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Investigation of Risk Factors Digestive System Cancer

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Abstract:

The digestive system cancer, from the esophagus to the rectum, remains one of the most common types of cancer and causes of death worldwide in both men and women.

A case-control study was conducted in Radiation and Isotopes Centre Khartoum RICK targeting the digestive system cancer patients who came to get treatment or follow-up during 2009. A total of 200 digestive system cancer patients and 200 controlled cases were interviewed using purposively designed questionnaires. The objective of this research is to investigate how the logistic regression methods are able to give improved prediction of risk factors of digestive system cancer. Logistic regression have been used for modeling the probability that a person developed digestive system cancer as a function of age, gender, tribe, height, weight, address as states or region, blood group type, cancer type, cancer stage, canned food, spicy food, diabetic, hypertensive, AIDS, jaundice with type (HA, HB and HC), anemia, regular tab, any digestive surgery and past history of digestive system disease and cancer in the patients family, gastroesophageal reflux, endoscopy, achalasia disease, gallstone and cholecystitis of the gallbladder, gallbladder polyps, chronic typhoid, chronic pancreatitis, heartburn, a persistent malaria, Helicobacter pylori infection and hypertrophic gastropathy, schistosomiasis, polyps, ulcerative colilis, Crohn disease, inflammatory bowel disease and sigmodiscopy, smoking, shaisha, snuff, consumed of alcohol; and the time period for each of that, drinking very hot liquids, physical activities, herbs used for treatment and lastly accessibility to RICK and Khartoum.

This research, has shown that the digestive surgery, achalasia disease,

inflammatory bowel disease, viral hepatitis type, schistosomiasis, herbs used for treatment and accessibility to RICK & Khartoum are significantly increasing the risk of digestive system cancer. The public awareness of this fatal disease must develop, to help in early detection of cancer and may decrease the mortality and ultimately will increase the probability of survival.

Keywords:

RICK, GIT, Logistic, cancer

Introduction :

Digestive system cancer, from the esophagus to the rectum, remains one of the most common cancers and causes of cancer death worldwide in both men and women. Although medical and surgical treatments such as endoscopic therapy, radiotherapy, operation and adjuvant chemotherapy have markedly improved the prognosis of patients with digestive system cancer, the mortality still remains high. Furthermore, several population-based case-control and cohort studies have suggested that important components of the diet, such as alcohol, processed meat and red meat, have an unfavorable effect on the risk of digestive system cancer (Murata et al., 2010).

The profile of cancer among Sudanese population is characterized by: high frequency of breast, oesophagus, gallbladder, lymphoma, nasopharynx, larynx, oral cavity and liver cancer and a low frequency of the prostate, lung and colorectal cancer. Relatively high frequency figures of breast cancer were reported only from 2004 to 2006 from 678 new cases to 718 new cases, the cancer mortality rate of 2006 was 23.2% from patients movements and 3.1% leading Non Communicable Diseases of Admission of 2005. Oesophagus, gallbladder and liver are the parts form digestive system in top cancer list, which means that digestive system cancer is common in Sudan (FMOH, 2000-2006). The incidence rate of digestive system cancer from 2000 to 2009 was:

(6129/ 38127)*100 = 16.1%

From total malignancies in RICK which is represent the annual rate of digestive system cancer incidence and therefore the number of new cases would be successive increases in each year.

The aim of the research is to identify the current situation of digestive system cancer risk factors in Sudan and to formulate

models of digestive system cancer risk factors in order to strengthen and improve strategies addressing cancer needs from communities. The research will help in better understanding of the current risk factors of digestive system cancer situation.

Having a risk factor, or even several of them, does not mean that a person will get the disease. Most who have one or more digestive system cancer risk factors never develop the disease, while many who are with digestive system cancer have no apparent risk factors. Even if a patient is with digestive system cancer and has a risk factor, it is difficult to prove that the risk factor caused his cancer. There are different kinds of risk factors. Some factors, like a person's age or race, can't be changed. Others are linked to cancer-causing factors in the environment like work environment. Still others are related to personal choices such as smoking, and drinking alcohol.

A risk factor is anything that affects chances of getting a disease such as cancer. Different cancers have different risk factors. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for a number of cancers. But having a risk factor, or even several risk factors, does not mean that a person may get the disease. And many people who get the disease may not have had any known risk factors. Scientists have found several risk factors that make a person more likely to get stomach cancer. Some of these can be controlled, but others cannot (Martinez *et al*., 1983).

Digestive system (GIT) cancer refers to malignant conditions of the gastrointestinal tract, including the oesophagus, stomach, liver, gallbladder, pancreas, colon, bowel and anus. Prognosis is variable, and depends almost entirely on the specific type of cancer. Oesophageal cancer has a dismal prognosis, largely because it is often detected late, while colon cancer has an excellent prognosis, when detected early. Pancreatic cancer also has a very poor prognosis, with only 5% of patients survive more than 5 years after diagnosis. Patients present with trouble swallowing, gastrointestinal haemorrhage or metastases (mainly in the liver).Intestinal obstruction is rare, due to the tumor's outward pattern of growth. Often, there is a history of vague abdominal pain or discomfort, and the tumor has become rather large by time the diagnosis made (Lan, 2005).

Digestive system cancer occurs in 10-20 per one million people. The true incidence might be higher, as novel laboratory methods are much more sensitive in diagnosing digestive system. In all, there are approximately 3500-5000 cases of digestive system per year in the United States. This makes digestive system the most common form of sarcoma, which constitutes more than 70 types of cancer, but in all forms constitutes less than 1% of all cancer. (Patton, 2005).

Method:

Logistic regression enables/is used to investigate the relationship between a categorical outcome and a set of explanatory variables. The outcome, or response, can be dichotomous (yes, no) or ordinal (low, medium or high). When someone has a dichotomous response, s/he is performing standard logistic regression. Logistic regression is an increasingly popular analytic tool used to predict the probability that the "event of interest" will occur as a linear function of one (or more) continuous and/or dichotomous independent variables. Logistic regression and least squares regression are almost identical. Both methods produce prediction equations. In both cases the regression coefficients measure the predictive capability of the independent variables.

While the response variable in a logistic regression is a 0/1 variable, the logistic regression equation, which is a linear equation, does not predict the 0/1 variable itself. In fact, before the development of logistic regression in the 1970s, this is what was done under the name of discriminate analysis. A multiple linear least squares regression was fitted with a 0/1 variable as a response. The method fell out of favor because the discriminate function was not easy to interpret. The significance of the regression coefficients could be used to claim specific independent variables that had predictive capability, but the coefficients themselves do not have a simple interpretation. In practice, a cut-off prediction value was determined. A case was classified as a 1 or a 0 depending on whether its predicted value exceeded the cut-off or not. The predicted value could not be interpreted as a probability because it could be less than 0 or greater than 1.

Instead of classifying an observation into one group or the other, logistic regression predicts the probability that an indicator variable is equal to 1. To be precise, logistic regression equation does not

directly predict the probability that the indicator is equal to 1. It predicts the log odds that an observation will have an indicator equal to 1. The odds of an event are defined as the ratio of the probability that an event occurs to the probability that it fails to occur.

For illustrative purposes a 1-1 matched data set was created from the digestive system cancer (matched with age). Thus, at the initial stage of model building , the model have tested the following variables canned food, spicy food, diabetic, hypertensive, jaundice, viral hepatitis with type (HA, HB and HC), anemia, regular tab, any digestive surgery and past history of digestive system diseases, cancers in the patients' families, gastroesophgeal reflux, endoscopy, achalasia, gallstone and cholecystitis of the gallbladder, gallbladder polyps, chronic typhoid, chronic pancreatitis, heartburn, a persistent malaria, *Helicobacter pylori* infection, hypertrophic gastropathy, schistosomiasis, polyps, ulcerative colilis Crohn disease, inflammatory bowel, smoker, shaisha, snuff, consumed alcohol, and time period for each of them, drinking very hot liquids, physical activities, herbs used for treatment and RICK accessibility.

After initial univariable analysis, one variable was found to be significant. Hence at the first stage all these variables were included in the model. The results of fitting the univariate logistic regression model to these data are given in the table. This table presents the following information which was given to each variables listed in the first column:

• The estimated slope coefficient for univariate logistic regression model containing only these variables.

• The estimated standard error of the estimated slope coefficient.

• The likelihood ratio test statistic, Wald (G), for the hypothesis that, the slope coefficient is zero. Under the null hypothesis, this quantity follows the chi-square distribution with one degree of freedom.

• The significance value, level for the likelihood ratio test.

• The estimated odds ratio, which is obtained by exponentiating the estimated coefficient which indicate how much the case risk being digestive system than control.

• The 95% CI for the odds ratio.

Before fitting multivariate models, it is noticeable that the "intercept only" model (or base model) for assessing over all significance in the 1-1 design is a model with likelihood:

$$l(\beta = 0) = \prod_{i=1}^{k} 0.5 \quad (0.5)^k$$

Since there is only one variable which is eligible for inclusion in this model,; the model to be developed starts with all variable taken into consideration, and then the significance of each one`s effect on the test will be tested in an attempt to come up with right set of variable .

Results:

In this section, the logistic regression model was specified and reported the regression results related to the factors that influence risk factors of digestive system cancer. In particular, the effect of a number of explanatory variables (namely, the risk factors of digestive system cancer) was examined among Sudanese people. Before doing so, however, and to avoid confusion, the classifications of logit models was briefly outlined, which will be used in data analysis. Conditional logistic regression was used to calculate the matched odds ratio and 95% confidence intervals for a univariable analysis, and the independent variables with p-value < 0.05 were selected for the multiple logistic regression models because of using the traditional level (such as 0.05) in logistic regression which often fails to identify variables known to the important (Mickey and Greenland, 1989).

The SPSS and LogXact 8 software packages of windows were used to perform logistic regression analysis; used all variables proposed in the model. As mentioned above, this study on digestive system cancer, the outcome variables was binary. The value '1' and '0' represented the cases and the controls respectively.The data was collected for 200 patients and 200 controls for all variables under study.

1. Binary logistics model:

For illustrative purposes a 1-1 matched data set was created from the digestive system cancer (matched with age). Thus, at the initial stage of model building , the model has tested the following variables canned food, spicy food, diabetic, hypertensive, jaundice, viral hepatitis with type (HA, HB and HC), anemia, regular tab, any digestive surgery and past history of

digestive system diseases, cancers in the patients' families, gastroesophgeal reflux, endoscopy, achalasia, gallstone and cholecystitis of the gallbladder, gallbladder polyps, chronic typhoid, chronic pancreatitis, heartburn, a persistent malaria, *Helicobacter pylori* infection, hypertrophic gastropathy, schistosomiasis, polyps, ulcerative colilis Crohn disease, inflammatory bowel, smoker, shaisha, snuff, consumed alcohol, and time period for each of them, drinking very hot liquids, physical activities, herbs used for treatment and RICK accessibility.

After initial univariable analysis, one variable was found to be significant. Hence at the first stage all these variables were included in the model. The results of fitting the univariate logistic regression model to this data are given in the table (1).

Since there is only one variable which is eligible for inclusion in this model, the model to be developed start with all variable taken into consideration, and then the significance of each one`s effect on the test will be tested in an attempt to come up with right set of variable(s). Table (1) presents the results of fitting this model, digestive surgery, anemia, hypertrophic gastropathy, polyps, gastroesophgeal reflux, achalasia disease, inflammatory bowel, gallstone & cholecystitis, chronic typhoid, gallbladder polyps, hypertensive, viral hepatitis types, schistosomiasis, ulcerative colilis crohn, shaisha, drinking very hot liquids, physical activity, RICK accessibility, heartburn and herbs used for treatment are significant with (p-value < 0.05) for Wald test, but the variables canned food, spicy food, anemia type, pernicious anemia, past history of digestive system diseases, diabetic, jaundice, viral hepatitis, chronic pancreatitis, smoker, snuff, smoker & snuffer, alcohol, cancer history in family, chemicals environment, regular tab, a persistent malaria have (p-value > 0.05). However, the effect of these variables may be confounded by the effects of the other variables in the model. To assess this, display the results of fitting the multiple logistic regression model without these variables will now be considered.

Table (1) Univariate logistic regressing model fitting

Variables	**B**	**S.E.**	**Wald**	**Df**	**p-value**	$\widehat{OR}$	**95. % C.I.** $\widehat{OR}$	
							Lower	**Upper**
Canned food	-0.163	0.202	0.651	1	0.420	0.850	0.572	1.262

Spicy food	-0.03	0.244	0.015	1	0.903	0.971	0.601	1.567
Digestive surgery	2.676	0.413	42.073	1	**0.000**	**14.5**	**13.71**	**28.23**
Anemia	0.711	0.371	3.668	1	**0.055**	**2.0**	**1.31**	**3.34**
Anemia type	0.007	0.007	0.863	1	0.353	1.007	0.992	1.021
Pernicious anemia	-0.225	0.476	0.223	1	0.637	0.798	0.314	2.031
Hypertrophic gastropathy	1.303	0.369	12.445	1	**0.000**	**3.7**	**2.96**	**6.64**
Past history of digestive system diseases	0.138	0.215	0.414	1	0.520	1.148	0.754	1.749
Polyps	0.818	0.337	5.895	1	**0.015**	**2.3**	**1.60**	**3.87**
Gastroesophgeal reflux	2.769	0.329	70.853	1	**0.000**	**15.9**	**15.30**	**31.24**
Achalasia disease	3.058	0.353	74.969	1	**0.000**	**21.3**	**20.60**	**41.90**
Inflammatory bowel	3.523	0.287	150.869	1	**0.000**	**33.9**	**33.34**	**67.24**
Gallstone & cholecystitis	2.584	0.389	44.043	1	**0.000**	**13.2**	**12.48**	**25.73**
Chronic typhoid	1.894	0.285	44.238	1	**0.000**	**6.6**	**6.09**	**12.73**
Gallbladder polyps	1.417	0.564	6.318	1	**0.012**	**2.4**	**1.31**	**3.73**
Diabetic	-0.385	0.444	0.754	1	0.385	0.680	0.285	1.623
Hypertensive	1.144	0.35	10.704	1	**0.001**	**3.1**	**2.45**	**5.59**
Jaundice	1.521	0.237	41.083	1	**0.000**	**4.6**	**4.11**	**8.69**
Viral hepatitis	0.031	0.034	0.83	1	0.362	1.031	0.965	1.102
Hepatitis types	0.012	0.004	9.79	1	**0.002**	**1.0**	1.00	2.02
Chronic pancreatitis	-0.409	0.458	0.796	1	0.372	0.665	0.271	1.631
Schistosomiasis	1.461	0.322	20.563	1	**0.000**	**4.3**	**3.68**	**7.99**
Ulcerative colilis Crohn	2.914	0.41	50.6	1	**0.000**	**18.4**	**17.62**	**36.05**
Smoker	-0.087	0.241	0.13	1	0.718	0.917	0.572	1.469
Snuff	-0.258	0.294	0.768	1	0.381	0.773	0.434	1.376
Smoker & snuffer	-0.309	0.396	0.611	1	0.435	0.734	0.338	1.594
Shaisha	1.806	0.498	13.156	1	**0.000**	**1.6**	**0.66**	**2.30**
Alcohol	-0.29	0.383	0.573	1	0.449	0.748	0.353	1.585
Cancer history in the family	-0.022	0.209	0.011	1	0.917	0.978	0.649	1.475
Chemicals environment	0.06	0.2	0.09	1	0.764	1.062	0.717	1.572
drinking very hot liquids	0.702	0.247	8.095	1	**0.004**	**2.0**	**1.53**	**3.55**
Physical activity	0.432	0.242	3.181	1	**0.075**	**1.5**	**1.07**	**2.61**
RICK accessibility	1.485	0.184	65.368	1	**0.000**	**2.3**	**1.91**	**4.18**
Regular tab	-0.113	0.238	0.226	1	0.635	0.893	0.56	1.423
Heartburn	0.587i	0.203	8.385	1	**0.004**	**1.8**	**1.40**	**3.20**
Herbs used for treatment	0.983	0.22	19.923	1	**0.000**	**2.7**	**2.24**	**4.91**
Persistent malaria	1.768	0.268	43.656	1	**0.000**	**5.9**	**5.33**	**11.19**

2. Logistics analysis:

The difference between the likelihood for the mother logit and that for the reduced logit follows the chi-square distribution with q degrees of freedom, where q refers to the number of cross alternative effects. For the present model, the likelihood ratio is for the mother and

reduced models and it is followed by the chi-square statistic for the likelihood ratio test which is 138.548. In view of these results, the difference in degrees of freedom between the two models is 1. Therefore, it is followed by the chi-square statistic for the likelihood ratio test which is 417.97 with a p-value 0.000 and this indicates that it is significant.

Predicted: These are the predicted values of the dependent variable based on the full logistic regression model, that shows how many cases are correctly predicted as cases and now many observed cases to be controlled and correctly predicted to be control, 186 cases are observed to be cases and correctly predicted to be cases, and the cases which how many cases are not correctly predicted are 16 cases are observed cases to be cases but they are predicted to be controlled cases.; and the 16 controls are observed to be controls but are predicted to be cases.

$\text{Log } (p/1\text{-}p) = b_0 + b1*x_1 + b_2*x_2 + b_3*x_3 + b_4*x_4 + \ldots\ldots\ldots + b_k x_k$

where: p is the probability of being case for digestive system cancer cases & k is the number of risk factors.

Wald chi-square value and 2-tailed p-value are used in testing the null hypothesis in which that the coefficient parameter is 0. If we use a 2-tailed test, then we will would compare each p-value to the preselected value of alpha and then we can accept or reject the null hypothesis.

Overall percentage: This gives the percentage of the cases for which the dependent variables were correctly predicted from the model and it is increased from 50% for the null model to 92% for the full model.

Hosmer-Lemeshow test: To test null hypothesis that a linear relationships do not exist between the predicted or variables and the log odds of the criterion variable. For that purpose cases were arranged and ordered by their predicted probability on the criterion variable. Chi-square test statistic was then computed by comparing differences between the observed frequencies with those expected something under the linear model. The resulting chi-square value with a p-value 0.955 indicates that the data fits the model well.

3. Binary logistic regression model:

The following formula shows the values for the logistic regression equation for predicting the dependent variable from the independent variable and they are in log-odds units:

It is observable from table (1) that digestive surgery, hypertrophic gastropathy, achalasia disease, inflammatory bowel, hepatitis type, schistosomiasis, ulcerative

colilis crohn, RICK accessibility and herbs used for treatment are all significant, while anemia, polyps, gastroesophgeal reflux, gallstone & cholecystitis, chronic typhoid, gallbladder polyps, drinking very hot liquids, physical activity, heartburn and a persistent malaria are insignificant.

The statement of digestive surgery $\hat{OR}$ equals 9.8, considers the model that fits to the regressing data age as a risk factor of digestive system cancer. The end point of a 95% CI for slope coefficient are 9.8 ± 1.96 *0.809, yielding the interval, the result suggests that the change in the log odds of the risk factor of digestive system cancer per digestive surgery between 8.08 and 11.52. This illustrates that this association between digestive surgery and digestive system cancer is statistically significant, but clinically it may be important.

It is obvious that in hypertrophic gastropathy, there is an association between digestive system cancer and hypertrophic gastropathy. The $\hat{OR}$ equals 7.5, considers the model that fits to the regressing data hypertrophic gastropathy infection as a risk factor of digestive system cancer. The end point of a 95% CI for slope coefficient are 7.5 ± 1 .96 *0.789, yielding the interval, the result suggests that the change in the log odds of the risk factor of digestive system cancer per hypertrophic gastropathy infection is between 5.75and 9.23.

Achalasia disease has a is highly statistically significant effect on developing digestive system cancer. The $\hat{OR}$ equals 6.4, considers the model that fits to the regressing data achalasia disease as a risk factor of digestive system cancer, the end point of a 95% CI for slope coefficient are 6.4 ± 1.96 *0.751, yielding the interval, the result suggests that the change in the log odds of the risk factor of digestive system cancer is between (4.43, 8.35).

There is a highly significant association between digestive system cancer and inflammatory bowel disease (IBD). The $\hat{OR}$ equals 20.2, considers the model that fits to the regressing data. On the other hand, inflammatory bowel disease (IBD) as a risk factor of digestive system cancer, the end point of a 95 % CI for slope coefficient are 20.2 ± 1.96*0.558, yielding the interval. The result suggests that the change in the log odds of the risk factor of digestive system cancer per inflammatory bowel disease (IBD) is between (19.01, 21.37), and it is clinically it is important. The results obtained are compatible with what is known in the literature.

There is a highly association between digestive system cancer and hepatitis types, (p-value 0.000). The $\hat{OR}$ equals 1.0, considers the model that fits to the regressing data, hepatitis types as a risk factor of digestive system cancer. The end point of a 95% CI for slope coefficient are 1.0 ± 1.96*0.757, yielding the interval, the result suggests that the change in the log odds of the risk factor of digestive system cancer per hepatitis types is between (0.97, 1.01).

There was a significant association between digestive system cancer and schistosomiasis, the $\hat{OR}$ equals 17.2, considers that model fits to the regressing data, schistosomiasis as a risk factor of digestive system cancer. The end point of a 95% CI for slope coefficient are17.2 ± 1.96 *0.9, yielding the interval, the result

suggests that the change in the log odds of the risk factor of digestive system cancer per schistosomiasis is between (15.71, 18.77). The results obtained were compatible with what is known in the literature since Sudan is endemic area of schistosomiasis and they are clinically very important results.

There is was a highly significant association between digestive system cancer and ulcerative colilis Crohn disease, the $\hat{OR}$ equals 18.3, considers the model that fits to the regressing data. In addition to that, ulcerative colilis Crohn disease as a risk factor of digestive system cancer, the end point of a 95% CI for slope coefficient are 18.3 ± 1.96 *1.334, yielding the interval. The result suggests that the change in the log odds of the risk factor of digestive system cancer per ulcerative colilis Crohn disease is between (16.35, 20.31).

In RICK or Khartoum accessibility, the $\hat{OR}$ equals 2.0, considers the model that fits to the regressing data, RICK or Khartoum accessibility as a risk factor of digestive system cancer. The end point of a 95% CI for slope coefficient are 2.0 ± 1.96 *0.399, yielding the interval. And the result suggests that the change in the log odds of the risk factor of digestive system cancer per RICK or Khartoum accessibility is between (1.08, 2.92).

It's obviously not RICK or Khartoum accessibility itself verb that causes digestive system cancer. This high significant indicates that there is a lack lake of health services and diagnosis of cancer in remote area or misdiagnose of digestive system cancer, so that most of the cases are at the late stages and there is a delay in presentation. Such screening is the most reliable way to find the earliest stages of digestive system cancer.

The digestive system cancer and herbs used for treatment are associated together, the $\hat{OR}$ equals 1.2, considers the model that fits to the regressing data. Herbs used for treatment as a risk factor of digestive system cancer and the end point of a 95% CI for slope coefficient are 1.2 ± 1.96 *0.566, yielding the interval. The result suggests that the change in the log odds of the risk factor of digestive system cancer per herbs used for treatment is between (0.14, 2.55).

Table (2): Multiple logistic regressing model fitting

Variables	B	S.E.	Wald	d.f	p-value	$\widehat{OR}$	95. % C.I. ($\widehat{OR}$)	
							Lower	upper
Digestive surgery	**2.282**	**0.878**	**6.758**	**1**	**0.009**	**9.8**	**8.08**	**11.52**
Anemia	0.583	1.155	0.255	1	0.614	1.8	-0.47	4.05
Hypertrophic gastropathy	**2.014**	**0.889**	**5.134**	**1**	**0.023**	**7.5**	**5.75**	**9.23**
Polyps	1.937	1.253	2.391	1	0.122	6.9	4.48	9.39
Gastroesophgeal reflux	0.256	1.001	0.066	1	0.798	1.3	-0.67	3.25
Achalasia disease	**1.855**	**0.999**	**3.443**	**1**	**0.064**	**6.4**	**4.43**	**8.35**
Inflammatory bowel	**3.005**	**0.603**	**24.815**	**1**	**0.000**	**20.2**	**19.01**	**21.37**
Gallstone & cholecystitis	3.03	0.842	12.944	1	0.000	20.7	19.04	22.34
Chronic typhoid	1.193	0.613	3.781	1	0.052	3.3	2.09	4.50
Gallbladder polyps	-1.327	1.761	0.568	1	0.451	3.0	-0.45	6.45
Hepatitis types	**0.012**	**0.01**	**1.466**	**1**	**0.000**	**1.0**	**0.97**	**1.01**
Schistosomiasis	**2.847**	**0.782**	**13.26**	**1**	**0.000**	**17.2**	**15.71**	**18.77**
Ulcerative colilis Crohn	**2.909**	**1.01**	**8.29**	**1**	**0.004**	**18.3**	**16.35**	**20.31**
Drinking very hot liquids	1.273	0.706	3.25	1	0.071	3.6	2.19	4.95
Physical activity	1.121	0.745	2.267	1	0.132	3.1	1.61	4.53
RICK accessibility	**1.737**	**0.469**	**13.732**	**1**	**0.000**	**2.0**	**1.08**	**2.92**
Heartburn	-0.043	0.521	0.007	1	0.934	1.0	-0.06	1.98
Herbs used for treatment	**0.187**	**0.687**	**0.074**	**1**	**0.024**	**1.2**	**0.14**	**2.55**
A persistent malaria	0.333	0.661	0.254	1	0.614	1.4	0.10	2.69
Constant	35.03	7.048	24.705	1	0.000	1.63		

Discussions:

Digestive surgery observed as a significant risk factor of digestive system cancer. These findings are consistent with the study by Fonager *et al.* (1998), that shows a was shown significant and a positive association with the digestive system cancer.

Achalasia disease was observed as a significant risk factor of digestive system cancer. These findings are consistent with the study by Fredens *et al.* (1989), that

shows a was shown significant and positive association with the digestive system cancer.

Inflammatory bowel disease was observed as a significant risk factor of digestive system cancer. These finding are consistent with the study by Fonager (1998), that shows was shown a significant and positive association with digestive system cancer.

Viral hepatitis types were observed as significant risk factors of digestive system cancer. These finding are consistent with the study by Omland, Farkas and Peter (2010), that shows a was shown significant and positive association with digestive system cancer.

Schistosomiasis was observed as significant risk factor of digestive system cancer. These findings are consistent with the study by Yosry, (2006), that shows a was shown significant and positive association with digestive system cancer.

Herbs used for treatment was observed as a significant risk factor of digestive system cancer. These finding are consistent with the study by Ahmed *et al.* (2010), that shows a was shown significant and positive association with digestive system cancer.

Conclusion:

finally, and from the above results, the digestive surgery, achalasia disease, inflammatory bowel disease, viral hepatitis types, schistosomiasis, herbs used for treatment, and RICK and Khartoum accessibility are at significantly increasing risks of digestive system cancer. Thus those something were the independent in multiple logistic regression models which express the digestive system cancer or lead to develop the chance of getting digestive system cancer in Sudan.

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