily apple eaters were more successful in avoiding prescription medications. In case of avoidance of overnight stay in the hospital, there seems to be no difference between apple eaters and non-apple eaters. (Fig. 2)

The analysis post adjustment of socio-demographic and health-related characteristics reveals different

results. After the adjustment with these variables, relationship between daily apple consumption and keeping the doctor away was no longer statistically significant. However, after the adjustment, a mild association was found between apple consumption and avoidance of prescription medications after adjustment. Apple eaters are more likely to avoid prescription medication use compared to non-apple eaters.

The analysis of potential dose-response relationship between daily apple intake and success in avoiding health care services shows no relationship between apple "dose" and the likelihood of avoiding health care services except for avoidance of prescription medications. Similarly, there was no threshold effect. However, this effect is noticed in the case of avoidance of physician visits by eaters of a medium or large apple a day [15-18].

Table 1. Characteristics of kashmiri adults 18 Years or older according to apple vs non-apple eater status^a

Characteristic	Persons, % ^b		P Value ^d
	Apple Eater (n = 15) ^c	Non-Apple Eater (n = 105)	
Socio-demographic Characteristics			
Mean age	46.3	48.8	.16
Sex			
Male	45.5	56	.64
Female	55.5	44	
Educational attainment			
≤High school	58.2	62.3	<.001
≥College	42.8	37.7	
Marital status			
Married or living with partner	62.3	60.2	.28
Divorced, separated, or widowed	5.2	8.4	
Never married	33.5	32.4	
Annual family income, \$			
<35 000	42.2	38.7	.62
35 000–74 999	40.4	39.4	
≥75 000	18.4	21.9	
Health-Related Characteristics			
Body mass index ^e			

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Reference range (<25.0)	36.1	38.0	.16
Overweight (≥25.0 to <30.0)	34.2	42.5	
Obese (≥30.0)	29.7	19.5	
Self-reported health status			.18
Excellent, very good, or good	87.5	72.8	
Fair or poor	24.5	27.2	
Smoking status			<.004
None	52.2	44.5	
Current	18.5	22.8	
Former	27.3	32.7	
Health insurance			.32
Private	34.2	31.2	
Public	8.9	11.3	
Uninsured	56.9	57.2	

^aAll summary statistics, which are weighted using complex survey design, represent national estimates. Sample is restricted to study participants who reported the quantity of food in the 24-h dietary recall period as being representative of their usual diet.

^bValues are presented as percentage of persons unless otherwise indicated.

^cApple eating was defined as consuming the equivalent of at least 1 small apple (149 g of raw apple) during the 24-hour dietary recall period.

^dt Test used to compare means and χ^2 test used to compare proportions.

^eCalculated as weight in kilograms divided by height in meters squared.

The Table also demonstrates that apple eaters had higher educational attainment and were less likely to smoke.

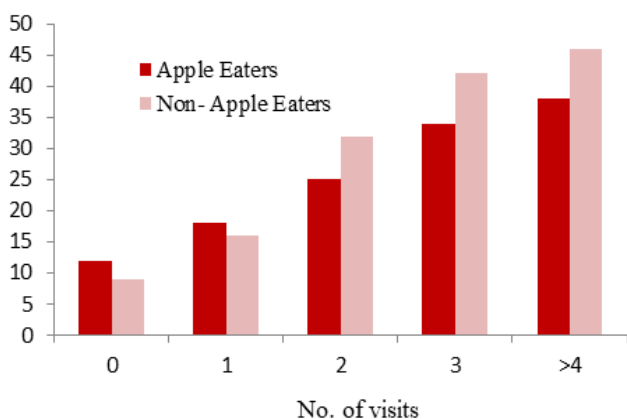


Fig. 1. Distribution of the number of physician visits

Self-reported number of visits to a physician within the previous year among Kashmiri adult apple eaters' vs non-apple eaters. χ^2 Test was used in comparison of proportions

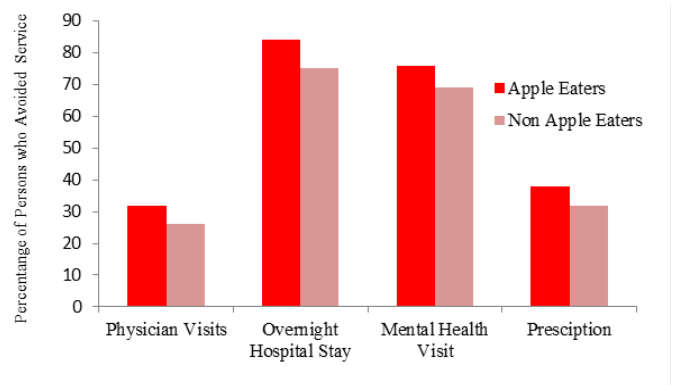


Fig. 2. Distribution of persons who avoided service

DISCUSSION

The present study of relationship between daily apple consumption and keeping the doctor away is unique in the best of our knowledge. The findings of this study may threaten the old age saying “an apple a day, keeps the doctor away.” However, the findings of this study reveal that apple consumption may limit regional health care spending. In the era of evidence-based researches, it would be more appropriate if the saying is revised as, “An apple a day keeps the chemist away.”

Our study has several important limitations. First, cross-sectional study design has limited the assessment of cause and effect in any observed relationships between daily apple consumption and successful avoidance of health care service use. However, we expect that reverse causality is highly unlikely (ie, that individuals who take no prescription medications are impelled to eat apples).

The second limitations is, though the analyses of this study includes variety of characteristics, including healthy and unhealthy behaviors, there may be huge possibility of residual confounding relationships observed between apple consumption and successful avoidance of health care services. Finally, our reliance on self-reported estimates of apple consumption may raise concerns. Estimating usual diet is clearly a challenge, and different methods entail specific tradeoffs. Evidence suggests that, at least for fruit and vegetable consumption, a single 24-hour recall is comparable with other methods such as food frequency questionnaires and repeated 24-hour dietary recalls. Although we cannot rule out

inaccurate reporting of either apple eating or health care use owing to social desirability, the likelihood of having introduced a bias away from the null appears quite low.

Some Case Studies

For last few years I was suffering from acute constipation. I visited many doctors for treatment but the medicines they prescribed were not much effective. Then one of my relatives asked me to go for unani treatment. The unani doctor gave me some sherbet and capsules to take every day before going to sleep. His treatment proved to be effective, but the problem was that I had to continuously take these medicines. If any day I forgot to take the medicine, the problem re-emerged again, which became a big concern for me. Then one day my son told me that he searched for the solution of the problem on internet and eating apples is one among them. As we have our own apple orchard, so I thought to give it a try. From last three months I am eating two apples every day, one in the morning and one in the evening. Initially I thought it will not work, but it proved to be very beneficial. I am an illiterate and do not know how actually it works, but it is a great solution for the constipation problem. Now I have even stopped taking medicines or visiting doctors because there is no need for it now. [26-30]

Cough and cold in the winter are common health issues in Kashmir because of the climate. During whole winter I used to have common cold which was very problematic. I used to take lots of medicines and also tried number of traditional methods to protect myself from this illness. One day, while talking to my friend (who himself is a doctor himself) about it, he advised me to eat one apple soaked in hot water before the dinner regularly. This winter I did as advised by him, and I felt a great relief as I hardly got common cold or cough. I also make my wife and children to eat apples so that they also do not suffer from such issues. [31-39].

When I was doing Post-Graduation in medicine, my supervisor once delivered a lecture on the health benefits of apples. The lecture was very impressive and full of information. After that lecture, I tried to investigate more on it and went through number of scientific studies conducted on it by researchers. Apples are very nutritious, rich in fiber and antioxidants and have the ability to prevent and cure various diseases. Whenever I get a patient for

whom apples could be helpful, I ask him/her to raw eat apples along with prescribing them medicines. I myself eat few slices of apple before every meal and it really works. [19-25].

CONCLUSION

Our investigation has allowed us to update the well-known proverb to clarify that, if anything, apple eating may help keep the chemist away. Were this borne out, it certainly could have health policy implications.

Consent And Ethical Approval

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors

Competing interests

Authors have declared that no competing interests exist.

Authors' Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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