

An Analysis of Breast cancer using RTD Matrix

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Abstract -Cancer occurs as a result of mutations, or abnormal changes, in the genes responsible for regulating the growth of cells and keeping them healthy. The cells in our bodies replace themselves through an orderly process of cell growth: healthy new cells take over as old ones die out. Cell, in due course of time, gains the ability to keep dividing without control or order, producing more cells just like it and forming a tumor. The breast has developed from cells in the breast due to a malignant tumor. In this paper an attempt is made to find out the peak age of a women getting breast cancer in Chennai by the method of unsupervised questionnaire. We collected the data from 100 patients of Adyar Cancer Institute, Chennai. The following are identified as the symptoms of breast cancer namely breast pain, rash/itching, swelling, skin retraction, nipple discharge, lump, left/right breast large in size. First section gives the details about breast cancer. Section two deals with the concept of RTD matrix. In section three the data being analyzed using RTD matrix. In section four conclusions and suggestions are derived.

Keywords-Cancer, Breast cancer, Breast pain, Symptoms, Rash/itching, Swelling, Skin retraction, Nipple discharge, Lump, Left/right breast large in size, ATD matrix, RTD matrix and CETD Matrix.

I. INTRODUCTION

Cancer occurs as a result of mutations, or abnormal changes, in the genes responsible for regulating the growth of cells and keeping them healthy. The term “breast cancer” refers to a malignant tumor that has developed from cells in the breast. Usually breast cancer either begins in the cells of the lobules, which are the milk-producing glands, or the ducts, the passages that drain milk from the lobules to the nipple. Less commonly, breast cancer can begin in the stromal tissues, which include the fatty and fibrous connective tissues of the breast. Breast cancer is always caused by a genetic abnormality. The estimation of the maximum age group is five-stage process. In the first stage we give the matrix representation of the raw data. However, only 5-10% of cancers are due to an abnormality inherited from the mother or father. About 90% of breast cancers are due to genetic abnormalities that happen as a result of the aging process and the “wear and tear” of life in general. The number of breast cancer cases in India is about 100,000 women each year and there will be approximately 2,50,000 new cases of breast cancer in India by 2015, says ICMR. Cancer rates could further increase by 50 per cent to 15 million new cases in the year 2020, according to the World Cancer Report, the most comprehensive global examination of the disease to date. . In the final stage we obtain the row sums of the CETD matrix. The graph of the RTD matrix and CETD matrix are given.

II. THE CONCEPT OF RTD MATRIX

A. Average Time Dependent (ATD) matrix

Raw data is transformed into a raw time dependent data matrix by taking along the rows the details of the age group and along the columns the number of occurrences of different symptoms. We make it into the Average Time Dependent Data (ATD) matrix (a_{ij}) by dividing each entry of the raw data matrix by the number of years i.e., the time period. This matrix represents a data, which is totally uniform. At the third stage we find the average and Standard Deviation (S.D) of every column in the ATD matrix.

B. Refined Time Dependent (RTD) matrix

Using the average μ_j of each j^{th} column and σ_j the S.D of the each j^{th} column we chose a parameter α from the interval $[0,1]$ and form the interval $[0,1]$ and form the Refined time dependent Matrix (RTD matrix), Using the formula

$$a_{ij} \leq (\mu_j - \alpha * \sigma_j) \text{ then } e_{ij} = -1 \text{ else}$$

$$\text{If } a_{ij} \in (\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j)$$

$$\text{then } e_{ij} = 0 \text{ else}$$

$$\text{if } a_{ij} \geq (\mu_j + \alpha * \sigma_j) \text{ then } e_{ij} = 1.$$

We redefine the ATD matrix into the Refined time dependent fuzzy matrix for here the entries are = 0 or 1. Now the row sum of this matrix gives the maximum age group.

C. Combined Effective Time Dependent Data (CETD) matrix

We also combine the above RTD matrices by varying the $\alpha \in [0,1]$, so that we get the Combined Effective Time Dependent Data (CETD) matrix. The row sum is obtained for CETD matrix and conclusions are derived based on the row sums. All these are represented by graphs and graphs play a vital role in exhibiting the data by the simplest means, which can be even understood by a layman.

a) Description of the problem

We have interviewed 100 women breast cancer patients in Adyar cancer institute in Chennai. The symptoms of breast cancer are breast pain, rash/itching, swelling, skin retraction, nipple discharge, lump, left/right breast large in size. We analyze these problems using fuzzy matrix, we call the RTD Matrix is fuzzified by the entries from the set $\{-1, 0, 1\}$.

In this paper we will discuss symptoms of breast cancer, which are taken as the columns of the initial row data matrix the age

group in years, 12-20, 21-35, 36- 45, 46-60 & 61-80.. The 3 x 8 matrix is not uniform i.e. the number of individual years in each interval may not be the same. So in the second stage, in order to obtain an unbiased uniform effect on each and every data so collected, transform this initial matrix into an Average Time Dependent Data (ATD) matrix. To make the calculations easier and simpler, in the third stage using the simple average techniques convert the above average time dependent data matrix in to a matrix with entries $e_{ij} \in \{-1, 0, 1\}$. We name this matrix as the Refined Time Dependent Data Matrix (RTD Matrix) or as the fuzzy matrix. The value of e_{ij} corresponding to each entry is determined in a special way. At the fourth stage using the fuzzy matrices we obtain the Combined Effect Time Dependent Data Matrix (CETD Matrix), which gives the cumulative effect of all these entries.

III. ESTIMATION OF MAXIMUM AGE GROUP OF BREAST CANCER PATIENTS BY USING 3 X 8 MATRICES

In this section we take eight attributes related to symptoms of Breast Cancer namely S_1 - breast pain, S_2 Rash/itching, S_3 - Swelling, S_4 - Skin retraction, S_5 - Nipple discharge, S_6 -

Lump, S_7 -Left/right breast large in size & S_8 - Same size to the CETD model.

Table 1 Initial raw data matrix of order 3 x 8

years	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
12-35	20	22	24	28	28	28	30	16
36-60	52	32	55	45	61	80	48	48
61-80	4	1	2	4	2	8	3	8

Table 2 The ATD matrix of order 3 x 8

years	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
12-35	0.83	0.91	1	1.16	1.16	1.16	1.25	0.66
36-60	2.08	1.28	2.2	1.8	2.44	3.2	1.92	1.92
61-80	0.2	0.05	0.1	0.2	0.1	0.4	0.15	0.4

Table 3 The Average and Standard deviation of the above ATD Matrix

Average	1.0 36	0.7 46	1.1 26	1.0 53	1.2 33	1.5 86	1.1 06	0.9 93
S.D	0.9 5	0.6 3	1.0 5	0.8 05	1.1 7	1.4 4	0.8 9	0.8 1

The RTD matrix for $\alpha=0.25$

0	1	0	0	0	-1	0	-1
1	1	0	1	1	1	1	1
-1	-1	-1	-1	-1	-1	-1	-1

The row sum matrix

-1
7
-8

The RTD matrix for $\alpha=0.65$

0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
-1	-1	-1	-1	-1	-1	-1	-1

The row sum matrix

0
8
-8

The RTD matrix for $\alpha=0.75$

0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
-1	-1	-1	-1	-1	-1	-1	0

The row sum matrix

0
8
-7

The RTD matrix for $\alpha=0.45$

0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
-1	-1	-1	-1	-1	-1	-1	-1

The row sum matrix

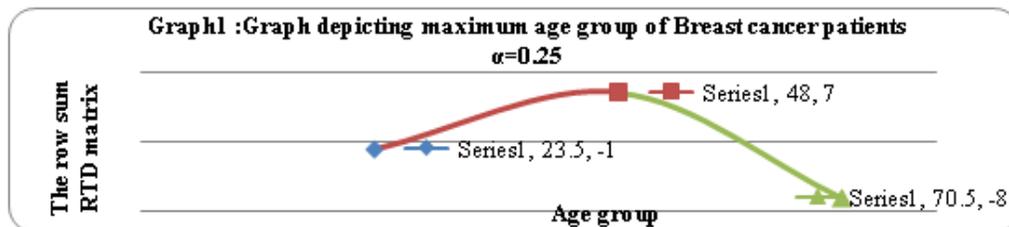
0
8
-8

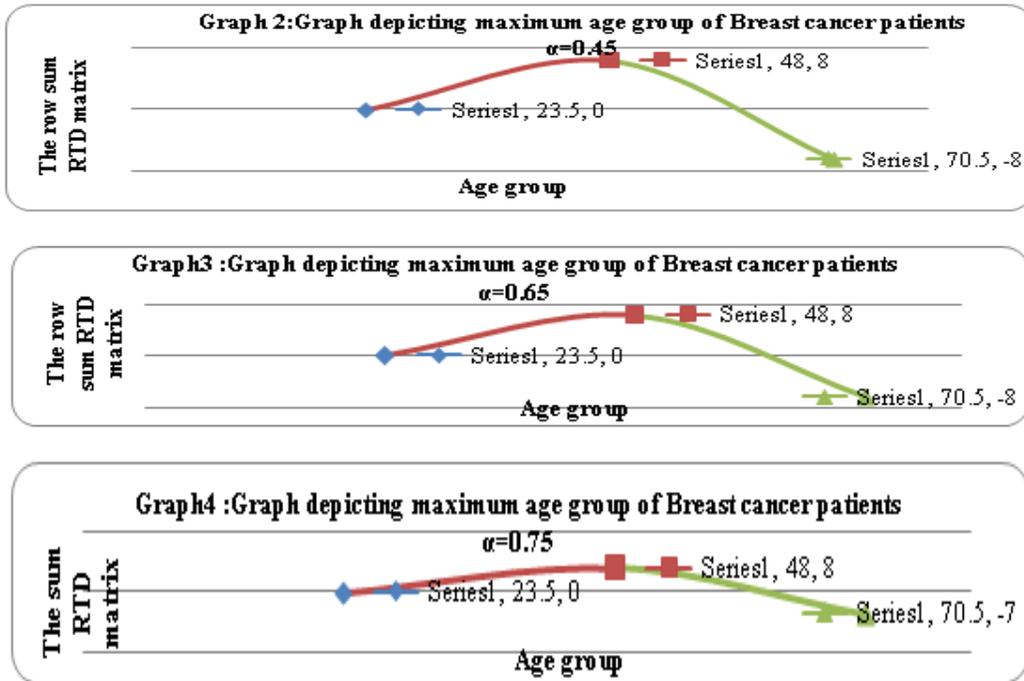
The CETD matrix

0	1	0	0	0	-1	0	-1
4	4	3	4	4	4	4	4
-4	-4	-4	-4	-4	-4	-4	-3

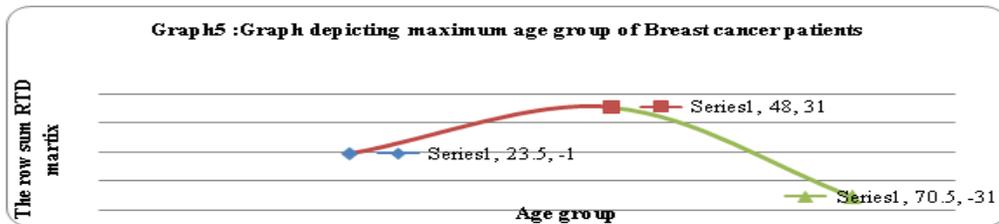
The row sum matrix

-1
31
-31



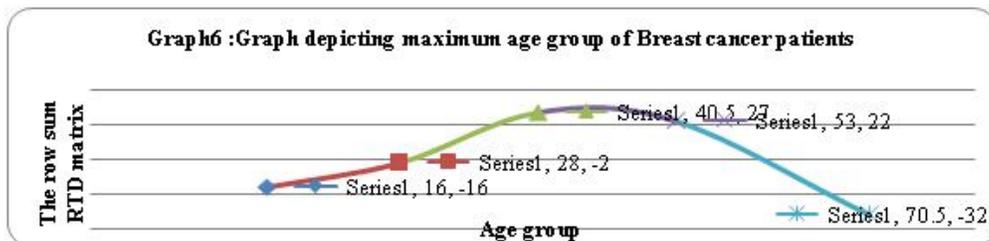


From the above graph, we observe that breast cancer starts at the age of 22. The peak age of women having breast cancer is 48. The peak period is 36 to 60.



Similarly if the estimation of maximum age group of breast cancer patients by using 5 x 8 matrices and $\alpha = 0.27, 0.43, 0.62, 0.78$ the CETD and Row sum matrices are follows:

The CETD matrix	The row sum matrix
$\begin{bmatrix} -4 & 0 & -3 & 0 & -2 & -2 & -1 & -4 \\ 0 & 0 & 0 & 0 & 0 & -2 & 0 & 0 \\ 2 & 4 & 4 & 1 & 4 & 4 & 4 & 4 \\ 4 & 0 & 2 & 4 & 2 & 4 & 4 & 2 \\ -4 & -4 & -4 & -4 & -4 & -4 & -4 & -4 \end{bmatrix}$	$\begin{bmatrix} -16 \\ -2 \\ 27 \\ 22 \\ -32 \end{bmatrix}$



From the above graph the breast cancer starts at the age of 18. The peak age of women having breast cancer is 48. The peak period is 46 to 60.

IV. CONCLUSION

From the above analysis, breast cancer starts at the age of 18. The peak age of women having Breast cancer is 48. The peak period for the Breast cancer is 40 to 50. Breast cancer mostly occurs in women over the age of 50, and the risk is especially high for women over age 60. The above analysis with the CETD matrix, the result gets confirmed.

REFERENCES

- [1] Vasantha Kandasamy. W.B, Elumalai, Victor Devadass and Mary John “*Application of CETD Matrix Technique to study the Social and Psychological problems faced by RAG pickers* (2007).
- [2] VasanthaKandasamy. W.B, Mary John.M and Kanagamuthu.T(2002) “*Study of Social Interaction and Women Empowerment Relative to HIV/AIDS*”.
- [3] Bart Kosko, “*Neural Networks and Fuzzy Systems*”, Prentice Hall of India Private Limited, (1967).
- [4] http://www.medicinenet.com/breast_cancer/article.html.
- [5] Journal of the National Cancer Institute (2000);92:840-841.
- [6] [6]Breast Cancer In India Rising Rapidly MedIndiahttp://www.medindia.net/news/view_news_main.asp?x=7279#ixzz203WT4QdG.
- [7] Use of internet and other information resources among adult cancer patients and their companions. Proc. Am. Soc. Clin. Oncol. (2001); 20: 398a (abstract 1589)