ARTICLE ORIGINAL

The consumption of red and processed meat and the risk of colorectal cancer: A case-control study among the tunisian population

La consommation de viande rouge viande transformée et le risque de cancer colorectal : étude cas-témoins à travers la population tunisienne

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RÉSUMÉ

Le cancer colorectal (CCR) est actuellement le troisième cancer le plus fréquent dans le monde. Son incidence et mortalité ne cessent d'augmenter. L'objectif de notre étude est d'examiner le lien entre la consommation de viande et le risque de cancer colorectal. Nous avons effectué une étude cas-témoins à l'institut Salah Azaiez. Cent-deux cas ont été inclus dans l'étude. Les habitudes alimentaires ont été évaluées à l'aide d'un questionnaire. L'âge médian était de 56 ans dans les deux groupes. 63% des patients étaient au stade I-III. L'indice de masse corporelle (IMC) moyen était de 24,76 Kg/m2 dans le groupe cas, et de 27,39 Kg/m2 dans le groupe contrôle. Les cas avaient davantage des antécédents familiaux de CCR et un niveau académique plus faible que le groupe de contrôle. Par ailleurs, il y avait une différence statistiquement significative entre les deux groupes en termes de niveau socio-économique et d'origine géographique. 90,2% des cas et 76,5% des contrôles consomment les viandes rouges. Seule la consommation élevée (> 100g) de viande était associée de manière significative au risque de CCR (p=0,023). A contrario, aucune association significative n'a été observée par rapport au mode cuisson de la viande. Concernant la viande transformée, elle est consommée par 51% des cas et 23,5% dans le groupe contrôle. Notre étude a établie une relation positive entre celle-ci et le risque de CCR (p=0,004En résumé, ces résultats suggèrent une relation significative entre une consommation élevée de viande rouge, la consommation de viande transformée et le risque de cancer colorectal.

Mot clés : Cancer colorectal, prévention, facteurs de risque, viande rouge, viande transformée

SUMMARY

Colorectal cancer (CRC) is at present the third most common malignancy in the world. With changes in lifestyle its incidence and mortality have increased during last decades. Our aim was to explore the association between red meat, processed meat and risk of colorectal cancer.
We performed a case–control study, conducted from February to March 2019 at Salah Azaiez institute. One hundred and two subjects were enrolled. Results showed that the case group included 52.9% males and 47.1% females. The control group enrolled 49%males and 51% females. The median age was 56 years old in the two groups. 63% of patients were stage I–III disease and 37% have a metastatic disease. The mean Body mass index was 24,76 Kg/m2 in CRC group was 27,39Kg/m2 in controls. CRC cases were more likely than controls to have a family history of CRC and a lower education level. There was a significant difference between cases and controls for socio-economic level and geographic origin. Ninety point two percent of cases and 76.5% of controls consume red meats, no significant association was observed between moderate red meat intake and colorectal cancer risk (p 0,063). However, a high total day meat consumption (> 100 g) was significantly associated with a high risk of CRC compared to low consumption (<50 g) (p=0.023) .In contrast no significant association was observed when comparing all cooking methods of meet. 51% of cases and 23,5% of controls intake processed meats. Processed meat was positively associated with CRC (p 0,004).
In conclusion our findings suggest that higher consumptions of red meat, the consumption of industrially processed meat increased the risk of CRC.

Key words: colorectal cancer, risk factor, red meat, processed meat, prevention

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INTRODUCTION

Colorectal cancer (CRC) is currently the third most common malignancy in the world and the first gastrointestinal cancer according to the WHO organization with an increasing incidence worldwide. Even if most cases occur in developed countries, its incidence has also increased in developing countries during the last decades due to changes in lifestyle and the westernization of dietary habits. Red meat and processed meat consumption have been incriminated as risk factors of CRC. Therefore, the purpose of this study is to examine the relationship between read and processed meat consumption and colorectal cancer risk among Tunisian population.

METHODS

This was a case–control study, conducted from February 2019 to March 2019 at Salah Azaiez institute. One hundred and two subjects (51 cases with CRC and 51 controls) were enrolled. Cases were primarily CRC patients diagnosed by histopathology The inclusion criteria for the case group were Tunisian patients and CRC diagnosed in any region of the colon and/or rectum, whereas the exclusion criteria were persons with a history of other cancer and persons with deterioration of general conditions. Controls were people from Tunisia seen during the same period of time who had no earlier history of cancer. Participants were asked to complete a questionnaire. Both groups were frequency matched for their age and gender. The questionnaire sought information on demographic characteristics: age, sex, marital status, residency (urban or rural), occupation, education levels, and level of income. We asked also about family history of CRC, dietary habits (energy intake, fiber intake) and lifestyle characteristics. The questionnaire included two meat groups: red meat and processed meat. "Red meat" included beef, lamb, rabbit, camel and others red meats. "Processed meat" referred to red meat or white meat that has been preserved either through industrial processing or through traditional methods such as Kaddid. All participants were asked, during the interviews, how often they consumed the amount of each type of meat. The participants could choose from these possible responses: never, 1-3 Times/ week, 4-6 Times/week, 1-3 Times /month. Each food item was assigned a portion size using standard local units such as plate, bowl and spoons. Standard local measures were converted to grams/ unit to allow the calculation of intakes in gram/ day. Statistical analyses were performed with SPSS software version 2.01.

RESULTS

General Characteristics of the Study Sample:

For the cases, 27 (52.9%) were males and 24 (47.1%) were females. For the controls, 25 (49%) were male and 26 (51%) were female. The mean ages were 56 ± 10.57 years old in cases and 56.06 ± 10.33 years old in the controls. The majority of case and control participants were married; 88.2% for controls and 78.4% for cases. 89% of case and 84, 3% of controls were upper poverty line. The educational level was limited in the majority of cases. The majority of participants lived in urban areas; 56.9% of cases and 84,3% of controls. Sixty three percent of patients were stage I–III disease and 37% with metastatic disease. The mean Body mass index of cases was 24, 76 Kg/m2 and it was 27,36Kg/m2 in controls.

There were no statistically significant differences between cases and controls for sexe, marital status, and body mass index. However, cases were more likely than controls to have a family history of CRC and had a lower education level. There was a significant difference between cases and controls for socio-economic level and geographic origin.

Red and processed meat consumption:

About 90% of cases and 76, 5% of controls consume red meat. No significant association was observed between red meat intake and colorectal cancer risk (p 0,063). However, a positive association was observed between total day meat consumption and CRC risk for a high consumption (> 100g) compared to low consumption (<50g) (p 0,023). In contrast no significant association was observed when comparing all cooking methods of meet. 99% of case group and all control group consume well-done meat. Fifty one percent of cases and 23, 5% of controls intake processed meats and there was a statistically significant association between the consumption of industrially processed meat and the increased the risk of CRC (p 0,004).

DISCUSSION & CONCLUSION

In recent years, the increase in CRC incidence is attributed to the changes in dietary habits and increased risk factors such as smoking, lack of physical activity and obesity (1). Due to the nutrition transition and the adoption of a western lifestyle, the Tunisian population now consumes more red and processed meat which are suggested to be an important CRC risk factor. Therefore we investigated to study the association. In our case-control study no significant associations between intake of red meat and the risks for colorectal cancer were shown. Our findings are consistent with another prospective study showing same results (2), they suggest however that the risk depends on the type of red meat consumed and cancer subsite. In fact, the risk for colon cancer was significantly elevated for higher intake of lamb (2). Our findings are in contrast to those of a meta-analysis of 21 prospective studies which found that intake of red meat was associated with significantly higher by 17 and 24%, respectively risks for colon cancer per every 100 g increment in intake(3). Possible explanations for the different findings between different studies may relate to differences in the study populations, the grouping of meats, or the range of meat intake.

Our study shows that high intake of red and consumption of processed meat is associated with significant increased risk of colorectal cancer and the results have been confirmed by the IARC (4). The World Cancer Research Fund /American Institute for Cancer Research in 2017 judged red meat to be a probable risk factor for CRC, while processed meat was judged to be a risk factor for CRC, recommending to limit intake of red meat and to avoid processed meat (5).

A meta-analysis of data from 10 studies estimated that for every 50grams of processed meat consumed on a daily basis, the risk of colorectal cancer increased by 18% (3). According to IARC processed meat was classified as carcinogenic to humans (4). Plausible mechanisms are that Red meat consists of compounds such as Heme iron which is thought to stimulate endogenous formation of N-nitroso compounds (NOCs) suspected to be carcinogens (6). Morover, Heme iron can induce oxidative stress and the production of genotoxic free radicals in the colonic stream (7). In addition, heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) formed during high-temperature meat cooking are also mutagens and carcinogens(8). In our study all participant consume well-done meat and there were not a significant association between cooking methods of meat and CRC. However, the results of other studies suggested that the association with colorectal cancer was found to be strongest for well-done red meat(9). Another important factor that could affect the eating habits of Tunisian is food prices. As processed meats are generally more affordable than red meat, dietary guidelines should be reviewed to ensure that they are in line with the changing eating habits. Because of its retrospective design, all reported assciations may be subject to memorization bias .The case control study because of its nature is also likely to be recalled differently between cases and controls.

In summary, the results suggest that higher consumptions of red meat, consumption of industrially processed meat increased the risk of colorectal cancer. Primary prevention of colorectal cancer should give importance to modification of multiple diet and lifestyle factors.

Table 1. Characteristics of Participants in the Study Group.

Parameters	Cases (n=51)	Controls (n=51)	p
Age, mean (SD)	56 ±10,57	56,06 ±10,33	,97
Sex, n (%)			,84
Male	27 (52,9)	25 (49)	
Female	24 (47,1)	26 (51)	
Family History of CRC			.03
Yes	13 (25,5)	7 (13,7)	
No	38 (74,5)	44 (86,3)	
Marital Status, n (%)			0,4
Married	40 (78,4)	45 (88,2)	
Single/widowed	11 (21,6)	6 (11,8)	
Education, n (%)			,02
<High School	36 (70,5)	18 (35,3)	
≥High School	16 (29,5)	34 (64,7)	
Geographic origin, n (%)			,02
Urban	29 (56,9)	43 (84,3)	
Rural	22 (43,1)	8 (15,7)	
Income, n (%)			,03
Below poverty line	8 (15,7)	1 (2)	
Upper poverty line	43 (84,3)	50 (98)	
BMI, mean (SD)	24,76 ±3,71	27,36 ±5,61	,07

Table 2. site and stage of CRC

	Cases (n=51)
Tumor site, n (%)	
Colon	31 (60,8)
Rectum	18 (35,3)
Colon and Rectum	2 (3,9)
Stage of CRC	
I or II or III	32 (62,7)
IV	19 (37,3)

Table 3. Frequency and daily quantity of meat consumption

	Cases (n=51)	Controls (n=51)	p
Red Meat Consumption			,06
Frequent	46 (90,2)	39 (76,5)	
Rare/Never	5 (9,8)	12 (23,5)	
Daily Red Meat Consumption			,02
<50g	41 (80,4)	37 (72,5)	
50-100g	6 (11,8)	13 (25,5)	
≥100g	4 (7,8)	1 (2)	
Processed Meat Consumption			,004
Frequent	26 (51)	12 (23,5)	
Rare/Never	25 (49)	39 (76,5)	
Daily Processed Meat Consumption			,006
<50g	44 (86,3)	50 (98)	
50-100g	4 (7,8)	1 (2)	
≥100g	3 (5,9)	0 (0)	

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