



Contents lists available at ScienceDirect

Journal of Oncological Science

journal homepage: <https://www.elsevier.com/locate/jons>

Review

More sunlight exposure may improve the overall survival in patients with pancreas cancer

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ARTICLE INFO

Article history:

Received 4 April 2016

Accepted 8 August 2016

Available online xxx

Keywords:

Pancreas cancer

Sunlight

Vitamin D

ABSTRACT

The protective effect of sun exposure on prognosis of cancer and cancer risk was previously reported in some studies except for melanoma and skin cancer. In presented study we aimed to compare the effect of sunlight exposure on prognosis of patients with pancreatic cancer (PC) in two regions with different sunlight exposure. Totally of 139 patients with PC from Akdeniz University from Antalya (n:103) and Kocatepe University (n:36) from Afyon were analyzed retrospectively. Antalya and Afyon state have different sunlight exposure. Two groups were compared in terms of overall survival (OS). The median OS values were 10,9 [95% CI: 7,8–14,0] and 6,9 [95% CI: 3,9–9,9] months for Antalya and Afyon groups, respectively and it was found a significant difference between groups for OS ($p = 0.015$). Also, the region and stage were an independent prognostic factor. In conclusion, the patients with PC had better OS in the region with more sunlight exposure.

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1. Introduction

Pancreatic cancer (PC) is the eighth and ninth leading cause of cancer deaths in men and women, respectively. In terms of cancer related deaths, PC is included in the top 5 cancers in developed countries.¹ After the age of 45, the incidence of PC rises and is higher in men than women. Hereditary risk factors were determined in 4–16% of patients with PC.² In the individuals with non-O blood group, the incidence of PC were significantly higher compared the others with blood group O.³ Some studies were previously reported that cigarette smoking, diabetes mellitus, cholecystectomy, body mass index ≥ 30 kg/m², daily intake of red meat, helicobacter pylori, and chronic hepatitis B and C infections increase PC risk.^{4–9}

The effect of sunlight exposure on prognosis of cancer patients were evaluated by some studies.^{10,11} It was generally reported the protective effect of sun exposure on prognosis of cancer and cancer risk except for melanoma and skin cancer. In a study, it was found

that ultraviolet B irradiance was independently inversely associated with incidence of PC in men and women.

In presented study we aimed to compare the effect of sunlight exposure on prognosis of patients with PC in two regions with different sunlight exposure.

2. Materials and methods

Totally of 139 patients with PC from Akdeniz University (n:103) and Afyon Kocatepe University (n:36) were analyzed retrospectively. Akdeniz University locates in Antalya state which locates in Mediterranean region with more sunlight exposure and a warmer climate while Afyon Kocatepe University locates in Afyon state which locates in inner Anatolia with lower sunlight exposure and a colder climate compared Antalya state. All patients had pancreatic adenocarcinoma confirmed by pathologic review after tru-cut biopsy or surgery. According to the regions where the patients live, the patients with PC were divided into two groups as Antalya and Afyon regions. The hours of sunny days according to region were recorded from the data of Turkish State Meteorological Service. The age, sex, stage, hemoglobin, lactate dehydrogenase (LDH), albumin, calcium and Ca 19-9 levels were recorded to Statistical Package for the Social Sciences 16.0 (SPSS 16.0, SPSS Inc., Chicago, IL, USA) statistical programme. In addition the date of diagnosis, the time of

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Peer review under responsibility of Turkish Society of Medical Oncology.

<http://dx.doi.org/10.1016/j.jons.2016.08.002>

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progression, the date of death of patients with PC were recorded into the SPSS 16.0 statistical programme.

Statistical analyses were performed using the SPSS software version 16.0. The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk’s test) to determine whether or not they are normally distributed. According to regions sunny days were compared using two independent samples *t* test. To determine properties of patients with PC, mean, frequencies analysis, two independent samples *t* test and Chi-square tests were performed. The overall survival (OS) was defined as the time from diagnosis to death. The effect of sunlight exposure on OS of patients with PC was investigated using log-rank test. The Kaplan–Meier survival estimates were calculated. P value < 0.05 was considered significant. After univariate analysis, multivariate analysis performed to define the independent prognostic factors for the OS.

3. Results

The hours of sunny days of Antalya and Afyon regions were shown in Fig. 1. For the total of 12 months, the hours of sunny days were higher in Antalya than Afyon (p = 0.142).

The mean age of Antalya and Afyon groups were 62,5 ± 10,4 and 66,7 ± 10,7 years, respectively (p = 0.043). It was no found any significant difference regarding sex, hemoglobin and Ca 19-9 levels between groups (p = 0.082, p = 0.140, p = 0.932, respectively). Albumin, LDH and calcium values were significantly higher in Antalya group than Afyon group (p = 0.003, p < 0.001, p < 0.001, respectively). All these results were depicted in Table 1.

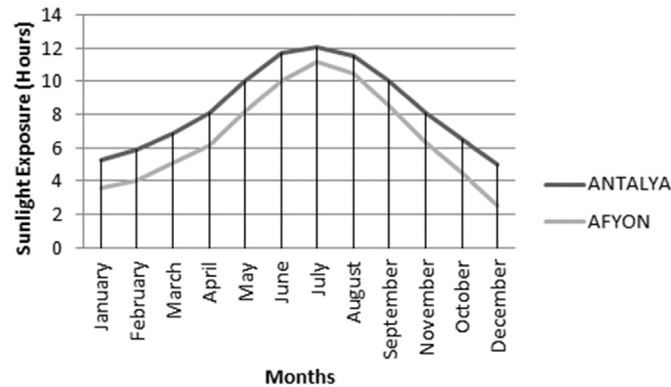


Fig. 1. Sunlight exposure according to regions

Table 1 Properties of groups

Parameters	Antalya (n:103)	Afyon (n:36)	P value
Age (mean)	62,5 ± 10,4	66,7 ± 10,7	0.043
Sex			
Male	76 (73,8%)	21 (58,3%)	0.082
Female	27 (26,2%)	15 (41,7%)	
Stage			
Stage 1	0	7 (19,4%)	0.017
Stage 2	9 (8,7%)	18 (50,0%)	
Stage 3	22 (21,5%)	7 (19,4%)	
Stage 4	70 (67,9%)	4 (11,1%)	
Unknown	2 (1,9%)	0	
Hemoglobin	12,3 ± 1,7	11,8 ± 1,6	0.140
Albumin	3,82 ± 0,57	3,43 ± 0,75	0.003
LDH	278 ± 153	609 ± 228	<0.001
Calcium	9,56 ± 0,72	8,97 ± 0,78	<0.001
Ca 19-9	1872 ± 6075	1968 ± 3462	0.932

The median OS values were 10,9 [95% CI: 7,8–14,0] and 6,9 [95% CI: 3,9–9,9] months for Antalya and Afyon groups, respectively and it was found a significant difference between groups for OS (p = 0.015). When evaluating local or locally advanced disease, there was also a significant difference between groups. The median OS time of the patients in Antalya had higher than in Afyon (p = 0.001). The median OS values were depicted in Table 2 and shown in Figs. 2 and 3.

In the univariate analysis, region (p = 0.017), stage (p = 0.015), hemoglobin (p = 0.006), albumin (p = 0.003), calcium (p = 0.028) and Ca 19-9 (p < 0.001) levels were found statistically significant (Table 3).

Table 2 The OS values for regions

Stage	Overall survival (median months)		P value
	Antalya	Afyon	
All patients	10,9 [95% CI: 7,8–14,0]	6,9 [95% CI: 3,9–9,9]	0.015
Stage I, II and III	21,9 [95% CI: 7,8–35,9]	8,7 [95% CI: 5,5–13,5]	0.001

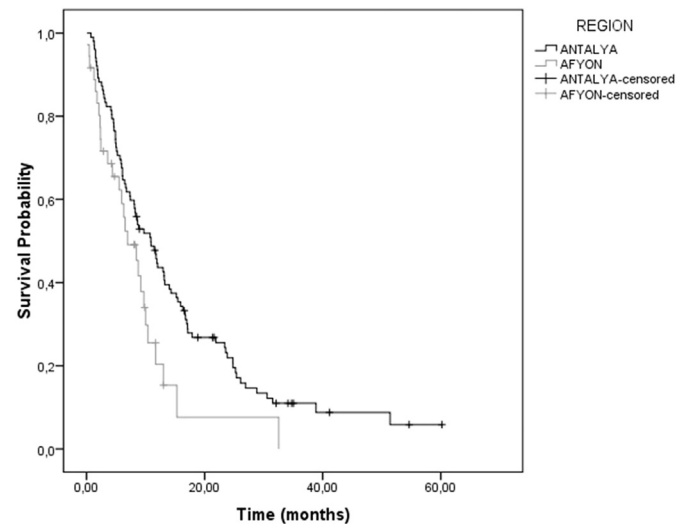


Fig. 2. The OS curves according to regions

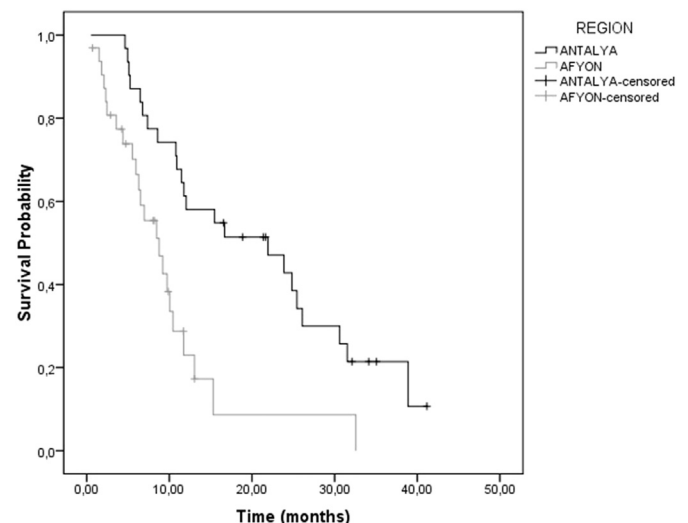


Fig. 3. The OS curves according to regions in local or locally advanced disease

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