ORIGINAL RESEARCH

Estimating Environmental and Occupational Factors that Contribute to Cancer in Sudan

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Abstract

Background: Cancer is a rapidly increasing problem in developing countries as statistics illustrate. Cases have risen from two million in 1985 to five million in 2000, and are projected to number 10 million in 2015.

Objective: The aim of this study is to investigated the risk factor and causative factors and geographical distribution over Sudan States and relationship of incidence with some patient's customs and dietary habits like in Sudan

Method: This study was performed in the Radiation and Isotopes Center of Khartoum (RICK) and National Cancer Institute (NCI) University of Gazeria. It focused on patients who treated in period of 2011-2012.

Results: The results showed that the most common cancers are prostate cancer 3.3% in males and 17.4% in breast cancer in females. The geographical incidence of cancer showed high incidence (46%) in Khartoum state according to RICK statistics and high incidence (64.1%) in Gezira state according to NCI statistics.

Conclusion: This study summarizes recent scientific evidence of environmental and occupational links to nearly 30 types of cancer. The study presents the state of the evidence on causal associations between environmental and occupational exposures and specific cancer types.

Keywords: Environment, Occupations, Cancer incidence, Sudan.

Introduction

Cancer is not a modern phenomenon – a bone tumor has been observed in a 14-year-old pharaoh who succumbed and was mummified, only to be accurately diagnosed three millennia later[1]. Chinese and Arabic medical writings also document clinical cases so well that some can clearly be identified today as cancer from the descriptions[2,3]. Cancer is a rapidly increasing problem in developing countries as statistics illustrate. Cases have risen from two million in 1985 to five million in 2000, and are projected to number 10 million in 2015. In developed countries, where there were five million cases in 1985 as well as in 2000, no increase is projected to 2015[4, 5]. Despite the high rates of infectious diseases such as tuberculosis and malaria in developing countries, this rapid increase of cancer has spurred nations to recognize increasingly the need for guidance in clinical and medical physics aspects of radiation oncology to improve their standards of cancer care[6]. No longer is cancer believed to be a disease of the affluent. The cancer rate in each age group, expressed as the number of cases in each 100,000 of that age group per year, is low in young persons, both affluent and poor[7]. The rapid rise of cancer in developing countries is attributable mainly to increasing life expectancy. This more aged population group is more likely to develop cancer. The likelihood of getting cancer does vary between developed and developing countries but the variation is far less than is commonly perceived. What is observed is that the spectrum of cancers seen in the opulent differs from that seen in disadvantaged populations. Males in developing countries have liver and esophagus tumors as the third and fourth most common cancers[8].These are relatively uncommon in developed countries, ranking lower than tenth. (table1.) Similarly, in women, breast cancer is the most common in both population groups. However cervical cancer in disadvantaged women is almost as common accounting for 17% of all female cancers. In well developed countries, cervical cancer accounts for only 4% of female cancers. Differing patterns of cancer have a profound influence on the need for specific radiotherapy resources[9]. These differences, coupled with the more advanced stages of cancer present in developing countries, place different demands on the selection and use of equipment for radiotherapy[10]. The treatment protocols and equipment modeled on the best developed countries seldom can be applied directly to developing countries owing to financial constraints and lack of qualified personnel. A comprehensive national cancer control programme -- including preventative and early detection measures, coupled with a judicious mixture of treatment by surgery, radiotherapy and chemotherapy -- now

results in the cure of 45% of all cancers in advanced countries. That is a target to which developing countries also aspire[11, 12].

Materials and Methods:

This is descriptive study designed to estimate environmental and occupational contributions to cancer in Sudan. Data concerning to this study were selected from these reported at a database of statistics Information and Research Center, Radiation and Isotopes Center of Khartoum (RICK) and National cancer Institute (NCI) during the period form 2011-2012. The data was analyzed by using statistical package, Statistical Package for Social Studies (SPSS) under windows

Table 1: The Most Common Primary Cancers In Males In Developed And Developing Countries (Ranked By Frequency)

Primary Cancer	Developing	Developed
Bladder	8	5
Colorectal	5	3
Esophagus	4	>10
Liver	3	>10
Lung	1	1
Oral cavity	7	9
Prostate	6	2
Stomach	2	4

RESULTS

The significant factors that were associated with increase risk of cancer in Sudan among the study group were different risk factors such as Metals such as arsenic, Natural fibers such as asbestos and Ionizing radiation. The results of this study were the most common cause of Cancer in the year 2009, according to the report form Radiation and Isotopes Center of Khartoum (RICK), breast cancer was most common cancer with 34.4%. The 10 common cancers are shown in (Figure 3). In males, the most common cancers are prostate cancer 3.3%, which is found around all Sudan, Non-Hodgkin's lymphoma NHL, followed by esophagus cancer, which is found mainly in northern part, bladder cancer 1.9%, CML by 1.5% and stomach cancer 1.4%. In females, breast cancer is still the most common 17.4%, while cervical cancer is second 5.5%, followed by

ovarian cancer 3.5%, esophagus 3.3%, CML 1.5%, NHL 1.3% and stomach cancers and nasopharynx cancer 0.9%. Endometrial and colorectal cancers are not as common as in Europe and United States.

The geographical incidence of cancer showed marked variations between different states in Sudan; Khartoum, White Nile, Blue Nile, Elgazira, Darfour, Kordofan, South region , North region , Sennar, Elgdarif, East region, from high incidence in Khartoum state to low incidence in South region, North region, Sennar, and Elgdarif states according to RICK showed in Figure 2. The geographical incidence of cancer in NCI showed in Figure 3.

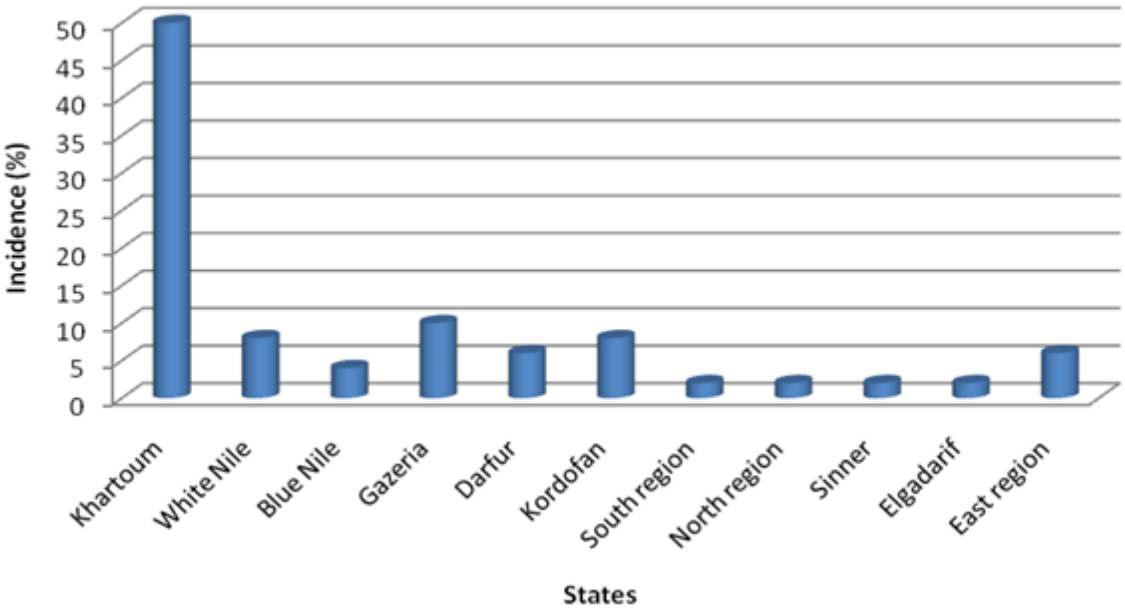

Figure 1: The total number of patients according to the states according (RICK)

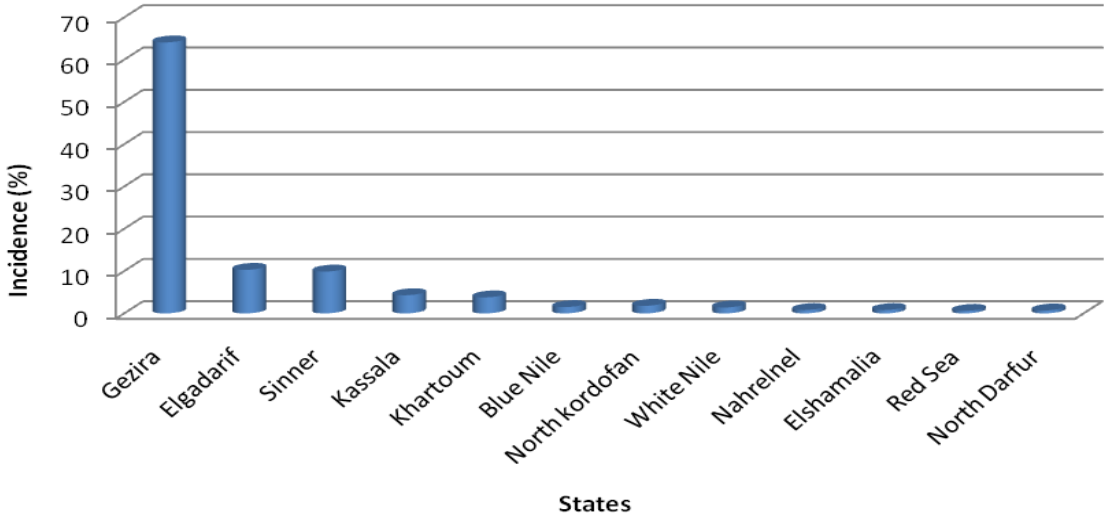

Figure 2: The total number of patients according to the states according to (NCI)

The total of new cancer patients at National Cancer Institute (NCI) as new cases of 770 cases, 45.6% (347) patients in male and 54.4% is female. In addition to 8 patients treated as benign diseases (Figure 3)

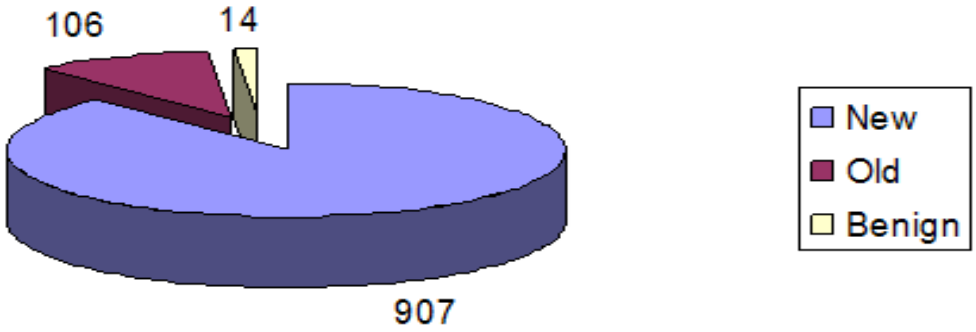

Figure 3: The number of patients according to (new and old) and sex in 2011-2012 in NCI

New cases: new patients, Old patients: patients transferred from Radiation and Isotopes Center of Khartoum (RICK)

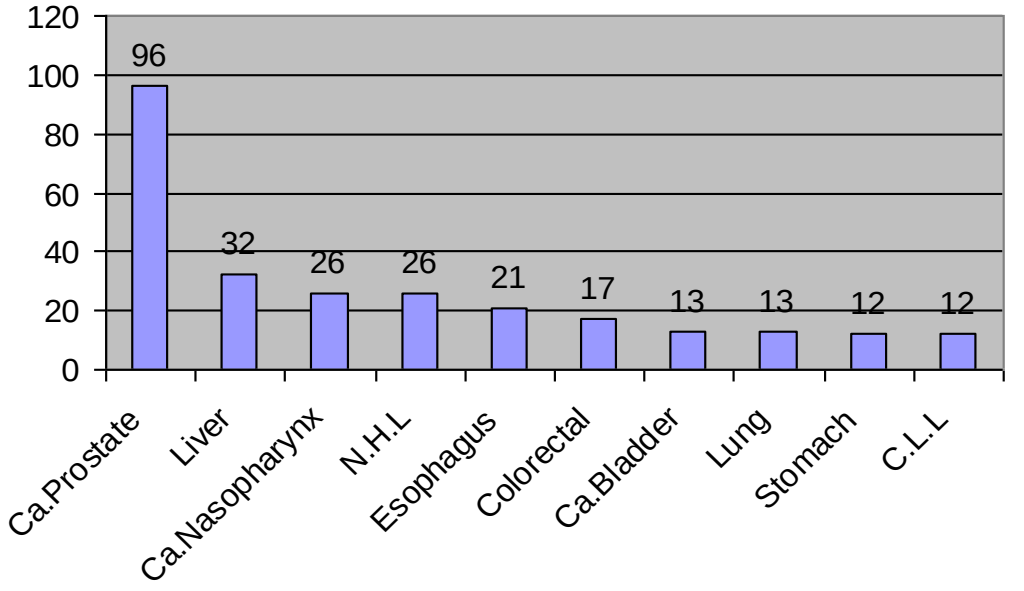

Figure 4. The 10 common Diseases among males (2011) – (NCI)

Discussion:

The importance of urban atmosphere pollution (e.g. with aromatic hydrocarbon and asbestos particles) in carcinogenesis is still uncertain. The places of arsenic in drinking water of certain population as cause of skin cancer and alfatoxins from Aspergillus Flavis in the staple foodstuffs of certain tropical peasants as cause of liver cancer seems undeniable. There are undoubtedly substances (e.g. nitrosamine), used as preservatives or coloring reagents in everyday foods, which if present in large enough quantities could be carcinogenic. The amounts present in food however are minute and the hazards, which they present, are uncertain.

Recommendations:

This paper summarizes recent scientific evidence of environmental and occupational links to nearly 30 types of cancer. It includes a critique of the 25-year-old analysis by Doll and Peto and subsequent analyses that attribute an extremely small fraction of cancer deaths to involuntary environmental and occupational exposures.

This study was citing several notable findings:

- Multiple exposures. Attempting to assign certain exposures (i.e. diet, smoking, environment, etc.) certain roles in causing cancer that will total 100% is inappropriate given that no one exposure singlehandedly produces cancer and many causes of cancer are still unknown. Comprehensive cancer prevention programs need to reduce exposures from all avoidable sources. Cancer prevention programs focused on tobacco use, diet, and other individual behaviors disregard the lessons of science.

Examples of strong causal links between environmental and occupational exposures and cancer include:

- Metals such as arsenic and cancers of the bladder, lung, and skin.
- Chlorination byproducts such as trihalomethanes and bladder cancer.
- Natural fibers such as asbestos and cancers of the larynx, lung, mesothelioma, and stomach.
- Petrochemicals and combustion products, including motor vehicle exhaust and polycyclic aromatic hydrocarbons, and cancers of the bladder, lung, and skin.
- Pesticide exposures and cancers of the brain, Wilms tumor, leukemia, and non-Hodgkin's lymphoma.
- Reactive chemicals such as vinyl chloride and liver cancer and soft tissue sarcoma.
- Metalworking fluids and mineral oils with cancers of the bladder, larynx, nasal passages, rectum, skin, and stomach.
- Ionizing radiation and cancers of the bladder, bone, brain, breast, liver, lung, ovary, skin, and thyroid, as well as leukemia, multiple myeloma, and sarcomas.
- Solvents such as benzene and leukemia and non- Hodgkin's lymphoma; tetrachloroethylene and bladder cancer; and trichloroethylene and Hodgkin's disease, leukemia, and kidney and liver cancers.
- Environmental tobacco smoke and cancers of the breast and lung.

Conclusion

The sum of the evidence regarding environmental and occupational contributions to cancer justifies urgent

acceleration of policy efforts to prevent carcinogenic exposures. By implementing precautionary policies, Europeans are creating a model that can be applied in the Sudan to protect public health and the environment. To ignore the scientific evidence is to knowingly permit tens of thousands of unnecessary illnesses and deaths each year.

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