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THE RELATIONSHIP BETWEEN COLORECTAL CANCER AND THE CONSUMPTION OF PROCESSED FOODS: A LITERATURE REVIEW

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Abstract: Cancer, also called malignant neoplasia, corresponds to a disordered cellular proliferation that can develop in different regions of the human body, compromising the functioning of the tissues of the affected organs. At the same time, it is known that, due to the advent of the industrialization process associated with the greater frenetic nature of contemporary life, the consumption of processed foods has increased significantly in recent years. In this sense, together with the growth in the consumption of processed foods, the incidence of a special type of the aforementioned illness, colorectal cancer (CRC), which represents malignant neoplasms that affect the regions of the large intestine, has been growing considerably and marking society contemporary, making it possible to assume that there is a relationship between such factors. Under this bias, the specific objectives of this scientific work are: to epidemiologically analyze the relationship between the consumption of processed foods and CRC, the effect of such products on carcinogenesis and its estimates for the future, in order to seek to achieve the general objective, which is to analyzethe relationship between colorectal cancer and the consumption of processed foods. Thus, this is a literature review based on the following guiding question: "What is the relationship between colorectal cancer and the consumption of processed foods?". In this sense, in order to seek to answer this question, searches were carried out in the EMBASE, LILACS, MEDLINE and SciELO databases, using the descriptors "Colorectal Neoplasms", "Food, processed" and "Risk Factors", combined using the Boolean operator "AND". Texts in their complete versions were selected as inclusion criteria, from the years 2018 to 2023, within a five-year interval, published in Portuguese, English or Spanish, resulting in a total of 25 articles. After screening in stages, and, according to the exclusion criteria, documents of the review type or that presented subjects that did not directly correspond to all of the aforementioned descriptors were discarded, 9 articles that specifically addressed the relationship between the colorectal cancer and the consumption of processed foods. Thus, based on the work analyzed in this literature review, with the general and specific objectives having been met, it was possible to identify a significant relationship between the consumption of processed foods and the development of colorectal cancer in different regions of the world.
Keywords: Processed foods; Carcinogenic effects; Colorectal cancer.

INTRODUCTION

Cancer, also called malignant neoplasia, corresponds to a disordered cellular proliferation – arising from genetic alterations, congenital or acquired, which enable the activation of oncogenes – which can develop in different regions of the human body, disorganizing cellular activity and, consequently, compromising the functioning of the tissues of the affected organs. (MACHADO et al., 2021).

At the same time, it is known that, due to the advent of the industrialization process associated with the greater frenetic nature of contemporary life, the consumption of processed foods has increased significantly in recent years, since these products are very practical in their preparation, optimizing the daily time of individuals who choose to consume this type of meal. (COSTA et al., 2020).

In this sense, together with the growth in the consumption of processed foods, the incidence of a special type of the aforementioned illness, colorectal cancer (CRC), which represents malignant neoplasms that affect the regions of the large intestine,

has been growing considerably and marking society contemporary, making it legitimate to assume that there is a relationship between such factors (DE PAULA; CAMARGO; ELIAS, 2019).

In fact, colorectal cancer, the object of study in this scientific work, according to estimates by the National Cancer Institute (INCA), is, in Brazil, the fifth most common neoplasm in the population, excluding non-melanoma skin cancer, so that, for each year of the biennium 2018 and 2019, there were an estimated 18,980 new cases of colon and rectal cancer in women and 17,380 in men (DA ROCHA LOBO; DEL GIGLIO; AGUIAR, 2020).

From this perspective, beingThis work is quite relevant, as it aims to contribute to the process of better understanding the vast area of oncology, seeking to relate colorectal cancer to the consumption of processed foods, the justification for this work is based on the interest of seeking to identify the possible relationship between colorectal cancer and the consumption of the aforementioned food products.

Thus, the specific objectives are: to epidemiologically analyze the relationship between the consumption of processed foods and CRC, the effect of such products on carcinogenesis and its estimates for the future, in order to seek to achieve the general objective, which is to analyzethe relationship between colorectal cancer and the consumption of processed foods.

METHODOLOGY

This is a literature review based on the following guiding question: "What is the relationship between colorectal cancer and the consumption of processed foods?". In this sense, in order to seek to answer this question, searches were carried out in the EMBASE, LILACS, MEDLINE and SciELO databases, using the descriptors "Colorectal Neoplasms", "Food, processed" and "Risk Factors", combined using the Boolean operator "AND". Texts in their complete versions were selected as inclusion criteria, from the years 2018 to 2023, within a five-year interval, published in Portuguese, English or Spanish, resulting in a total of 25 articles. After screening in stages, and, according to the exclusion criteria, documents of the review type or that presented subjects that did not directly correspond to all of the aforementioned descriptors were discarded, 9 articles that specifically addressed the relationship between the colorectal cancer and the consumption of processed foods, so that six of them presented the relationship between the consumption of processed foods and CRC, with their data displayed in a table; three of them, having one in common with the previous stage, the effect of such products on carcinogenesis; and a final article, which discussed CRC incidence estimates for the future.

RESULTS AND DISCUSSION

Based on the work analyzed in this literature review, some relationships between the consumption of processed foods and the development of colorectal cancer were observed.

Certainly, fulfilling the first specific objective ofepidemiologically analyze the relationship between the consumption of processed foods and CRC,a study that used Cox regression models to estimate adjusted risk rates for colorectal cancer by dietary factors in the UK Biobank study, with men and women aged 40 to 69 as the study population, demonstrated that participants who reported consuming an average of 76 g/day of processed meat – 14 g/day less than the maximum amount recommended by the UK Government itself, which reflects a characteristic of society itself –, compared to those who consumed 21 g/day, they had a 20

higher % of acquiring colorectal cancer, so that, during an average of 5.7 years of follow-up, more than 2600 cases of colorectal cancer were recorded (BRADBURY; MURPHY; KEY, 2020).

A population-based prospective case-control study of Molecular Epidemiology of Colorectal Cancer, involving more than 10,000 volunteers in northern Israel, interviewed personally about their dietary intake and lifestyle through a food frequency questionnaire among Jewish and Arab peoples, in a unique Mediterranean environment, demonstrated that, due to their cultural and behavioral aspects, the individuals interviewed, unlike the people participating in the population study in the United Kingdom mentioned above, did not consume a large amount of processed foods, in especially the meat. However, even given the aspect discussed, it was noticed that, due to the fact that Jews consume more of these products, compared to Arabs, there was still a preponderance in cases of CRC in such individuals. Therefore, in this other study, it was also possible to verify that the consumption of processed foods, even when consumed in small quantities, has some degree of relationship with the development of colorectal cancer (SALIBA et al., 2019).

Furthermore, another analysis carried out with a population of Koreans, a people whose number of cases of colorectal cancer, especially in the distal colon, increased significantly, reaching the second highest incidence rate of this neoplasm in 2018 – by seeking to identify the key modifiable lifestyle factors underlying the alarming rise in CRC incidence, having obtained information on CRC statistics from the Korean National Cancer Incidence Database and on the distribution of factors dietary and lifestyle measures known to modify the risk of CRC from the Korean National Health and Nutrition Examination Survey -, pointed out that, associated with the reduction in physical activities and the increase in the speed of these people's routine, the consumption of processed foods is quite related to colorectal carcinogenesis (KHIL et al., 2021).

Besides, about the Asian continent, specifically in Japan, an analysisinvolving 356,038 participants and 9244 incident cases of colorectal cancer from 6 large-scale population-based cohort studies in Japan, warns that greater intake of processed meat, mainly from cattle, is positively related to the development of this type of neoplasm. Given this, there is a correlation between the consumption of red and processed meat on the Asian continent and the exponential emergence of colorectal cancer diagnoses (ISLAM et al., 2019).

Moving to sub-Saharan Africa, in the nation of Zimbabwe, 100 colorectal cancer cases and 200 community controls were recruited. Data were collected using a food frequency questionnaire and dietary patterns derived from principal components analysis, with generalized linear and logistic regression models being used to assess associations between dietary patterns, participant characteristics and colorectal cancer. Thus, having identified three main dietary patterns: traditional African food, urbanized food and processed food, it was noticed that the first two types were being replaced by the last, with an increase in colorectal neoplasms, confirming the relationship between them and the consumption of processed foods (KATSIDZIRA et al., 2018).

Finally, a study carried out in America, in the United States, with the participation of 923 individuals residing in Stroke Belt states, using online surveys to verify the levels of consumption of meat, red meat and healthy foods, OLS regression to evaluate the association between residence in Stroke

Belt states and colorectal cancer incidence quartiles with food consumption, and path analysis using structural equation modeling to assess whether age, sex, race/ethnicity, income, and health index comorbidity mediates the association between residence in the Stroke Belt of eight states, colorectal cancer incidence groups and meat consumption, it was seen that, by consuming more processed food, residents of Stroke Belt states were more predisposed to developing this type of neoplasia, demonstrating that the consumption of processed foods is intrinsically linked to the development of colorectal cancer (MAYFIELD et al., 2023).

Therefore, it is valid to infer that, even in the face of an enormous diversity of cultures, habits and behaviors spread across the world, the link between the increase in the consumption of processed foods and the increase in cases of colorectal cancer exists and is very present. in contemporary times, as shown in the table below, prepared according to the six studies covered in this initial part of the results.

Thus, having achieved the specific objective ofepidemiologically analyzing the relationship between the consumption of processed foods and CRC, results that demonstrated the effect of such products on this carcinogenesis could also be found.

Certainly, it can be highlighted that carcinogenic substances present in processed foods lead to the development of such cancer. In this sense, it is known that, among them, there are N-nitroso compounds (NOCs) that are added as preservatives or endogenously synthesized in the gastrointestinal tract through reactions between nitrite, amines and amides in processed meat, as they, once present in the human body, NOCs act as genotoxins that induce mutations in DNA, which can result in the process of carcinogenesis. (KHIL et al., 2021).

Furthermore, as another oncogenic element, it was observed that the microbial metabolism of dietary sulfur, also from the consumption of processed foods, produces hydrogen sulfide (H2S), a notable gastrointestinal carcinogen. In fact, evaluating long-term adherence to the sulfur microbial diet, it was observed that it was characterized by the high consumption of processed meats, related to the development of CRC, with more than 2,000 cases of adenoma being recorded as a result of this factor. early onset. In other words, it has been proven that dietary interactions, arising from the consumption of processed foods, with sulfur-metabolizing bacteria in the intestine have a strong influence on colorectal carcinogenesis, especially early-onset carcinogenesis (NGUYEN et al., 2021).

Thus, in line with this fact, one aspect to be observed is that, in fact, the development of colorectal cancer is linked to diet, since, according to a study carried out by the Men's Lifestyle Validation Study, the processed food diet associated with Sulfur metabolism by intestinal microbiota bacteria can increase the risk of colorectal cancer. This way, it is clear how ultra-processed foods harm microbiota metabolism, which can increase the risk of developing colorectal neoplasia. (WANG et al., 2021).

Concluding the presentation of the results, in order to achieve the last objective of analyzing the CCR estimates for the future, in order to, finally, seek to achieve the general objective, which is to analyzethe relationship between colorectal cancer and the consumption of processed foods, a study was found that simulates the evolution of colorectal cancer cases in the German region until the year 2050.

Certainly, according to this study, which used the International Agency for Research on Cancer (IARC) as a reference, there is sufficient evidence for the carcinogenicity

Population sample (n)	Kind of study	Collection Location	Processed Food Consumption Style	CRC Incidence Degree
175404	Retrospective cohort study	UK	Moderate	Moderate
10026	Case-control study	Israel	Low	Low
100000	Cross-sectional study	South Korea	High	High
356038	Population-based cohort study	Japan	High	High
300	Case-control study	Zimbabwe	Low	Low
923	Cross-sectional study	U.S	Very high	Very high

Table 1: Epidemiological analysis of the relationship between the consumption of processed foods and CRC.

of the consumption of processed foods in humans, specifically in relation to the risk of colorectal cancer (CRC) (NIEDERMAIERet al., 2023).

From this perspective, to construct the aforementioned estimate, a macro-simulation approach was used to calculate age- and sex-specific potential impact fractions over a 30-year period (2020-2050), estimating numbers and proportions of future CRC cases. avoidable in different scenarios of reducing processed food intake in the German population (NIEDERMAIERet al., 2023).

Thus, by this analysis, being possible to eliminate the intake of processed foods could reduce the burden of CRC by approximately 205,000 cases in Germany (9.6%) in 2020-2050, 2/3 among men (145,000) and 1/3 among women (60,000), so that reductions in the average consumption of these foods by one or two portions (each 11 or 22 g) per day will reduce the number of CRC cases by 68,000 (3.1%) and 140,000 (6. 5%), respectively (NIEDERMAIERet al., 2023).

Therefore, based on the results presented, confirming the existence of a relationship between colorectal cancer and the consumption of processed foods, and achieving the main objective of this work, a reduction in this scope can substantially reduce the incidence of CRC in Germany and, consequently, having the countless similarities between the populations of different locations at continental and intercontinental levels in other nations have been seen.

FINAL CONSIDERATIONS

Based on the work analyzed in this literature review, it was possible to identify a significant relationship between the consumption of processed foods and the development of colorectal cancer in different regions of the world. In fact, the studies examined addressed diverse populations and found consistent evidence of this association.

In this sense, this is explained, since several carcinogenic substances present in processed foods, such as N-nitroso compounds (NOCs), have been identified as responsible for the induction of mutations in DNA and the process of colorectal carcinogenesis, also from the consumption of processed foods, produces hydrogen sulfide (H2S), a gastrointestinal carcinogen. Thus, these biochemical factors reinforce the connection between the consumption of processed foods and the development of colorectal cancer, considering that long-term adherence to a diet rich in processed foods and an imbalance in the intestinal microbiota were associated with a greater risk of development of such neoplasms.

In conclusion, the results presented in this literature review reinforce the existence of a relationship between the consumption of processed foods and the development of

colorectal cancer, since this association has been confirmed in its biochemical origin and observed in different populations around the world, pointing to the need for public health measures aimed at reducing the consumption of these foods. After all, based on the above, raising awareness about the risks associated with processed foods and promoting a healthy diet are essential for preventing colorectal cancer and, therefore, improving the health of the population in general.

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