An Analysis of Risk Factors of Breast Cancer using Interval Weighted Fuzzy Cognitive Maps (IWFCMs)

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Abstract - Cancer begins when cells in a part of the body start to grow out of control. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. There are many types of cancer. Breast cancer is the second most commonly diagnosed cancer in the world. The risk factors of breast cancer as it are the second major cause of cancer death in among women. FCM have been applied in many fields successfully to show the relationship between the nodes. In this paper analyzing the risk factors of breast cancer by using the (IWFCMs) which is the combination of the Fuzzy Cognitive Maps (FCMs) and CETD matrix in which indeterminacy is included. It has also become very essential that the notion of logic plays a vital role in several of the real world problems like law, medicine, industry, finance, IT, stocks and share etc.

Key Words-Fuzzy Cognitive Maps (FCM) and risk factors of breast cancer.

I. INTRODUCTION

Cancer is the general name for a group of more than 100 diseases. Although there are many kinds of cancer, all cancers start because abnormal cells grow out of control. The body is made up of trillions of living cells. Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries[1]. By Dr Ananya Mandal, MD says that "Cancer possess the same common properties of:

- abnormal cell growth
- capacity to invade other tissues
- capacity to spread to distant organs via blood vessels or lymphatic channels (metastasis)

Untreated cancers can cause serious illness by invading healthy tissues and lead to death"[2]. It is reported that one in 22 women in India is likely to suffer from breast cancer during her life time. The data was collected from 100 patients of Adyar Cancer Institute, Chennai.In 1965, L.A. Zadeh has introduced a mathematical model called Fuzzy Cognitive Maps. After a decade in the year 1976, Political scientist R. Axelord [3] used this fuzzy model to study decision making in social and political systems. Then B. Kosko [4,5,6] enhanced the power of cognitive maps considering fuzzy values for the concepts of the cognitive map and fuzzy degrees of interrelationships between concepts. FCMs can successfully represent knowledge and human experience, introduced concepts to represent the essential elements and the cause and effect relationships among the concepts to model the behavior of any system. It is a very convenient simple and powerful tool, which is used in numerous fields such as social economical and medical etc. We recall the notion of Fuzzy Cognitive Maps (FCMs), which was introduced by Bart Kosko [7] in the year 1986. We also give several of its interrelated definitions. FCMs have a major role to play mainly when the data concerned is an unsupervised one. Further this method is most simple and an effective one as it can analyze the data by directed graphs and connection articles.

II. FUZZY COGNITIVE MAPS

Fuzzy Cognitive Maps (FCMs) are digraphs that capture the cause/effect relationship in a system. Nodes of the graph stand for the concepts representing the key factors and attributes of the modeling system, such as inputs, variable states, components factors, events, actions of any system. Signed weighted arcs describe the causal relationships, which exists among concepts and interconnect them, with a degree of causality. The constructed graph clearly shows how concepts influence each other and how much the degree of influence is. Cognitive Maps (FCMs) were proposed for decision making by Axelrod for the first time.

Using two basic types of elements; concepts and causal relationship, the cognitive map can be viewed as a simplified mathematical model of a belief system. FCMs were proposed with the extension of the fuzzified causal relationships. Kosko, introduced FCMs as fuzzy graph structures for representing causal reasoning. When the nodes of the FCM are fuzzy sets then they are called fuzzy nodes. FCMs with edge weights or causalities from the set {-1, 0, 1} are called simple FCMs.Consider the nodes/concepts $C_1, C_2, C_3,\ldots, C_n$ of the FCM. Suppose the directed graph is drawn using edge weight e_{ij} from {-1, 0, 1}. The matrix M be defined by $M = (e_{ij})$ where e_{ij} is the weight of the directed edge C_iC_j. M is called the adjacency matrix of the FCM, also known as connection matrix. The directed edge e_{ij} from the causal concept C_i to concept C_j measures how much C_i causes C_j .The edge e_{ij} takes values in the real interval $[−1, 1]$. $e_{ij} = 0$ indicates no causality.
$e_{ij} > 0$ indicates causal increase/positive causality.
$e_{ij} < 0$ indicates causal decrease/negative causality.

Simple FCMs provide quick first-hand information to an expert's stated causal knowledge. Let $C_1, C_2, C_3, \ldots, C_n$ be the nodes of FCM. Let $A = (a_1, a_2, \ldots, a_n)$ is called a state vector where either $a_i = 0$ or 1. If $a_i = 0$, the concept a_i in the

OFF state and if $a_i = 1$, the concept a_i in the ON state, for i = 1, 2, …, n. Let C_1, C_2, C_3,…, C_iC_j. be the edges of the FCM ($i \neq j$). Then the edges form a directed cycle.An FCM is said to be cyclic if it possesses a directed cycle. An FCM with cycles is said to have a feedback, when there is a feedback in an FCM, i.e., when the causal relations flow through a cycle in a revolutionary way, the FCM is called a dynamical system. The equilibrium state for the dynamical system is called the hidden pattern. If the equilibrium state of a dynamical state is a unique state vector, it is called a fixed point or limit cycle. Inference from the hidden pattern summarizes the joint effects of all interacting fuzzy knowledge.

III.   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 $\left(a_{ij} \right)$ 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 jth column and σ_j the S.D of the each jth 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

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

if $a_{ij} \in \left(\mu_j - \alpha * \sigma_j , \mu_j + \alpha * \sigma_j \right)$ then

$e_{ij} = 0$ else

if $a_{ij} \geq \left(\mu_j + \alpha * \sigma_j \right)$ 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 [8,9].

D.   Average Time Dependent (ATD) matrix
Raw data transform it into a raw time dependent data matrix by taking along the rows the age group and along the columns using the raw data matrix we make it into the Average Time

Dependent Data (ATD) matrix $\left(a_{ij} \right)$ 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.

IV.   ALGORITHMIC APPROACH IN INTERVAL WEIGHTED FUZZY COGNITIVE MAPS (IWFCM)

When analyzed the social problem using FCM, it give the main causes of the problem, Which mean ON-OFF state of the attributes The causes of the problem is not same for all the age group. It is vary and depend on the age. Therefore, our model is analyzing the problem using FCM methodology in different age group. For that the concept of the problem i.e. the attributes of the problem spilt into related causes of different age group. It has a slight modification only in Algorithmic approaches. To derive an optimistic solution to the problem with an unsupervised data, the following steps to be followed

Step 1 : For the given model (problem), collect the unsupervised data that is in determinant factors called nodes.

Step 2: Consider the ages AG_1, AG_2, …, AG_n. Spilt the ages AG_1 to AG_i, AG_{i+1} to AG_j, AG_{j+1} to AG_k, AG_{k+1} to AG_l, AG_{l+1} to AG_n.

Step.3: In the attributes C_1, C_2 ..., C_n. fix the attributes C_1, C_2 ..., C_i for the first group. Similarly fix the remaining attributes C_{i+1},..., C_n in all the remaining age groups. Some attributes are repeated in two or more age groups. Denote the repeated attributes as C_i^*.

Step 4: According to the expert opinion, obtain the connection matrix for each age group denoted by M_i. Here the number of rows in the given matrix = number of steps to be performed.

Step 5: Consider the state vector C_1 by setting c_1 in ON position that is assigning the first component of the vector to be 1 and the rest of the components as 0. Find $C_1 X M_1$. The state vector is updated and threshold at each stage.

Step 6: Threshold value is calculated by assigning 1 for the values > 0 and 0 for the values < 1. The symbol '↪' represents the threshold value for the product of the result.

Step 7: When the same threshold value occurs twice. The value is considered as the fixed point. The iteration gets terminated.

Step 8: Consider the state vector C_1 by setting c_2 in ON state that is assigning the second component of the vector to be 1 and the rest of the components as 0. Precede the calculations discussed in Steps 5 to 7.

Step 9: Before thersholding take the corresponding weight age and take into account of each input state vector. It is called weight age of ON state vector.

Step 10: Calculate the average weighted sum called W^{sum}.

Step11: Calculate Interval Weight age of State Vector for each age group.

$$\text{Interval Weight age} = \frac{Average\ of\ W^{sum}}{Age\ Interval}$$

Step 12: Finally find the Interval Weight for ages AG_i to AG_n
This new model giving the ranking for causes to each agroup and overall age. It is called the Interval Weighted Fuzzy Cognitive Maps (IWFCMs).

V. BREAST CANCER

Breast cancer is a malignant tumor that starts in the cells of the breast. A malignant tumor is a group of cancer cells that can grow into surrounding tissues or spread to distant areas of the body. The disease occurs almost entirely in women, but men can get it, too [10]. In 2012, an estimated 227,000 women and 2,200 men in the United States will be diagnosed with breast cancer, and approximately 40,000 women will die from it [11]. Worldwide, breast cancer is the most commonly diagnosed malignancy and the leading cause of cancer death in women, accounting for approximately 14 percent of cancer deaths [12, 13].Breast cancer is the most common cancer in women and the second most common cancer in the world. According to the National Cancer Institute, roughly 90% of women who get breast cancer live for at least five years or more.

The most common type of breast cancer begins in the milk ducts of the breast. The second most common type originates in the breast's lobules, or glands that produce milk. These are both invasive --- and infiltrating---cancers, meaning that they spread to other parts of the body if left untreated. Other types of breast cancer are less common [14]. The risk of developing breast cancer is modified by environment, lifestyle, genetics and a combination of these factors. Healthy cells are the basic building blocks of all tissue and organs in the body. The risk of developing breast cancer is modified by environment, lifestyle, genetics and a combination of these factors [15].

VI. DESCRIPTION OF THE PROBLEM

In this paper we will discuss the risk factors of breast cancer using Interval Weighted Fuzzy Cognitive Maps (IWFCM). The risk factors are BRCA1 & BRCA2, Changes in other genes, Certain Benign breast cancer, Non-proliferative lesions, Menstrual periods, Aging, Family history, Proliferative lesion without atypia, Having children, Birth control, Genetic risk factors, Breast feeding, Personal history, Proliferative lesions without atypia, Drinking alcohol / Tobacco smoke, Night duty due to workload, Induced abortion, Lobular carcinoma in situ, Dense in breast tissue, Hormone therapy after menopause, Chemical in the environment, Diethylstilbestrol exposure, Previous chest radiation, Estrogen therapy, Antiperspirants, Unhealthy food.

These risk factors are not same for all the age groups. So, we divide the age groups into five intervals i.e. 12-20, 21-35, 36-45, 46-60 and 61-80. Risk factors are classified into five groups, each group has six factors. Based on the expert's opinion formed the risk factors is suitable for in particular age group. It gives the ranking to the risk factors for each age group and also gives the overall ranking to the problem.

To make the calculations easier and simpler using the simple average techniques convert the 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. Using the fuzzy matrices we obtain the Combined Effect Time Dependent Data Matrix (CETD Matrix), which gives the cumulative effect of all these entries. In the final stage we obtain the row sums of the CETD matrix. The tables given are self-explanatory at each stage.

VII. ADAPTATION OF IWFCMS TO THE PROBLEM

To analyze the risk factors of Breast Cancer, we have interviewed and discussed with 100 women in different ages in Adyar cancer institute and with the experts opinion we have taken the following attributes.

A_1-Genetic risk factors
A_2-BRCA1 & BRCA2
A_3-Changes in other genes
A_4-Certain Benign breast cancer
A_5-Non-proliferative lesions
A_6-Menstrual periods
A_7-Aging
A_8-Family history
A_9-Proliferative lesion without atypia
A_{10}-Having children
A_{11}-Birth control
A_{12}-Breast feeding
A_{13}*-Personal history
A_{14}-Proliferative lesions with atypia
A_{15}-Drinking alcohol / Tobacco smoke
A_{16}*-Night duty due to workload
A_{17}-Induced abortion
A_{18}*-Lobular carcinoma in situ
A_{19}-Dense in breast tissue
A_{20}-Hormone therapy after menopause
A_{21}*-Chemical in the environment
A_{22}-Diethylstilbestrol exposure
A_{23}-Previous chest radiation
A_{24}-Estrogen therapy
A_{25}-Antiperspirants
A_{26}-Unhealthy food
Note-(The repeated attributes are denoted by *)

Now based on the expert's opinion we obtain the following connected matrix M_1 : Table:1

$M_1 =$

12-20	A_1	A_2	A_3	A_4	A_5	A_6
A_1	0	0	1	0	0	1
A_2	0	0	1	0	0	1
A_3	1	0	0	0	1	1
A_4	0	0	1	0	0	1
A_5	0	0	1	0	0	1
A_6	1	0	1	0	0	0

Let us start with the node A_1 is in the ON state i.e., Genetic risk factors is in ON state and all other nodes are in the OFF condition. Suppose the input vector $B_1 = (1\ 0\ 0\ 0\ 0\ 0)$ The effect of B_1 on the dynamical system M_1 is given by

$B_1 M_1 = (0\ 0\ 1\ 0\ 0\ 1) \hookrightarrow (1\ 0\ 1\ 0\ 0\ 1) = B_2$
$B_2 M_1 = (2\ 0\ 2\ 0\ 1\ 2) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = B_3$
$B_3 M_1 = (3\ 0\ 4\ 0\ 24) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = B_4 = B_3$
B_3 is a fixed point of the dynamical system.(where $\hookrightarrow$ denotes the thresholding and updating of the resultant state vector)

The hidden pattern of the fixed point is given by $(1\ 0\ 1\ 0\ 1\ 1)$ which implies that first, third, five and six attributes come to ON state. i.e. Genetic risk factors, Changes in other genes, Non-proliferative lesions, Menstrual periods are major causes. Let us take the node A_2 is in ON state i.e., BRCA1 & BRCA2 is in ON state and all other nodes are in OFF condition. Suppose the input vector is $C_1 = (0\ 1\ 0\ 0\ 0\ 0)$

The effect of C_1 on the dynamical system M_1 is given by
$C_1 M_1 = (0\ 0\ 1\ 0\ 0\ 1) \hookrightarrow (0\ 1\ 1\ 0\ 0\ 1) = C_2$
$C_2 M_1 = (2\ 0\ 2\ 0\ 1\ 2) \hookrightarrow (1\ 1\ 1\ 0\ 1\ 1) = C_3$
$C_3 M_1 = (3\ 15\ 0\ 2\ 5) \hookrightarrow (1\ 1\ 1\ 0\ 1\ 1) = C_4 = C_3$. C_3 is a fixed point of the dynamical system. The hidden pattern of the fixed point is given by $(1\ 1\ 1\ 0\ 1\ 1)$ which implies that expect the fourth all are in ON state. i.e. Genetic risk factors, BRCA1 & BRCA2, Changes in other genes, Non-proliferative lesions, Menstrual periods are main causes. Let us take the node A_3 is in ON state i.e., Changes in other genes is in ON state and all other nodes are in OFF condition. Suppose the input vector is
$D_1 = (0\ 0\ 1\ 0\ 0\ 0)$

The effect of D_1 on the dynamical system M_1 is given by

$D_1 M_1 = (1\ 0\ 0\ 0\ 1\ 1) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = D_2$
$D_2 M_1 = (3\ 0\ 4\ 0\ 24) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = D_3 = D_2$. D_2 is a fixed point of the dynamical system.

The hidden pattern of the fixed point is given by $(1\ 0\ 1\ 0\ 1\ 1)$ which implies that first, third, fifth and sixth are in ON state. i.e. Genetic risk factors, Changes in other genes, Men-

strual periods, Non-proliferative lesions are main causes. Let us take the node A_4 is in ON state i.e., Certain Benign breast cancer is in ON state and all other nodes are in OFF condition. Suppose the input vector is
$E_1 = (0\ 0\ 0\ 1\ 0\ 0)$

The effect of E_1 on the dynamical system M_1 is given by
$E_1 M_1 = (0\ 0\ 1\ 0\ 0\ 1) \hookrightarrow (0\ 0\ 1\ 1\ 0\ 1) = E_2$
$E_2 M_1 = (2\ 0\ 2\ 0\ 1\ 2) \hookrightarrow (1\ 0\ 1\ 1\ 1\ 1) = E_3$
$E_3 M_1 = (3\ 0\ 5125) \hookrightarrow (1\ 1\ 1\ 0\ 1\ 1) = E_4 = E_3$

E_3 is a fixed point of the dynamical system. The hidden pattern of the fixed point is given by

$(1\ 0\ 1\ 0\ 1\ 1)$ which implies that expect the second and fourth the remaining attributes are in ON state. i.e. Genetic risk factors, Changes in other genes, Menstrual periods, Non-proliferative lesions are main causes.

Let us take the node A_5 is in ON state i.e., Non-proliferative lesions is in ON state and all other nodes are in OFF condition. Suppose the input vector is

$F_1 = (0\ 0\ 0\ 0\ 1\ 0)$
The effect of F_1 on the dynamical system M_1 is given by
$F_1 M_1 = (0\ 0\ 1\ 0\ 0\ 1) \hookrightarrow (0\ 0\ 1\ 0\ 1\ 1) = F_2$
$F_2 M_1 = (2\ 0\ 2\ 0\ 1\ 2) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = F_3$
$F_3 M_1 = (3\ 0\ 4\ 0\ 24) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = F_4 = F_3$

F_3 is a fixed point of the dynamical system. The hidden pattern of the fixed point is given by
$(1\ 0\ 1\ 0\ 1\ 1)$ which implies that first, third, fifth and sixth are in ON state. i.e. Genetic risk factors, Changes in other genes, Menstrual periods, Non-proliferative lesions are main causes. Let us take the node A_6 is in ON state i.e., Menstrual periods is in ON state and all other nodes are in OFF condition. Suppose the input vector is
$G_1 = (0\ 0\ 0\ 0\ 0\ 1)$

The effect of G_1 on the dynamical system M_1 is given by
$G_1 M_1 = (1\ 0\ 1\ 0\ 0\ 0) \hookrightarrow (1\ 0\ 1\ 0\ 0\ 0) = G_2$
$G_2 M_1 = (2\ 0\ 2\ 0\ 1\ 2) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = G_3$
$G_3 M_1 = (3\ 0\ 4\ 0\ 2\ 4) \hookrightarrow (1\ 0\ 1\ 0\ 1\ 1) = G_4 = G_3$

G_3 is a fixed point of the dynamical system. The hidden pattern of the fixed point is given by $(1\ 0\ 1\ 0\ 1\ 1)$ which implies that expect the second and fourth the remaining attributes are in ON state. i.e. Genetic risk factors, Changes in other genes, Menstrual periods, Non-proliferative lesions are main causes. The attributes Night duty due to workload and Chemical in the environment has minimum and maximum weight age at the age 46-60 respectively.

Table -1

12-20	Initial State Vector	Weight age of ON State Vector						ON State Vector					
		A_1	A_2	A_3	A_4	A_5	A_6	A_1	A_2	A_3	A_4	A_5	A_6
	(1 0 0 0 0 0)	3	0	4	0	2	4	1	0	1	0	1	1
	(0 1 0 0 0 0)	3	1	5	0	2	5	1	1	1	0	1	1
	(0 0 1 0 0 0)	3	0	4	0	2	4	1	0	1	0	1	1
	(0 0 0 1 0 0)	3	0	5	1	2	5	1	0	1	1	1	1
	(0 0 0 0 1 0)	3	0	4	0	2	4	1	0	1	0	1	1
	(0 0 0 0 0 1)	3	0	4	0	2	4	1	0	1	0	1	1
	Column sum (W^{sum})	18	1	26	1	12	26	6	1	6	1	6	6
	Average of W^{sum}	3.000	0.167	4.333	0.167	2.000	4.333	1.000	0.167	1.000	0.167	1.000	1.000
	Weightage of State Vector	0.333	0.019	0.481	0.019	0.222	0.481	0.111	0.019	0.111	0.019	0.111	0.111

Table-2 Weightage of State Vector = Average of W^{sum} / Age interval

Age	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	$A_{13}*$
12-20	18	1	26	1	12	26	0	0	0	0	0	0	0
21-35	0	0	0	0	0	0	12	1	14	24	1	17	0
36-45	0	0	0	0	0	0	0	0	0	0	0	0	10
46-60	0	0	0	0	0	0	0	0	0	0	0	0	0
61-80	0	0	0	0	0	0	0	0	0	0	0	0	18
	18	1	26	1	12	26	12	1	14	24	1	17	28
	3.0000	0.1667	4.3333	0.1667	2.0000	4.3333	2.0000	0.1667	2.3333	4.0000	0.1667	2.8333	4.6667

Similarly, we get for the remaining weight age of state vectors.

Table-3

Age	A_{14}	A_{15}	$A_{16}*$	A_{17}	$A_{18}*$	A_{19}	A_{20}	$A_{21}*$	A_{22}	A_{23}	A_{24}	A_{25}	A_{26}
12-20	0	0	0	0	0	0	0	0	0	0	0	0	0
21-35	0	0	0	0	0	0	0	0	0	0	0	0	0
36-45	17	9	1	1	16	0	0	0	0	0	0	0	0
46-60	0	0	1	0	14	12	12	1	18	0	0	0	0
61-80	0	0	0	0	0	0	0	1	0	6	1	13	3
	17	9	2	1	30	12	12	2	18	6	1	13	3
	2.8333	1.5000	0.3333	0.1667	5.0000	2.0000	2.0000	0.3333	3.0000	1.0000	0.1667	2.1667	0.5000

Table-4

Attributes rank	12-20	21-35	36-45	46-60	61-80
1	0.481 A_6 Menstrual periods	0.267 A_{10} Having Children	0.283 A_{14} Proliferative lesions without atypia	0.200 A_{22} Diethylstilbestrol exposure	0.150 $A_{13}*$ Personal history
2	0.481 A_3 Changes in other genes	0.189 A_{12} Breast feeding	0.267 $A_{18}*$ Lobular carcinoma in situ	0.156 $A_{18}*$ Lobular carcinoma in situ	0.108 A_{25} Antiperspirants
3	0.222 A_5 Non-Proliferative lesions	0.156 A_9 Proliferative lesion without atypia	0.167 $A_{13}*$ Personal history	0.133 A_{20} Hormone therapy after menopause	0.050 A_{23} Previous chest radiation
4	0.019 A_2 BRCA1 &BRCA2	0.133 A_7 Aging	0.150 A_{15} Drinking alcohol /Tobacco smoke	0.133 A_{19} Dense in breast tissue	0.025 A_{26} Unhealty food
5	0.019 A_4 Certain Benign breast cancer	0.011 A_8 Family history	0.017 $A_{16}*$ Night duty due to workload	0.011 $A_{16}*$ Night duty due to workload	0.008 $A_{21}*$ Chemical in the environment
6	0.333 A_1 Genetic risk factors	0.011 A_{11} Birth control	0.017 A_{17} Induced abortion	0.011 $A_{21}*$ Chemical in the environment	0.008 A_{24} Estrogen therapy

VIII.   CONCULSION

From the calculation Personal history, Lobular carcinoma in situ, Chemical in the environment, Night duty due to work load are main causes for breast cancer. From the table described above shows the clear picture of the women affected in cancer. This table gives ranking of each risk factor at the age interval. One of the attribute is the Personal history which shows that the highest weight age at the age 36-45 and lowest weight age at the age 61-80. The attribute Lobular Carcinoma has minimum weight age at the age 46-60 and maximum weight age at the age 36-45. The attributes Night duty due to workload and Chemical in the environment has minimum and maximum weight age at the age 46-60 respectively.

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