Evaluation of Cancer disease for the period (1995-2005) in Tikrit teaching hospital

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Received 1/12/2005: accepted 30/12/2005

Abstract

In this study we evaluate the 20 type of cancer disease in Tikrit teaching hospital for the period from 1995 to 2005 by using three statistical methods (regression analysis , T-test and completely random design) .The presentation and description of all cases among male and female were confirmed. And also explain the effect of ages for each type of cancer distribution among age groups of both sexes.

The results of this study are (1)- The female cancers are leukemia, lung, bladder, uterus, breast, brain, stomach, pancreas, rectum, kidney, liver, urinary, larynx, thyroid gland, colon, bone, small intestine and skin (2)- The male cancers are leukemia, lung, bladder, prostate, bone, brain, stomach, pancreas, rectum, kidney, liver, urinary, larynx, thyroid gland, colon, lymphoma, small intestine and skin .(3)- There are significant different between male and female for 9 type of cancer namely , leukemia, lung , bladder, brain, stomach, pancreas, urinary, colon and bone.(4)- There exist significant different between all cancers and the more significant are leukemia and lunge.(5)-There are significant different between female cancers and the more significant are breast, uterus and leukemia. (6)- There exist significant difference between male cancers and the more significant are leukemia and lunge.

تقييم الأورام السرطانية خلال الفترة (1995-2005) في مستشفى تكريت التعليمي

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المستخلص

تم في هذه الدراسة تقييم 20 نوع من الأورام السرطانية في مستشفى تكريت العام من عام 1995 إلى عام 2005 بواسطة استخدام ثلاث طرق إحصائية (تحليل الانحدار ،اختبار- T ، تصميم تام التعشية) من اجل تقديم ووصف لكل الأورام السرطانية في مستشفى تكريت العام مقسمة حسب الذكور والإناث فضلا عن توضيح تأثير العمر على كل نوع سرطاني.

نتيجة هذه الدراسة (1) الأورام النسائية هي الدم ، رئة، مثانة، رحم، ثدي،دماغ، معدة، بنكرياس،مستقيم، كلى، كبد،مجاري بولية،حنجرة، غدة درقية ،قولون ،عظم،أمعاء والجلد (2)الأورام الذكرية هي الدم ،رئة ،مثانة ، بروستات ،عظم ، دماغ، معدة ،بنكرياس، مستقيم ، كلى، كبد، مجاري بولية، حنجرة، غدة درقية، قولون، غدد لمفاوية، أمعاء والجلد.(3)هناك فروق معنوي بين الذكور والإناث لـ 9 أورام هي الدم، رئة، مثانة،دماغ،معدة،بنكرياس، مجاري بولية، قولون والعظم .(4)هناك فروق معنوية بين إعداد الأورام السرطانية كافة والأكثر عددا كان سرطان الدم والرئة.(5) هناك فروق معنوية بين إعداد الأورام السرطانية للإناث كافة والأكثر عددا كان الثدي، رحم والدم.(6) هناك فروق معنوية بين إعداد الأورام السرطانية للذكور كافة والأكثر عددا كان الدم والرئة.

Introduction

In medical research it is often desirable to obtain a mathematical expression by which the value of one variable might be used to predict the value of another. Regression used for different purposes .The most common objective of regression analysis is to obtain an equation that may be used to predict or estimate the value of one variable corresponding to a given value of the other variable. For regression, data consist of pairs (X_i, Y_i) of measurements selected from the population of interest.

In completely random design , experimental units are simply chosen at random from the population to which inferences are to be made. The total sample is randomly divided into groups and the different treatments or condition under study are then applied to the groups , one treatment or condition to a group. If the treatments differ from each other then the various treatment groups will have different mean values at the end of the experiment. Each experiment will have method of analysis, the completely random design or any other method have it . This method is analysis of variance. In a completely randomized design, there are k treatments , each of which is assigned at random to a group of experimental units .

The main aim of this study are presentation and description all cases among male and female, find the significant difference between male and female by using T-test and significant difference between all cancer using ANOVA table. And also explain the effect of ages for each type of cancer distribution among age groups of both sexes

Patients and Methods

This study consist of 1555 case taken from Tikrit teaching hospital (1995 – 2005) .Data contain 20 type of cancer divided between male and female. So we will presented the descriptive and method of analysis to find the significant different between cancer's type ,the effect of age on this kind and exist or not exists significant different between male and female for each kind. Application of statistical methods (regression analysis, T test, completely random design) to observe the significance difference between type of cancer among both sexes and significance difference between age groups of both sexes .

(1) Regression Analysis

A mathematical equation which defines the relationship between the dependent variable Y and the independent variable X is obtained from a sample and then a statistical test of hypothesis enables us to reach an objective decision. The equation can then be used to predict values of the dependent variable Y from values of the independent variable X . Before an equation relating X and Y can be estimated , we must assume the functional form of the relationship :

(1) (X_i, Y_i)= ith pair of observations

(2) $\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y}) = \sum XY$

(3) $\sum_{i=1}^{n}(Y_i - \bar{Y})^2 = \sum Y^2$ (4)

$\sum_{i=1}^{n}(X_i - \bar{X})^2 = \sum X^2$ (5) The sample regression line is written:

$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X$ $\hat{\beta}_1 = \frac{\sum xy}{\sum x^2}$ and

$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1 \bar{X}$ (6) Residual Variance

$R^2 = 1 - \left[\sum (X_i - \hat{X}_i)^2 / \sum (X_i - \bar{X})^2\right]$

(2) T test

In this study we have the difference variance of variables , then we can

use the formula $t = \dfrac{\overline{X}_1 - \overline{X}_2}{\sqrt{\dfrac{S^2_1}{n_1} + \dfrac{S^2_2}{n_2}}}$ With t distribution and degree of freedom $n_1 - n_2 - 2$.

(3) Completely Random Design

In a completely randomized design each experimental unit has an equal and independent chance of receiving any one of the treatments. The basic assumption underlying this design is that the observed values in any one group represent a random sample of all possible values of all experimental units under that particular treatment. We assume that the responses are normally distributed about the treatment mean and that the variation among observations treated alike is identical for all treatments.

Calculation from analysis of variance techniques are customarily displayed in an ANOVA table:

Source of variation	Degrees of freedom	Sum of Squares	Mean Squares	F
Among treatment	K-1	SST	MST	MST / MSE
Within treatment	N-K	SSE	MSE	
Total	N-1	SS		

The total sum of squares is the total of the squared deviations of the observation from the overall mean of the data : $SS_{total} = \sum Y^2 - \dfrac{(\sum Y)^2}{N}$.

Since the within treatments variation is the variation associated with observations treated a like, it is the variation associated with experimental or random error

$$SS_{within} = SSE = \sum Y^2 - \sum \frac{(T_i)^2}{n_i} .$$

Among groups sum of squares SST is the final source of variation to be calculated is the among treatments variation(the failure of the K treatment means to be alike) the computational formula is given by

$SS_{Among} = SST = \sum \dfrac{(T_i)^2}{n_i} - \dfrac{(\sum Y)^2}{N}$ and SSE is rarely computed directly $SSE = SS_{total} - SST$. After that compute the degrees of freedom and enter in the table ANOVA.

Finally we compute the mean square by $MST = \dfrac{SST}{K-1}$ AND $MSE = \dfrac{SSE}{N-K}$. The test of the significance of differences among means is accomplished by computing the ratio of the estimate of σ^2 based on between variation MST to the estimate based on within variation MSE. This ratio is called an F statistic : $F = \dfrac{MST}{MSE}$.

Duncan's Multiple Range Test

This method used when replication of groups are equal in the first we calculated $S_X = \sqrt{\dfrac{S^2_e}{n}}$, S^2_e : is the mean square error in ANOVA table and n is the number of replication in each group. From Duncan's table we get the significant studentized range SSR with error degree of freedom n and p is the number of mean inside the comparison . Second step find the least significant range LSR where $LSR = SSR \times S_X$. After that find the different between the means .So any different greater than LSR is significant different .

Results

Table (1): Female cancers in Tikrit (1995-2005)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
leukemia	14	17	3	3	4	6	7	5	7	7	6
lung	0	3	0	3	4	3	5	1	1	4	6
bladder	5	0	1	3	1	3	3	3	4	5	1
uterus	20	21	4	4	3	4	2	3	7	4	3
breast	35	14	1	5	6	2	1	4	4	5	5
brain	1	0	0	1	1	4	1	1	1	1	4
stomach	0	1	1	0	1	3	1	2	2	0	2
pancreas	0	2	2	1	3	0	0	0	1	0	1
rectum	5	8	0	2	1	1	0	0	0	0	1
kidney	3	2	5	2	2	5	4	4	6	6	4
liver	0	4	1	0	2	2	2	0	0	2	4
urinary	0	0	0	1	3	3	1	0	0	1	1
larynx	6	3	1	1	1	0	1	3	2	0	3
Thyroid gland	4	1	0	0	1	0	0	0	0	1	4
colon	0	3	0	2	3	3	2	1	4	4	3
bone	0	0	0	2	1	3	2	2	1	1	3
Small intestine	0	0	1	1	3	3	2	0	0	2	4
skin	0	0	1	0	2	1	1	0	0	0	2

Table (2): Male cancers in Tikrit (1995-2005)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
leukemia	38	21	6	15	10	12	13	36	34	17	18
lung	39	8	6	12	7	10	4	5	3	8	8
bladder	10	5	7	5	5	8	2	6	6	7	18
prostate	9	7	6	8	5	6	4	1	6	8	15
bone	2	1	1	2	3	6	5	1	4	4	29
brain	4	6	4	5	3	11	12	5	7	15	9
stomach	0	4	2	4	5	4	6	3	3	2	0
pancreas	6	5	4	4	1	6	3	1	0	2	0
rectum	1	4	3	0	0	7	4	4	1	0	8
kidney	4	10	3	4	6	8	3	4	0	8	0
liver	1	2	1	0	1	5	6	1	15	0	5
urinary	4	7	6	5	3	3	3	0	0	14	2
larynx	8	1	5	0	2	7	4	5	3	1	5
Thyroid gland	0	1	0	1	5	7	4	0	3	2	0
colon	4	3	4	1	4	3	4	0	5	5	7
lymphoma	1	0	3	0	4	2	5	2	2	0	3
Small intestine	5	1	2	5	9	6	5	6	5	4	4
skin	1	0	3	0	4	1	2	0	0	0	1

Table(3) : Regression Analysis for male cancers

Kind	Sig. Age	R^2 Sig. Age	Regression equation	Result
leukemia	40-59	0.91	$Y=3.8-1.7X_1+0.1X_2+1.3X_3+1.4X_4+0.1X_5+0.4X_6$	Sig.
lung	60-79	0.99	$Y=0.1+1.1X_1+1.1X_2+1.1X_3+0.8X_4+0.9X_5+1.02X_6$	Sig.
bladder	60-79	0.98	$Y=0.75+1.07X_1+0.99X_2+0.86X_3$	Sig.
prostate	60-79	0.98	$Y=0.5+0.9X_1+0.97X_2+0.93X_3$	Sig.
bone	60-79	0.99	$Y=-0.3+0.8X_1+0.7X_2+1.9X_3+1.5X_4$	Sig.
brain	40-59	0.99	$Y=-0.7+X_1+1.2X_2+1.5X_3+0.7X_4+1.1X_5+0.9X_6$	Sig.
stomach	40-59	0.82	$Y=0.5+0.8X_1+1.18X_2+0.79X_3$	Sig.
pancreas	60-79	0.96	$Y=Y=1.5+0.8X_1+0.8X_2+0.7X_3$	Sig.
rectum	40-59	0.92	$Y=-0.9+0.9X_1+1.4X_2+1.6X_3$	Sig.
kidney	80-100	0.98	$Y=0.7+0.5X_1+0.9X_2+1.002X_3+1.04X_4$	Sig.
liver	80-100	0.95	$Y=-1.4+1.5X_1+1.01X_2+1.3X_3+3.1X_4$	Sig.
urinary	20-39	0.99	$Y=-0.4+1.1X_1+1.1X_2+0.9X_3+0.9X_4$	Sig.
larynx	40-59	0.83	$Y=4.1+2.5X_1-0.7X_2+1.5X_3-1.7X_4+1.2X_5$	Sig.
Thyroid gland	80-100	0.92	$Y=-0.27-0.16X_1+1.08X_2+1.9X_3$	Sig.
colon	80-100	0.79	$Y=2.2+0.5X_1+0.65X_2+0.6X_3$	Sig.
lymphoma	60-79	0.60	$Y=1.2+0.8X_1+0.88X_2$	Not Sig.
Small intestine	40-59	0.99	$Y=0.4+0.92X_1+0.98X_2+0.86X_3+0.9X_4$	Sig.
skin	80-100	0.33	$Y=2.05-0.8X_1+0.75X_2$	Not Sig.

Table(4) : Regression Analysis for female cancers

kind	Sig. Age	R^2 Sig. Age	Regression equation	Result
leukemia	20-39	0.98	$Y=-5.6+0.1X_1+2.8X_2+3.5X_3+2.7X_3+0.5X_4$	Sig.
lung	60-59	0.56	$0.49+0.29X_1+0.19X_2+0.24X_3$	Not Sig.
bladder	60-79	0.51	$Y=2.5+0.74X_1+0.37X_2$	Not Sig.
uterus	60-79	0.99	$Y=0.17+0.08X_1+0.04X_2+0.04X_3$	Sig.
breast	80-100	0.99	$Y=-3.3+1.2X_1+1.4X_2+2.7X_3$	Sig.
brain	80-100	0.89	$Y=0.72+0.16X_1+1.47X_2$	Sig.
stomach	80-100	0.47	$Y=0.69+0.61X_1+1.64X_2$	Not Sig.
pancreas	80-100	0.94	$Y=0.83+0.53X_1+0.68X_2$	Sig.
rectum	60-79	0.97	$Y=1.12+1.28X_1+0.42X_3$	Sig.
kidney	40-59	0.84	$Y=0.28+1.45X_1+1.47X_2+1.3X_3$	Sig.
liver	80-100	0.28	$Y=2.09+0.5X_1+0.83X_2$	Not Sig.
urinary	40-59	0.16	$Y=1.88+0.44X_1$	Not Sig.
larynx	40-59	0.96	$Y=0.21+0.15X_1+0.14X_2+0.1X_3$	Sig.
Thyroid gland	80-100	0.96	$Y=0.74+1.03X_1+1.09X_2$	Sig.
colon	80-100	0.49	$Y=2.36-0.27X_1+0.34X_2+0.88X_3$	Not Sig.
bone	Month-1	0.02	$Y=2.3-0.17X1$	Not Sig.
Small intestine	40-59	0.95	$Y=-0.59+1.47X_1+1.35X_2+1.15X_3$	Sig.
skin	Month-1	0.30	$Y=0.8+0.6X_1$	Not Sig.

Table (5): Different between male and female by T-test

Cancer	Female		Male		T – Test	T-Table	Results
	$\overline{X}_1$	S_1	$\overline{X}_2$	S_2			
leukemia	9.65	5.05	25.56	10.8	4.4	1.725	Sig.
lung	2.59	1.89	12.13	12.54	2.5	1.725	Sig.
bladder	2.64	1.9	7.44	3.74	3.05	1.725	Sig.
brain	1.2	1.26	6.95	3.34	5.37	1.725	Sig.
stomach	1.07	0.9	2.6	1.78	2.59	1.725	Sig.
pancreas	0.86	0.97	2.76	2.35	2.5	1.725	Sig.
rectum	2.88	3.2	2.7	2.49	0.15	1.725	Not Sig.
kidney	3.68	1.46	4.15	3.1	0.45	1.725	Not Sig.
liver	1.8	1.63	3.95	5.05	1.34	1.725	Not Sig.
urinary	0.67	0.99	3.58	3.77	2.47	1.725	Sig.
larynx	2.5	1.96	3.68	2.76	1.19	1.725	Not Sig.
Thyroid gland	1.36	1.6	1.6	1.99	0.4	1.725	Not Sig.
colon	2.27	1.41	3.46	2.02	1.7	1.725	Sig.
bone	1.06	1.11	4.8	7.38	1.7	1.725	Sig.
Small intestine	1.11	1.38	4.77	1.68	5.6	1.725	Not Sig.
skin	0.45	0.7	0.69	1.02	0.66	1.725	Not Sig.

Table (6): Significant different between all cancers by ANOVA Table

Source of variation	Degrees of freedom	Sum of Squares	Mean Squares	F	F table
Among treatment	19	6143.2	323.3	9.8	1.57
Within treatment	200	6569.7	32.8		
Total	219	12712.97			

Table (7): Dancan's Multiple range test for all cancers

	2	3	4	5	6	7	8	9	10	12	14	16	18	20
SSR	2.7	2.9	3.02	3.09	3.15	3.2	3.23	3.26	3.29	3.34	3.38	3.41	3.44	3.5
LSR	4.59	4.9	5.1	5.25	5.35	5.4	5.49	5.5	5.59	5.67	5.7	5.79	5.84	5.9
The Mor	leukemia		lung	breast	Bladder ---									

Table (8): Significant different between female cancers by ANOVA

Source of variation	Degrees of freedom	Sum of Squares	Mean Squares	F	F table
Among treatment	17	692.68	40.7	3.3	1.57
Within treatment	180	2190.82	12.17		
Total	197	2883.5			

Table (9): Dancan's Multiple range test for female cancers

	2	3	4	5	6	7	8	9	10	12	14	16	18	20
SSR	2.7	2.9	3.02	3.1	3.15	3.19	3.23	3.26	3.29	3.3	3.38	3.41	3.44	3.47
LSR	2.8	3.0	3.17	3.24	3.3	3.34	3.39	3.42	3.45	3.5	3.54	3.58	3.61	3.64
The Mor	breast		uterus	leukemia	Kidney ---									

Table (10): Significant different between male cancers by ANOVA

Source of variation	Degrees of freedom	Sum of Squares	Mean Squares	F	F table
Among treatment	17	3479.99	204.7	8.97	1.57
Within treatment	180	4107.9	22.8		
Total	197	7587.9			

Table (11): Dancan's Multiple range test for male cancers

	2	3	4	5	6	7	8	9	10	12	14	16	18	20
SSR	2.7	2.9	3.02	3.09	3.15	3.19	3.2	3.26	3.29	3.34	3.38	3.4	3.4	3.5
LSR	3.7	4.1	4.2	4.3	4.4	4.46	4.5	4.56	4.6	4.67	4.7	4.7	4.8	4.9
The Mor	leukemia		lung	Bladder	Brain ---									

Discussion

This study indicated 1555 cases distributed among male and female for 20 type of cancer. In this study we used three statistical methods, regression analysis , T-test and completely random design . Each one of this gives interest results, descriptive cases by two tables (table 1&2) female cancers and male cancers from 1995 to 2005 , regression analysis use to explain the significant age in each type of cancers for male and female in tables (3&4). In female there are significant age in 11 cancers kind , leukemia, uterus, breast, brain, pancreas, rectum, kidney, larynx, thyroid gland, small intestine and skin. But 7 cancers type not significant age, lug, bladder, stomach, liver, urinary, colon and bone. The significant age in bone and skin is between (month-1), leukemia between (2-39), kidney ,larynx and small intestine the significant age is (40-59), uterus and rectum the significant age is (60-79). But breast , brain, pancreas and thyroid gland significant age is (80-100).

In this study, male significant age in 16 type, leukemia ,lung, bladder, prostate, bone, brain, stomach, pancreas, rectum, kidney, liver, urinary, larynx, thyroid gland, colon and small intestine . But 2 type not significant namely, lymphoma and skin . In urinary the significant age is between (20-39), leukemia, brain, stomach, rectum, larynx and small intestine the significant age is (40-59). But in lung, bladder, prostate, bone, pancreas the significant age is (60-79). In kidney, liver, thyroid gland and colon significant age is (80-100) .

Table (5) show that T-test give the significant different between male and female in 9 type namely leukemia, lung , bladder, brain, stomach, pancreas, urinary, colon and bone . But there are 7 type not significant different between male and female , rectum , kidney, liver, larynx, thyroid gland, small intestine and skin . Completely random design proved exist significant different between all cancers by ANOVA table (table 6) . Table (7) show that significant different in leukemia and lunge. But in table (8) ANOVA table show there are cancers and table (9) explain the significant different in breast , uterus and leukemia . Table (10) show that exists significant different between male cancers in ANOVA table and the significant different in leukemia and lung in table (11).

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