

# COLORECTAL CARCINOMA IN WEST AFRICANS: SOME CONSIDERATIONS ON ITS RELATIVELY LOWER INCIDENCE COMPARED TO CAUCASIANS

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## SUMMARY

Carcinoma of the colon and rectum is about the 2<sup>nd</sup> commonest cancer in the developed (western) world; however in developing countries especially West Africa it has not yet reached such magnitude. This suggests that there may be factors either anthropomorphic or environmental which may be responsible for this. The paper acknowledges the reduced incidence of colorectal cancer in native West Africans living in Africa and endeavors to highlight the various factors that produce this observation in medical literature. A compelling search through available literature on the aetiology, epidemiology and comparative anthropology of colorectal cancer was done. Internet search using Pubmed, British library online and Google scholar was also utilized. The rarity of adenomatous polyposis syndromes in the native West African contributes to the reduced incidence of colorectal cancer. Cancer prevention and cancer-protective factors are deemed to lie in the starchy, high-fiber, spicy, peppery foodstuff low in animal protein which many West African nations consume. Lactose intolerance which many black races have is also suggested to be protective, likewise exposure to sunlight and physical activity.

The natural geographical location which ensures all-year-round sunshine, avoidance of western-type diet and rarity of polyposis coli syndromes may continue to keep the rates of colorectal cancer down (when compared to Caucasians) in the native West African.

**KEY WORDS:** Colorectal Cancer, West Africans, Dietary habits.

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## INTRODUCTION

Colorectal cancer incidence is reportedly lower in West Africans than in Caucasians. The prevalence of colorectal cancer in those

western countries has been linked to hereditary/genetic predispositions and environmental influences like life-style patterns and diet. The adenoma-carcinoma sequence has been adduced to be the final pathway of these links mentioned above. In West Africa, the rarity of these colonic adenomata has led to the consideration of a different mechanism by which colorectal carcinoma develops. This paper intends to review literature that may have relevance to the possible reason for the low incidence of colorectal carcinoma in the native West African.

## DISCUSSION

Colorectal carcinoma in Nigeria, the most populous nation in West Africa with 120 million inhabitants, seems to be increasing in incidence. The time trends in common cancers in

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men from the Ibadan cancer registry in Nigeria show that four decades ago (1960-1969), the top five cancers in men did not include colorectal cancer. But by the last decade, carcinoma of the colon and rectum moved from the tenth to the fourth position.<sup>1</sup>

However studies that have been published from various centers in the country show that the number of patients seen per year with colorectal cancer in each center ranges from about 6 to 25.<sup>2-9</sup> Each of these centers is a teaching hospital or tertiary health facility that serves populations of about one million to 1.5 million people. In a westernized country like Australia, up to 317 new cases of either colon or rectal cancers are reportedly seen yearly.<sup>10</sup> All strata of society are involved in this disease; indeed colorectal carcinoma has been recorded to be no respecter of persons in Nigeria as clergymen, petty traders, professionals and traditional rulers were not exempted.<sup>4</sup> Incidence rates in Nigeria are put at 3.4 cases per 100 000 compared with 35.8 cases per 100 000 each year in the state of Connecticut, USA.<sup>11</sup> This shows that even if it seems that incidence rates are increasing in Nigeria, such rates are still about one-tenth of what is seen in the truly developed countries. This situation seems to prevail in developing countries especially in Africa and it has been shown in South Africa that in spite of the establishment of westernized dietary habits in South African blacks they still have a much lower incidence of colorectal cancer than South African whites.<sup>12</sup> These westernized diets include grilled meats like steaks, deep-fried chicken and burger-meats which are served in ever-growing and popular western fast-food establishments. In a bid to find reasons and explanations for this observed rarity of colon and rectal cancer in West Africans generally and Nigerians specifically, this review will concentrate on the following areas:

\* **Colonic adenomatous polyps:** Only two cases of familial adenomatous polyposis have been reported in Ibadan in the last 35 years<sup>3</sup> and two cases of hereditary non-polyposis colon

cancer have been reported within the last 15 years.<sup>13</sup> This relative absence of pre-malignant conditions like adenomatous polyps in the West African has been reported by several authors.<sup>4,12,14-16</sup> This lack of a detectable adenoma-carcinoma sequence in Africans may indicate a different aetiopathogenesis of colorectal cancer.<sup>14</sup> In addition the relatively younger age at which West Africans develop this disease has also been said to be against the adenoma-carcinoma link.<sup>4,14,17</sup>

\* **Diet:** This is one area that has been extensively researched in the epidemiology of colorectal carcinoma. Appreciation of the environmental dependence of bowel cancer was noticed from migration studies as one can see the contrast between American blacks, who now have an incidence comparable to Caucasians, and that of native Africans. This is because these migrants have adopted the dietary customs of their new country.<sup>16</sup> Indeed the idea that colon cancer is linked to diet is usually credited to Dennis Burkitt who reported that colorectal cancer was rare among rural Africans, this, he suggested was because Africans had little meat in their diet and instead eat a lot of fiber from fruits, grains and vegetables.<sup>16</sup> Colonic adenocarcinoma is the 3<sup>rd</sup> commonest malignant neoplasia in societies with western-type life style as diet rich in red meat and fat, lacking in vegetables, fruit and fiber is implicated in colonic carcinogenesis.<sup>18</sup> It is without doubt that countries that consume a lot of meat and animal fat have the highest rates of colon cancer and this inversely correlates with the consumption of dietary fiber.<sup>19-21</sup> The protection that fiber offers has been shown to be dependent on the type of fiber consumed as many studies have found no protective effect of cereals-type fiber and have consistently found a protective effect of vegetable and fruit fiber.<sup>21-24</sup> The typical West African diet consists of a carbohydrate-based bolus-type of meal which cannot be consumed alone but with soup that is usually vegetable-based. In very rural and poor communities meat is hardly eaten and fleshy fruits may be the lunch or

dinner of many. Another problem concerning meat intake is the mode of preparation or cooking of the meat. Meat cooked at high temperatures contains a class of carcinogens called heterocyclic amines (HCA).<sup>25,26</sup> These are produced when meat is heated above 180 °C for long periods and these HCAs have consistently been identified in well-done meat products from the North American diet.<sup>25</sup> The poor electricity supply in most rural and urban areas in this country (Nigeria) does not encourage refrigeration of meat thus many households deep-fry meat for preservation and consumption. Meat grilled or barbecued contains the highest amount of polycyclic aromatic hydrocarbons (PAH) because of the exposure to smoke formed from the pyrolysis of fatty juices that drip down onto the heat source.<sup>27</sup> Maybe this may have a role to play in some of the colon cancers seen in these parts. Indeed some authors have alluded to the carcinogenic properties of charcoal-roasted meat called 'suya' in Nigeria.<sup>28,29</sup> The carbohydrate-based diet of Nigerians had been mentioned earlier and this has been shown to be protective against the development of colon cancer. The human colonic bacteria ferment starch and non-starch polysaccharides to short-chain fatty acids, mainly acetate, propionate and butyrate. Butyrate has been found to be a preferred substrate for colonocytes and appears to promote a normal phenotype in these cells. Resistant starch fermentation favors butyrate production and may be more protective against colorectal cancer than non-starch polysaccharides which are the major components of dietary fiber.<sup>2,30-34</sup> Also the resistant starch from maize has been shown experimentally to produce more 'colon-friendly' butyrate than that of potato starch.<sup>31</sup> Cassava may also, by a different mechanism, be protective against cancer because it contains a chemical called tamarin which is responsible for the production of hydrocyanide. This tamarin has been shown in vitro to cause death of cancer cells by self-toxicity with hydrocyanide.<sup>35</sup> The Nigerian diet favors a variety of cassava-based bolus meals.

\* **Spices and phytonutrients:** Epidemiological data supports the fact that the lowest incidences rates of colorectal cancer are found in India, Asia and Africa.<sup>36-38</sup> These are also the places where foods are hot and spicy. This has led to a closer look at these phytonutrients as they are now called and their mode of protection from colorectal cancer. Turmeric (curcumin), which is an ingredient in Indian curry, has anticancer properties.<sup>39-42</sup> Curcumin is diferuloylmethane and it targets multiple signaling pathways that may protect the colon by decreasing the activity of beta-glucuronidase and mucinase.<sup>40,41</sup> Other anticancer properties of curcumin include inhibition of lipoxygenase activity, specific inhibition of cyclooxygenase 2 expression and the promotion/progression stages of carcinogenesis.<sup>42</sup> Garlic and onions, which contain diallyl sulphide, were found to suppress cell division in human colon tumor cells.<sup>43</sup> Red pepper which is used widely in Nigerian cooking has been shown to protect against colorectal carcinoma.<sup>44,45</sup> The main ingredient of red chili pepper is capsaicin and this is known to cause death of colon cancer cells.<sup>45</sup>

\* **Body weight/size and physical activity:** Increased caloric intake and reduced physical activity seems to be the sign of development and civilization, and this leads to obesity which is a common ailment in the United States. Many studies have shown a link between an increase in body size and colorectal cancer.<sup>21,46-49</sup> Those who indulge in a lot of physical activity have a lower chance of developing colorectal cancer.<sup>21,47,49</sup> In the developing countries, the level of poverty precludes the luxury of over-indulgence in food and ensures continuous physical activity either from farming, manual labor or self-employment. For in the developing countries one starves if one does not work. Ironically this has now been seen to reduce the chance of developing colorectal cancer because obesity and lack of physical activity are not common in West Africans in general and Nigerians in particular.

\* **Malabsorption/lactose intolerance:** Lactose intolerance is seen more in the African race than in Caucasians. Interestingly, the malabsorption that this causes has now been hypothesized to be a protective factor against the development of colorectal cancer.<sup>50</sup>

\* **Sunlight and vitamin D:** West Africa is blessed with sunlight all year round. Sunlight is important in the peripheral manufacture of vitamin D in the human body. Vitamin D and calcium have been shown to be protective against colorectal cancer.<sup>51,52</sup> Thus geographical serendipity also plays a part in the provision of factors that keep the incidence of colorectal cancer low in West Africans.

To conclude, one may infer that the explanation why the incidence of colorectal cancer in West Africans as a whole and in Nigerians specifically remains low is rooted in (a) The rarity of adenomatous polyposis syndromes, (b) The protective effects of our starch-based, vegetable-based, fruit-based and spicy, peppery diet and (c) Our geographical location which ensures sunshine all year round.

It may be possible in future to reduce the effects of point (a) by inter-racial marriages ensuring mixing of genetic susceptibilities and point (b) by radical dietary changes with adoption of a total western-oriented diet, but at present and for the most of the population this low incidence of colorectal cancer is the status quo.

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