Open Access

Original Article

Association of Dietary Habits in Esophageal Cancer–A Case-Control Study from Pakistan

Shahid Hussain, Saima Zahoor, Mohammad Hayat, Maryum Nouman, Ayesha Shahid

Department of Oncology, Jinnah Postgraduate Medical Centre, Karachi Pakistan

ABSTRACT

Objective: To see the association between dietary habits in the development of oesophageal carcinoma.
Study Design: Case control study.
Place and Duration of Study: Department of Medical Oncology at Jinnah Postgraduate Medical Centre, Karachi Pakistan, from Feb 2019 to Dec 2019.
Methodology: Patients from age 15-80 years of either gender were included in the study. All the patients presenting to hospital OPD with histopathologically confirmed of oesophagus carcinoma were included. Controls were the healthy attendants coming at the same hospital. The data was collected through pre-designed questionnaire.
Results: Total of 173 cases and 173 controls were included in the study. The mean age of the cases and controls were reported as 48.07±14.13 years and 48.86±15.32 years. After adjusting odds in multivariate analysis family history of cancer (OR=3.76; 95% CI: 1.76-7.90, p<0.05), the consumption of chicken (OR=5.22; 95% CI: 3.01-9.056, p<0.05), red meat (OR=5.06; 95% CI: 2.70-9.46, p<0.05) & smoked food (OR=3.36; 95% CI: 1.76-6.44, p<0.05) more than three times per week remained positively associated with oesophagus carcinoma.
Conclusion: The study showed association between consumption of chicken, red meat, hot drinks & smoked food with oesophageal carcinoma.

Keywords: Dietary habits, Oesophagus carcinoma, Squamous cell carcinoma.

How to Cite This Article: *Hussain S, Zahoor S, Hayat M, Nouman M, Shahid A. Association of Dietary Habits in Esophageal Cancer–A Case-Control Study from Pakistan. Pak Armed Forces Med J 2023; 73(Suppl-1): S5-8. DOI: https://doi.org/10.51253/pafmj.v73i3.3833*

INTRODUCTION

Esophageal carcinoma is the seventh most commonly diagnosed cancer across the world with an annual incidence of 3.4% of all cancers and over 570,000 new cases have been diagnosed in 2018.[1-2].The incidence of esophageal cancer has shown considerable geographical variation. In the East Asia, South Europe, and East and South parts of Africa, the squamous cell carcinoma is highly prevalent.[3] In Pakistani population, esophageal carcinoma is the 4th most common malignancy; 2nd most common in women and 5th most common in men with as many as 97% cases categorized as squamous cell carcinoma on histology.[4]. Esophageal cancer is not only highly prevalent, it is also most life threatening malignancy due to its poor prognosis. It has a five-year survival rate of 10% or less. The main reason is diagnosis at advanced stages due to absence of any early clinical signs.[3] The earliest underlying pathology is chronic inflammation of the esophageal epithelium which leads to continuous activation of inflammatory cytokines locally as well as systemically.[5,6] The evidence has suggested the role of modifiable risk factors in development of esophageal cancer. These include, but are not limited to, alcohol consumption, smoking, red and processed meat consumption, human papillomavirus infection, reduced consumption of fruit, vegetables, white meat, folate, and some carotenoids.[7] Pro-inflammatory dietary patterns were seen to influence both the underlying inflammation and the development of carcinoma.[5] The studies have shown significant association of fresh fruit and vegetables consumption with reduced risk of developing oesophageal cancer, especially in Japanese population where the incidence reduced by 11% which introduction of 100 grams of fruit daily.[8,9] Despite these risks, there are very few studies that have evaluated whether specific dietary patterns are associated with increased risk of esophageal malignancies. There is particularly a dearth of data in Pakistani population. Hence, this study is conducted. The purpose of this study is to determine the association of dietary habits with oesophageal carcinoma. Owing to cultural and geographical variability; the food habits also vary in this part of the world. Therefore, it is mandatory to evaluate diet as risk factor so that preventive strategies can be exercised.

Correspondence: Dr Shahid Hussain, Department of Oncology, Jinnah Postgraduate Medical Centre, Karachi Pakistan
Received: 31 Jan 2020; revision received: 28 Jul 2020; accepted: 20 Aug 2020

METHODOLOGY

The case-control study was conducted at the Department of Medical Oncology, Jinnah Postgraduate

Medical Centre Karachi conducted from from February 2019 to December 2019. The study was approved by institutional review board (NO.F.2-81-IRB/2019-GENL /10419/JPMC) and informed consent was attained from all participants.Sample size was estimated using online Open Epi sample size calculator taking statistics for poultry consumption among patients with oesophagus carcinoma as 12(62%) and 12(78.11%) among controls, power of test 80%and 95% confidence level. The calculated sample size was 173 cases and 173 controls. All the patients of age 15-80 years of either gender were included using non-probabilityconsecutive sampling technique. Cases were patients presenting to hospital OPD with histologically confirmed squamous cell carcinoma of oesophagus carcinoma. Controls were the healthy attendants coming at the same hospital. Patients without histologically confirmed oesophagus carcinoma, GERD, patients with memory problems and smokers were excluded from the study to remove any confounding factor. All the subjects were divided into two equal groups of cases and controls. The data regarding demographics & dietary habits was collected through pre-designed questionnaire. SPSS version 23 was used to analyse data. Mean and SD were calculated for quantitative variables whereas frequencies & percentages were calculated for qualitative variables. Univariate analysis was performed by using logistic regression between cases and controls for dietary habits. Initial univariate logistic regression models included each variable as potential explanatory variables with cases and controls. Dietary habits were taken as risk factors for exposure associated with esophagus carcinoma. The variables associated with cases/controls in univariate logistic regression models with $p<0.25$ were included in a single multivariate logistic regression model. OR >1 showed positive association whereas $p\leq0.05$ was taken as statistically significant for multivariate model.

RESULTS

Total of 173 cases and 173 controls were included in the study. The mean age of the cases and controls was 48.07±14.13 years and 48.86±15.32 years. Among cases majority of the patients were females (n=96, 55.5%) whereas in controls majority of patients were males (n=113, 65.3%). Besides 9, n=135, 78%) cases and (n=156, 90.2%) controls had no history of cancer in family. However, the comparison between esophagus carcinoma & gender and family history of cancer had showed statistical difference between the stratified groups ($p<0.05$) (Table-1).

Table-I: Descriptive Statistics (n=346)

Characteristics	Characte-ristics Distribution	Patients with Positive Characteristic	Patients with Negative Characteristic	*p*-value
Clinical Characteristics				
Age in years (Mean±SD)	48.07±14.13	48.86±15.32	48.44±14.72	0.592
Gender				
Male	77(44.5%)	113(65.3%)	190(54.9%)	0.001
Female	96(55.5%)	60(34.7%)	156(45.1%)	
Family History of Cancer				
Yes	38(22%)	17(9.8%)	55(15.9%)	0.001
No	135(78%)	156(90.2%)	291(84.1%)	

The dietary habits of the patients showed that the consumption of chicken, dairy product, red meat, fruits & smoked food more than 3 times/week were (n=222, 64.2%), (n=271, 78.3%), (n=254, 73.4%), (n=251, 72.5%) & (n=271, 78.3%) respectively. About (n=201, 58.1%) of the patients used to drink hot drinks more than 4 times per day & (n=180, 52%) of the patients used to consume fish & shrimps less than and equal to 10 times/month (Figure).

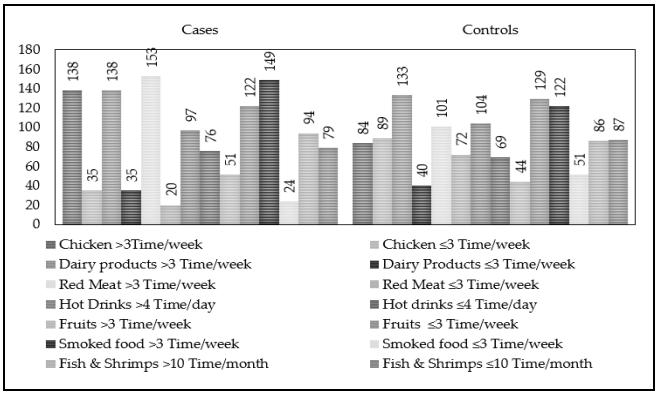

Figure: Frequency distribution of dietary habits

In univariate model, the consumption of chicken, red meat & smoked food more than three times per week were 4.17(95% CI: 2.59-6.72), 5.45 (95% CI: 3.12-9.50) & 2.59 (95% CI: 1.51-4.45) times significantly more likely to develop oesophagus carcinoma as compared to patients who consumed chicken, red meat and smoked food less & equal to 3 times per week ($p<0.05$) (Table-II). After adjusting odds in multivariate analysis family history of cancer (OR=3.76; 95% CI: 1.76-7.90, $p<0.05$), the consumption of chicken (OR=5.22; 95% CI: 3.01-9.056, $p<0.05$), red meat (OR=5.06; 95% CI: 2.70-9.46, $p<0.05$) &smoked food (OR=3.36; 95% CI: 1.76-6.44, $p<0.05$) more than three times per week remained positively associated with oesophagus carcinoma (Table-III).

Table-II: Association of Dietary Habits and Oesophagus Carcinoma (n=346)

Dietary Habits	Cases	Controls	*p*-value	O.R(95% CI)
Chicken (times/week)				
>3	138	84	0.001	4.17 (2.59-6.72)
<=3	35	89		
Dairy Product (times/week)				
>3	138	133	0.514	1.18 (0.71-1.97)
<=3	35	40		
Red Meat (times/week)				
>3	153	101	0.001	5.45 (3.12-9.50)
<=3	20	72		
Hot Drinks (times/day)			0.446	0.84 (0.55-1.29)
>4	97	104		
≤4	76	69		
Fruits (times/week)			0.399	0.81 (0.50-1.31)
<=3	122	129		
>3	51	44		
Smoked food (times/week)			0.001	2.59 (1.51-4.45)
<=3	149	122		
>3	24	51		
Fish & Shrimps (times/month)			0.389	1.20 (0.78-1.83)
<=10	94	86		
>10	79	87		

Table-III: Multivariate Logistic Regression Analysis between Cases & Controls (n=346)

Variables	*p*-value	Adjusted O.R	95% CI for ORs	
Sex				
Female Male	0.127	10.596	0.306	1.160
Family History of cancer				
No Yes	0.001	13.768	1.796	7.903
Chicken (times/week)				
<=3 >3	0.001	5.222	3.011	9.056
Red Meat (times/week)				
<=3 >3	0.001	15.063	2.708	9.464
Smoked food (times/week)				
<=3 >3	0.001	13.368	1.761	6.443

DISCUSSION

Numerous studies have focused on various aspects of dietary habits for prevention of oesophageal cancer. Zhao *et al*. and Lippi *et al*. revealed that hot drinks such as tea, coffee and red meat and processed meatare prominent factors subjective to oesophageal cancer.[10,11] Similarly, the current study revealed the association between various dietary habits and oesophageal cancer. It shows positive and negative association of varying frequencies of Red meat, chicken, smoked food, hot drink and fruit intake. It was found that 70.52% cases were reported to consume fruits less than 3 times. Gao *et al*. and Sardana *et al*. acknowledged that the incidence of esophageal cancer can be decreased among individual who increase their fruit consumption by 100 grams per day.[12-13]

Zhu *et al*. in the year 2014 conducted a systematic review and found that high intake of red meat and low intake of poultry foods are associated with an increased risk of esophageal squamous cell carcinoma. High meat intake, especially processed meat, is likely to increase esophageal adenocarcinoma risk.[14] Likewise, comparing cases and control groups of the present study, the consumers of chicken, red meat & smoked food more than 3 times per week were more likely to develop esophageal cancer as compared to patients who consumed chicken, red meat and smoked food less & equal to 3 times per week (p<0.05). On the contrary, there is no significant association between esophageal carcinoma and consumption of dairy products more than 3 times per week and less than 3 times per week (p>0.05). Moreover, the present study revealed that consumption of tea has no impact upon esophageal cancer. However, Islami *et al*. in the year 2009 found that consumption of hot drink increase risk of developing oesophageal carcinoma15

The effect of age, gender, obesity, lifestyle and physical activity have been reported in literature.Dix O *et al*., Xie *et al*., and Arnold *et al*. have demonstrated strong male predominance with up to 8 and 3 men for every woman affected with esophageal adenocarcinoma and esophageal squamous cell carcinoma.[16-19]. It has been hypothesized that sex hormones also play a role in the development of esophageal cancer or more specifically that oestrogen prevents such development oestrogen prevents such development.[20,2121] Similarly, in the current study mean age of the cases and controls were reported as 48.07±14.13 years and 48.86±15.32 years. Among cases majority of the patients were females 96(55.5%) whereas in controls majority of patients were males 113(65.3%).

This study also evaluated the influence of family history of oesophageal car-cinoma, among 173 cases and controls (n=38, 22%) and (n=17, 9.8%) had a history of oesophageal cancer in family respectively. Similarly, the study in China observed positive association of esophageal squamous cell carcinoma associated with a positive family history of esophageal cancer among first degree relatives (odds ratio (OR)=1.85, 95% confidence interval (CI): (1.42–2.41), after adjusting age, sex, family size and other confounders.[22]

CONCLUSION

In the light of the association of dietary habits alone as well as in combination with other factors is found significant. The present study results revealed that there is strong association between consumption of chicken, red meat & smoked food more than three times per week and esophageal carcinoma. The analysis also showed that family history of cancer is a risk factor in development of esophageal cancer. The results reflect more need to conduct awareness among individuals and modify their dietary pattern to reduce risk of esophageal cancer.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SH: & SZ:, Study design, drafting the manuscript, critical review, approval of the final version to be published.

MH: & MN: , Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AS: Concept, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Huang FL, Yu SJ. Esophageal cancer: Risk factors, genetic association, and treatment. Asian J Surg 2018; 41(3): 210-215.
2. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global Cancer Statics CA Cancer J Clin. 2015; 65(2): 87-108
3. Abnet CC, Arnold M, Wei WQ. Epidemiology of Esophageal Squamous Cell Carcinoma Gastroenterol 2018; 154(2): 360-373.
4. Ahmad Z, Idress R, Fatima S, Uddin N, Ahmed A, Minhas K et al. Commonest cancers in Pakistan-findings and histopathological perspective from a premier surgical pathology center in Pakistan. Asian Pac J Cancer Prev 2016; 17(3): 1061.
5. Shivappa N, Hébert JR, Rashidkhani B. Dietary inflammatory index and risk of esophageal squamous cell cancer in a case-control study from Iran. Nutrition Cancer 2015; 67(8): 1255-61.
6. Jayedi A, Emadi A, Shab-Bidar S. Dietary Inflammatory Index and Site Specific Cancer Risk: A Systematic Review and Dose-Response Meta-Analysis Adv Nutr 2018; 9(4): 388-403
7. Castro C, Peleteiro B, Lunet N. Modifiable factors and esophageal cancer: a systematic review of published meta-analyses. J Gastroenterol 2018; 53(1): 37-51.
8. Yang C, Wang H, Wang Z, Du H, Tao D, Mu X, et al. Risk factors for esophageal cancer: a case-control study in South-western China. Asian Pac J Cancer Prev 2005; 6(1): 48-53.
9. Yamaji T, Inoue M, Sasazuki S, Iwasaki M, Kurahashi N, Shimazu T, et al. Fruit and vegetable consumption and squamous cell carcinoma of the esophagus in Japan: the JPHC study. Int J Cancer 2008; 123(8): 1935-1940
10. Zhao X, Lim F.Lifestyle Risk Factors in Esophageal Cancer: An Integrative ReviewCrit Care Nurs Q 2020; 43(1): 86-98.
11. Lippi G, Mattiuzzi C, CervellinG.Meat consumption and cancer risk: a critical review of published meta-analyses Crit Rev Oncol Hematol 2016; 97(1): 1-14.
12. Gao YT, McLaughlin JK, Gridley G, Blot WJ, Ji BT, Dai Q et al. Risk factors for esophageal cancer in Shanghai, China. II. Role of diet and nutrients. Inter J Cancer 1994;58(2): 197-202.
13. Sardana RK, Chhikara N, Tanwar B, Panghal A. Dietary impact on esophageal cancer in humans: a review Food Funct 2018; 9(4): 1967-1977.
14. Zhu HC, Yang X, Xu LP, Zhao LJ, Tao GZ, Zhang C et al. Meat consumption is associated with esophageal cancer risk in a meat- and cancer-histological-type dependent manner. Digestive Diseases Sci 2014; 59(3): 664-673.
15. Islami F, Pourshams A, Nasrollahzadeh D, Kamangar F, Fahimi S, Shakeri R, et al. Tea drinking habits and oesophageal cancer in a high risk area in northern Iran: population based case-control study. Bmj 2009; 338(2): b929.
16. Dix O, Thakur M, Genova A. Increased Risk of Esophageal Cancers Among Men in Taiwan. Cureus 2020; 12(2): 1-4.
17. Xie S-H, Lagergren J. Social group disparities in the incidence and prognosis of oesophageal cancer. United European Gastroenterol J 2018; 6(3): 343-348.
18. Arnold M, Soerjomataram I, Ferlay J, Forman D. Global incidence of oesophageal cancer by histological subtype in 2012. Gut 2015; 64(3): 381-387.
19. Xie S-H, Lagergren J. The male predominance in esophageal adenocarcinoma. Clinical Gastroent Hepatol 2016; 14(3): 338-47.
20. Chandanos E, Lagergren J. The mystery of male dominance in oesophageal cancer and the potential protective role of oestrogen. European J Cancer 2009; 45(18): 3149-55.
21. Sukocheva OA, Li B, Due SL, Hussey DJ, Watson DI.Androgens and esophageal cancer. World J Gastroenterol 2015; 21(20): 6146-6156.
22. Chen T, Cheng H, Chen X, Yuan Z, Yang X, Zhuang M. Family history of esophageal cancer increases the risk of esophageal squamous cell carcinoma. Scien Reports 2015; 5(1): 16038.