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Communication between body mass index and the risk of obesity-related cancer: A 5-year study on patients with cancer

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Introduction: **Cancer is one of the chronic and non-communicable diseases that include a wide range of diseases considering that, significant correlation was found in some studies between cancer and BMI higher than normal, and so far in this field few studies have been done in Khuzestan province and Ahwaz city. Also, planning to increase the health level of cancer patients in khuzestan province, it needs to know all the risk factors for the disease in this province. Therefore, this 5-year study on cancer patients referred to Shafa Hospital in Ahvaz, with the goal Determine the communication between body mass index and the risk of obesity-related cancer.** ***Materials and Methods:*** **In this retrospective cross-sectional descriptive-analytic study, 1346 cases of patients with different types of cancer with BMI> 30, admitted to Shafa Hospital, Ahvaz city which for 5 years, with the diagnosis of any cancer and history of the disease with a BMI of over 30, And referring to the Ahvaz Shafa hospital, from 2012 to 2016, entered the study. The inclusion criteria included all patients with a medical diagnosis and history of any type of cancer with a BMI> 30, and in each age group and sex, and the exit criteria included other records of patients who had non-cancer medical diagnosis, cases with a BMI of less than 30, as well as incomplete cases. The data in this study included demographic, laboratory and clinical data of patients. Data were then entered into SPSS software version 20 and analyzed by descriptive statistics, analytical tests and significant level of P <0.05.** ***Results:*** **This study included 1346 individuals with different types of cancer with an average age of 64.08±88.52 years and 754 (56.0%) were female and the rest were male. Also, the mean BMI in these patients was 33.16 ± 5.08, that indicating patients with moderately obese (Obese Class I). In this study, the relationship between BMI and education was significant (p = 0.002). Also, 944 (70.1%) patients had malignant tumors and the rest were benign. The highest prevalence of cancer in this study was related to gastrointestinal cancers with 55.5%. In this study, also was calculated BMI for different types of cancer, that the highest incidence was related to gastrointestinal cancer (BMI = 35.57 ± 9.06). In this study, 456 (33.8%) patients had a history of diabetes. There was a significant relationship between the history of diabetes and gastrointestinal cancers (p = 0.008).** ***Conclusion:*** **In this study, the average body mass index of patients was moderately obese (obese class I). Also, the highest incidence of cancer in this study was related to gastrointestinal cancers, and there was a significant relationship between the history of diabetes and gastrointestinal cancer. Therefore, it is necessary to make changes in the lifestyle of people living in Khuzestan province. Also can prevented from developing obesity and diabetes which provides the ground for all types of cancer, especially gastrointestinal, with doing aerobic exercise, nutrition correction and not taking foods high in fat and high cholesterol.**

INTRODUCTION

Cancer is one of the chronic and non-communicable diseases that include a wide range of illnesses. This disease like other chronic diseases, in each person, the age group and any race occur and is considered as a major health problem affecting community health (1). The mortality rate due to cancer is increasing And at least about 8 million people die every year because of cancer; According to world health organization statistics, the mortality rate from cancer will rise from 45% in 2007 to 65% in 2030 (2). Unlimited proliferation potential, reduced apoptosis, increased angiogenesis, invasive tissue and metastasis are factors of cancer progression (3). The increasing importance of investigating changes in the expression of genes in the creation of various types of cancers, and the emergence of new biotechnology methods has led to in recent years in studies on the etiology of this disease, are of particular importance such molecular studies (4). Meanwhile, obesity and diabetes increase the risk of cancer (5). Diabetes is the most common endocrine disorder in the world (6). And a metabolic disorder characterized by chronic hyperglycemia and leads to damage to the various organs of the affected person and reduces her longevity (7). Diabetes is also a major cause of morbidity and

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mortality in the industrialized world and developing countries (8). According to the world health organization statistics by 2020, are affected by the disease about 333 million people worldwide (9). Diabetes also accounts for 15 percent of health care spending in the United States (10). Diabetes complications, in addition to high costs for individuals and society, also increase mortality in people with diabetes (11). Patients with diabetes are at greater risk than the general population of the growing urinary tract, liver, biliary, pancreatic, colon, endometrial, and kidney cancer. Several confounding factors are directly related to clinical differences in diabetes at various levels of metabolic control, diabetes duration, anti-diabetic treatment profiles, and the presence of complications or association with disease (12). Therefore, it is difficult to accuracy in evaluation the risk of incidence cancer in diabetes. In addition, common risk factors for both illnesses such as age, sex, ethnicity, alcohol, tobacco, diet, obesity and physical activity, and body mass index seem to make the relationship more complicated (13,23,24).

Considering that in the study of renehan et al. (14), in men, increase in BMI at a rate of 5 kg per square meter, were associated strongly with esophageal adenocarcinoma, and cancer of thyroid, colon and kidney. As well as in women strong communication between 5 kg / m 2 increase in BMI and endometrial cancer, gallbladder, esophageal adenocarcinoma, and kidney cancer have been recorded. And also because there was a probability association between cancer and BMI higher than normal in Khuzestan province, and that studies should be conducted in this regard and in order to help continue studies in this field, to be more aware of this connection. Also, planning to increase the health level of cancer patients in Khuzestan province, it needs to know all the risk factors for the disease in this province and so far, few studies have been carried in this field in khuzestan province and Ahwaz city. Therefore, this 5-year study on cancer patients referred to Shafa Hospital in Ahvaz, with the goal determine the Communication between body mass index and the risk of obesity-related cancer.

MATERIALS AND METHODS

In this retrospective cross-sectional descriptive-analytic study, 1346 cases of patients with different types of cancer with BMI> 30, hospitalized in Shafa Hospital in Ahvaz city, which resided in Ahvaz, Masjed Soleyman, Shoushtar, Dezful, Behbahan, Abadan, Izeh, Khorramshahr, Lali and Andika, which has been studied for 5 years from 2012 to 2016. The files were investigated by ten researchers who were in the medical records of the hospital. These patients that with a diagnosis of any cancer and a history of the disease with a BMI of above 30, And referring to the Ahvaz Shafa Hospital, from 2012 to 2016 and entered the study.

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The data needed for the study were extracted from patients' medical records during the years mentioned in the medical records section of the hospital. The inclusion criteria included all patients with a medical diagnosis and a history of any type of cancer with a BMI> 30, and in each age group and sex. The exit criteria included other records of patients with non-cancer medical diagnosis, records with a BMI less than 30, as well as incomplete cases. To study cases and collect data, first, introduction letter of written on behalf of deputy of education and research Ahwaz University of Medical Sciences was taken then, the records of patients referring to the hospital in the archives section were used. The required information was collected through a researcher checklist from the records.

Was the information studied in this study includes demographic information, laboratory and clinical patients such as gender, age, BMI, marital, ethnicity, occupation, economic status, level of education, having or not having a family history of cancer and history of diabetes, type of cancer, type of tumor, Having or not having a history of chemotherapy, a history of drug use or smoking and alcoholic drinks. Then, the data were entered into SPSS version 20. Data were analyzed by descriptive statistics including enumerated tables, mean, standard deviation and variance, and analytical tests including T-test, Anova, chi-square and Chi-square Pearson and at the significant level of $P < 0.05$.

RESULTS

This study included 1346 individuals with different types of cancer with an average age of 64.08±88.52 years. 754 (56.0%) were female and the rest were male. The mean glucose level of these patients was 266.78 ± 94.61. Also, the mean BMI in these patients was 33.16 ± 5.08, that indicating patients with moderately obese (Obese Class I).

In terms of ethnicity, 527 people (39.1%) were Lor. 479 people (35.5%) were Arabs, 247 (18.3%) were Shoushtari-Dezfuli and 93 (6.9%) were kord. As well as in terms of marital status, 745 (55.3%) were married, 425 (31.5%) were single and 176 (13.0%) died of their husbands. Also, 852 people (63.2%) rights were monthly less than 1 and a half million toman, and the rest were above that amount. A statistically significant relationship was found between gender and family history of cancer ($p < 0.0001$). Also was significant relationship between job and family history of cancer ($P = 0.009$) and the significant relationship between BMI and educational level ($p = 0.002$). Table 1 shows the demographic information of these individuals.

In this study, 944 (70.1%) patients had malignant tumors and the rest were benign (Figure 1). Also, 1152 patients (85.5%) had a history of chemotherapy and the rest had no history (Figure 2). 748 (55.5%) of the patients in this study were gastrointestinal cancers, also 322 (23.9%) patients had genital cancers, of these types of cancer in women, was most ovarian cancer and men were more prostate cancer. Of the other types of cancers, 89 (6.6%) of lung cancer patients, 78 (5.7) bone marrow cancer, 64 (4.7%) of leukemia, and 45 (3.3%) were kidney cancer (Figure 3). In this study also, the average BMI for different types of cancer was calculated, the highest BMI was for gastrointestinal cancers (BMI = 35.57 ± 9.06), (Figure 4).

In this study, 456 (33.8%) patients had a history of diabetes. There was a significant relationship between the history of diabetes and gastrointestinal cancers ($p = 0.008$). In this study, 244 people (18.1%) had a history of drug or smoking use. And 49 (3.6%) had a history of alcohol consumption, and the relationship between alcohol consumption with a history of chemotherapy was significant, that is, people who consumed more alcohol, they had more chemotherapy ($p = 0.002$).

DISCUSSION

The results of this study showed that 55.5% of patients had gastrointestinal cancers. In this study, the average body mass index was calculated for different types of cancer, which was the highest amount for gastrointestinal cancers. In this study, 33.8% of the patients had a history of diabetes. There was a significant relationship between the

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Table 1 Demographic characteristics of cancer patients and its relevance to family history of cancer, history of diabetes and BMI using T-test, ANOVA, Chi-square and Chi-square Pearson

Variable	Classification	Number	Percentage	Relationship with family history of cancer (P value)	Relationship with history of diabetes (P value)	Relationship with BMI (P value)
sex	Male Female	592 754	43.9 56.0	p <0.0001	p=0.008	p <0.0001
Education	Under the diploma Diploma and higher	847 499	62.9 37.0	p=0.05	p=0.06	p=0.002
Occupation	Free Housewife Unemployed Employee	563 342 241 200	41.8 25.4 17.9 14.8	P=0.009	p=0.06	p=0.03

** A significant level below 0.05 is considered.*

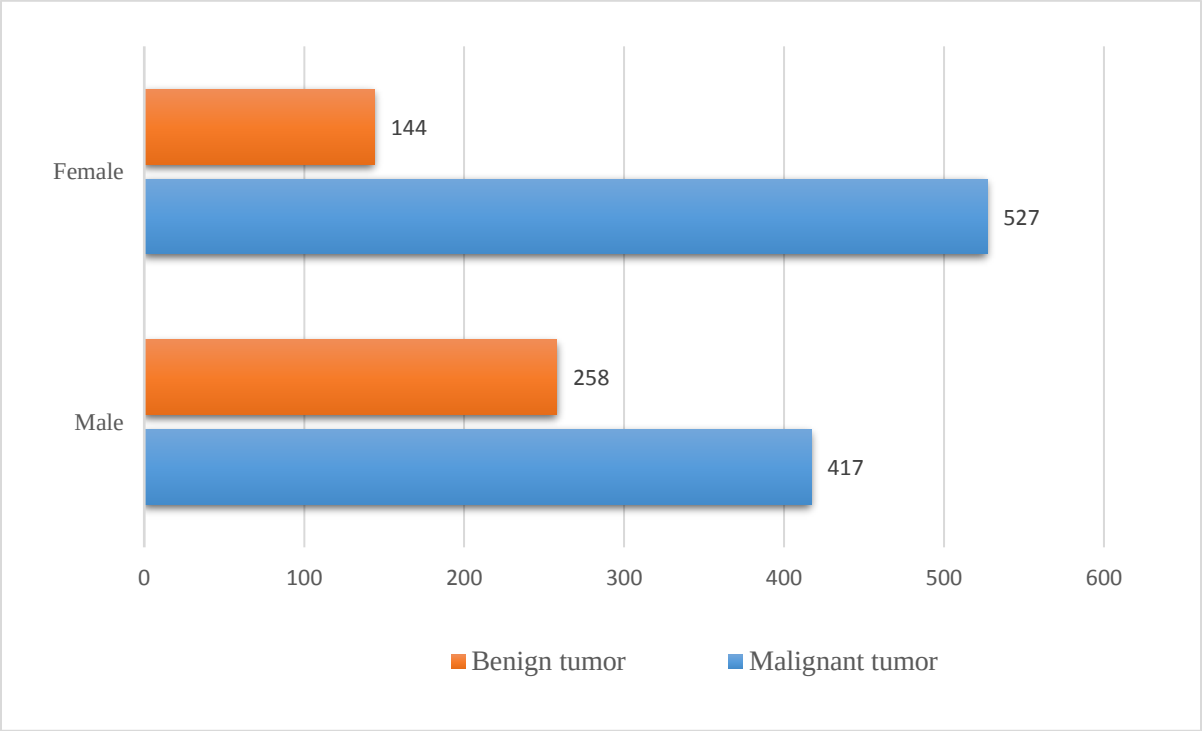

Figure 1 Frequency comparison Type of cancer tumor according to gender

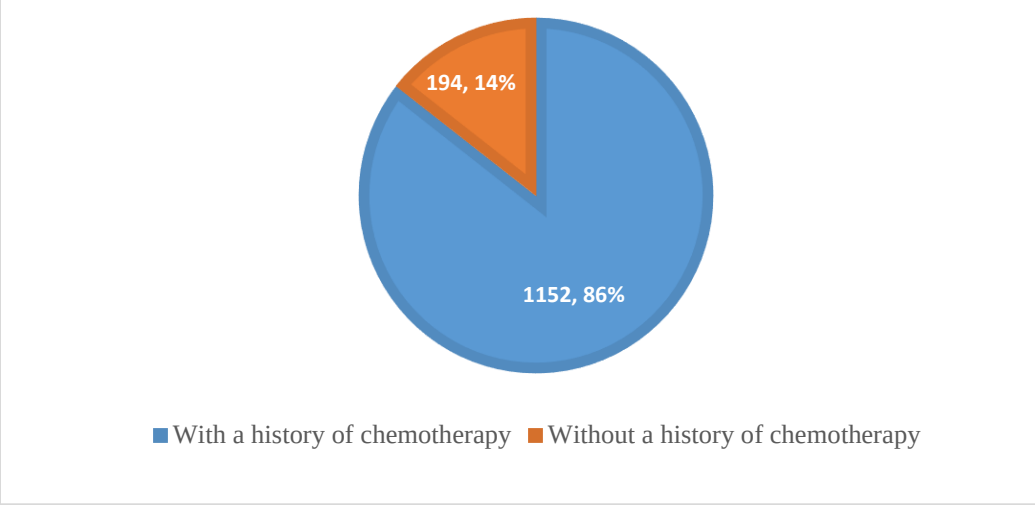

Figure 2 Frequency of chemotherapy history in cancer patients

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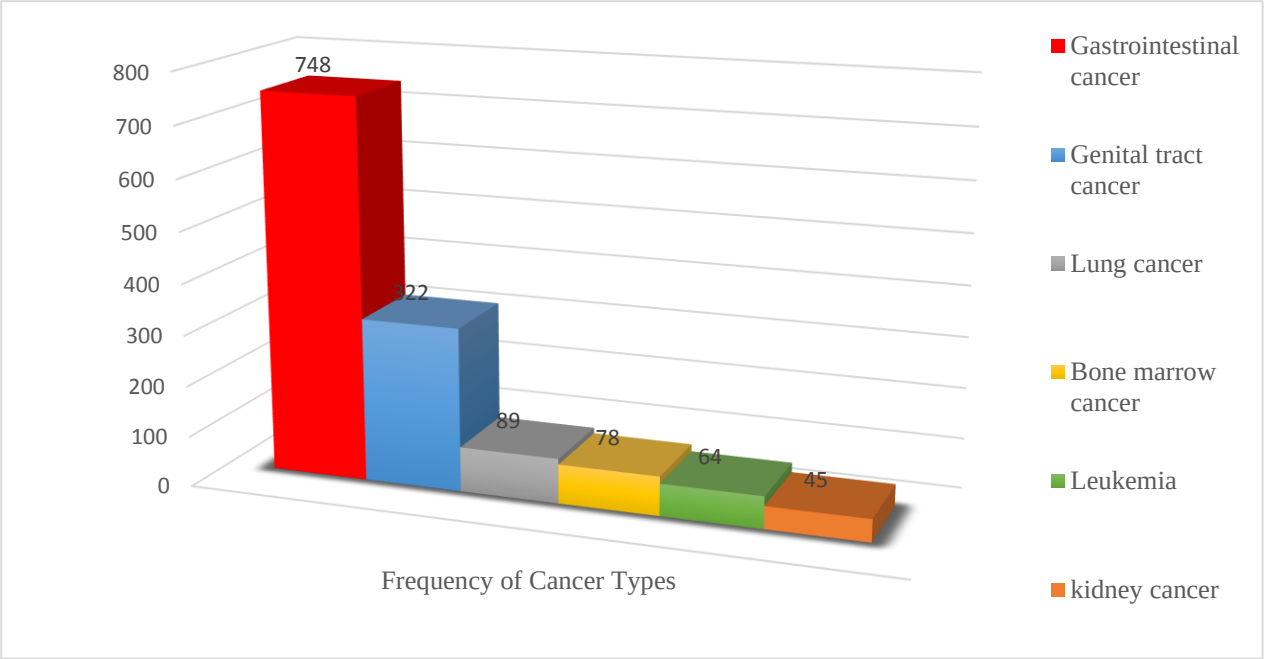

Figure 3 Frequency of cancer types in patients with this disease

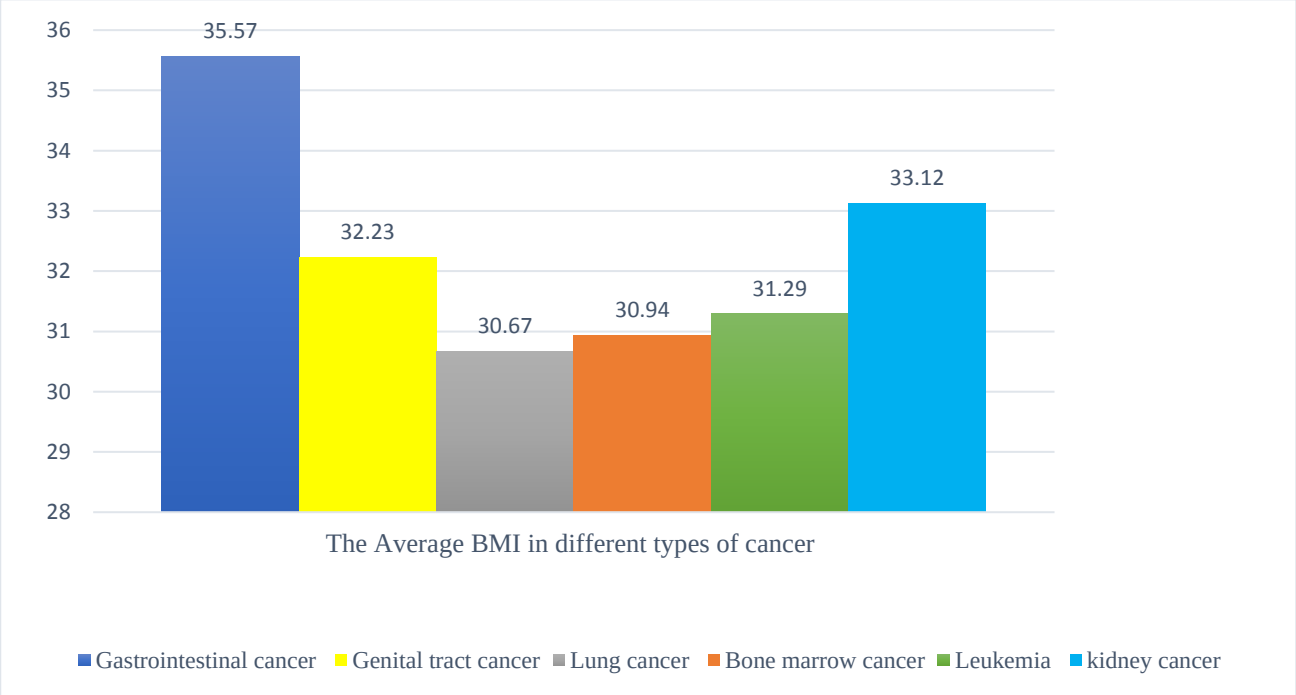

Figure 4 The Average BMI in different types of cancer (For ease of writing the numbers on the Diagram, the standard deviation is set aside). It should also be noted that; BMI More than 25 to 29.9 = represents a person overweight, in the range of 30 to 34.9 = signs of moderately obese (Obese Class I) and in the range of 35 to 39.9= signs severe obesity (Obese Class II).

history of diabetes and gastrointestinal cancers. Hyperglycemia can have a direct effect on tumor growth, because cancer cells strongly emphasize glycolysis. Findings from various studies have shown that excessive obesity and diabetes increase the chances of developing colorectal cancer. Research also shows that People with over-obesity and diabetes are more at risk for colon cancer than non-diabetics, but so far, not specified the reasons for this connection and what to do to prevent colon cancer in diabetics. Also, the risk of large bowel cancer is higher in diabetic people than in healthy people. The risk of rectal cancer in people with diabetes is more than other people, although this increase seems to be limited to men only (15-17).

In a study by Azizi et al. (18), which was called the risk of colorectal cancer in type 2 diabetic patients, showed that diabetes and obesity increases the risk of colorectal cancer. In this study, 207 patients with colorectal cancer with colonoscopy and positive pathology and cases of incidence and among patients referring to colonoscopy units of

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reference hospitals in Tabriz city with 207 cases referring to the same units with colonoscopy and negative pathology and without previous history of polyps, neoplasms and other cancers were studied. In this study, 207 patients with colorectal cancer had 48 patients with diabetes in contrast, of the 207 controls, only 21 were diabetic. The final analysis, in the presence of other effective factors, showed that diabetes mellitus increases the chances of developing colorectal cancer.

In a study by manami Inoue et al. (19), entitled "Diabetes and the risk of cancer, were diagnosed a total of 6462 new cases of cancer. In men, the risk of general cancer has increased by 27% in those with a history of diabetes. HR was very high for people with liver, pancreatic and kidney cancer. In this study, we also saw increased risk of colon cancer and gastric cancer with marginal significance. In women, the incidence of cancer was significantly increased at the borderline while the incidence of gastric cancer and liver cancer was statistically significant. Also the incidence of ovarian cancer was observed at the border.

In this study, gastrointestinal cancer was the highest percentage of cancer in both men and women. The results of lotfi et al. showed that the gastric cancer was the highest incidence of cancer in men (13.7%), and the breast cancer was the highest incidence of cancer in women (11.7%). Bladder cancer and cervical lymphoma was not observed in women while cancer of the larynx, tongue, skin, myosarcoma and malignant tumor of the eye was not observed in men (20). Cause of gastrointestinal cancer was high in this study and also in many studies due to high risk factors for gastrointestinal cancers such as increased carbohydrate and fat intake, lifestyle changes, lack of mobility and obesity, and so on.

The mean BMI in these patients was 33.16 ± 5.08, that indicating patients with moderately obese (obese class I). However, patients with gastrointestinal cancer had higher BMI (BMI = 35.57 ± 9.06), which indicates severe obesity (Class II obesity). So we can say that in this study obesity has a direct impact on the types of cancer, especially gastrointestinal cancer. In the study of renehan et al. (14), showed that in men increase in BMI at a rate of 5 kg per square meter, were associated strongly with esophageal adenocarcinoma, and cancer of thyroid, colon and kidney. As well as in women have been recorded strong communication between 5 kg / m 2 increase in BMI with esophageal adenocarcinoma and cancers of endometrial, gallbladder and kidney.

Also, the results of the study by Lynn et al. (21), showed that overweight adults (BMI≥25) and increased glucose (≥125 mg / dL), have doubled the risk of obesity-related cancer, while overweight adults with normal glucose increased the risk by 50%. Adults with normal weight with increased glucose did not risk excessive cancer.

Also, the study by schrijnders et al. (22) showed that women with type 2 diabetes, were at risk for obesity-related cancer compared to women in the general population for 5 years before diabetic diagnosis. In men and women, the peak incidence of obesity related cancer was observed, following the diagnosis of diabetes. From the second to fifth year, after diagnosis of diabetes, the incidence of cancer related to obesity in women was higher than that of women in the general population.

CONCLUSION

In this study, the average body mass index of patients was moderately obese (obese class I). Also, the highest incidence of cancer in this study was related to gastrointestinal cancers and there was a significant relationship between the history of diabetes and gastrointestinal cancer. Therefore, it is necessary to make changes in the lifestyle of people living in khuzestan province. Also can prevented from developing obesity and diabetes which provides the ground for all types of cancer, especially gastrointestinal, with doing aerobic exercise, nutrition correction and not taking foods high in fat and high cholesterol. And it's better that obese and overweight people; refer to a physician nutrition specialist to determine the amount of your normal body mass index and to get the appropriate diet.

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Conflict of interest
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