SIMPLE FUZZY MODELS FOR IDENTIFYING AND ESTIMATING THE MAXIMUM AGE GROUP PATIENTS SUFFERED BY MALARIA DISEASE PROBLEMS (SFMIEMPSMDP)

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Abstract: Malaria is an existing harmful curable simple disease. The harmful effects of malaria parasites to human body cannot be underestimated. In this paper the "Combined effective time dependent data matrix" CETD –MATRIX methods is presenting for providing the decision support plat form to malaria researchers, physicians and other health care practitioners. Simple Fuzzy Models are used for Identifying and Estimating the level of the disease under particular symptoms and different Age groups of patients Studied by the collection of Raw Data's under Major symptoms through an expert Doctors decisions. Simple fuzzy variables such as Mild, Moderate, Severe and Very-Severe malaria problems are taken for Identifying and Estimating the maximum age group Patients suffered by malaria disease problems throw the following fuzzy ranges [$0.1 \le x < 0.3$, $0.3 \le x < 0.6$, $0.1 \le x < 0.3$, $0.8 \le x \le 1.0$] .The Raw-Data's are Collected by different Hospitals in Bagalkot District.

Keywords: Raw-data by expert physicians, Malaria, Fuzzy Logic, fuzzy matrix models ATD, RTD , CETD matrix and Fuzzy Expert System.

Introduction-I:

Fuzzy Expert System:

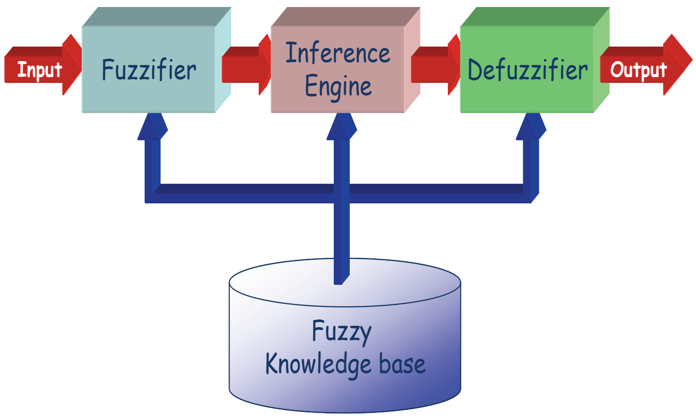


Fig-01:-Architecture of an Expert System

Malaria an existing harmful curable disease, In this Paper a fuzzy expert system and "Combined effective time dependent data matrix" CETD –MATRIX methods are used to present for providing the decision support platform to malaria researchers, physicians and other health care practitioners in malaria endemic regions, analysis of this disease examining through normal symptoms of this harmful disease by an expert physicians. Every patient treatment followed by these simple and normal symptoms to cure the main disease by taking quick decisions by an expert doctors. The main investigation of this Research paper contain simple fuzzy models for identifying and estimating the maximum age group patients suffered by malaria disease. A fuzzy expert system for diagnosing malaria infected patients. An expert system for identifying and estimating the malaria problems using symptoms, and fuzzy variables such as Mild-malaria, Moderate- malaria , Severe-malaria and Very-Severe malaria problems. Estimating the maximum age group suffered malaria problems under following fuzzy ranges are as follows, [Mild, Moderate, severe, and Very-Severe] = [$0.1 \le x < 0.3$, $0.3 \le x < 0.6$, $0.1 \le x < 0.3$, $0.8 \le x \le 1.0$] Estimating the level of this harmful but simple disease by using fuzzy logic, fuzzy matrix , ATD, RTD and CETD-matrix. case based reasoning for medical diagnosis using fuzzy set theory. Malaria is a potentially fatal blood disease caused by parasite that is transmitted to human and animal hosts by the Anopheles mosquito. The body of the adult Anopheles mosquito is dark brown to black in color and has 3-sections which are

1) Head 2) Thorax and 3) Abdomen

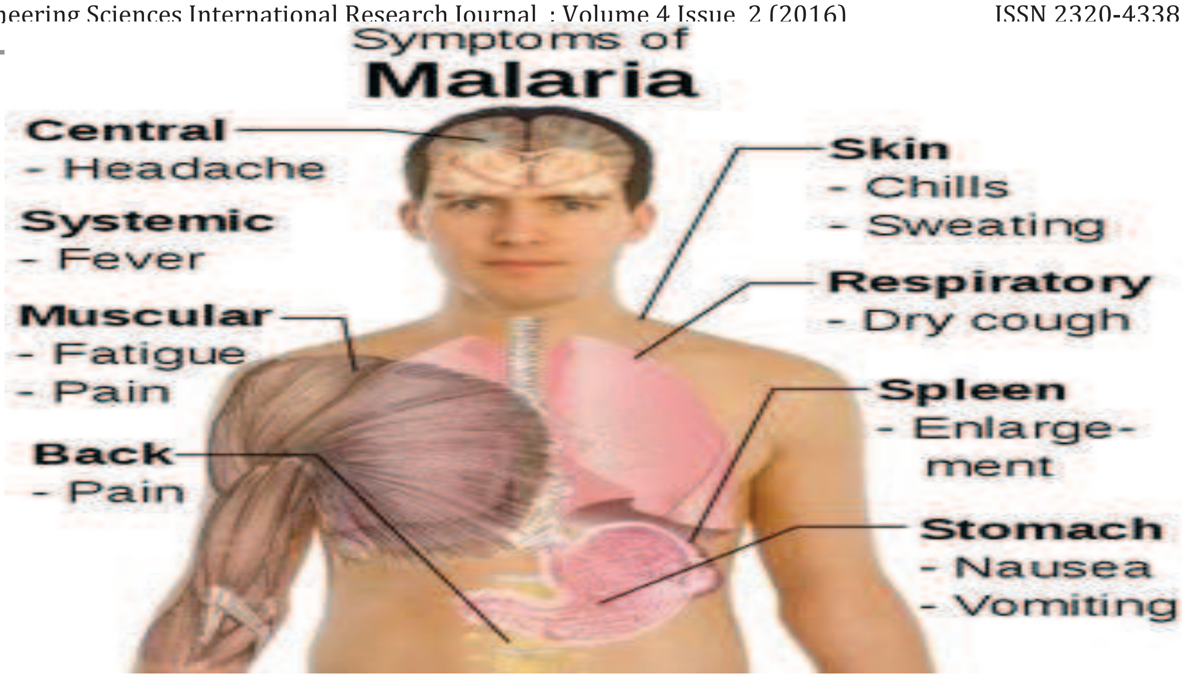


Fig-02:- Common Symptoms of malaria

When resting, the stomach area of the malaria mosquito species points upward, rather than being even with the surface like most mosquitoes. The female Anopheles mosquito will mate several times in her short lifespan, producing eggs after she has found a blood meal. Although she only lives a few weeks to a month at most. she will have been able to produce thousands of eggs during that time. The human parasite, Plasmodium falciparum, is dangerous not only because it digests the red-blood cell's hemoglobin, but also because it changes the adhesive properties of the cellit inhabits. This change in turn causes the cell to stick to the walls of blood vessels. It becomes especially dangerous when the infected blood cells stick to the capillaries in the brain, obstructing blood flow, a condition called cerebral malaria.

Symptoms: Malaria Infected patients suffered by Normal symptoms as follows in the Table below.

Table-No-01

P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
Fever	Headache	Stomachache, Nausea	Vomiting	Musccular Pain, Fatigue	Spleen Enlargment	Joint Pain	Back pain	Dizziness Skin, Cills	Loss of appetite

Malaria: Is an infection caused by parasite that is carried from person to person by a certain type of female mosquito, malaria can make people very risk or die Malaria is usually found in places to be with warmer temperatures to grow before they are old enough to be transmitted to humans. Although Malaria can cause illness and death but it can be prevented and treated. General Malaria symptoms are as follows from the above table and similar set of symptoms are High fever, Shaking, Diarrhea, Body ache, Flue-like symptoms

Parasite: A parasite is an organism that lives on or another organism. The four recognized species of malaria parasites pathogenic to man are Plasmodium falciparum , Plasmodium vivax ,Plasmodium malaria and Plasmodium ovale The above four parasites P. Falciparum is very dangerous

Literature Review-II:

1. **Concpt Of Fuzzy Matrices:** Closed interval [0, 1] denotes the unit interval. We say $x \in [0, 1]$ if $0 \le x \le 1$. We also call the unit interval as a fuzzy interval. We say [a, b] is a fuzzy sub interval of the fuzzy interval [0, 1] if $0 \le a < b \le 1$: we denote this by $[a, b] \subseteq [0,1]$. We also use the convention of calling $[-1, 1]$ to be also a fuzzy interval. $x \in [-1, 1]$ if $-1 \le x \le 1$. Thus we have $\{x \mid x \in [0, 1]$ i.e., $0 < x < 1\}$ is uncountable; hence [0, 1] is an infinite set as [0, 1] is an uncountable set. Let X be any universal set. The characteristic function maps elements of X to elements of the set to elements of the set {0, 1}, which is formally expressed by $\mu_A : X \to [0,1]$ Set A is defined by its characeristic function μ_A To be more non technical a fuzzy set can be defined
2. Mathematically by assigning to each possible individual in the universe of discourse a value representing its grade of membership in the fuzzy set. For Zadeh introduced a theory whose objects fuzzy sets are set with boundaries that are not precise. The membership in a fuzzy set is not a matter of affirmation or denial but rather a matter of a degree. The significance of Zadeh's contribution

was that it challenged not only probability theory as a sole agent for uncertainty

The Mathod Of Application Of Cetd Matrix: Here we show a very simple effective technique on the collected data. These real data collected from malaria infected persons we recognize and estimate the maximum age group patients, who suffered from Mild, Moderate, Severe, and Very severe malaria, from these health hazards occure due to endemic and epidemic areas(places) is studied by using this fuzzy-matrix models. We give an algebraic approach to the health hazards faced by people due to malaria infections in the **TOOGONACY** Village, **GULEDGUDD** town of Badami talook ,Bagalkot ditrict karnatak state first by the terms endemic and epidemic areas due to the lack of pollution, we mean the pollution of this areas mainly due to ignore relating malaria disease. First we study the level of knowledge and awareness relating to malaria infected people existing among migrant laborers and malaria parasite infected people living Around the Bagalkot district.

The study was mainly motivated from the data collected in these places in my Paper 50 -malaria infected persons most of them belonged to a category that comes to be defined these infected group comes under **ENDEMIC** and **EPIDEMIC** Areas conditions and rest of them attacked mainly by **MIGRANT LABOURERS** .Rest of these malaria infected migrant people who have come to enjoy their native festivals, for family problems, for attending relative marrages etc---- from city like **GOA, MANGALORE, CAPU** in Udupi Dist and by neighbor states I also study main reason for these migrant groups how the new economic conditions ,policies of liberalization and globalization has affected people to loose their traditional livelihood and sources of local employment , laboure work forcing them to migration. Due to these migrant people harmful to every village , city, town people such groups are largely spread the disease of malaria. For the total atmosphere polluted by these groups of people in and around area. This study is significant because most villages, cities, towns faces the same problems in our india To the best of our knowledge one has ever cared to study the health hazards suffered by our people due to malaria disease. Thus my Paper study investigation can be adopted **ENDEMIC, EPIDEMIC, HIGH- RISK** areas. Now my Paper aim is approach to **MILD, MODERATE, SEVERE** and **VERY SEVERE** malaria problems Identifying and estimation under investigation by simple fuzzy matrix models. We approach the problem of measure by determining the peak age group in which they are maximum affected by these Linguistic variable degrees of malaria disease. Already our government of india providing all types of health facilities due to this simple and very dangerous disease malaria. **Malaria problem is an exclusively local phenomenon incidence of malaria varies from village to village , city to city and even city from ward to ward mile stones of malaria control measures taken up in india.**

1. Government of India launching of Malaria Eradication Programme NMEP started in 1958
2. Epidimiological Surveillance initiated in 1961.
3. Modified plan of operation of NMEP-Implemented From 01 - 04 – 1977 with change in strategy from eradication to containment
4. Plasmodium falciparum (P.F) Containment program (PFCP) was added to NMEP.
5. Malaria action plan (MAP) then accelerated map has been taken up in high risk areas in 1995.

Materials And Methods-III:

Datas: The data's are Collected Govt Primary health center **TOOGUNSHI-VILLEGE** (remote area village) S.R. vastrad Government Hospital **GULEDGUDD**(Small town) **TQ:- BADAMI. Dist:- BAGALKOT. State:-- Karnatak**

We have selected 50 patients, To Estimate The Maximum Age group of **MILD, MODERATE, SEVERE, AND VERY-SEVERE** Malaria problems under the range of fuzzy values shown below in the

Table-No-02

Liguistic variables	Fuzzy Values
Mild	**$0.1 \leq x < 0.3$**
Moderate	**$0.3 \leq x < 0.6$**
Severe	**$0.6 \leq x < 0.8$**
Very-severe	**$0.8 \leq x \leq 1.0$**

In this sequel , we made an honest attempt to incorporate fuzzy techniques using fuzzy matrix method to estimate maximum age groups suffered malaria problems measured with respective fuzzy ranges.

SIMPLE FUZZY MATRIX MODEL-The method of application of CETD matrix, A simple fuzzy marix model have five stages

I. **First stage :-- Fuzzy Matrix Model (FMM):** We have a raw data in hand. How raw data transformed in to a fuzzy Matrix model. Raw data transformed in to fuzzy matrix model using the technique of

a) Average(mean value) b) standerd deviation

II. **Second stage : Average Time Dependent Data (ATD) Matrix:** First raw data in hand is converted or transformed in to raw time dependent data matrix i.e **Average time dependent data (ATD) matrix** Arranging raw data(symptoms) along the rows. Age groups along the columns, which are belongs to mild, moderate,severe, and very severe malaria of different degrees, to construct raw data matrix we make it into the Average or mean and Time dependent Data (ATD) Matrix i.e $[a_{ij}]_{MXN}$ by dividing each entry of the raw data matrix by the number years i.e the time period. This matrix represents a data, which is totally Uniform.

II. **Third stage :-- Refined Time Dependent Data (RTD) matrix:** To make the calculation simple and easy we make use of simple everage technique to convert the ATD matrix in to RTD Matrix where $e_{ij} \in \{ -1, 0, 1 \}$ we call this matrix as Refined time dependent data (RTD) matrix The values of e_{ij} obtained in a special way i.e The Average or Mean(AV or MN) and the standerd deviation(S.D) Of each column in Average time dependent data (ATD) matrix are

1) Every value of Everage or Mean of each j^{th} columns are used here and is denoted by μ_j and
2) Every j^{th} column of Standerd Deviation (S.D) also used here and is denoted by σ_j
3)Uncertainty existing variable value of parameter $\alpha \in [0, 1]$ is chosen here. Refined time dependent data fuzzy matrix (RTD-Matrix) $[e_{ij}]_{MXN}$ **is formed by using the formula**

If $a_{ij} \le (\mu_j - \alpha * \sigma_j)$ **, then** $e_{ij} = -1$ **else (besides)**

If $a_{ij} \in (\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j)$**, then** $e_{ij} = 0$ **else**

If $a_{ij} \ge (\mu_j + \alpha * \sigma_j)$ **, then** $e_{ij} = 1$

Where a_{ij}'s are the entries of the ATD matrix: The ATD mateix is conversation in to the RTD matrix We redefine the ATD matrix in to the RTD matrix for here the entries are 1, 0, and 1 now the row sum of this matrix gives the maximum age group. Thus for different values of α we obtained different refined time time dependent data matrices. The main perpose of introducing the refined time dependent data matrix is only to minimize the time involved in performing the simple airthmatics calculations and operations on the matrix.

IV-Fourth stage :-- Combined Effective Time Dependent Data (CETD) Matrix: In the final stage we combine the above RTD Matrices by varying the values of parameters $\alpha \in [0, 1]$ so that we get the Combined Effective Time Dependent Data (CETD) Matrix.

V-Fifth-Stage: The row sum is obtained for CETD Matrix and conclusions are derrived 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 understandable even by a Layman. Hence this method is very effective and simple at the same time. The raw data which have been collected from Govt Primary Medical Health centre at TOOGUNACY-village and S.R.VASTRAD Govt Hospital GULEDGUDD-Town in Badami-talook. District-Bagalkot State-karnatak.

Where we have syllected 100 malaria infected patient under Doctor suggestion with LabTechnition. Every month visited the Hospital and note-down the History of patients conditions examined by the doctor. And arrange the patients age groups with the range of fuzzy variables shown below Table-No-03

Table-No-03.

Age Groups	Lingistic Variables	Fuzzy Values
11-20,21-30,31-40,41-50,51-60,61-70	Mild-Malaria	$0.1 \le x < 0.3$
11-20,21-30,31-40,41-50	Moderate-Malaria	$0.3 \le y < 0.6$
11-20,21-30,31-40,41-50,51-60	Severe-Malaria	$0.6 \le X < 0.3$
10-17,18-24,25-29,30-39,40-49,50- 59, 60-75	Very-Severe-Malaria	$0.8 - \le t \le 1.00$

Where $x=y=z=t=\alpha \in [0,1]$

linguistic variables Mild, Moderate, Severe and Very-severe bounds between the Fuzzy ranges of α, where $\alpha \in [0, 1]$

Since x = { Mild, Moderate, Severe and Very-severe}

Where x is bounded $\Rightarrow 0 \le$ liguistic variable of x ≤ 1

The Raw-Data In our hand these are collected by medical case records from different hospitals, were the **50**- malaria infected patients of different age groups of malaria case records transformed in different range of parameters, denote α Each of these groups is transformed in to Time dependent matrices. After obtaining the matrices using the techniques of average and standard deviation (S.D) Identify the peak age group in which they suffer the maximum health hazard. Identification of the each maximum age groups will play a vital role in improving their health conditions by providing the best health facilities with broadcast aware to take care precautionary treatment, Very needful to Identifying P-Falciparum cases by Migrant people. To the best of our knowledge such study has not been mathematically carried out by any one on this type of simple but very dangerous disease of malaria. The Raw Data (malaria health problems) Under investigation has been classified under five broad heads

Mild-Malaria problems, Moderate-Malaria problems, Severe-Malaria problems and Verey-Severe Malaria problems Severe or very-severe problems by P-Falciparum Malaria

I. First four major heads(1,2,3,4) used for estimation of maximum age groups of common malaria problems studied by simple fuzzy matrix models.

II. And Identification, estimation for particular patient common malaria problem, using Triangular membership function, studied under fuzzy expert system and rule base expert system.

III. Head-No-5, Identification, estimation for particular patient who suffered severe and very-severe malaria problems under fuzzy expert system and rule base expert system, and used for Trapezoidal Membership Function.

I. Estimation of maximum age group of the common people having MILD-MALARIA Problem due to malaria infection using matrices.

In this major study of health problems faced by the common malaria infected people having MILD-MALARIA with MILD FEVER of this simple disease, patients suffered 10-symptoms viz.

II. Estimation of maximum age group using 6 x10 Matrices Initial Raw Data

Matrix mild-malaria problem of order 6 x10

Symptoms: Mild- malaria patients suffered by 10-symptoms viz P_1- Fever, P_2-Headache, P_3 -Nausea, P_4 -Vomiting, P_5 -Muscle ache, P_6- Cough, P_7 -Joint pain, P_8- Body weak, P_9 - Diarrhea, P_{10} - Loss of appetite

Which are used as columns of initial raw data matrix. Age group in years 11-20,21-30,31-40,41-50 are used as the row of the matrix. The estimation of the maximum age group is a five stage process. As follows

1. Raw Data used for Matrix representation. Entries of this matrix corresponding to the intersection of Rows and Columns. And these are the values corresponding to a live Net-work. The 6x10 matrix is not uniform i.e the number of individual years in each intervals may not be the same.
2. In second position the collection of each and every datas are in order to obtain an unbiased uniform effect takes place. So transform this initial matrix in to an Average Time Dependent Data (ATD) Matrix. For this we get calculations becomes easier and simpler.
3. Using simple average technique formulas transform the above ATD matrix in to a RTD-matrix with entries $e_{ij} \in \{-1 ,0 ,1\}$ We name this matrix as Refined Time Dependent Data Matrix
4. (RTD-Matrix) Or as required FUZZY-MATRIX. The values of e_{ij} corresponding to each entries calculated in special technique.
5. Combining the above RTD-Matrices results by varying the parameter $\alpha \in [0, 1]$ So that we get Combined Effective Time Dependent Data (CETD) Matrix. Which gives Cumulative effect of all these entries.
6. In the Fifth-Final stage The Conclusions are derived based on the row sums of CETD-Matrix. The tables given are self – explanatory at each stage.

All these are represented by an ELEGANT Graphs and all these graphs play a vital role in exhibiting the data by the simplest means. which can be even understood by layman.

1. MILD-MALARIA [0.1≤ x <0.3]

I. Using the Raw-Data for constructing the initial MXN - FUZZY-MATRIX system for analyzing THE MILD- MALARIA Problems of order 6x10

II. Estimation of maximum age group patients suffering for Mild-Malaria Problems of order 6x10 (EMAGMMIP)

Mild malaria patients suffered by 10-symptoms as follows Table.No-04

P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
Fever	Headache	Stomachache, Nausea	Vomiting	Musccular Pain, Fatigue	Spleen Enlargment	Joint Pain	Back pain	Dizziness Skin,Cills	Loss of appetite

Which are used as columns of initial raw data matrix. Age group in years 11-20,21-30,31-40,41-50, 51-60, 61-70. are used as the row of the matrix. The estimation of the maximum age group is a five stage process. As follows

Table No-0 5

Ages	P_1	P_2	P_3	P	P_5	P_6	P_7	P_8	P_9	P_{10}
11-20	9	8	6	7	5	4	10	6	5	10
21-30	15	12	18	10	16	11	15	8	13	16
31-40	18	15	16	17	14	12	19	16	13	18
41-50	25	27	22	18	26	20	16	17	15	24
51-60	8	7	5	6	7	4	5	4	9	6
61-70	7	9	6	5	8	6	8	6	7	9

Table No-06:- Mid-values of year-column of the above patient groups as follows

Year	Mid-value
11-20	10
21-30	10
31-40	10
41-50	10
51-60	10
61-70	10

The corresponding average time dependent data matix (ATD-matrix) of Mild - malaria Problems of order 6x10

$$\begin{pmatrix} 0.9 & 0.8 & 0.6 & 0.7 & 0.5 & 0.4 & 1.0 & 0.6 & 0.5 & 1.0 \\ 1.5 & 1.2 & 1.8 & 1.0 & 1.6 & 1.1 & 1.5 & 0.8 & 1.3 & 1.6 \\ 1.8 & 1.5 & 1.6 & 1.7 & 1.4 & 1.2 & 1.9 & 1.6 & 1.3 & 1.8 \\ 2.5 & 2.7 & 2.2 & 1.8 & 2.6 & 2.0 & 1.6 & 1.7 & 1.5 & 2.4 \\ 0.8 & 0.7 & 0.5 & 0.6 & 0.7 & 0.4 & 0.5 & 0.4 & 0.9 & 0.6 \\ 0.7 & 0.9 & 0.6 & 0.5 & 0.8 & 0.6 & 0.8 & 0.6 & 0.7 & 0.9 \end{pmatrix}$$

Now to find the everage and standerd deviation(S.D) of the above ATD-Matrix

X_1 , X_2 , X_3 ,----- X_n (number of variable functions in each column)

P_1 , P_2 , P_3 ,---- P_n (number of symptoms in above fzzy matrix)

Average of ATD-Matrix denoted by μ_j

$\left.\begin{matrix}\textbf{Standerd}\\ \textbf{Deviation}\end{matrix}\right\}$ of ATD-Matrix denoted by σ_j

$$\left.\begin{matrix}\textbf{Standerd}\\ \textbf{Deviation}\end{matrix}\right\} = \sigma_j = \frac{\sqrt{\sum(X-\overline{X})^2}}{N} \quad \text{Where } \overline{X} = \frac{\sum f(x)}{n} \text{ and } N = n-1$$

Average denoted by $\mu_j = \overline{X} = \frac{\sum f(x)}{n}$

N = Total number of elements in each column subtracted by one

Table No-07:-The Average and Standerd Deviation (S.D) of the above ATD Matrix

Symptoms	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
$\mu_{j=Average}$	**1.4**	**1.3**	**1.2**	**1.05**	**1.3**	**1.95**	**1.2**	**O.95**	**1.03**	**1.4**
$\sigma_j = S.D$	**0.70**	**0.75**	**0.74**	**0.57**	**0.78**	**0.62**	**O.53**	**0.56**	**0.39**	**0.67**

I.**Refined Time Dependent Data RTD-Matrix for α =0.** **Row sums**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 1 & -1 & 1 & -1 & 1 & 1 & 1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} -10 \\ 4 \\ 10 \\ 10 \\ -10 \\ -10 \end{pmatrix}$$

II.Refined Time Dependent Data RTD-Matrixfor α =0.15 **Row sums**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 1 & -1 & 1 & 0 & 1 & 1 & 1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} -10 \\ 5 \\ 10 \\ 10 \\ -10 \\ -10 \end{pmatrix}$$

III.Refined Time Dependent Data RTD-Matrix for α =0.2 **Row sums**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 1 & 0 & 1 & 0 & 1 & 1 & 1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} -10 \\ 6 \\ 9 \\ 10 \\ -10 \\ -10 \end{pmatrix}$$

IV.Refined Time Dependent Data RTD-Matrixfor α =0.25 Row sums

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 & -1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} -10 \\ 3 \\ 9 \\ 10 \\ -10 \\ -10 \end{pmatrix}$$

V.Refined Time Dependent Data RTD-Matrixfor α =0.3 Row sums

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} -10 \\ 5 \\ 9 \\ 10 \\ -10 \\ -10 \end{pmatrix}$$

VI. Graphical comparison with conclusion of maximum age group of the patients which age groups affected by Mild-malaria problem of order 6x10 CETD Matrix

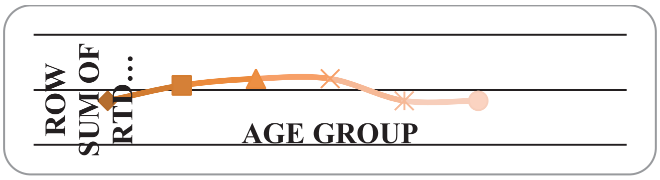
Mild Malaria of CETD-Matrix of order 6x10 Row sums

$$\begin{pmatrix} -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 \\ 3 & -2 & 5 & -1 & 4 & 5 & 5 & -5 & 4 & 5 \\ 5 & 5 & 5 & 5 & 3 & 5 & 5 & 4 & 5 & 5 \\ 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 \\ -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 \\ -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 \end{pmatrix} \quad \begin{pmatrix} -50 \\ 23 \\ 47 \\ 50 \\ -50 \\ -50 \end{pmatrix}$$

Particular Elegant systematic Graphs of above Matrics Systems as FolIows

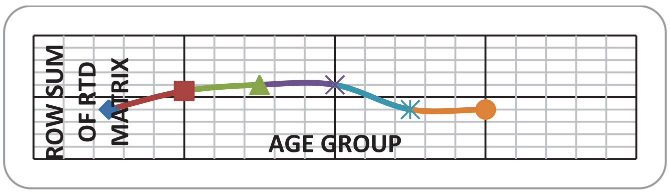
Graph-1:

Graph depicting maximum age group of malaria infected patients with problem related to mild malaria for α =0.1



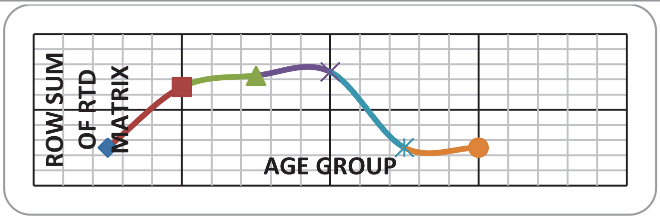
We observe from the above graph that mild-malaria problem between the age group 31- 40 year.

GRAPH-2:Graph depicting maximum age group of malaria infected patients with problem related to mild malaria. for α =0.15



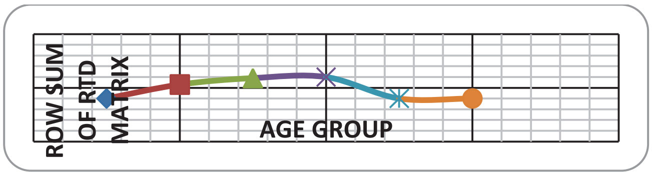
We observe from the above graph that mild-malaria problem between the age group 20- 40 years

Graph-3:-Graph depicting maximum age group of malaria infected patients with problem related to mild malaria. for α =0.2



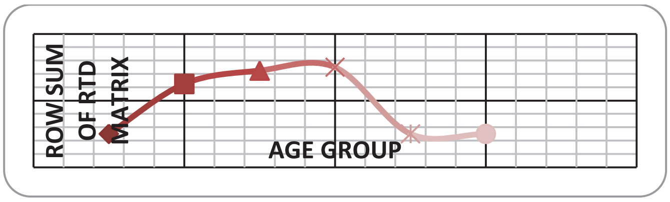
We observe from the above graph that mild-malaria problem between the age group 20- 40 years

Graph-04: Graph depicting maximum age group of malaria infected patients with problem related to mild malaria for α =0.25



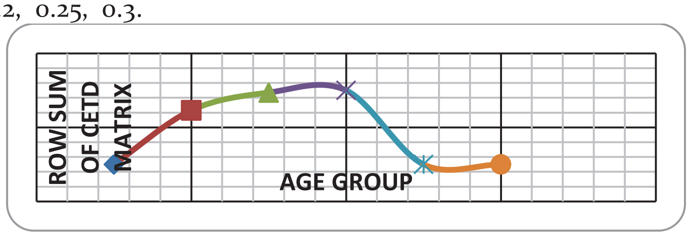
We observe from the above graph that mild-malaria problem between the age group 20- 40 years

GRAPH-5: Graph depicting maximum age group of malaria infected patients with problem related to mild malaria. for α =0.3



We observe from the above graph that mild-malaria problem between the age group 20- 40 years

Graph-6: Graph depicting maximum age group of malaria infected patients with problem related to mild malaria for α =0.1, 0.15, 0.2, 0.25, 0.3.



From the above analysis of all Graphs, we observe that the maximum age group getting mild-malaria problem has not changed with the change in the value of the parameter from 0 to 1.
i.e α ϵ [0.1,0.15,0.2,0.25,0.3] The mathematical inference is that the maximum age group of malaria infected patients to have mild-malaria problem is between the age group 20-40 years. And the Combined Effect Time Dependent data matrix also confirm the same result.

2. Moderate-Malaria [0.3 ≤ x < 0.6]

I.Using the Raw-Data FOR constructing the initial MXN - FUZZY-MATRIX system for analysing THE MODERATE - MALARIA Problems of order 4x10

Table.No-08: Estimation of Maximum Age Group of Moderate Malaria Infected Patient Of order4x10 (SFMIEMMD)

Years	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
11-20	7	6	4	6	5	7	4	6	3	5
21-30	23	18	24	16	29	16	18	10	16	17
31-40	16	15	12	14	16	13	15	8	9	14
41-50	7	4	5	3	4	2	6	0	2	6

Tabe-No-09:-Mid-values of year-column of the above patient groups as follows

Year	Mid-value
11-20	10

21-30	10
31-40	10
41-50	10

The corresponding average time dependent data (ATD-matrix) of Moderate-Malaria Problems of order 4x10.

Table-No-10:--The Average and Standard Deviation (S.D) of the above ATD Matrix

Symptoms	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
$\mu_{j=Average}$	1.32	1.08	1.12	0.97	1.35	0.9	1.00	O.6	0.75	1.05
$\sigma_j = S.D$	0.77	0.68	0.92	0.62	1.17	0.62	O.76	0.55	0.64	0.59

I.Refined Time Dependent Data RTD-Matrix for α =0.3 **Row sum**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 & -1 & -1 \\ 1 & 1 & -1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 \end{pmatrix} \begin{pmatrix} -9 \\ 7 \\ 10 \\ -9 \end{pmatrix}$$

II.Refined Time Dependent Data RTD-Matrix for α =0.35 **Row sum**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 & -1 & -1 \\ 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \begin{pmatrix} -9 \\ 8 \\ 10 \\ -10 \end{pmatrix}$$

III.Refined Time Dependent DataRTD-matrix for α =0.4 **Row sum**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 & -1 & -1 \\ 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \begin{pmatrix} -9 \\ 7 \\ 10 \\ -10 \end{pmatrix}$$

IV.Refined Time Dependent DataRTD-matrix for α =0.45 **Row sum**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & 0 & -1 & 0 & -1 & -1 \\ 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \begin{pmatrix} -8 \\ 7 \\ 10 \\ -10 \end{pmatrix}$$

V.Refined Time Dependent Data RTD matrix for α =0.5 **Row sums**

$$\begin{pmatrix} -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 & -1 & -1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix} \begin{pmatrix} -9 \\ 5 \\ 10 \\ -10 \end{pmatrix}$$

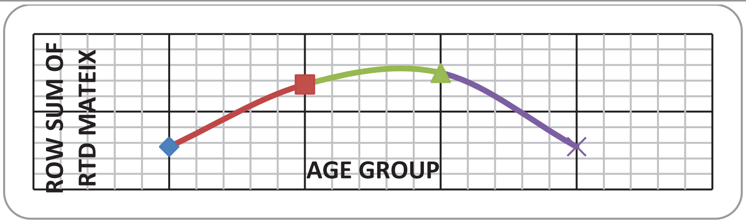
VI. Graphical comparison with conclusion of maximum age group of the patients which age groups affected by moderate malaria problem of CETD Matrix Cumulative effect of CETD-Matrix Row-sum

$$\begin{pmatrix} -5 & -5 & -5 & -5 & -5 & -5 & -5 & 0 & -5 & -5 \\ 4 & 5 & -1 & 5 & 0 & 5 & 5 & 4 & 2 & 5 \\ 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 \\ -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -5 & -4 \end{pmatrix} \begin{pmatrix} -45 \\ 34 \\ 50 \\ -49 \end{pmatrix}$$

For $\alpha =$ 0.3, 0.35, 0.40, 0.45, 0.50.

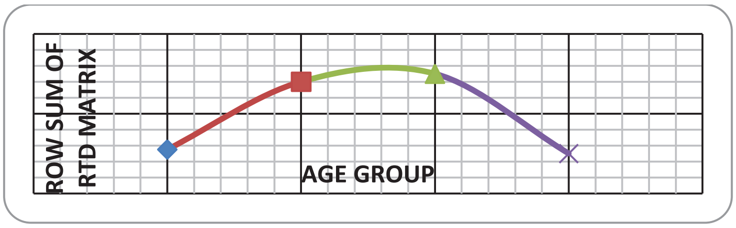
Particular Elegant systematic Graphs of above Metrics Systems as FoIIows Graph-No-7 -12

Graph-7 : Graph depicting maximum age group of malaria infected patients with problem related to moderate malaria. for α = 0.3



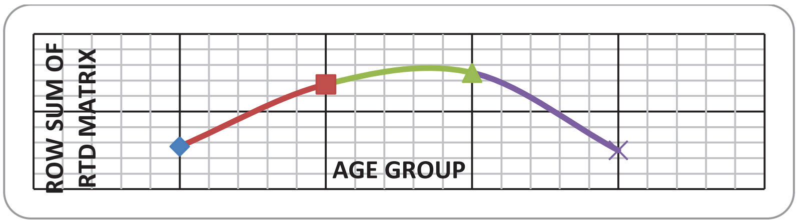
We observe from the above graph that moderate-malaria problem between the age group 21- 30 years

Graph-8 : Graph depicting maximum age group of malaria infected patients with problem related to moderate malaria. for α = 0.35



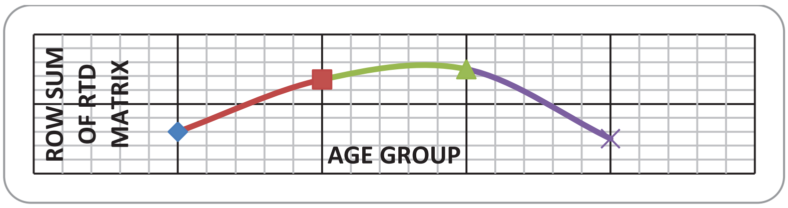
We observe from the above graph that moderate-malaria problem between the age group 21- 30 year

Graph-9 : Graph depicting maximum age group of malaria infected patients with problem related to moderate malaria for α = 0.4



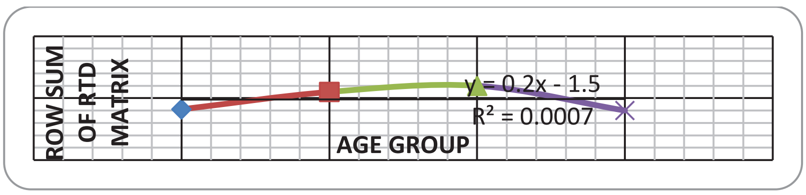
We observe from the above graph that moderate-malaria problem between the age group 21- 30 year

Graph-10: Graph depicting maximum age group of malaria infected patients with problem related to moderate malaria. for α = 0.5



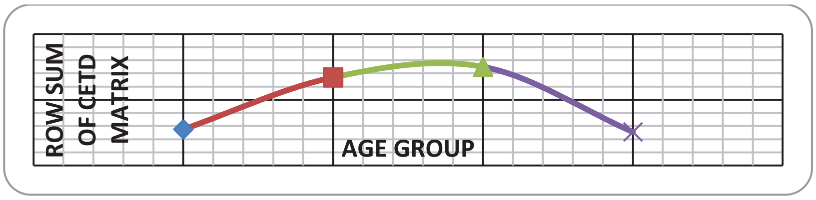
We observe from the above graph that moderate-malaria problem between the age group 21- 30 year

Graph-11: Graph depicting maximum age group of malaria infected patients with problem related to moderate malaria for α =0.5



We observe from the above graph that moderate-malaria problem between the age group 21- 30 year

Graph-12 : Graph depicting maximum age group of malaria infected patients with problem related to moderate - malaria. for α =0.3, 0.35, 0.4, 0.45. 0.50



From the above analysis of all Graphs, we observe that the maximum age group getting moderate-malaria problem has not changed with the change in the value of the parameter from 0 to 1.
i.e $\alpha \in [0.3, 0.35, 0.4, 0.45, 0.5]$ The mathematical inference is that the maximum age group of malaria infected patients to have moderate-malaria problem is between the age group 21-30 years. And the Combined Effect Time Dependent data(CETD) matrix also confirm the same result.

3. SEVERE-MALARIA [$0.6 \le x < 0.8$]

I. Using the Raw-Data for construct the initial MXN - FUZZY-MATRIX system for analysing THE SEVERE-MALARIA Problems of order 5x10

II. Estimation of maximum age group patients suffering from Severe-Malaria Problems of order 5x10 (SFMIEMMD)

Which are used as columns of initial raw data matrix.Age group in years 11-20,21-30,31-40,41-50, 51-60 are used as the row of the matrix. The estimation of the maximum age group is a five stage process. As follows

Table No-11

Ages	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
11-20	25	27	22	18	26	20	16	17	15	24
21-30	15	12	18	10	16	11	15	8	13	16
31-40	7	6	4	5	6	3	4	3	4	6
41-50	5	7	4	3	6	4	6	4	5	7
51-60	8	7	5	6	4	3	9	5	4	9

Table-No-12:-Mid-values of year-column of the above patient group matrix as follows

Ages	Mid-value
11-20	10
21-30	10
31-40	10
41-50	10
51-60	10

The corresponding average time dependent data matix (ATD-matrix) of Severe-Malaria Problems of order 4x10.is

$$\begin{pmatrix} 2.5 & 2.7 & 2.2 & 1.8 & 2.6 & 2.0 & 1.6 & 1.7 & 1.5 & 2.4 \\ 1.5 & 1.2 & 1.8 & 1.0 & 1.6 & 1.1 & 1.5 & 0.8 & 1.3 & 1.6 \\ 0.7 & 0.6 & 0.4 & 0.5 & 0.6 & 0.3 & 0.4 & 0.3 & 0.4 & 0.6 \\ 0.5 & 0.7 & 0.4 & 0.3 & 0.6 & 0.4 & 0.6 & 0.4 & 0.5 & 0.7 \\ 0.8 & 0.7 & 0.5 & 0.6 & 0.4 & 0.3 & 0.9 & 0.5 & 0.4 & 0.9 \end{pmatrix}$$

Table No-13:-The Average and Standard Deviation (S.D) of the above ATD Matrix

Symptoms	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
$\mu_{j=Average}$	1.2	1.18	1.06	0.84	1.16	0.82	1.00	0.74	0.82	1.24
$\sigma_j = S.D$	0.82	0.88	0.87	0.59	0.93	0.74	0.53	0.57	0.53	0.76

I.Refined Time Dependent Data, RTD-Matrix for α =0.6 Row sum

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & 0 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & 0 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & -1 & 0 & -1 & -1 & 0 & 0 & -1 & 0 \end{pmatrix} \quad \begin{pmatrix} 4 \\ 10 \\ -9 \\ -9 \\ -4 \end{pmatrix}$$

II.Refined Time Dependent DataRTDMatrix for α =0.65 **Row sum**

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & -1 & -1 & 0 & -1 & -1 & -1 & -1 & -1 \\ -1 & 0 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & 0 & -1 & -1 & 0 & 0 & -1 & 0 \end{pmatrix} \quad \begin{pmatrix} 4 \\ 10 \\ -8 \\ -9 \\ -3 \end{pmatrix}$$

III.Refined TimeDependent Data RTDMatrix for α =0.7 **Row sum**

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & -1 & -1 & 0 & 0 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & 0 & 0 & -1 & 0 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & 0 & -1 & 0 \end{pmatrix} \quad \begin{pmatrix} 4 \\ 10 \\ -7 \\ -7 \\ -2 \end{pmatrix}$$

IV.Refined TimeDependent Data RTDMatrix for α =0.75 **Row sum**

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & -1 & 0 & 0 & -1 & -1 & -1 & -1 & -1 \\ -1 & 0 & -1 & -1 & 0 & 0 & -1 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & -1 & 0 & 0 & -1 & 0 \end{pmatrix} \quad \begin{pmatrix} 4 \\ 10 \\ -6 \\ -5 \\ -3 \end{pmatrix}$$

V. Refined TimeDependent Data RTDMatrix for α =0.8 **Row sum**

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & -1 & 0 & 0 & 0 & -1 & -1 & -1 & -1 \\ -1 & 0 & -1 & -1 & 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & -1 & -1 & 0 \end{pmatrix} \quad \begin{pmatrix} 3 \\ 10 \\ -5 \\ -4 \\ -3 \end{pmatrix}$$

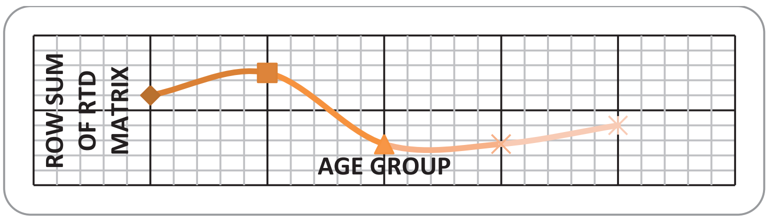
VI. Combined effective Time Dependent Data CETD-Matrix **Row sum**

$$\begin{pmatrix} 0 & 0 & 5 & 0 & 0 & 0 & 5 & 0 & 4 & 5 \\ 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 & 5 \\ -1 & -2 & -5 & -2 & -1 & -2 & -5 & -5 & -5 & -5 \\ -5 & -1 & -5 & -5 & -2 & -2 & -5 & -2 & -3 & -4 \\ 0 & 0 & -1 & 0 & -4 & -4 & 0 & -1 & -5 & 0 \end{pmatrix} \quad \begin{pmatrix} 19 \\ 50 \\ -33 \\ -34 \\ -15 \end{pmatrix}$$

For α = 0.6, 0.65, 0.7, 0.75, 0.8

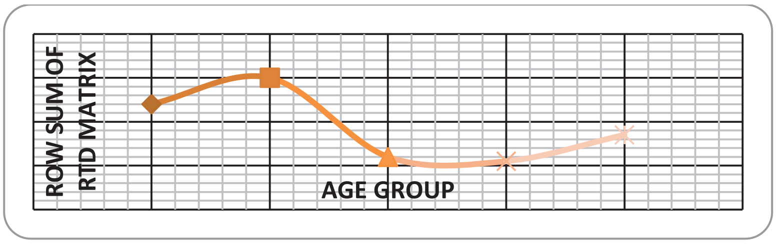
Particular systematic Elegant Graphs of above Matrics Systems as FoIIows

Graph-13 : Graph depicting maximum age group of malaria infected patients with problem related to severe – malaria for α =0.6



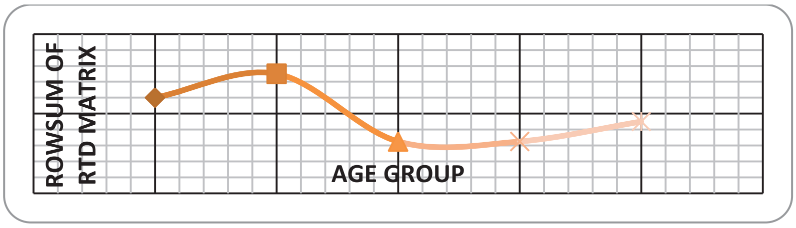
We observe from the above graph that moderate-malaria problem between the age group 11- 28 year

Graph-14 :-Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for α =0.65



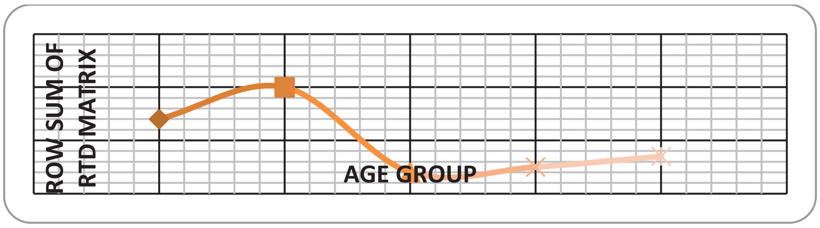
We observe from the above graph that moderate-malaria problem between the age group 11- 28 year

Graph-15:-Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for α =0.7



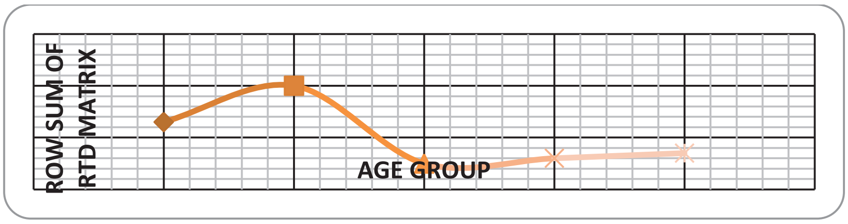
We observe from the above graph that moderate-malaria problem between the age group 11- 28 year

Graph-16 :- Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for α =0.75



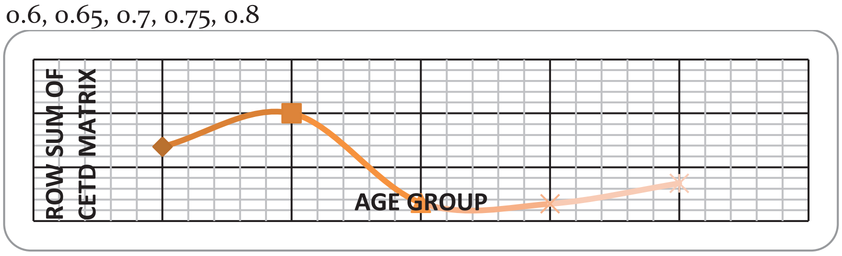
We observe from the above graph that moderate-malaria problem between the age group 11- 28 year

Graph-17:- Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria.for α =0.8



We observe from the above graph that moderate-malaria problem between the age group 11- 28 year

Graph-18:- Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. For $\alpha =$ 0.6, 0.65, 0.7, 0.75, 0.8



From the above analysis of all Graphs, we observe that the maximum age group getting moderate-malaria problem has not changed with the change in the value of the parameter from 0 to 1. i.e α ϵ [0.6,0.65,0.7,0.75,0.8] The mathematical inference is that the maximum age group of malaria infected patients to have moderate-malaria problem is between the age group 11-28 years. And the Combined Effect Time Dependent data(CETD) matrix also confirm the same result.

4.VERY-SEVERE-MALARIA [$0.8 \leq X \leq 1.0$]

I.Using the Raw-Data for constructing the initial MXN - FUZZY-MATRIX system for analyzing very-severe malaria Problems of order 7x10

II. Estimation of maximum age group patients suffering from Very- Severe-Malaria Problems of order 5x10 **(SFMIEMMD)**of order 7x10

Symptoms:-- Very-severe malaria patients suffered by 10-symptoms vizWhich are used as columns of initial raw data matrix. Age group in years 10-17, 18-24, 25-29, 30-39, 40-49, 50-59, 60-75. are u-sed as the row of the matrix.The estimation of the maximum age group is a five stage process. As follows Using Raw-Data construct initial simple Fuzzy-Matrx model of order 7x10

Table-NO-14

Ages	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
10-17	12	10	9	13	14	8	7	6	3	5
18-24	10	9	8	9	9	6	4	5	4	6
25-29	13	12	10	8	10	12	11	7	6	10
30-39	9	7	8	10	11	10	9	5	7	8
40-49	7	8	10	4	8	8	7	6	5	9
50-59	6	6	7	3	11	4	5	4	3	2
60-75	3	4	5	1	8	2	4	5	7	3

Table-No-15:-Mid-values of year-column of the above patient groups as follows

Year	Mid-value
10-16	7
17-24	8
25-29	5
30-45	16
46-55	10
56-65	10
66-75	10

The corresponding average time dependent data matiX (ATD-matrix) of Very Severe - malaria Problems of order 7x10

$$\begin{pmatrix} 1.43 & 1.29 & 1.14 & 1.29 & 1.29 & 0.86 & 0.57 & 0.72 & 0.57 & 0.86 \\ 1.5 & 1.25 & 1.13 & 1.63 & 1.75 & 1.00 & 0.87 & 0.75 & 0.37 & 0.63 \\ 2.60 & 2.40 & 2.00 & 1.60 & 2.00 & 2.40 & 2.20 & 1.40 & 1.20 & 2.00 \\ 0.19 & 0.25 & 0.31 & 0.13 & 0.50 & 0.13 & 0.25 & 0.31 & 0.44 & 0.19 \\ 0.60 & 0.60 & 0.70 & 0.30 & 1.10 & 0.40 & 0.50 & 0.40 & 0.30 & 0.20 \\ 0.70 & 0.80 & 1.00 & 0.40 & 0.80 & 0.80 & 0.70 & 0.60 & 0.50 & 0.90 \\ 0.90 & 0.70 & 0.80 & 1.00 & 1.10 & 1.00 & 0.90 & 0.50 & 0.70 & 0.80 \end{pmatrix}$$

Now to find the everage and standerd deviation(S.D) of the above ATD-Matrix ,The Average and Standard Deviation (S.D) of the above ATD Matrix

Table-No-16

Symptoms	**P_1**	**P_2**	**P_3**	**P_4**	**P_5**	**P_6**	**P_7**	**P_8**	**P_9**	**P_{10}**
$\mu_{j=Average}$	**1.15**	**1.10**	**1.01**	**0.91**	**1.22**	**0.95**	**0.86**	**O.67**	**0.58**	**0.80**
$\sigma_j = S.D$	**0.80**	**0.70**	**0.52**	**0.63**	**0.52**	**0.72**	**O.63**	**0.36**	**0.30**	**0.61**

I.Refined TimeDependent Data RTDMatrix for α =0.8 Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & -1 & 0 \\ 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} -1 \\ 1 \\ 9 \\ -10 \\ -4 \\ -2 \\ 0 \end{pmatrix}$$

II.Refined TimeDependent Data RTDMatrix for α =0.85 Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & 0 & -1 & 0 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & -1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 3 \\ 10 \\ -10 \\ -5 \\ -3 \\ 0 \end{pmatrix}$$

III. Refined TimeDependent Data RTD-Matrix for α =0.9 Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 1 \\ 10 \\ -10 \\ -4 \\ -1 \\ 0 \end{pmatrix}$$

IV. Refined TimeDependent Data RTD-Matrix for α =0.95 Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 2 \\ 9 \\ -10 \\ -3 \\ 0 \\ 0 \end{pmatrix}$$

V. Refined TimeDependent Data RTD-Matrix for α =1.00 Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & 0 & -1 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 1 \\ 10 \\ -9 \\ -3 \\ 0 \\ 0 \end{pmatrix}$$

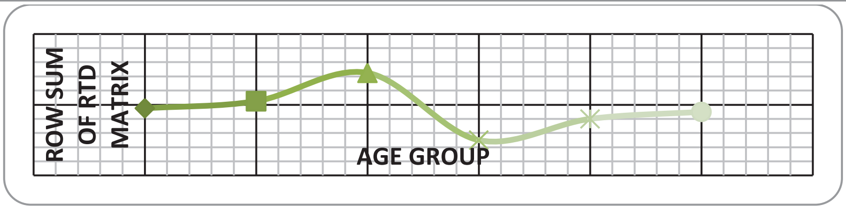
VI. Combined effective Time Dependent Data CETD-Matrix Row sum

$$\begin{pmatrix} 0 & 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 4 & 3 & 1 & 0 & 0 & 0 & 0 \\ 5 & 5 & 5 & 4 & 5 & 5 & 4 & 5 & 5 & 5 \\ -5 & -5 & -5 & -5 & -5 & -5 & -5 & -4 & -4 & -5 \\ 0 & 0 & 0 & -5 & 0 & -1 & 0 & -5 & -5 & -5 \\ 0 & 0 & 0 & -4 & -2 & -1 & 0 & -3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} -1 \\ 8 \\ 48 \\ -48 \\ -21 \\ -10 \\ 0 \end{pmatrix}$$

For $\alpha = 0.8, 0.85, 0.90, 0.95, 1.00$

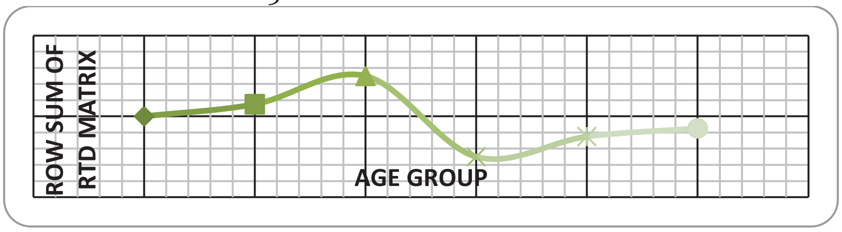
Particular systematic Elegant Graphs of above Matrics Systems as FoIIows

Graph-19: Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for α =0.8



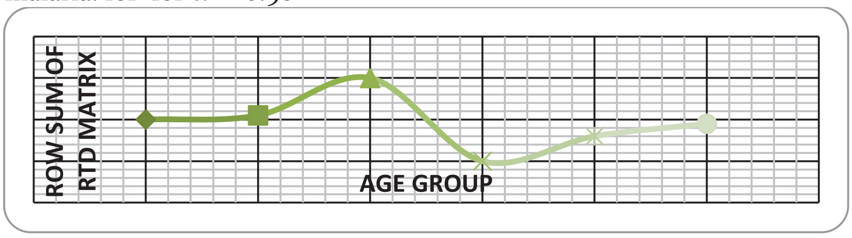
We observe from the above graph that moderate-malaria problem between the age group 17- 28 years

Graph-20: Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for for α =0.85



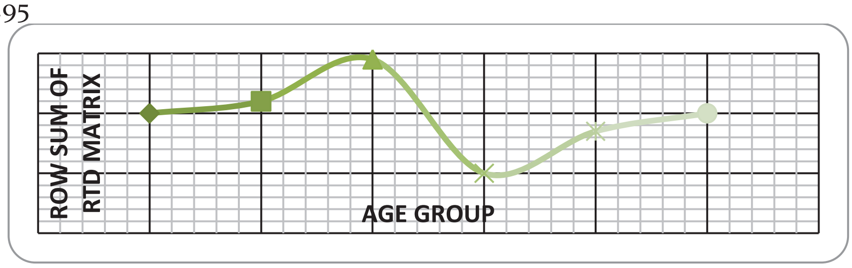
We observe from the above graph that moderate-malaria problem between the age group 17- 28 year

Graph-21 : Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for for α =0.90



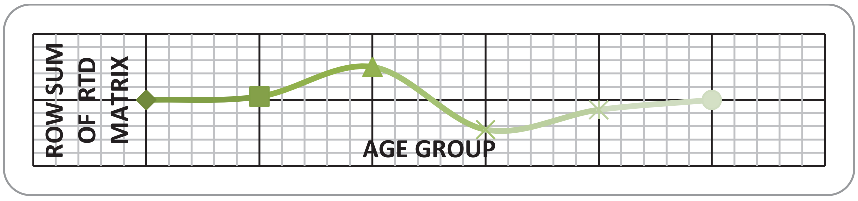
We observe from the above graph that moderate-malaria problem between the age group 17- 28 year

Graph-22: Graph depicting maximum age group of malaria infected patients with proble related to severe - malaria. for α =0.95



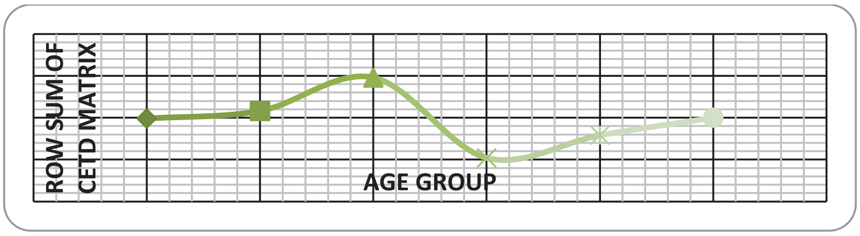
We observe from the above graph that moderate-malaria problem between the age group 17- 28 year

Graph-23: Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. for α =1.00



We observe from the above graph that moderate-malaria problem between the age group 17- 28 year

Graph-24: Graph depicting maximum age group of malaria infected patients with problem related to severe - malaria. For α = 0.8, 0.85, 0.9, 0.95, 1.00



From the above analysis of all Graphs, we observe that the maximum age group getting moderate-malaria problem has not changed with the change in the value of the parameter from 0 to 1.

i.e $\alpha \in [0.8, 0.85, 0.9, 0.95, 1.0]$ The mathematical inference is that the maximum age group of malaria infected patients to have moderate-malaria problem is between the age group 17-28 years. And the Combined Effect Time Dependent data(CETD) matrix also confirm the same result.

Conclusion:- The objective of this project is to find out the maximum age group patients suffered malaria problem and estimated all groups under given ranges and represented by an elegant diagram of graphs On the basis of the all presented, it can be concluded that there is no doubt whether Fuzzy Expert Systems should be applied for medical purpose. The use of fuzzy logic for medical diagnosis provides an efficient way to assist inexperienced physicians to arrive at the final diagnosis of malaria more quickly and efficiently. The developed (SFMIEMMD) provides decision support platform to assist malaria researchers, physicians and other health practitioners in malaria endemic regions. The authors believe that the approach proposed in this study, if used intelligently. Malaria, is an existing tropical diseases that were considered in this work. The development of this differential diagnosis will help to benefit countries in remote places where health care services are limited. Based on the linguistic tags, a fuzzy CETD-Matrix method is created; in the fuzzy inference engine the generalized fuzzy soft set is used to generate the suspected diseases. The contribution of the system that was built and implemented is to improve the performance of Doctors in the aspect of diagnosing of tropical diseases and also to reduce the amount of time a patient spends in the hospital.

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