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NUTRITIONAL PERSPECTIVE ABOUT PROSTATE CANCER DISPARITY BETWEEN THE WEST AND THE REST OF THE WORLD

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Abstract- The hypothesis is that the lack of natural phytochemicals in the diet of the men in the West contributes to the higher incidence of prostate cancer, as compared to the rest of the world. There is strong evidence in the literature that phytochemicals play the role of a defense system in a human body so that the body is not as vulnerable to incurable and dangerous diseases. There have been studies that show phytochemicals play a major role in the prevention of cancer and fewer studies specifically on prostate cancer. Health benefits are best obtained through the consumption of a varied diet that comprise fruits and vegetables, grains, legumes and seeds which contain the phytochemicals. The current work has shown the perspective that some common foods that contain high amounts of phytochemicals which could be key to good health (as regards not getting prostate cancer) include garlic, onion, coriander, cumin, chili peppers and turmeric, as well as the almost universal food items of vegetable oil, onions and black pepper. The current paper has shown the perspective that the large incidences of prostate cancer in the USA, Canada, several western European nations, Australia and New Zealand are probably due to the lack of active phytochemicals in the daily diet of the majority of the men in these countries.
Key words- Prostate Cancer, natural phytochemicals, daily diet

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Hypothesis

The hypothesis is that the lack of natural phytochemicals in the diet of the men in the West contribute to the higher incidence of prostate cancer, as compared to the rest of the world.
The factor of concern is the amount and frequency of phytochemicals and other anticancer factors (e.g. TNF) in the diet. This work is expected to improve the understanding of prostate cancer health disparities between the West and the rest of the world.

Background

Literature Review

Studies on the protective action of phytochemicals against cancer include [1-19]. In fact, [5-8] are three related reviews on the subject. In [5], Beecher performed a review of the cancer preventative effects of cruciferous vegetables. In [6], Rao and Rao did a review about carotenoids and human health. Reference [7] is a comprehensive review of cancer prevention through dietary antioxidants. In [8], it was concluded that recent increases in consumption of more energy-dense, nutrient-poor foods with high levels of sugar and saturated fats, combined with reduced physical activity, have led to obesity rates that have risen threefold or more since 1980 in some areas of North America and Europe. Obesity poses a major risk for serious diet-related chronic diseases, including type 2 diabetes, cardio-vascular diseases, hypertension, stroke, and certain forms of cancer. In [16], a very small inverse association between intake of total fruits and vegetables and cancer risk was observed. One of the facts to come out from the 5-a-day campaign in the U.S.A. is that despite canvassing and promoting dietary recommendations to eat at least five portions of fruit and vegetables a day for the past 25 years, still less than 25% of the American population achieve this level of intake, [8]. These figures are similar for many European countries (Boffetta et al.[10]; http://www.guardian.co.uk/uk/2007/dec/30/schools.schoolmeals; http://www.telegraph.co.uk/health/healthnews/7572108/Britons-eating-fewer-vegetables-despite-5-a-daycampaign.html; http://www.who.int/dietphysicalactivity/media/en/gs_fv_ppt_mmeyer.pdf). These facts provided the backdrop for the current work.

In [20], it was found that the antioxidant phytochemicals in garlic do prevent oxidant damage. This action allows garlic to play a role in preventing diseases such as cancer. Turmeric, garlic and ginger are discussed with respect to chemoprevention in [21]. Reference [22] is about cumin and cancer in rats. Reference [23] results indicated that linalool (coriander, parsley) possessed the strongest activity (amongst other spices and herbs studied) against a broad spectrum of carcinoma cells. Reference [24] is work related to cancer prevention effects of chili peppers. It was found that capsaicin generates reactive oxygen species in cells with resultant induction of apoptosis and cell cycle arrest, which is beneficial for cancer chemoprevention.

Studies related to prostate cancer prevention and foods exist for tea polyphenols (tea), curcumin (turmeric), genistein (soy bean), resveratrol (grapes, peanuts), lycopene (tomatoes, water melon), pomegranate and lupeol (mangoes), [7]. In reference [25], they found protective effects of vegetables, particularly cruciferous vegetables, on prostate cancer risk. Kolonel et al. [26] suggest that legumes (not limited to soy products) and certain categories of vegetables may protect against prostate cancer. Giovannucci [27] did an epidemiological literature review of the antioxidant value of tomatoes and tomato products as well as lycopene on prostate cancer. Results were different amongst published studies; however, he observed that the studies which claimed that lycopene gave some protection against prostate cancer to the consumer were based on cohorts that consumed much more tomatoes and tomato products than those in the studies that claimed otherwise, one study was as much as ten times more. That the quantity of the vegetable or fruit item to be consumed for sufficient preventative effect to be shown was strongly indicated. Gupta et al. [28-30] performed work to show the prostate cancer preventative effect of green tea. Curcumin (turmeric) has been shown to induce apoptosis in both androgen-dependent and androgen-independent prostate cancer cells; this was accomplished by downregulating apoptosis suppressor proteins and other crucial proteins such as the androgen receptor [31].

The literature indicates that studies have been done singly, and in various combinations, about food items that will be examined in the current work, but not in the exact combination.

Justification/Rationale

Statistic shows that one out of three people is affected by cancer before the age of 75. This represents 12 per cent of all reported deaths on Earth. Generally, data has shown that individuals consuming fewest fruits and vegetables have twice the chance of developing certain cancers, suggest that these dietary shortcomings could play a role in the higher cancer rates now afflicting the West [17]. In this context, the 'West' refers to the USA, Canada, Western Europe, Australia and New Zealand. In the USA, the gender-specific cancer with the highest mortality in men is prostate cancer. While there is abundant scientific and government support for recommending diets rich in nutrients from fruits and vegetables, there is only limited evidence that physiological effects result from any specific phytochemicals.

In addition, the nutritional campaign to eat at least five portions of fruit and vegetables a day for the past 25 years in the USA and Europe have not succeeded, [8, 10]. The time is ripe for a nutritional campaign that is more easy to implement and therefore adopted by the masses. The motivation to look at culinary styles of various cultures come from the fact that these styles have been proven at some level, and that the food ingredients used by these different cultures have been incorporated for a long time in their daily diets, often for centuries.

It is also common knowledge that agriculture in developed nations (in the West) is more prone to employ pesticides and hence the produce (being thus protected) tend to have less natural phytochemicals, which are nature's agents for protecting the various edible plant life. For efficiency and productivity, pesticides have customarily been used in agriculture in the United States, Canada, Western Europe, Australia and New Zealand. Because of the 'protection' afforded by these pesticides against pests and disease, the fruits and vegetables consumed by the populations of these countries lack in the amount of natural phytochemicals found in naturally grown or organically grown produce. This reduced availability of phytochemicals in the produce could be a contributory factor to the incidence of prostate cancer and other cancers in the West since the natural protection provided by the consumption and assimilation of these natural phytochemicals have been decreased with the use of pesticides. This contributory factor is over and above the fact that diets in the West contain less fruits and vegetables per calorie consumed than diets in East Asia and South Asia, for instance.

It is a fact that there is prostate cancer disparity between African Americans and males of other cultural origins and genetic makeup in the USA. The dietary habits of most of the African countries will not be examined. The Arab countries (including Egypt) will be considered.

The Nutrient Health Equation

The quality of a diet can be based on three simple criteria:

- Levels of micronutrients (vitamins, minerals, phytochemicals) per calorie.
- Amounts of macronutrients (fat, carbohydrate, protein) to meet individual needs, without excessive calories that may lead to weight gain or health compromise.
- Avoidance of potentially toxic substances (such as trans fats) and limited amounts of other potentially harmful substances (such as sodium).

Fuhrman created The Health Equation: H=N/C or Health = Nutrients/Calories (first published in 1999 in his work, The Health Equation and later described in more detail in his book [32]) to define how the quality of calories impacts health.

This equation means a person's health can be predicted by the micronutrient per calorie density of the person's diet. Micronutrient per calorie density is important in devising and recommending menu plans and dietary suggestions that are the most effective for preventing and reversing disease.

To assure nutritional excellence means to meet an individual's unique nutritional needs to profound therapeutic effects for preventing, treating and reversing disease. Dietary micronutrient quality must be increased accordingly to utilize dietary recommendations therapeutically for disease reversal or to protect high-risk individuals.

Though micronutrient density is critically important, it is not the only factor that determines health. For example Vitamin D levels, B12, and proper omega-3 intake are important for optimal long-term health as well as avoidance of sodium and other toxic ex-

cesses. These concerns are not addressed in the H = N/C equation. However, if the focus is consuming more micronutrient-rich natural foods then the other important nutritional benefits automatically will follow, such as lower sodium, reduced calories, high fiber and volume, a low glycemic index, and a high satiety and phytochemical index to name a few.

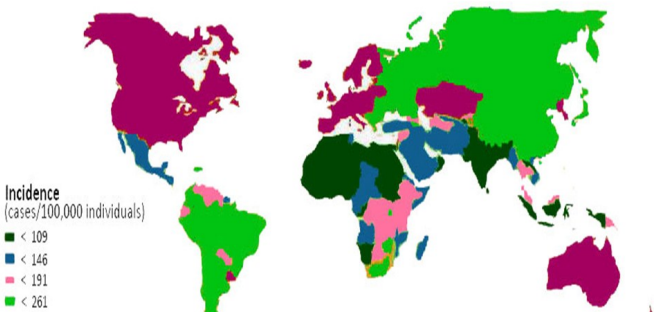

Fig. 1- Global Distribution of Cancer Incidence [17]

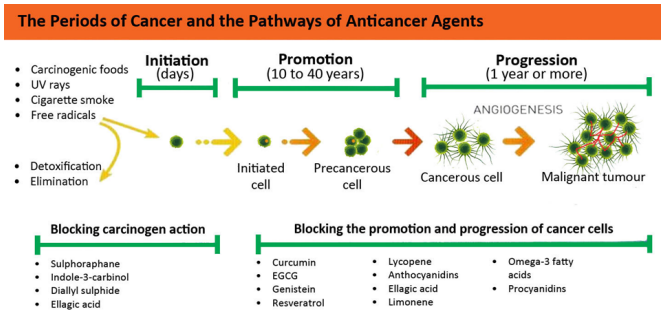

Fig. 2- The Initiation, Promotion and Progression Periods of Cancer, [17].

Some not as common knowledge about fighting cancer are listed below. It is an assumption of the current paper that cancer may be reduced by eating foods rich in cancer-fighting agents. The major phytochemicals in the more commonly available produce (in urban USA) are shown in Fig. 3.

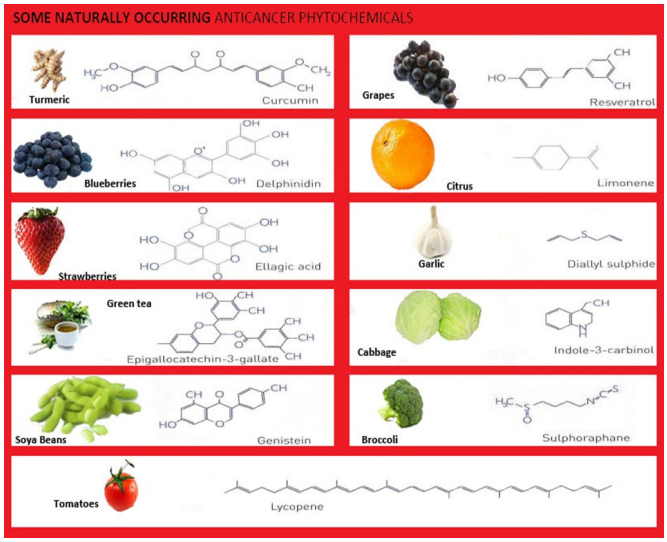

Fig. 3- Anticancer phytochemicals present in some common fruits and vegetables, [17].

From Figure 2, it is clear that the promotion period before the cancer progression period, can be long, 10 to 40 years, [17]. In addition, some common knowledge about diet and exercise in the fight against getting cancer in general.

- Quit smoking
- Lower red meat and calorie intake- avoid or reduce industrially processed foods i.e. chips, soft drinks, crisps.
- Avoid barbecued meats. The greasy drippings that fall and catch fire produce toxic substances known as aromatic hydrocarbons.
- Exercise regularly.
- Opting to modify your diet in order to include certain foods that are exceptional sources of anticancer molecules represents one of the best weapons currently at our disposal in the fight against cancer.
- While it is true that the tumors that form spontaneously in our bodies generally remain microscopic in size, posing no danger to health, it is also true that all too often these tumors do not grow and develop into lethal end stage cancer. However, if it does grow, we will be at risk of developing cancer.
- We should try to think of cancer as a chronic disease, one that can be controlled on a daily basis with the help of foods rich in anticancer compounds.
- Among the many anticancer compounds present in fruits and vegetables, phytochemicals are the most important.

The eleven more common food and drink items available in the urban areas of the USA in Fig.3 are turmeric, blueberries, strawberries, green tea, soya beans, tomatoes, grapes, citrus, garlic, cabbage and cruciferous vegetables, broccoli. These food and drink items are of plant origin, with significant amounts of demonstrated active phytochemicals.

Comparing Fig. 4 and Fig. 1 above, it is clear that prostate cancer is an important cancer in the western world of North America (excluding Mexico), Western Europe (excluding the Mediterranean countries), Australia and New Zealand. The latest estimates of global cancer incidence show that prostate cancer has become the third most common cancer in men, with half a million new cases each year, almost 10% of all cancers in men The incidence of prostate cancer varies widely around the world, with by far the highest rates in the USA and Canada [33]. There has been a gradual increase in the incidence of prostate cancer since the 1960s in many countries and in most continents; there were large increases in the late 1980s and early 1990s in the USA.

Perspective

Phytochemicals have been recognized as a plant chemical that hold within them certain disease-preventing compounds. Although these phytochemicals are not yet widely classified as nutrients (but has been included in Fuhrman's formula), their substances aid animals and people by creating a preventive barrier against diseases and sickness. Over 900 different phytochemicals have been identified as components of food and are at present still being discovered in the different foods which are consumed on a day-to-day basis.

From as early as 1980, the National Cancer Institute Chemoprevention Program of the Division of Cancer Prevention and Control

began to study and evaluate the different types of phytochemicals for safety, efficacy, and applicability for prevention and treatment of diseases. Researchers have for a long time been conducting tests and have come to recognize that there are phytochemicals which are present not only in plants for their protection, but also that these chemicals can aid human life.

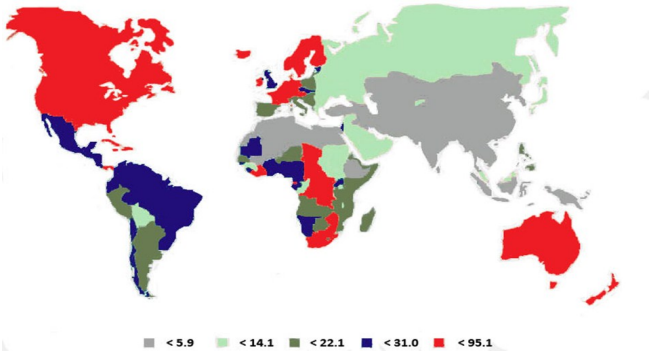

Fig. 4- The incidence of prostate cancer world-wide, agestandardized, using the World standard population, [33].

From Figure 4, it is evident that there is a disparity in prostate cancer between the West and the rest of the world. We are now going to study the common plant ingredients in the major cooking styles of the major countries (regions) around the world to substantiate the hypothesis. The cooking style of a region or country embodies the cultural practices of the people, sometimes for over a long period of time. The style with respect to the food ingredients used, is evidence that those food ingredients (identified here with that style) are omnipresent in the daily diet of the people. Unlike Fig. 3 which shows the phytochemicals present in food items easily available in urban U.S.A, the food items focused upon in this section are the ones which are used every day in the preparation of the daily meals of the people.

In Table 1, is listed the common foods and their well known phytochemicals associated with each of the cooking styles identified for various countries and regions of the world. The cross in the table indicate that the food item is present, and the single line indicate that the food item is present in some parts of the country or region only. It should be noted that many of the food items have other active phytochemicals besides those listed, some perhaps yet to be discovered.

The East Asian (Chinese) diet commonly involves stir-frying of vegetables, with or without small bite-size portions of meat, fish or equivalent (e.g. soya bean curd). The base of stir-fry dishes is vegetable oil, garlic, onion, ginger, black pepper and coriander. This base contains several known cancer-fighting phytochemicals. This fact does not take into account the daily widespread consumption of soya sauce and soya bean products, tea, cabbage and cruciferous vegetables in China.

Table 1- Common Foods (and Phytochemicals) in Various Regions of the World

The Japanese (also East Asian) diet usually involves ginger, onions, soya sauce, black pepper and mirin, all rich in active phytochemicals. Soya bean products and tea are also universally consumed in Japan as they are in China. Mirin is fermented rice which is used as a sugar substitute in savory dishes; it contains B vitamins and probiotics.

The South Asian (Indian) diet is traditionally a vegetarian diet with milk and dairy products. The phytochemicals exist in fruits and vegetables; hence a vegetarian diet is full of cancer-fighting nutrients. In cooking the ubiquitous curry which is an everyday dish, the common ingredients are vegetable oil, turmeric, black pepper, chili pepper, cumin, onion, garlic and coriander. All these have high content of active cancer-fighting phytochemicals. In addition, turmeric is used as a ubiquitous antiseptic and anti-inflammatory therapeutic substance and tea is drunk widely. The Pakistani, Bangladeshi and Sri Lankan cooking styles are similar to the Indian style with respect to the food items described here.

The South-East Asian (Indonesian, Filipino, Malaysian, Thai, Cambodian, Vietnamese, Laotian, Burmese, etc.) diets tend to be an age-old fusion of East Asian and South Asian diets. A vegetable oil, garlic, onion, ginger, black pepper, chili pepper, coriander and turmeric are used in various combinations and quantities in the daily food intake of the peoples of South-East Asia. Hence, the micronutrients that fight cancer are omnipresent in the diets of the peoples.

The typical Middle-Eastern (Arab) diet comprise the ingredients of vegetable oil, onions, garlic, black pepper and cumin, all of which are rich in phytochemicals. The typical Egyptian diet contain as much fruits and vegetables per calorie intake as the East Asian or South Asian diet. Hence, these diets have a high H value in the micronutrient health equation.

The North American diet (USA and Canada) of the fast-food variety contains vegetable oil, potatoes, black pepper and onions as the common food items consumed. Potatoes do not have a high content of active phytochemicals. These common food items lack tremendously in (demonstrated active) phytochemical content with respect to calorie intake, as compared to the East Asian and South Asian diets for instance. The western European countries which are at the highest risks for prostate cancer, including Australia and New Zealand, have fast-food diets similar to the North American diet.

It is interesting to note that of the Western Europe countries, Spain and Italy fall out of the regions with the highest levels of prostate cancer, dropping two levels each, Figure 4, as compared to the cancer (all types) incidences map in Figure 2. In both countries (as well as in other Mediterranean countries), a common cooking base is comprised of olive oil, garlic, onion, black pepper and coriander, which in combination increase the source of phytochemicals several times as contrasted with the other western European countries. Cumin is used daily in some areas of Spain.

In Figure 4, it is clear that Latin America (all countries south of the USA in the Americas) are not at the highest level of prostate cancer incidences. The culinary styles found in Latin America have evolved from the Mediterranean culinary style, so that the same observations apply. Cumin is used daily in many parts of Latin America.

The Caribbean nations and islands have a lot of influence from the USA, and in many of them, much of their food products are imported from the USA. The North American fast-food diet is prevalent in the Caribbean nations and islands. In Figure 4, these nations and islands are in the same category as the USA and Canada with respect to prostate cancer incidences.

The common cooking ingredients common to the major customary diets investigated here are one type of vegetable cooking oil,

black pepper and onions. The major phytochemicals in olive oil and canola oil are well known. Since the C value of oil is high, the H value is not increased by oil. Onions and black pepper by themselves seem not be enough either. The other common ingredients for cooking in the various customary cuisines seem to contribute significantly to reduce the incidence of prostate cancer. In Table 1, the notable ones are observed to be garlic, ginger, coriander, chili pepper, cumin and turmeric. These six plant dietary items in conjunction with onions and black pepper occur in all the major cuisines studied above, missing one, two or three at the most. The vegetable oil helps the body assimilate the food products.

Research [34,35] has revealed that eating a combination of broccoli and tomatoes which possess lycopene, offers a powerful and protective effort against cancer which cannot be possible by eating either one of the vegetable alone. It was also demonstrated that when a person eats one tomato, he/she does not only consume lycopene, but instead the person is consuming many other phytochemicals, a few of which have been demonstrated as helping (active) to prevent chronic diseases like prostate cancer, and many others that have not been studied yet.

Conclusion

There is strong evidence in the literature that phytochemicals play the role of a defense system in a human body so that the body is not as vulnerable to incurable and dangerous diseases. There have been studies that show phytochemicals play a major role in the prevention of cancer and fewer studies targeted at prostate cancer. Health benefits are best obtained through the consumption of a varied diet that comprise fruits and vegetables, grains, legumes and seeds which contain the phytochemicals. The current work has shown the perspective that some common foods that contain high amounts of phytochemicals which could be key to good health (as regards not getting prostate cancer) include garlic, onion, coriander, cumin, chili pepper and turmeric, as well as the almost universal food items of vegetable oil, onions and black pepper.

The current paper has shown the perspective that the large incidences of prostate cancer in the USA, Canada, several western European nations, Australia and New Zealand are probably due to the lack of active phytochemicals in the daily diet of the majority of the men in these countries.

Further Work

The findings of the current work provide justification for further research to monitor the diet of men in developed countries (in the West) in the coming years to see if there are any increase in the consumption of fruits and vegetables, and to see if there is any change in their leadership in suffering the most from prostate cancer.

The countries of most of Africa need to be studied with respect to nutrition and prostate cancer, especially those with high incidences of prostate cancer. It would be interesting to investigate if there is a causative link between the disparity of prostate cancer amongst the people of African American descent and the rest of the male population in the U.S.A., and the high incidences of prostate cancer in many African countries, as shown in Fig. 4.

In addition, a campaign to include several of the food items studied here in the daily nutrition of the American and European people could be more successful than the current campaign to consume five servings of fruits and vegetables. (It takes a lot of effort and planning for the average busy working person in western society to consume five servings of fruits and vegetables daily). The principal reason for success would be that people can achieve the inclusion of the food items studied here, by simply adopting one of the culinary styles cited here. Food manufacturers can also prepare ready-made meals using one or all of the healthy culinary styles, thus propagating the new concept put forward by the current work. Success will be better ensured if such healthy meals are easily available from the supermarkets without radical changes to one's normal diet (meat and potatoes, for instance). Meat and potatoes, for instance, could be cooked with the Chinese cooking ingredients or the Japanese cooking ingredients and provide the protective phytochemicals. Studies could be made about such a campaign and its success or failure.

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Table 1- Common Foods (and Phytochemicals) in Various Regions of the World

Country/Region	Veg. Oil	Onion (diallyl sulphide)	Black Pepper (peperine)	Garlic (diallyl sulphide)	Coriander (linalool)	Ginger (gingerols)	Soy (genistein)	Tea (catechins)	Chili Pepper (capsaicin)	Cumin (limonene)	Turmeric (curcumin)
China	X	X	X	X	X	X	X	X	/		
Japan	X	X	X			X	X	X			
S. Asia (India, etc)	X	X	X	X	X		X	X	X	X	X
S.E. Asia	X	X	X	X	X	X	X	X	X	/	X
Middle East	X	X	X	X					/	X	
Eqyptian	X	X	X	X	X				X	X	
Mediterranean	X	X	X	X	X					/	
Latin American	X	X	X	X	X					/	
N. American	X	X	X								
European (exclude Mediterranean)	X	X	X								
Australia, N. Zealand	X	X	X								