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Original Article

Association of Sociodemographic Determinants and Risk Factors with Advance Esophageal Cancer

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ABSTRACT

Objective: To evaluate the association of socio-demographic characteristics, pathological features, addictions and dietary habits with advanced esophageal cancer among patients presenting at Karachi's tertiary care hospital.

Study design: Cross-sectional analytical study.

Place and study duration: Oncology Department, Jinnah Postgraduate Medical Center, Karachi Pakistan, from May 2019 to Feb 2020.

Methodology: Three hundred patients of age more than 15 years of either gender presenting with proven diagnosis of esophageal cancer were enrolled in the study using non-probability consecutive sampling technique. Data regarding socio-demographics, eating habits, addictions, pathological features were noted. Tumor stage 1 and 2 were considered as early stage and stage 3 and 4 were considered as advanced stage of esophagus carcinoma. SPSS version 23 was used to analyze the data.

Results: The mean age of the patients with esophagus carcinoma was estimated as 50.32±13.44 years. The age (p=0.001), gender (p=0.001), occupation (p=0.003), monthly income (p=0.001), education (p=0.005), residence (p=0.011), histopathological type (p=0.001), site (p=0.013) and grade (p=0.001) of tumor, obesity (p=0.001), smoking (p=0.001), betel nut, pan and huqqah consumers (p=0.001), low fruits and vegetables intake (p=0.001) and high spicy food intake (p=0.001) were found to be positively associated with advance stage of tumor.

Conclusion: Socio-demographic determinants, pathological features, addictions and dietary habits play important role in the progression of esophageal carcinoma.

Keywords: Adenocarcinoma, Esophageal cancer, Personal behaviors, Rural area, Socio-demographics determinants, Squamous cell carcinoma.

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INTRODUCTION

Esophageal carcinoma 'EC' is one of the most frequent GI malignancy and it has high mortality rate. Overall, there were nearly 572,034 new EC cases (3.2%) and 508.585 deaths (5.3%) in 2018.[1] Males are at higher risk as compared to females and there is variation in the prevalence and death rates between the gender, ethnicity and regions globally. EC incidence rates vary enormously with the highest rates in Eastern Africa, Southern Africa and Eastern Asia, the lowest in Central Africa, Western Africa and Central America.[2]

Adenocarcinoma (ADC) and squamous cell carcinoma (SCC.) are the most common histological types of EC. SCC is predominant worldwide and ADC is common in developed countries. Approximately 75% of new EC cases emerged in Asia owing to the "Asian Esophageal Cancer Belt," with squamous cell carcinoma (SCC) being the prevalent histological form.[3,4] In Pakistan, SCC of EC is the fourth most common carcinoma among both males and females. Approximately 2.3% of patients in Karachi are diagnosed with ADC and 97% were diagnosed with SCC in 2016.[5]

The epidemiology and survival of EC patients have numerous feautures which are highly related with economy, culture, lifestyle and dietary habits.[6] The potential factors for the development of EC includes smoking, consumption of alcohol, use of inappropriate amount of salty diet, physical inactivity, columnar metaplasia (Barrett's esophagus) and obesity. In developing nations, low socio-economic status, nutritional deficiency and social habits have raised the incidence of EC.[7] In addition, very hot drink consumption, less intake of vegetables and fruits, and betel nut consumption are the other factors that contribute to EC.[6]

Over the past decade, the incidence of EC is increasing in Pakistan but there is still lack of data regarding true incidence of SCC and ADC and their association with various socio-demographic factors. The goal of the present study was therefore to determine the socio-demographic factors of esophageal cancer at tertiary care hospital at Karachi.

This study would also serve to educate our community, so they can modify their lifestyle to reduce the risk factors of EC like smoking and alcohol.

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METHODOLOGY

The cross-sectional analytical study was conducted at the Oncology Department of Jinnah Postgraduate Medical Center, Karachi Pakistan, from May 2019 to February 2020. The sample size of 296≈300 patients was estimated using Raosoft sample size calculator by taking statistics of tobacco smoking as 26%,[8] margin of error as 5% and 95% confidence level.

Inclusion Criteria: All patients of aged >15 years, of either gender presenting with proven diagnosis of EC were enrolled in the study.

Exclusion Criteria: The sudy excluded patients with problems in speaking and addressing question-naires or signing the informed consent document.

Approval from the Ethical Review Board (Letter no. F.2-81/2019-GENL/20333/JPMC) was obtained before conduct of the study. After explaining the aims of the study, informed consent was obtained from all the eligible patients. All the patients were interviewed by researcher using pre-designed questionnaire and data regarding socio-demographics, eating habits and addictions were noted. Computed tomography scans was also done along with histological analysis to assess the characteristics of tumor like grade, stage, site and type. Tumor stage 1 & 2 were considered as early stage and stage 3 & 4 were considered as advanced stage of esophagus carcinoma.

Statistical packages for social sciences version 23 was used to analyze the data. Numeric variables were represented as Mean±SD. Categorical/binomial variables were represented as frequency and percentage. The association between stage of tumor and socio-demographic factors and other risk factors was assessed using chi-square test. The *p*-value≤0.05 was taken as statistically significant.

RESULTS

Total 300 patients with esophageal carcinoma were included and the mean age was estimated as 50.32±13.44 years. Majority of the patients were males 206(68.7%), belonged from rural areas 213(71%), Sindhi speaking 123(41%), illiterate 119(39.7%), unemployed 219(73%) and had monthly income <15,000 rupees 168 (56%). About 259(86.3%) patients had no family history of esophagus carcinoma, 132(44%) were obese and 156 (52%) had sedentary lifestyle. About 204(68%) of the patients had squamous cell carcinoma. The most prevalent site of tumor was lower one third 139 (46.3%) followed by middle one third and upper one third respectively. Almost 200(66.7%) patients had moderately differentiated tumors. Majority of the patients presented with early stage (I-II) of cancer 162(54%).

Table-I: Baseline Characteristics of Included Esophageal Carcinoma Patients (n=300)

Variables	n (%)
Age groups (years)	
≤50	144(48)
>50	156(52)
Mean±SD	50.32±13.44
Gender	
Male	206(68.7)
Female	94(31.3)
Residence	
Rural	213(71)
Urban	87(29)
Ethnicity	
Sindhi	123(41)
Balochi	33(11)
Pashto	22(7.3)So
Punjabi	17(5.7)
Urdu	90(30)
Others	15(5)
Education	
Illiterate	119(39.7)
Primary	50(16.7)
Matric	58(19.3)
Intermediate	29(9.7)
Graduate	40(13.3)
Employment Status	
Employed	81(27)
Unemployed	219(73)
Monthly family income	
<15,000 rupees	168(56)
15,000-30,000 rupees	113(37.7)
>30,000 rupees	19(6.3)
Family history of Esophageal cancer	
Yes	41(13.7)
No	259(86.3)
Obese (Body mass index ≥27.5kg/m^2)	
Yes	132(44)
No	168(56)
Sedentary lifestyle	
Yes	156(52)
No	144(48)
Histological type	
Squamous cell carcinoma	204(68)
Adenocarcinoma	96(32)
Site	
Upper	67(23.3)
Middle	94(31.3)
Lower	139(46.3)
Grade	
Poorly differentiated	60(20)
Moderately differentiated	200(66.7)
Well differentiated	40(13.3)
Stage	
Early stage (1-2)	162(54)
Advanced stage (3-4)	138(46)

According to dietary habits 190(33%) patients had low vegetable intake (1-3 times per week), 183(32%) had low fruits intake (1-3 times per week), 92(16%) had spicy food intake (>3 times per week) and 48(8%) had high red meat intake (>3 times per week). (Figure-1)

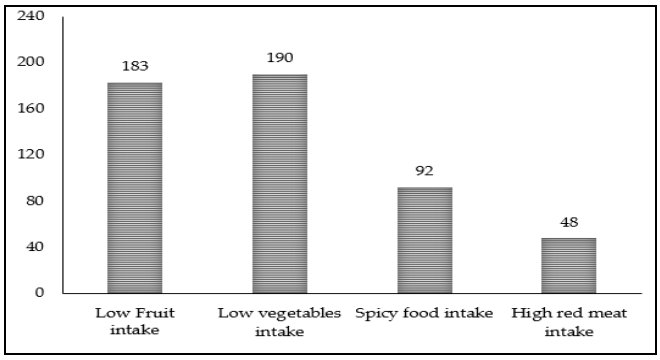

Figure-1: Dietary Patterns of Included Patients (n=300)

Almost 129(43%) patients were smokers, 121 (40.3%) were betel nut consumers, 105(35%) were pan consumers, 86(28.7%) were huqqa consumers, 65 (21.7%) were gutka consumers, 24(8%) were naswar consumers and 22(7.3%) were alcohol consumers.

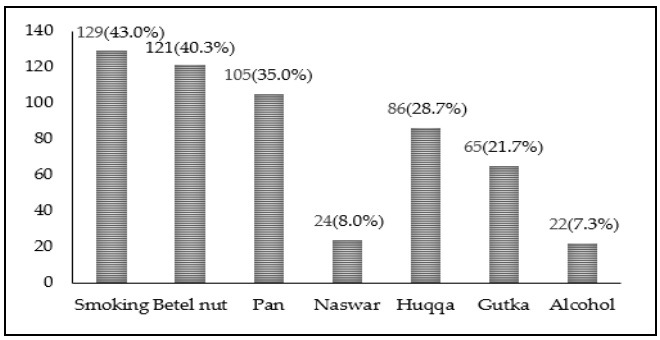

Figure-2: Addictive Substance of Included Patients (n=300)

The patients with early and advanced stage of esophagus carcinoma were stratified with socio-demographic factors. The age (p=0.001), gender (p=0.001), occupation (p=0.003), monthly income (p=0.001), education (p=0.005) and residence (p=0.011), histopathological type (p=0.001), site (p=0.013) and grade (p= 0.001) of tumor, obesity (p=0.001), smoking (p=0.001), betel nut, pan and huqqah consumers (p=0.001), low fruits and vegetables intake (p=0.001) and high spicy food intake (p=0.001) were found to be positively associated with advance stage of tumor.

DISCUSSION

Esophageal cancer is a malignancy with poor prognosis. Treatment of esophageal carcinoma is challenging, with more than 50% of patients diagnosed with advanced stage of tumor being incurable.[8] In our study about 46% of the patients presented with advanced stage of esophageal carcinoma (III & IV).

Over half of the patients were aged >50 years in our sample. Esophageal carcinoma has been found to be rare in younger people under the age of 30. The incidence of esophageal cancer in northern China among people under the age of 30 years has been reported as 0.7% and in northeastern Iran 1% respectively.[8-10] In a Pakistani study conducted among 335 esophageal cancer patients, the mean age at the time of presentation was 52 years,[4] whereas in our study it was 50 years. In another Pakistani study by Khan *et al.* similar results were observed, the mean age was 50 years with majority of the patients were of age >50 years.[11] We found majority of patients with advanced stage of tumor were of age >50 years (66.7%) whereas 23.6% were of age ≤50 years, hence the relationship between age and stage of tumor was statistically significant (p<0.05).

In the present study male to female ratio was 2.1:1 whereas in other local studies the male to female ratio was estimated as 1.4:1 to 3:1.[11-13] In our study, majority of the females presented with early stage of tumor (74.5%) whereas most of males presented with advanced stage of tumor, hence statistically significant relationship was found between gender and stage of tumor (p<0.05). Hence, males with an advanced tumor stage may be attributed to their lifestyle influences such as heavy smoking, alcohol consumption, and smokeless tobacco use.[14] We also found significant association between smoking, betel nut consumption, pan consumption, huqqah consumption with advanced stage of esophagus tumor (p<0.05). Sun *et al.* found in their study significant association between advanced stage of tumor and heavy smokers (p=0.007).[15] In Pakistani studies, it has been identified chewing pan, smoking, eating naswar and inhaling snuff as potential risk factors for esophagus carcinoma.[16,17] Afridi *et al.* in 2000 found odds of developing esophagus carcinoma as 3.3 times higher among smokers as compared to non-smokers and 2 fold higher among naswar users than non-users.[16]

Worldwide, carcinoma of esophagus is highly prevalent among individuals with low socioeconomic status.[18] This statement is reproduced in the present study where majority of the patients were illiterate, 73% of the patients were unemployed and 56% patients had monthly income <15,000 rupees. The low socio-economic status is considered as an independent

Table-II: Association between Potential Factors and Advanced Stage of Esophagus Carcinoma (n=300)

Factors	Stage		*p*-value
	Early Stage	Advanced Stage	
Age Group			
≤50 years	110(76.4%)	34(23.6%)	0.001
>50 years	52(33.3%)	104(66.7%)	
Gender			
Male	92(44.7%)	114(55.3%)	0.001
Female	70(74.5%)	24(25.5%)	
Occupation			
Employed	55(67.9%)	26(32.1%)	0.003
Unemployed	107(48.9%)	112(51.1%)	
Monthly Income			
<15,000 rupees	68(40.5%)	100(59.5%)	0.001
15,000-30,000 rupees	82(72.6%)	31(27.4%)	
>30,000 rupees	12(63.2%)	7(36.8%)	
Education			
Illiterate	49(41.2%)	70(58.8%)	0.005
Primary	35(70%)	15(30%)	
Matric	31(53.4%)	27(46.6%)	
Intermediate	20(69%)	9(31%)	
Graduate	25(62.5%)	15(37.5%)	
Residence			
Rural	105(49.3%)	108(50.7%)	0.011
Urban	57(65.5%)	30(34.5%)	
Ethnicity			
Sindhi	63(51.2%)	60(48.8%)	0.266
Balochi	18(54.5%)	15(45.5%)	
Pashto	14(63.6%)	8(36.4%)	
Punjabi	7(41.2%)	10(58.8%)	
Urdu	48(53.3%)	42(46.7%)	
Others	12(80%)	3(20%)	
Histological Types			
Squamous cell carcinoma	90(44.1%)	114(55.9%)	0.001
Adenocarcinoma	72(75%)	24(25%)	
Site			
Upper	39(58.2%)	28(41.8%)	0.013
Middle	39(41.5%)	55(58.5%)	
Lower	84(60.4%)	55(39.6%)	
Grade			
Poorly differentiated	10(16.7%)	50(83.3%)	0.001
Moderately differentiated	119(59.5%)	81(40.5%)	
Well differentiated	33(82.5%)	7(17.5%)	
Obese (Body mass index≥27.5kg/m²)			
Yes	52(39.4%)	80(60.6%)	0.001
No	110(65.5%)	58(34.5%)	
Sedentary Life Style			
Yes	76(48.7%)	80(51.3%)	0.06
No	86(59.7%)	58(40.3%)	
Family History of Esophageal Cancer			
Yes	17(41.5%)	24(58.5%)	0.083
No	145(56%)	114(44%)	
Smoking			
Yes	43(33.3%)	86(66.7%)	0.001
No	119(69.6%)	52(30.4%)	
Betel nut			
Yes	42(34.7%)	79(65.3%)	0.001
No	120(67%)	59(33%)	
Pan			
Yes	39(37.1%)	66(62.9%)	0.001
No	123(63.1%)	72(36.9%)	
Naswar			
Yes	9(37.5%)	15(62.5%)	0.091
No	153(55.4%)	123(44.6%)	
Huqqa			
Yes	29(33.7%)	57(66.3%)	0.001
No	133(62.1%)	81(37.9%)	
Gutka			
Yes	29(44.6%)	36(55.4%)	0.086
No	133(56.6%)	102(43.4%)	
Alcohol			
Yes	8(36.4%)	14(63.6%)	0.085
No	154(55.4%)	124(44.6%)	
Low Fruits Intake (1-3 times/week)			
Yes	65(35.5%)	118(64.5%)	0.001
No	97(82.9%)	20(17.1%)	
Low Vegetables Intake (1-3 times/week)			
Yes	83(43.7%)	107(56.3%)	0.001
No	79(71.8%)	31(28.2%)	
Spicy Food Intake(>3 times/week)			
Yes	37(40.2%)	55(59.8%)	0.001
No	125(60.1%)	83(39.9%)	
High Red Meat Intake (>3 times/week)			
Yes	134(53.2%)	118(46.8%)	0.511
No	28(58.3%)	20 41.7%)	

risk factor for the high incidence of esophagus carcinoma.[18,19] The majority of patients in the current study lived in rural areas (71%). In a study conducted at Kashmir valley also found similar results that 77% of the individuals belonged from rural areas.[20] Other international studies also observed most of the patients were from rural areas.[14,21] We found significant association between education, monthly income, employment status and residence with late stages of esophageal carcinoma (III-IV) (p<0.05).

The micronutrient deficiencies like zinc, riboflavin, selenium, vitamin C, A, E, lower fresh vegetables and less fruit intake can be a potential risk for EC. Many studies showed protective relationship between vegetables and fruits intake and esophagus cancer.[22] In the current study, >30% of the patients were consuming low fruits and vegetables intake and are highly associated with advanced stage of cancer (p<0.05). As well as advance stage of EC was also associated with high spicy food intake.

In the current study, 44% of the patients were obese and 52% had sedentary lifestyle. Moreover, 60.6% and 51.3% of the obese and physically inactive patients had advance stage of cancer (III-IV). Based on the results of meta-analysis study, it has been observed that the odds of esophageal carcinoma is lower among physically active individuals as compared to those who have sedentary lifestyle.[23] The protective effect of physical activity towards carcinoma may be mediated by combating carcinogenic adverse events of obesity, decreasing systematic inflammation and increasing insulin sensitivity resulting in beneficial immuno-modulation.[23]

We found most of the patients had squamous cell carcinoma type of esophageal cancer. Several Pakistani studies also observed squamous cell carcinoma was most prevalent histological type of esophageal carcinoma.[4,5,12,13,16,17,24] Among people of North America and Europe, adenocarcinoma is most frequent histological type and in China squamous cell carcinoma is prevalent and accounts for 90% of the esophageal cancer. In current research, majority of the esophagus carcinoma were moderately differentiated and had lower site involvement. Statistically significant relationship was found between advanced stage of tumor and histological type, grade and tumor site (p<0.05). In another study by Ahmad *et al.* also found majority of the patients had lower site involvement of tumor.[5]

CONCLUSION

Socio-demographic determinants, pathological features, addictions and dietary habits play important role in the progression of esophageal carcinoma.

Conflict of Interest: None.

Author's Contribution:

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

SS & GH: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

BR & VR: Critical review, concept, data acquisition, data analysis, drafting the manuscript, approval of the final version to be published.

TA & MA: Data acquisition, data analysis, 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.

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