

Research Article

The Association between Diet and Esophageal Cancer in Afghanistan: A Case-Control Study

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Abstract

Introduction: Esophageal cancer is one of the most common cancers worldwide. According to World Health Organization (WHO) estimates, esophageal cancer is the fourth most common cancer among Afghan men and the fifth most common cancer among Afghan women in 2018. Data on the link between diet and disease are extremely limited in Afghanistan. Therefore, we aimed to investigate the relationship between diet and esophageal cancer in Afghanistan. In this hospital-based case-control study, 84 esophageal cancer patients (newly diagnosed), and 164 controls with no history of chemotherapy or radiotherapy (due to cancer) were included. The cases and controls are aged between 20 and 75 years and matched in terms of age \pm 5 year and sex. All participants were interviewed face to face by trained female investigators using structured questionnaires. Differences in general characteristics and diet between cases and controls were examined by the t-test and chi-square test. The Binary Logistic Regression was used to examine the association between food consumption and esophagus cancer. The mean age of study participants was 55 years. The salty food 1 time or more per day 9.3 times (95% CI: 3.390-25.807), intake of meat 1 time or more per day 7.345 times (95% CI: 0.79-26.083), and pepper 1 time or more per day 2.342 times (95% CI: 0.968- 1.456) were increased the odds of esophageal cancer in Afghans population.

Conclusion: We found that high intake of salty food, pepper, and red meat positively associated with risk of esophageal cancer and the higher intake of fruits, vegetables, fish, and poultry reduce the risk of esophageal cancer in Afghans population. Further studies (e.g. cohort studies) with a large sample size are required to establish this association.

Introduction

Esophageal cancer is one of the most common cancers worldwide [1]. Esophageal cancer in men are 3 to 4 times more likely than the women in developed countries [2]. Esophageal cancer is the eighth most common cancer and the sixth leading cause of death from cancer in the world [3, 4]. According to World Health Organization (WHO) estimates, there are around 19,450 new cancer cases from 38 million populations in Afghanistan. Esophageal cancer is the fourth most common cancer among Afghan men and the fifth most common cancer among Afghan women in 2018 [5, 6]. A study in Afghanistan showed that the high incidence risk of esophageal cancer in the Uzbek and Turkmen ethnic group [7]. Several studies have been conducted on the economic burden of esophageal cancer. For instance, a study in Canada reported that the costs estimate \$50620(95%CI: \$47677 - \$53562) for esophageal cancer beyond 1 year after diagnosis [8].

Risk factor of esophageal cancer include genetic [9], sex [10], tobacco [11], alcohol [12], obesity [13], Human papillomavirus (HPV) [14], chemical exposure [15], race/ethnicity, and Dietary intake have long been

associated with the risk of esophageal cancer [16, 17]. For instance, a case-control study in Uruguay, which includes 261 cases and 522 controls showed that eating daily barbecue meat increases the risk of esophageal cancer [18]. Another case-control study showed that high intake of hot foods, fried and barbecued meats increased the risk of esophageal cancer [19]. Most of case-control studies showed that consumed fewer fresh fruits, and raw vegetables increased the risk of esophageal cancer [20, 21].

Moreover, a case-control study in South America showed that consumed hot beverage increases the risk of esophageal cancer and the high intake of fruits, and vegetables decreased the risk of esophageal cancer [22]. Several studies showed that drinking the high temperature of tea, and coffee increases the risk of esophageal cancer [23, 24]. Further, several studies found that salted meat increases the risk of esophageal cancer [25, 26]. According to a study in Uruguay showed that consumed red meat, stewed meat, and salted meat related with moderate to strong effects on the risk esophageal cancer [27]. On the other hand, most of case-control studies showed that high intake of white meat, poultry, and fish presented moderate inverse associations with esophageal cancer [28, 29]. Some studies showed that high intake of lean meat, fruits, and

raw vegetables decreased the risk of esophageal cancer [29-33]. Given these findings, it seems that the intake of fruits, vegetables, and lean meat decreased the risk of esophageal cancer. No previous study has examined the association between diet and esophageal cancer in Afghanistan. In the current study, we aimed to examine the association between diet and risk of esophageal cancer among Afghan adults.

Materials and Methods

Study Design: This is a hospital-based case-control study.

Study Participants: The case-control study was conducted (maximum one month elapsed since the detection) in the Jamhuriat hospital, Kabul-Afghanistan in the period of Jan-Nov 2018. Cases were 82 patients with esophageal cancer and 164 controls. We considered the odds ratio of 2.5. We assumed a type I error of 5%, study power of 80% ($\beta=0.20$), and the ratio of cases to controls as 1. Cases were selected from the patients who have been histologically diagnosed with esophageal cancer and have been registered in the cancer ward of the Jamhuriat hospital. Controls were selected from the patients who are admitted to other wards of Jamhuriat hospital. The cases and controls are aged between 20 and 75 years and matched in terms of age \pm 5year and sex. All cases and controls provide written informed consent. The inclusion and exclusion criteria were the following: the inclusion criterias are to have a histological diagnosis of esophageal squamous cell carcinoma in case criteria and to be insufficiently good physical and mental health to give reliable answers to the questionnaire in the case and control criteria. Those with a history of chemotherapy or radiotherapy (due to cancer) were not included in the study.

Assessment of variables: A pretested questionnaire was used which the questionnaire included information on socio-demographical factors, about age, sex, physical activity, residence (urban and rural), smoking (less than 3 cigarettes a day, 3-5 cigarettes a day, 6-9 cigarettes a day, \geq 10 cigarettes a day), family history of cancer, drink tea, fried foods, outdoor foods, salt intake, meal temperature, spicy food consumption, and drink tea. A short form of the International Physical Activity Questionnaire (IPAQ) was used for measuring the physical activity of participants. Weight and height were measured to the nearest 0.1 kg using a digital scale and tape measure with minimal clothes without shoes and standing position. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m²).

Data Collection: Open-end questions were used in the current study. During a year, the common dietary intakes of participants before the diagnosis of gastric cancer in cases, and before the interview in controls were examined. All participants were interviewed face to face by trained female investigators using structured questionnaires. The frequency of consumption was divided into four categories, which is never, 1time or more per month, 1time or more per week, and 1time or more per day. Each interview usually took about 40 or 50 minutes.

Sampling: Controls meeting our inclusion criteria were selected from the hospital population. We calculated required sample size [34]. Eligible subjects including 82 cases and 164 controls were recruited. Written informed consent was obtained from all subjects.

Statistical Analysis: Differences in general characteristics and diet between cases and controls were examined by the t-test and chi-square test. The Binary Logistic Regression was used to examine the association between food consumption and esophagus cancer. A p-value of <0.05 was considered significant. All statistical analyses will be done using the Statistical Package for Social Science version 24 (SPSS Inc., Chicago, Illinois, USA).

Results

General characteristics of study participants, separately by cases and controls in (Table 1). Compared with controls, cases had a lower mean weight, and BMI. They were more likely to be physically active, live in rural areas, family history of cancer, smoke 6-9 cigarettes a day, and \geq 10 cigarettes a day than controls. Dietary habits of study participants, separately by cases and controls in (Table 2). Compared with controls, cases were more likely to drink hot tea, fried foods, outdoor foods, have a high salt intake, and have a high temperature of the meal. They were less likely to spicy food consumption, drink moderate, cold tea, have the low and median salt intake, and have the low and moderate temperature of the meal than controls. Association between food consumption and esophageal cancer, separately by cases and controls in (Table 3). Compared with controls, cases had higher intakes of salty

Table1: General Characteristics of study participants.

	Cases (n=82)	Controls (n=164)	P**
Age (years)	56 \pm 12	54 \pm 11	0.56
Weight (kg)	67 \pm 15	77 \pm 12	<0.001
BMI (kg/m ²)	24 \pm 3	28 \pm 3.72	<0.001
Physical activity (MET-h/week)	3 \pm 1	2 \pm 0.99	<0.001
Male (%)	66	59	0.873
Residence (rural, %)	77	35	<0.001
Smoking			0.91
Less than 3 cigarettes a day	2	7	
3-5 cigarettes a day	40	47	
6-9 cigarettes a day	51	49	
\geq 10 cigarettes a day	17	6	
Family history of cancer	39	7	<0.001

Abbreviations: MET (Metabolic Equivalents) and BMI (Body Mass Index)

*All values are mean \pm SD unless indicated.

** P values were obtained from independent Student's t test or chi-square test, where appropriate.

Table 2: Dietary habits of study participants.

	Cases (n=82)	Controls (n=164)	P**
Drink tea			<0.001
Hot	78	59	
Moderate	10	27	
Cold	3	5	
Fried food consumption (%)	48	2.4	<0.001
Outdoor food usage (%)	58.5	30	<0.001
Spicy food consumption (%)	16	27	0.056
Salt intake (%)			0.001
Low	13	47	
Median	34	62	
High	43	5	
Meal temperature (%)			<0.001
Hot	32	2	
Moderate	15	43	
Cold	52	73	

Table 3: Association between food consumption and esophageal cancer.

	Cases (n=82)	Controls (n=164)	OR	(CI 95%)
Fish and poultry				
Never	7	1	1	
1 time or more per month	12	15	0.190	0.020-1.837
1 time or more per week	25	46	0.78	0.009-0.667
1 time or more per day	2	4	0.204	0.024-1.752
Fruits				
Never	40	6	1	
1 time or more per month	14	17	0.124	0.0041-0.376
1 time or more per week	15	34	0.066	0.023-0.189
1 time or more per day	15	27	0.083	0.29-0.242
Vegetables				
Never	10	3	1	
1 time or more per month	11	29	0.791	0.183-1.423
1 time or more per week	28	36	0.233	0.059-0.929
1 time or more per day	17	34	0.150	0.036-0.618
Salty food				
Never	2	56	1	
1 time or more per month	5	11	0.798	0.052-1.444
1 time or more per week	56	3	0.23	0.128-0.776
1 time or more per day	47	13	9.3	3.390-25.807
Meat				
Never	5	3	1	
1 time or more per month	25	28	0.079	0.22-0.434
1 time or more per week	49	52	0.835	0.66-1.432
1 time or more per day	5	1	7.345	2.079-26.083
Pepper				
Never	3	48	1	
1 time or more per month	14	3	0.097	0.024-0.360
1 time or more per week	19	11	0.327	0.146-0.729
1 time or more per day	29	2	2.342	0.968- 1.456

Abbreviations: OR (odds ratio), CI (confidence interval). Binary logistic regression was used to obtain OR and 95% CI.

food, meat, and pepper. They consumed lower number of fish-poultry, fruits, and vegetable than control. The salty food (OR=9.3, 95%CI: 3.390-25.807), meat (OR=7.345, 95% CI: 0.79-26.083), and pepper (OR=2.342, 95% CI:0.968- 1.456) were increased the odds of esophageal cancer.

Discussion

In the current study, a significant positive association was seen between diet and odds of esophageal cancer in Afghanistan. The association was independent of potential confounders such as age, sex, and other various environmental factors. To the best of our knowledge, this is the first study examining the relationship between diet and risk of esophageal cancer in Afghanistan. Esophageal cancer is the eighth most common cancer and the sixth leading cause of death from cancer in the world [35, 36]. Diet is very important variable for increase and decrease the risk of esophageal cancer[31]. For instance, a case-control study in Taiwan showed that consumed salted food (OR=2.3, 95%CI: 1.2-4.2), and pickled vegetables (OR=2.5,95%CI: 1.3-4.5) less than one week increased the risk of esophageal cancer in men [37].

A case-control study in Uruguay revealed that high intake of alcohol, tobacco, and salted meat increased the risk of esophageal cancer [27]. Some other studies showed that lower intake of fruit, and vegetable increase the risk of esophageal cancer [38]. A retrospective cohort study in China showed that a positive family history, low education, surface water use, and pork consumption in the male gender were increased the risk of esophageal cancer, while smoking and alcohol use, pickled vegetable and moldy food consumption were not risk factors in this study [39]. Additionally, a study in North eastern region of India showed that consumption of very spicy food, hot foods, and beverages was positively associated with the risk of esophageal cancer. However, green leafy vegetables, and fruits were decreased the risk of esophageal cancer [40]. A case-control study in south western china revealed that the smoking (OR=4.06, 95%CI: 1.55-10.6), eating food rapidly (OR=5.84, 95%CI, 2.05-16.7), drinking shallow ground water (OR=4.18, 95%CI, 1.30-13.4), frequent intake of pickled vegetables (OR=2.12, 95%CI, 1.00-4.49), and alcohol drinking (OR=2.49, 95%CI: 1.06-5.85) were increased the risk of esophageal cancer[41]. Although, frequent intake of fresh fruit (OR=0.42, 95%CI, 0.19-0.89), fresh vegetables (OR= 0.62, 95%CI, 0.32-1.17), and eggs (OR=0.59, 95%CI, 0.25-1.39) decreased the risk of esophageal cancer [41].

Several studies showed that high intake of the hot drinking beverage such as coffee with milk but not coffee alone, and tea increased the risk of esophageal cancer [42, 43]. Several studies showed that high intake of the hot food, and fast eating speeds increased the risk of esophageal cancer [44-46]. On the other hand, a case-control study revealed that dietary intake of protein, vitamin C, B1, and E reduced the risk of esophageal cancer [47]. An epidemiology study showed that higher intake of fruits, and vegetable was reduced the risk of esophageal cancer [47]. Several studies showed that the high consumption of carrots, green vegetables, and fresh fruits were reduced the risk of esophageal cancer [32, 48]. In conclusion, most studies showed the positive association of the diet and esophageal cancer among the adult population.

Our study had several strengths. This is the first study to examine the association between diet and esophageal cancer in Afghanistan. Easily accessible patients in the hospital, and enough time for filling the questioner. However, there are also a few limitations, due to the case-control design of the study, recall bias might be present. In fact, prior epidemiological studies have demonstrated that cases usually recall their dietary intakes better than controls. The use of hospital controls may be criticized because their dietary habits may differ from those of the general population. and the language barrier.

In conclusion, we found that high intake of salty food, pepper, and meat positively associated with risk of esophageal cancer, and the high intake of fruits, vegetables, fish, and poultry reduce the risk of esophageal cancer in the Afghans study group. Further studies (e.g. cohort studies) with a large sample size are required to establish this association.

Statement of Authorship: HJ contributed to conception, design, search, statistical analyses. BB and MB contributed to data interpretation and manuscript drafting, data clearing, statistical analyses and drafting the manuscript. AMB supervised the study. All authors approved the final manuscript for submission.

Conflicts of interest: All authors declared no potential personal or financial conflicts of interest.

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QUESTIONNAIRE:

Date: _____ Hospital: _____

1. Medical Record Number (_____)

2. Ward (_____)

3. Gender

Male Female

4. Age.....

5. Weight.....

6. BMI.....

7. Where do you live?

Urban Rural

8. Have you smoked?

Never
 Ex-smokers
 Current smokers

9. Smoking

Less than 3 cigarettes a day
 3-5 cigarettes a day
 6-9 cigarettes a day
 ≥10 cigarettes a day

10. Family history of cancer? Yes or No

If yes, type of cancer

11. Drink tea?

Hot
 Moderate
 Cold

12. Fried Food Consumption? Yes/No

13. Outdoor food usage? Yes/No

14. Spicy food consumption? Yes/No

15. Salt intake?

Low
 Median
 High

16. Meal temperature?

Hot

Moderate

Cold

17. How often did you eat fish and poultry?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

18. How often did you eat fruits?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

19. How often did you eat salty food?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

20. How often did you eat vegetables?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

21. How often did you eat meat?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

22. How often did you eat peppers?

Never
 1 time or more per month
 1 time or more per week
 1 time or more per day

Physical Activity Questionnaire:

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

.....days per week

No vigorous physical activities**Skip to question 3**

2. How much time did you usually spend doing vigorous physical activities on one of those days?

.....Hours per day

.....minutes per day

Donot know/not sure.

3. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis?

Do not include walking.

.....days per week

No moderate physical activites**Skip to question 5**

4. How much time did you usually spend doing moderate physical activities on one of those days?

.....hours per day

.....minutes per day

Donot know/not sure.

5. During the last 7 days, on how many days did you walk for at

least 10 minutes at a time?

.....days per week

No walking**Skip to question 7**

6. How much time did you usually spend walking on one of those days?

.....hours per day

.....minutes per day

Donot know/not sure.

7. During the last 7 days, how much time did you spend sitting on a week day?

.....hours per day

.....minutes per day

Donot know/not sure.