منشورات جامعة وادي النيل
مجلة النيل للآداب والعلوم الانسانية
(ISSN: 1858 – 7054)
المجلد الأول، العدد الأول، 2020م
http://www.nilevalley.edu.sd

Using Statistical Methods to Detect Variables Leading to Cancer (A Case Study of River Nile State)

Iman Mahmoud Ibrahim Abdo

Faculty of Economics and Administrative Sciences, Nile Valley University

Corresponding author: drimanmahmoud@gmail.com

Abstract:

The study problem is represented in the knowledge of variables leading to cancer, which is considered as an incurable disease that has recently spread since the beginning of 21th century. The study aims to find out the state's position on cancer, as well as the causes of this disease, it also attempts to find out the relationship between cancer and some other variables. Cancer data was obtained from the Center for Oncology and Cancer Research in Shendi (during 2016). The paper adopts the descriptive analytical method and using the frequency tables and Chi Square test. The study found that there is a significant relationship between the incidence of cancer and each of the type, date of disease and age, while no significant relationship were found between residence and cancer. The study recommends the need to abstain from smoking, alcohol and drugs in general, also to maintain personal hygiene and eating healthy foods, and to make periodic examinations for the early disease detection.

Keywords: Leukaemia, colon cancer, lung cancer, pharyngeal cancer, laryngeal cancer.

استخدام الطرق الاحصائية لمعرفة المتغيرات المؤدية لمرض السرطان (دراسة حالة: ولاية نهر النيل)

ايمان محمود ابراهيم عبدو

كلية الاقتصاد والعلوم الادارية، جامعة وادي النيل

مستخلص:

تتمثل مشكلة الدراسة في معرفة المتغيرات المؤدية للإصابة بمرض السرطان والذي يعتبر مرض عضال انتشر منذ مطلع هذا القرن وشكل هاجساً لدى الكثيرين وذلك لصعوبة علاجه ولآثاره الصحية الجسيمة التي تفتك بخلايا الجسم وتؤدى في كثير من الأحيان للوفاة. هدفت الدراسة لمعرفة موقف الولاية من الاصابة بمرض السرطان ومعرفة الاسباب المؤدية للإصابة بهذا المرض والعلاقة بين الاصابة بمرض السرطان وبعض المتغيرات الأخرى. تم الحصول على بيانات الاصابة بمرض السرطان من مركز الأورام وأبحاث السرطان بمدينة شندى (خلال عام 2016م). استخدم في هذا البحث المنهج الوصفي التحليلي للبيانات حيت تم وصف البيانات باستخدام الجداول التكرارية كما تم تحليل البيانات باستخدام اختبار مربع كاي. توصلت الدراسة الي أنه توجد علاقة معنوية بين الاصابة بمرض السرطان وكل من النوع وتاريخ الإصابة بالمرض والعمر بينما لم نجد علاقة معنوية بين السكن والإصابة بمرض السرطان. أوصت الدراسة بضرورة الابتعاد عن التدخين والكحول والمخدرات عموماً والمحافظة على النظافة الشخصية وتناول الأطعمة الصحية وعمل فحوصات دورية للكشف المبكر للمرض.

كلمات مفتاحية: *سرطان الدم، سرطان القولون، سرطان الرئة، سرطان البلعوم، سرطان الحنجرة.*

Introduction

Cancer is a disease that affects certain genes that control the process of growth and replacement of dead cells after wounding. The human body is made up of different cells in simple forms and functions. Each cell has an outer shell and its nucleus. The nucleus retains the basic information of the cell. Genes determine the system and the way the cell works.

During our lifetime, some cells of the body die naturally and the body compensates for this lack of cells by cell division which usually occurs regularly so that our bodies can grow, replace or repair damaged tissue. When cells work as planned, the body remains healthy, but when that system breaks down the body gets sick.

In the case of cancer abnormal cells grow and instead of replacing damaged cells only those cells proliferate significantly and without stopping overwhelmed the affected organ, the problem of so-called tumor (Al-Aqeel, 2013).

Statement of the problem:

Despite the advancement of science and technological development in various sectors, the most important of which is the medical and pharmaceutical sectors, cancer is still a stigma of fear and a source of terror among many people. Conceal the news of their illness from others and some may suffer from a bad psychological situation, which adversely affects their health and increases the speed of the spread of the disease, so the problem of this study is to identify the causes of this disease using statistical methods.

Importance of the study:

The importance of the study is divided into two parts:

Scientific Importance:

The importance of this study is the attempt of researchers to apply statistical methods to detect the variables and causes leading to cancer in order to help specialists in finding solutions to reduce this incurable disease.

Practical importance:

The practical importance of this study is the adoption of more health awareness campaigns for the detection of all types of cancer, as well as possible to use some kind of vaccine to stimulate the immune system in humans to fight cancer.

Study assumptions:

This study is based on several hypotheses:

1 /There is no significant statistical relationship between age and cancer.

2 /There is no significant statistical relationship between the sex and cancer.

3 /There is no significant statistical relationship between the type of cancer and the incidence of cancer.

4 /There is no significant statistical relationship between housing and cancer.

Study objectives:

The objectives of the study are as follows:

1/ To put hand on the state's position of incidence of cancer.

2/ To know the causes and variable leading to cancer.
3/ To identify the relationship between the incidence of cancer and some other variables.
4/ To make some recommendations that try to reduce the spread of this incurable disease.

Study methodology:

This paper is based on descriptive analytical method of the available data, where data were described using the frequency distribution tables graphs and then data was analyzed using the cross tabulation analysis and chi – square test.

Study population:

The River Nile State has an area of 122.123 Km^2 and a population of 534.1.027 inhabitants as stated by 2008 census.

Center for Oncology and Cancer Research in Shendi:

The idea started in 2008 with the establishment of an integrated center for the treatment of tumors and cancer research. To conduct periodic cancer surveys in the region, the center has five departments (Early detection, diagnosis by radioisotopes, Department of Chemotherapy, Radioactive Iodine, and Department of Atomic Radiation Therapy). The latter is divided in two sections closely and remotely. Neighboring regions and a number of states of Sudan, the organs are complete and find support from the Federal Health, Presidency and Revenue Commission beside the National Fund for Medical Supplies, affiliated to the Center for Federal Health and Shendi University.

Previous studies:

1-**Study of Hassan (2015)** entitled; Cancer disease and its relationship with some psychological variables: This study aimed to detect the general characteristic of the level of depression and the degree of self-confidence, and the degree of satisfaction with life in cancer patients in Khartoum state, and to know the differences between them, as well as to know the relationship between these psychological variables and their relationship to the gender variable, and to achieve these goals the researcher used the descriptive analytical method. The sample of the study was (85), (32) males and (53) females. The researcher used a number of statistical methods (arithmetic mean, T- test).

The average combined single sample and T-test for two independent groups and Pearson's linear correlation coefficient, mono-variance analysis, percentages and Fakernbach equation). Overall self-confidence is high in cancer, the general characteristic of life satisfaction is high in cancer patients, there are statistically significant differences in favor of males.

There is no inverse relationship between depression and self-confidence, and there is an inverse relationship between depression and satisfaction. With the disease, attention should be made to factors that help raise the morale of cancer patients and work must be done to increase the factors that contribute to increase self-confidence and satisfaction.

2 - **Study of Nasser** (2013) entitled; Analysis of the variables affecting the incidence of breast and lung cancer in the provinces of the middle Euphrates: The study aimed to shed light on the variables affecting the incidence of breast and lung cancer and to analyze these variables. The study came out with many results, including that cancer diseases are caused by factors in common with many diseases and some cancer diseases are unique to one cause and not the other. For example, smoking is a major cause of lung cancer. In the female to breast

cancer, the age factor is a common factor in most adult cancers, including breast cancer for females and lung cancer for men.

3- Study of Buzgova and Jarosova (2014) entitled (Association between unmet needs and quality of life in hospitalized cancer patients no longer receiving anti-cancer treatment). Assessing the quality of life and unmet needs of cancer patients is an integral part of palliative care. This cross-sectional study sought to determine whether there is an association between quality of life and unmet needs, anxiety and depression in cancer patients who are no longer receiving anti-cancer treatment. The sample consisted of 93 patients from the oncology department at the University Hospital in Ostrava for whom further cancer treatment had been terminated as ineffective in halting the progression of their cancer. The overall quality of life score was quite low at 46. Most unmet needs were defined in terms of physical, psychological or spiritual needs. Correlations were found between impaired quality of life and lower Karnofsky scores ($r = 0.50$); increased physical ($r = 0.52$), psychological ($r = 0.44$) and spiritual ($r = 0.36$) needs; and higher levels of anxiety ($r = -0.30$) and depression ($r = -0.68$). Effective management of patients' physical (pain, fatigue and depression), psychological and spiritual needs may improve their quality of life.

Comparison between previous researches and this study:

The above previous studies investigated only variables affecting only two types of cancers (breast and lung cancer) but in this study there is a consideration for studying all types of cancer. The other previous study analyzed the relationship between cancer and some psychological variables and arithmetic mean, T-test, but in our study we analyzed the variables leading to cancer using frequency distribution, cross tabulation and chi square tests.

Conceptual framework and presentation

There are several types of cancer:

1/ Leukemia:

It is a type of blood and tissue cancers that produce blood cells such as bone marrow. When a person suffers from leukemia, the bone marrow begins to produce many white blood cells that enter the bloodstream and begin to crowd out healthy natural blood cells and enable them to perform their functions properly.

Symptoms:

- Feeling tired and tired
- Lose too much weight for no reason
- Loss of appetite or feeling of fullness after eating a little food
- Easy bleeding and bruising
- Recurrent infection
- Fever or unexplained night sweats
- Swollen lymph nodes
- Swelling and discomfort in the abdomen
- Swollen and bleeding gums

2/ Breast cancer:

It is a type of cancer that appears in the tissues of the breast.

Symptoms:

- Change in the shape of the breast.
- The appearance of mass in the breast.
- Liquid out of the nipple.
- The appearance of red spots with scales.

3/ Colon cancer:

Colon cancer is a type of disease that affects the colon, and colon cancer (rectum) is a cancer in the last 15 cm of the colon and in most cases colon cancer begins as a small block of non-cancer cells called polyp and after a period of time polyps formed polyps turn into cancer lumps in the colon. These polyps may be small and intestinal with very few symptoms if any and tests that are conducted regularly can prevent starchy and the development of colon cancer by early detection of strains before they turn into cancerous tumors (Al-Aqeel, 2013).

Symptoms:

- Change in normal bowel activity.
- Blood in the stool.
- Permanent intestinal cramps.
- Abdominal gas flatulence.
- Abdominal pain.
- Fatigue and weakness.

4/ Lung Cancer:

Lung cancer is the leading cause of cancer deaths among both women and men. However, most deaths from lung cancer can be prevented because smoking is responsible for 95% of all cases of lung cancer.

Quitting smoking even after years of smoking can reduce the risk of lung cancer by avoiding exposure to other factors that cause lung cancer, such as exposure to radiation and secondhand smoke (Al-Aqeel, 2013).

Symptoms:

- New cough appears and does not disappear
- Changes in existing chronic cough or smoking cough
- Cough accompanied by bloody phlegm
- Shortness of breath
- Chest pain
- Hoarseness
- Aches in and around the shoulder area as a result of tumor pressure on the nerves.

5/ Endometrial and cervical cancer:

Endometrial cancer is the most common gynecological cancer in the United States of America and is the third leading cause of death.

The most common type of endometrial cancer is endometrial cancer, which affects women in desperation, usually in the form of vaginal bleeding.

Symptoms:

- Vaginal bleeding for those in despair.
- Vaginal discharge continuously and dense smelly foul.
- Pain at the time of intercourse.
- Bleeding from the vagina in an unusual and unnatural.
- Feeling of burning and discomfort when urinating or descent of urine mixed with blood
- Significantly affects the bladder.
- Lose weight suddenly and for no apparent reason.
- Loss of neck in eating and also a feeling of fatigue and extreme fatigue.

6/Testicular cancer:

It is a cancer that grows in the testicle. It is a part of the male reproductive system. Statistics in the United States indicate that between 7,500 and 8,000 diagnosis of testicular cancer occurs every year over the course of human life.

Symptoms:

It is often the mass of the testicles can be palpable, ie. any touch can occur and symptoms may include one or more of the following:

- The presence of swelling or stiffness in one of the testicles
- Abnormal sensitivity
- Loss of sexual activity
- Withdrawal of sexual desire
- A burning sensation, especially after physical activity
- Dull pain in the lower abdomen or thigh and sometimes described as a heavy feeling
- Lower back pain
- The presence of blood with semen
- General weakness and feeling tired

Testicular cancer is one of the most treatable cancers, more than 95%, especially if it is not spread in the body. There are three basic types: surgery, radiation therapy, chemotherapy and surgery by a urologist. Radiation therapy is carried out by oncologists and chemotherapy is the work of oncologists.

7/ Pharyngeal cancer:

Oral pharyngeal cancer is one of the types of head and neck cancers that affects the oropharynx, the central part of the throat.

Symptoms:

- Swollen lymph nodes in the neck
- Sore throat in one continuous place after treatment
- Pain that emanates from the throat to the ears
- Swallowing difficult or painful and often leads to malnutrition and weight loss
- Bloody secretions from the nose
- Nasal congestion on one side
- Hearing loss in one ear and recurrent ear infection

- Double vision

8/ Brain cancer

The proliferation of abnormal cells in the brain tissue is not necessarily that all the tumors that originate in the brain are cancerous and therefore the term brain cancer is used to express only malignant tumors.

Malignant tumors grow violently with tight control of healthy cell tissues and by occupying certain areas as well as the use of blood supply and nutrients to the stomach for normal healthy tissue.

Symptoms:

- The headache start frequently
- Problems in the vision, such as mist and the loss of vision surrounding.
- Gradual loss of sensation and movement of hands and legs with sensation.
- Poor balance and a clear defect in the patient
- The emergence of speech problems that did not exist before
- Inactivity or drowsiness in excess of habit
- Memory problems

9/ Kidney cancer:

Kidney cancer, also called adenocarcinoma, is a disease in which malignant cancer cells develop inside the inner shells of the tiny tubes that make up the kidney.

There are two main types of cancer according to their histological origin:

A/ Renal cell carcinoma

B / Kidney pelvic cancer: Urothelial cell carcinoma

It is necessary to differentiate between the origin of the two types when dealing with cancer, because each type special advantages affect treatment options.

10/ Esophageal cancer:

Esophageal cancer is a result of the growth of cancer cells in the lining of the esophagus. Esophageal cancer is an uncommon but dangerous type.

Type I: Squamous carcinoma:

It is most common where the upper part of the esophagus develops malignant tumors

Type II: Aden carcinoma:

It is most common in the lower part of the esophagus, especially in the area of the esophagus.

The main symptoms of esophageal cancer:

- Dysphagia which means difficulty swallowing
- Burning sensation when trying to swallow food
- Chest pain and difficulty swallowing
- Hoarseness and cough
- Gradual weight loss and fatigue due to the inability to eat
- Pain in the throat and discomfort

11/ Liver cancer:

This is the growth and spread of intact liver cells within the liver.

Symptoms (Al-Ageel, 2013):

- If the cancer patient felt pain in the upper abdomen to the right, especially as the pain may increase to include other areas (such as the area of the back and shoulders).
- The appearance of inflatable in the abdomen.
- The occurrence of wasting and the patient lost weight and appetite in a short period.
- Injury fatigue, laziness and extreme fatigue.
- Turn the color of the injured skin to a yellow color and the spread of bile in the body and under the skin as a result of imbalance in the liver.

12/ Laryngeal cancer:

It is a malignant tumor that occurs as a result of the growth of cancer cells.

Causes of throat cancer (Al-Aqeel, 2013)

- Smoking is the most common cause of laryngeal cancer as well as oral and lung cancer
- Drinking of alcohol
- Exposure to inhalation of toxic substances

Symptoms:

- Hoarseness or change in sound
- Tumor in the neck
- A sense of something strange in the throat
- A sense of suffocation, especially at night
- Halitosis be unpleasant

General causes of cancer:

In general, it can be said that the causes of cancer vary from person to person and there are a varieties of reasons:

- Genetics: such as the presence of disease in family history.
- Aging.
- Environmental pollution and frequent exposure to harmful radiation.
- Drinking alcohol and smoking.
- Recurrent infection with a bacterial or viral infection.
- Exposure to carcinogenic chemicals such as asbestos.
- Diseases that reduce immunity.
- The nature of food and obesity.

Cancer treatment:

There are three main types of ways to treat cancer of all kinds:
o Surgical treatment.
o Chemical treatment.
o Radiotherapy.

Study field and results

Data on all 174 patients attending center during 2016 were analyzed as follows:

1/ Respondent's sex:

It is found that the majority of the respondents were females where they represented 58% while males represented only 42% (Table 1).

Table (1): Distribution of respondents by type

	Frequency	Percent
Male	73	42.0
Female	101	58.0
Total	174	100.0

Source: by researcher using SPSS

2 / Respondent's age:

According to Table (2), it is found that the majority of people with cancer (21.3%) fall in the age group of 45 -54, followed by the age group of 55-64 (19%), and then the age group of 65-74 (18.4%) and the lowest age group 95-100 (0.6%).

Table (2): Distribution of respondents by age

Age Group	Frequency	Percent
5-14	2	1.1
15-24	4	2.3
25-34	12	6.9
35-44	25	14.4
45-54	32	18.4
55-64	37	21.3
65-74	33	19.0
75-84	22	12.6
85-94	6	3.4
95-100	1	0.6
Total	174	100.0

Source: by researcher using SPSS

3 / Respondent's residence:

As shown in Table (3), it is found that the majority of the respondents are from Shendi (69.5%), followed by Aldamar (9.2%), Khartoum (8.0%), Atbara (6.3%), respectively.

Table (3): Distribution of respondents by residence

Area	Frequency	Percent
Shendi	121	69.5
Khartoum	14	8.0
Atbara	11	6.3
Aldamer	16	9.2
Berber	2	1.1
AbuHamad	2	1.1
Alobeid	2	1.1
Albawga	1	0.6
Alabedia	2	1.1
Sedoan	3	1.7
Total	174	100.0

Source: by researcher using SPSS

4 / Respondent's date of disease:

Table (4) shows the frequency of disease incidence according to month. It is found that June is the highest month (25.9%), followed by March, September, December, February, January, April, July, November, October and May, who represent 12.1, 10.9, 11.2, 9.8, 7.5, 6.9, 6.3, 3.4, 2.9 and 1.1%, respectively.

Table (4): Distribution of respondent's date of disease

Months	Frequency	Percent
January	13	7.5
February	17	9.8
March	21	12.1
April	12	6.9
May	2	1.1
June	45	25.9
July	11	6.3
August	13	7.5
September	19	10.9
October	5	2.9
November	6	3.4
December	10	11.2
Total	174	100.0

Source: by researcher using SPSS

5/ Respondent's type of cancer:

The most common type of cancer is breast cancer which represent (27%) of total cases, followed by ovarian cancer (12.6%), cervix uteri cancer (10.3%). However, the least one is laryngeal cancer (2.9%).

Table (5): Distribution of respondents by type of cancer

	Frequency	Percent
Breast	47.0	27.0
Ovarian	22	12.6
Stomach	12	6.9
Cervix Uteri	18	10.3
Colon	8	4.6
Prostates	11	6.3
Gland	6	3.5
Lung	8	4.6
Lips	7	4.0
Laryngeal	5	2.9
Skin	7	4.0
Bones	8	4.6
Rectum	6	3.5
Pancreatic	9	5.2
Total	174	100

Source: by researcher using SPSS

Chi Square tests for the independence of variables:

The Chi square test was conducted to determine the existence of a relationship between the dependent variable (cancer type) and each of the independent variables (date of disease, age, residence and sex) under the under the assumption of null hypothesis:

H_0: There is no significant relationship between the two variables against

H_1: There is a significant relationship between the two variables

1/ The Chi Square tests between type of cancer test and date of disease

From Table (6), the p-value of chi square test is less than 0.05 and that means the null hypothesis is rejected, while the alternative hypothesis is accepted, i.e. there is a significant relationship between cancer type and date of disease.

Table (6): The chi square test between type of cancer and date of disease

	Value	Df	Asymp. Sig (2 sided)
Person Chi squire	1013.929	864	0.000
Likelihood ratio	418.140	864	0.0001
Linear-by-linear Assciation	4.812	1	0.028
N of valid cases	157		

2/ The Chi Square test between type of cancer and age:

From Table (7) the p-value of chi square test is less than 0.05 which means that null hypothesis is rejected, while the alternative hypothesis is accepted, i.e. there is a significant relationship between cancer type and age.

Table (7): Chi Square test between type of cancer and age

	Value	Df	Asymp. Sig (2 sided)
Person Chi squire	.6783540	3240	.000
Likelihood Ratio	665.813	3240	.0001
Linear-by-Linear Association	.281	1	596.
N of Valid Cases	157		

3/ The Chi Square test between type of cancer and residence:

From Table (8) the p-value of chi square test is greater than 0.05 and that means the null hypothesis is accepted, while the alternative hypothesis is rejected, i.e. there is no significant relationship between cancer type and residence.

Table (8): Chi Square test between type of cancer and residence:

	Value	Df	Asymp. Sig (2 sided)
Person Chi squire	559.719	648	999.0
Likelihood Ratio	202.087	648	0.0001
Linear-by-Linear Assciation	0.688	1	0.407
N of Valid Cases	157		

4/ The Chi Square test between type of cancer and sex:

Results in Table 7 revealed that the p-value of chi square test is less than 0.05 and that means the null hypothesis is rejected, while the alternative hypothesis is accepted, i.e. there is a significant relationship between cancer type and sex.

Table (9): Chi square test between type of cancer and sex

	Value	Df	Asymp. Sig (2 sided)
Person Chi squire	100.388	72	015.
Likelihood Ratio	202.087	72	.000
Linear-by-Linear Association	.0065	1	.025
N of Valid Cases	157		

Discussion

After conducting the applied study, researcher attained the following results:

1- There is a significant relationship between sex and the incidence of cancer, ie, the type affects the incidence of this disease and this is noted in the frequency distributions, where the majority of infected females.
2- There is a significant correlation between the date of disease and the incidence of cancer, because most patients leave in the first half of the year.
3- There is a significant relationship between age and the incidence of cancer, i.e. that the age affects the incidence of this disease, where the injury is focused on ages older than 40 years.
4- There is no significant relationship between residence and the incidence of cancer because most of the respondents are residents of Shendi city and only a few come from neighboring areas.

Recommendations:

There are different ways to reduce the risk and incidence of cancer:

1. Encourage scientist to make more studies to discover all causes that lead to cancer.
2. Make a regularly permanent examination at least once a year.
3. Personal hygiene and disinfection of hands, the soap material is sterile to the body
4. Limit alcohol consumption Muslims generally should not drink alcohol and alcohol and can increase the risk of many types of cancer
5. Know your family history to get statistics about their history of patients and genetic diseases they carry.

Conclusion:

With the advancement of science and technological development in various sectors, the most important of which is the medical and pharmaceutical sectors, cancer is still a stigma of fear and a source of terror for many people, especially since the causes of this disease have not all been identified up to this day. People suffering from cancer are considered to be sentenced to death and lose hope in life and waiting for death at every moment. Therefore, this study applies statistical methods to find out the causes leading to this disease in the hope that the competent authorities will help in reducing the incidence of this incurable disease.

References

The Holy Quran

Al-Aqeel, Mohammed bin Abdulrahman (2013). All you want to know about cancer.

Al-Nouri, Ahmed Hamad (1999). Methods of demographic analysis, the first edition. University of Gazira, Sudan.

Buzgova, R. and Jarosova, D. (2014). Association between unmet needs and quality of life in hospitalised cancer patients no longer receiving anti-cancer treatment. Czech Republic, Ostrava.

Hassan, Manahil Mohamed Ahmed (2015). Cancer disease and its relationship to some psychological variables. Sudan.

Daoud, Juma Mohammed (2009). Introduction to Population Statistical Analysis. Ministry of Health (2016), River Nile State (Atbara).

Nasser, Ali Hussein (2013). Analysis of variables affecting the incidence of breast and lung. Sudan

National Census Bureau (2008). Central Statistical Organization of the Nile River State. Oncology and Cancer Research Center, Shendi.