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Research Article

The Ketogenic Diet Intervention in Obesity-Associated Colon Cancer Risk Reduction

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Abstract

Colon cancer causes morbidity and mortality. Many reviews have suggested that ketogenic diet intervention is associated with obesity and a higher risk of colon cancer. Is currently unknown comprehensive data from the literature review available from respective journals on ketogenic dietary intervention in obesity-associated colon cancer risk reduction. People with obesity may be able to reduce their risk of colorectal cancer with weight loss medication. The ketogenic dietary modification may have the ability to protect against the early prevention of colon cancer. There are many factors that lead to obesity-associated colon cancer risk reduction and the ketogenic dietary mechanisms behind it are still undergoing intensive weight loss interventions. This review aims to report on obesity-associated colorectal cancer and the beneficial effects of the ketogenic diet to reduce the risk of obesity-associated colorectal cancer.

Keywords: Ketogenic diet, Obesity, Body mass index, Colorectal cancer, Vegetables.

Introduction

The ketogenic diet is a high percentage of fat and a low-carbohydrate diet with adequate amounts of protein intervention for obesity-induced colon cancer strategy [1]. A ketogenic diet can reverse metabolic obesity and inhibit inflammation [2]. The ketogenic diet appears to sensitize most cancers to reduce colon cancer and obesity [3]. A ketogenic diet is exploiting the reprogrammed metabolism of cancer cells [4]. Recently, the ketogenic diet is making the diet an adjuvant colon cancer therapy [5,6]. Here we discuss the ketogenic diet intervention in obesity-associated colon cancer risk reduction. A ketogenic diet has been developed for caloric restriction to apply to colon cancer treatment [7]. A ketogenic diet contains high fat and protein in foods which will usually lead to rapid weight loss. The ketogenic diet is a typical low-carbohydrate diet and high-oil diet resulting in water loss [8,9]. The majority of reports for the use of the ketogenic diet in obesity-induced colon cancer standard therapies. Thus, a ketogenic diet is based on its overall good safety. The ketogenic diet makes the diet a promising candidate to enhance the anti-colon cancer effects of classic chemo- and radiotherapy based on this potential to increase the quality of life [10]. Some reports have supported our knowledge that found a positive association and an important to replicate our finding about obesity-induced colon cancer [11]. Little is known about the role of the ketogenic diet system in chronic inflammation to obesity-associated colon cancer. A ketogenic diet promotes various anti-obesity and anti-colon cancer through amelioration of inflammation. Obesity has been previously reported on colon cancer is associated with a 30~70% risk increase [12]. This chapter summarizes the ketogenic diet underlying obesity and colon cancer available anti-obesity and anti-colon cancer treatments, furthermore, discusses the obesity-induced colon cancer disease progress of body fat excess [13]. The association between

colon cancer and obesity could be likely attributed to obesity-associated chronic inflammation.

Obesity-Induced Colon Cancer

Obesity has been associated with colon cancer development and is a major problem [8]. A Ketogenic diet is an association between obesity and colon cancer. Obesity-related colon cancer death is at least partly mediated by higher BMI or excess body fat [14]. Colon cancer metastasis accounts for 90% is obesity increases. Thus, weight control is key to preventing colon cancer. This is associated with controlling Body Mass Index (BMI). The obesity-associated increased risk for colon cancer can be accounted for by the increased risk due to obesity overweight [15,16]. Obesity-induced metabolic dysfunction leads to inflammation effects and colon cancer development leading to carcinogenesis [17]. Obese individuals should be screened for colon cancer (Figure 1).

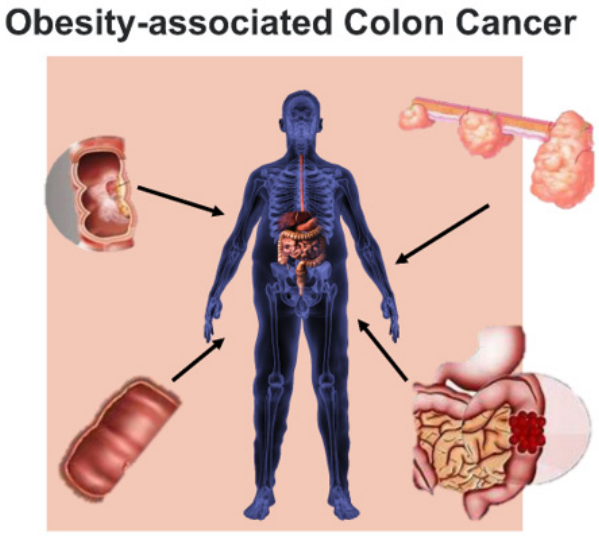

Figure 1: Obesity-association colon cancer.

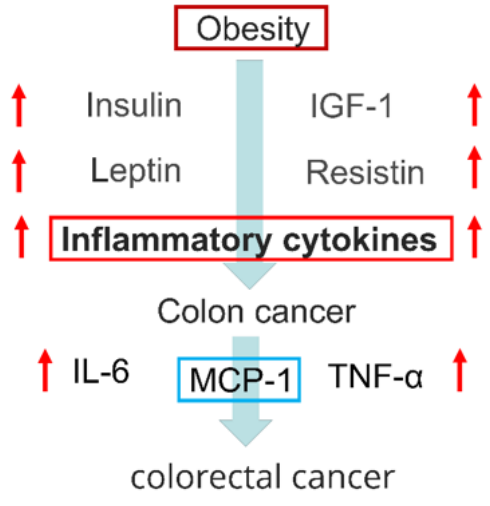

Figure 2: The relationship between obesity, inflammatory cytokines, colon cancer, and colorectal cancer.

Obesity is associated with several diseases, including colon cancer. Adipose tissue is distributed around the intestine organs releasing fatty acids and regulating adipokine metabolism in the intestine. Excessive fat intake results in obesity and the proliferation of adipocytes, leading to local pro-inflammation in adipose intestine tissue and changes in the adipokine. This leads to immune cell recruitment. And adipocytes release pro-inflammatory cytokines [18]. High levels of free fatty acids and inflammation interfere with

insulin resistance leading to adipocyte-developed colon cancers. In colon cancer development, obesity has been shown to increase the blood levels of insulin, IGF-I, leptin, resisting, IL-6, TNF-α, and MCP-1 (Figure 2). This chapter addresses the idea of obesity-associated inflammation leads to colon cancer development in the intestine [19]. In addition, we provide excessive obesity can lead to colon cancer and clarify the mechanism in the reverse obesity-associated colon cancer system.

These factors play an important role in obesity by controlling insulin, IGF-I, leptin, and resisting increases. From obesity-related inflammatory cytokines (IL-6, TNF-α, and MCP-1) controlling obesity could be effective in the improvement of obesity-related colon cancer and colorectal cancer.

A Ketogenic Diet Reverses Obesity and Reduces Colon Cancer

A ketogenic diet has been shown to have a tumor growth-limiting effect to protect healthy cells from DNA damage and accelerates a promising opportunity for colon cancer cells toward chemotherapeutic toxicity or radiation [20,21]. Overall ketogenic diet metabolome during tumorigenesis in colon cancer. Weight loss has been related to reduced obesity and the incidence of colon cancer. A ketogenic diet has been related to weight reduction. Thus, calorie-restricted diets, ketogenic diets, high fiber diets, plant-based diets, protein restriction diets as well as prebiotics. Only obesity (13.2%) had an appropriate obesity diagnosis. Weight loss is shown to improve by the ketogenic diet. Being overweight for obesity-related cancers and obesity cost the health system (Figure 3). In this chapter, the ketogenic treatment of colon cancer has two manifested distinct profiles of metabolic enzymes and mitochondrial dysfunction. Some reports have reported the ketogenic diet as a chemo preventative strategy for colon cancer. Obesity is due to colon cancer through systemic inflammation [22]. Moreover, it has been found a ketogenic diet could kill colon cancer cells through anti-inflammatory, anti-angiogenic, and anti-invasive functions. A ketogenic diet reported in various colon cancer models [23]. A ketogenic diet is a high-fat, moderate protein, and low-carbohydrate diet, as a potential intervention strategy.

The ketogenic diet works on pathophysiological chronic inflammation, oxidative stress, and mitochondrial stress. In starvation conditions, a ketogenic diet leads to altered energy metabolism use of low carbohydrates and high fats, ketone bodies appeared and increased in the blood, which eventually forces the body to use them to produce energy [16]. The ketogenic diet led to the ketogenesis process in the body [24].

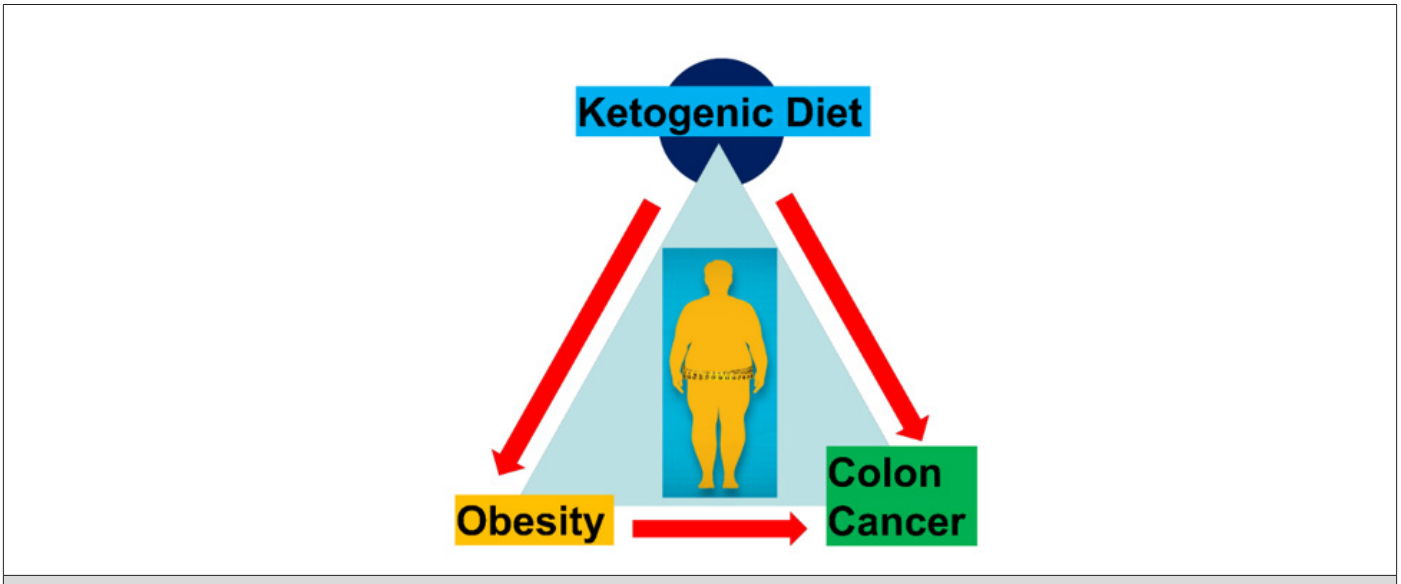

Figure 3: The relationship between ketogenic diet, obesity, and colon cancer in obese adults.

Explain the ketogenic Diet as an Anti-Colon Cancer Effect

Obesity development increased BMI outcomes by exacerbating systemic inflammation (Figure 4). A higher BMI is associated with colon cancer. A ketogenic diet is an extremely eliminating diet of safety, used for BMI loss in overweight and obese. To further elucidate the ketone bodies β-hydroxybutyrate and acetoacetate are important alternate insulin, IGF-1, and insulin resistance as a ketogenic diet therapy. Tumorigenesis requires IGF-1 accumulation [25]. A Ketogenic diet can improve ketone body increases [26]. Controlling colon cancer growth is an important role in a ketogenic diet therapy obesity-associates colon cancer [27]. Furthermore, we highlight IGF-1 and insulin-sensitive suppressed that could explain

the anti-colon tumor effects of the ketogenic diet. A ketogenic diet replaced ketone bodies with carbohydrates as an energy source for colon cancer requires. A ketogenic diet not only reduced the serum concentration of glucose but also reduced the serum levels of insulin and IGF-I. This can suppress tumorigenesis [28]. Carbohydrate intake restriction has a significant inverse on ketone body insulin levels and IGF-1 concentration [29].

Obesity development	BMI
normal weight	18.5 ~ 24.9
overweight	25.5 ~ 29.9
obese	30.5 ~ 34.9
severely obese	35.5 ~ 39.9
morbidly obese	>40.5

(kg/m^2)

Figure 4: Overweight BMI outcome.

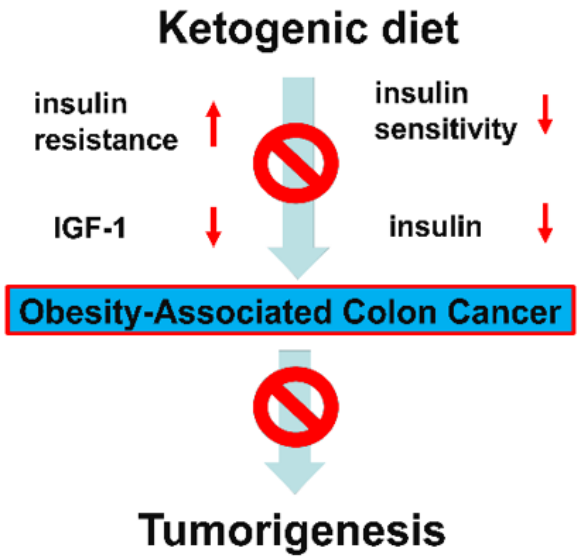

Figure 5: To elucidate a ketogenic diet therapy anti-tumorigenesis.s

Obesity development BMI prevalence of overweight, obese, severely obese, and morbidly obese outcomes.

These findings could be explained by the high levels of BMI. Considering the low efficiency of the growth factor to stimulate the growth of colon cancer cells, the supplementation of a ketogenic diet is potential adjuvant therapy for colon cancer. The progression of colon cancer is systemic inflammation [30]. It has been reported that the ketogenic diet metabolite of the ketone body specifically β-hydroxybutyrate and acetoacetate acid can directly suppress colon cancer inflammation [31]. Due to the ketogenic diet's role in promoting the regulation of ketolases and ketogenesis. Modifying ketogenesis and ketolases pathway metabolic pathways with potential health effects [32,33]. Since ketolases pathway leads to colon cancer cells using increased ketone bodies as energy-impaired cancer cells. Therefore, a ketogenic diet is involved in obesity-associated colon cancer inflammatory mediators, oxidative stress, and insulin resistance. We have proposed a mechanism whereby obesity raises the risk of colon cancer and decreases the obesity threshold (Figure 5).

Obesity-associated colon cancer using ketone bodies as metabolites leads to insulin resistance increases and decreases insulin, IGF-I, and insulin sensitivity.

Conclusion

In this chapter, we have shown ketogenic diet therapy promoted β-hydroxybutyrate and acetoacetate as a colon cancer strategy provided ketone bodies as an energy source to lead to cancer cell fermentation resulting in mitochondrial function impairment and inflammatory-related cancers [34,35]. Obesity-associated colon cancer provided the ketogenic diet to reduce insulin sensitivity and IGF-I to suppress insulin and IGF-I-induced colon cancer growth (Figure 4).

Authors Contributor

All authors read and approved the final manuscript.

Acknowledgment

None.

Conflicts of Interest

None of the authors has conflicts of interest to declare.

References

1. Das M, Webster NJG (2022) Obesity, cancer risk, and time-restricted eating. Cancer Metastasis Rev 41(3): 697-717.
2. Sui Y, Chen J (2022) Hepatic FGF21: Its Emerging Role in Inter-Organ Crosstalk and Cancers. Int J Biol Sci 18(15): 5928-5942.
3. Alesi S, Villani A, Mantzioris E, Takele WW, Cowan S, et al. (2022) Anti-Inflammatory Diets in Fertility: An Evidence Review. Nutrients 14(19): 3914.
4. Bohm MS, Sipe LM, Pye ME, Davis MJ, Pierre JF, et al. (2022) The role of obesity and bariatric surgery-induced weight loss in breast cancer. Cancer Metastasis Rev 41(3): 673-695.
5. Barrea L, Vetrani C, Caprio M, Cataldi M, et al. (2022) From the Ketogenic Diet to the Mediterranean Diet: The Potential Dietary Therapy in Patients with Obesity after CoVID-19 Infection (Post CoVID Syndrome). Curr Obes Rep 11(3): 144-165.
6. Napoleão A, Fernandes L, Miranda C, Marum AP (2021) Effects of Calorie Restriction on Health Span and Insulin Resistance: Classic Calorie Restriction Diet vs. Ketosis-Inducing Diet. Nutrients 13(4): 1302.
7. Boscaini S, Leigh SJ, Lavelle A, García Cabrerizo R, Lipuma T, et al. (2022) Microbiota and body weight control: Weight watchers within? Mol Metab 57: 101427.
8. Beam A, Clinger E, Hao L (2021) Effect of Diet and Dietary Components on the Composition of the Gut Microbiota. Nutrients 13(8): 2795.
9. Shon J, Han Y, Park YJ (2022) Effects of Dietary Fat to Carbohydrate Ratio on Obesity Risk Depending on Genotypes of Circadian Genes. Nutrients 14(3): 478.
10. Cortez NE, Mackenzie GG (2021) Ketogenic Diets in Pancreatic Cancer and Associated Cachexia: Cellular Mechanisms and Clinical Perspectives. Nutrients 13(9): 3202.
11. Mittelman SD (2020) The Role of Diet in Cancer Prevention and Chemotherapy Efficacy. Annu Rev Nutr 40: 273-297.
12. Pourvali K, Monji H (2021) Obesity and intestinal stem cell susceptibility to carcinogenesis. Nutr Metab (Lond) 18(1): 37.
13. Katsnelson A (2022) Can Diet Change the Course of Cancer? ACS Cent Sci 8(8): 1037-1039.
14. Gavrilovici C, Rho JM (2021) Metabolic epilepsies amenable to ketogenic therapies: Indications, contraindications, and underlying mechanisms. J Inherit Metab Dis 44(1): 42-53.
15. Drabińska N, Wiczkowski W, Piskuła MK (2021) Recent advances in the application of a ketogenic diet for obesity management. Trends in food science & technology 110: 28-38.
16. Gómez de Segura I, Ahechu P, Gómez Ambrosi J, Rodríguez A, Ramírez B, et al. (2021) Decreased Levels of Microfibril-Associated Glycoprotein (MAGP)-1 in Patients with Colon Cancer and Obesity Are Associated with Changes in Extracellular Matrix Remodelling. Int J Mol Sci 22(16): 8485.
17. Kim JY (2021) Optimal Diet Strategies for Weight Loss and Weight Loss Maintenance. J Obes Metab Syndr 30(1): 20-31.
18. Duraiyarasan S, Adefuye M, Manjunatha N, Ganduri V, Rajasekaran K (2022) Colon Cancer and Obesity: A Narrative Review. Cureus 14: e27589.
19. Xie H, Wu Z, Li Z, Huang Y, Zou J, et al. (2022) Significance of ZEB2 in the immune microenvironment of colon cancer. Front Genet 13: 995333.
20. Lee H (2022) Obesity-Associated Cancers: Evidence from Studies in Mouse Models. Cells 11: 1472.
21. Lazarova D, Bordonaro M (2022) Hypothesis: Mutations and Immunosurveillance in Obesity-Associated Colorectal Cancer. J Cancer 13: 3044-3050.
22. Park S, An J, Ha SY, Nam S, Kim JH (2022) Immune signature as a potential marker for predicting response to immunotherapy in obesity-associated colorectal cancer. J Gastroenterol Hepatol 37(8): 1579-1587.
23. De A Boleti AP, De O Cardoso PH, F Frihling BE, E Silva PS, De Moraes LFRN, et al. (2023) Adipose tissue, systematic inflammation, and neurodegenerative diseases. Neural Regen Res 18(1): 38-46.
24. Yancy WS, Mitchell NS, Westman EC (2019) Ketogenic Diet for Obesity and Diabetes. JAMA Intern Med 179(12): 1734-1735.
25. Joshi S, Ostfeld RJ, McMacken M (2019) The Ketogenic Diet for Obesity and Diabetes-Enthusiasm Outpaces Evidence. JAMA Intern Med 179(9): 1163-1164.
26. Paoli A (2014) Ketogenic diet for obesity: friend or foe? Int J Environ Res Public Health 11(2): 2092-2107.
27. Ye R, Cheng Y, Ge Y, Xu G, Tu W (2023) A bibliometric analysis of the global trends and hotspots for the ketogenic diet based on CiteSpace. Medicine (Baltimore) 102(5): e32794.
28. Lu G, Huang X, Lin C, Zou L, Pan H (2023) A bibliometric and visual analysis of low carbohydrate diet. Front Nutr 10: 1085623.
29. Teke Kısa P, Güzel O, Arslan N, Demir K (2023) Positive effects of ketogenic diet on weight control in children with obesity due to Prader-Willi syndrome. Clin Endocrinol (Oxf) 98(3): 332-341.
30. Tozzi R, Campolo F, Baldini E, Venneri MA, Lubrano C, et al. (2022) Ketogenic Diet Increases Serum and White Adipose Tissue SIRT1 Expression in Mice. Int J Mol Sci 23(24): 15860.
31. Sun Y, Chen H, Bai Y, Zhang T, Bai W, et al. (2022) Ketogenic diet may be a new approach to treatment stress urinary incontinence in obese elderly women: report of five cases. BMC Womens Health 22(1): 402.
32. Zhang J, Chen B, Zou K (2023) Effect of ketogenic diet on exercise tolerance and transcriptome of gastrocnemius in mice. Open Life Sci 18(1): 20220570.

33. Tamraz M, Al Ghossaini N, Temraz S (2023) The Ketogenic Diet in Colorectal Cancer: A Means to an End. Int J Mol Sci 24(4): 3683.

34. Manolis AS, Manolis TA, Manolis AA (2023) Ketone Bodies and Cardiovascular Disease: An Alternate Fuel Source to the Rescue. Int J Mol Sci 24(4): 3534.

35. Dyńka D, Kowalcze K, Paziewska A (2022) The Role of Ketogenic Diet in the Treatment of Neurological Diseases. Nutrients 14(23): 5003.