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Mathematical Model Related to Human life Expectancy

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ABSTRACT: *In human life, above 35years of age the following factors like Hypertension, Diabetics and Asthma used to occur. Once these factors are observed in individuals the treatment preferred is taking medicines continuously for several years. So, we proposed a mathematical model related to these factors in which the patient details are collected from various sources and the model is applied on this data. The results are monitored to certain extended from the data collected, if results are observed make the suggestions are made to the change way of treatment which does not suites current state.*

KEYWORDS*: Hybrid dynamical system, SCBZ property, Ordinary Differential Equation*

INTRODUCTION

Hypertension, also referred to as high bloodpressure, is a condition in which the arterieshave persistently elevated blood pressure. Every time the human heart beats, it pumps blood to the whole body through the arteries. According to the given data inMed lexicon's medical dictionary, hypertension means "High blood pressure; transitory or sustained elevation of systemic arterial blood pressure to a level likely to induce cardiovascular damage or other adverse effects or consequences." The normal level for blood pressure is below120/80, where 120 represent the systolicmeasurement (peak pressure in the arteries) and80 represents the diastolic measurement (minimum pressure in the arteries). Blood pressure between 120/80 and 139/89 is called prehypertension (to denote increased risk of hypertension), and a blood pressure of 140/90 or above is considered hypertension. Hypertension may be classified as essential or secondary. Essential hypertension is the term for high blood pressure with unknown cause. It accounts for about 95% of cases. Secondary hypertension is the term for high blood pressure with a known directcause, such as kidney disease, tumors, or birth control pills.

Diabetes is a condition characterized by high blood sugar (glucose) levels due to a lack or insufficient production of a hormone called insulin in the body. Insulin is responsible for decreasing the blood sugar levels and aids in producing energy for the cells. Without enough insulin, glucose obtained from the food builds up in the bloodstream leading to a hike in blood sugar levels above than the normal limits. This causes many health complications.

Hormones in the body can act on cells through receptors. Glucose enters cells only if insulin, which is a hormone, attaches itself to the receptor cell wall. By going and attaching itself like a magnet to the receptors, insulin helps cells to extract glucose from the blood.

When there is absolutely no insulin supply *or* if it is insufficient or the quality is poor or abnormal, the glucose can't enter your cells. Consequently, there is not enough energy to run your body and everything begins to shutdown and you become adiabetic.

Asthma is a disease affecting the airways that carry air to and from your lungs. People who suffer from this chronic condition (long-lasting or recurrent) are said to be asthmatic. The inside walls of an asthmatic's airways are swollen or inflamed. This swelling or inflammation makes the airways extremely sensitive to irritations and increases your susceptibility to an allergic reaction.

As inflammation causes the airways to become narrower, less air can pass through them, both to and from the lungs. Symptoms of the narrowing include wheezing (a hissing sound while breathing), chest tightness, breathing problems, and coughing. Asthmatics usually experience these symptoms most frequently during the night and the early morning.

Quality-adjusted life expectancy (QALE) is a summary measure that combines mortality and health-related quality of life across different stages of life. The objective of this study was to estimate QALE loss due to five chronic diseases-diabetes mellitus, hypertension, asthma, heart disease, and stroke.

Persons with each of the five diseases had significantly lower life expectancy and QALE. Because the prevalence of diabetes and hypertension has increased significantly in the United States in the last two decades, the burdens of these two conditions, measured by population QALE losses, had increased 83% and 29% from 1993 to 2009, respectively. Also, by examining changes in population QALElossat different ages, policymakerscan identify age groups most affected by particular diseases and develop the most cost-effective interventions by focusing on these groups.

LITERATURE SURVEY

The survey shows different methods applied only differential transformation equations in which it is now easy to find out the i th eigen value and eigen function at a time [1]. Finally two eigen value problems are solved by the method. Differential Transformation method is capable to solve the Bratu problem [2]. A considerable research works have been conducted recently in applying DTM to different types of partial differential equation and fractional differential equations. A powerful numerical tool in solution of ordinary differential equations, for solving the governing equation of motion [3]. The method is capable of modeling any beam whose cross-sectional area and moment of inertia vary along beam with any two arbitrary functions and any type of cross-section with just one or few elements so that it can be used in most of engineering applications. Using differential transformation method to solve the Lane-Emden equations as singular initial value problems is also introduced [4]. Thus the method is efficient and reliable.

OUR PROPOSED MODEL

We proposed a model using differential equations, the parameters x, y, z for hypertension, Diabetes and Asthma respectively. Now, the rate of change for blood pressure or Hypertension, Blood sugar and Asthma is given by

$$\frac{dx}{dt}, \frac{dy}{dt}, \frac{dz}{dt} \text{ respectively.}$$

Also we consider normal blood pressure level, blood sugar level and peak low rate as a, b and c respectively.

The Relational Equations is $\frac{dx}{dt} + a\frac{dy}{dt} + b + \frac{dz}{dt} + c = 0 \longrightarrow (1)$

$$\text{Let } c_1 = \frac{dx}{dt} ; \; c_2 = \frac{dy}{dt} ; \; c_3 = \frac{dz}{dt}$$

$$\frac{dx}{dt} + ac_2 + b + c_3 + c = 0$$

(1) $\longrightarrow$

$$\frac{dx}{dt} = -ac_2 - b - c_3 - c$$

$$dx = (-ac_2 - b - c_3 - c)dt$$

$$\int dx = \int (-ac_2 - b - c_3 - c)dt$$

$$\boxed{x = -ac_2t - bt - c_3t - ct + A}$$

$$(1) \longrightarrow \quad c_1 + a\frac{dy}{dt} + b + c_3 + c = 0$$

$$a\frac{dy}{dt} = -c_1 - b - c_3 - c$$

$$a\ dy = \left(-c_1 - b - c_3 - c\right)dt$$

$$a\int dy = \int\left(-c_1 - b - c_3 - c\right)dt$$

$$a\ y = -at - bt - c_3 t - ct + B$$

$$\boxed{y = \frac{1}{a}\left[-c_1 t - bt - c_3 t - ct + B\right]}$$

$$(1) \longrightarrow \quad c_1 + ac_2 + b + \frac{dz}{dt} + c = 0$$

$$\frac{dz}{dt} = -c_1 - ac_2 - b - c$$

$$dz = \left(-c_1 - ac_2 - b - c\right)dt$$

$$\int dz = \int\left(-c_1 - ac_2 - b - c\right)dt$$

$$\boxed{z = -c_1 t - ac_2 t - bt - ct + C}$$

The solutions of system of Equation is

$$x = -ac_2 t - bt - c_3 t - ct + A$$

$$y = \frac{1}{a}\left[-c_1 t - bt - c_3 t - ct + B\right]$$

$$z = -c_1 t - ac_2 t - bt - ct + C$$

We have collected patient's data from the various sources on all these factors. Now, we have applied these values as input in our proposed model. The equations obtained some results shows that lives span is much reduced from total period. (Graph-I).

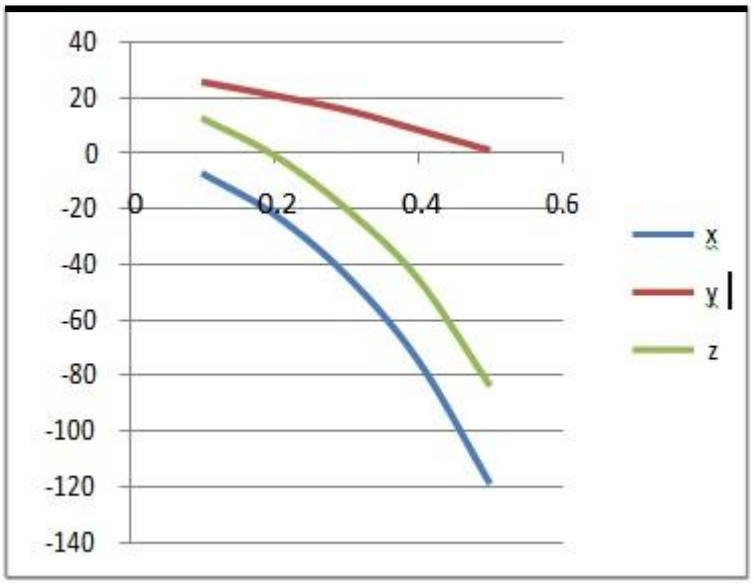
Using differential transformation method (6). The difference values for x, y & z are calculated. This value too shows the negative life span from total time period. (Graph-2(a), 2(b), 2(c)).

Based on the results obtained from the model we can suggest physicist to deliver treatments accordingly.

TABLE-I:
Hypertension(x), Diabetes(y) and Asthma (z) Versus time period in months.

t	0.1	0.2	0.3	0.4	0.5
x	-7.1	-21.9	-43.8	-74.5	-119
y	25.76	20.93	15.65	8.466	1.166
z	12.73	-0.6	-19.8	-45.1	-83.75

GRAPH-I
Lives span reduced on total time period
TABLE-II

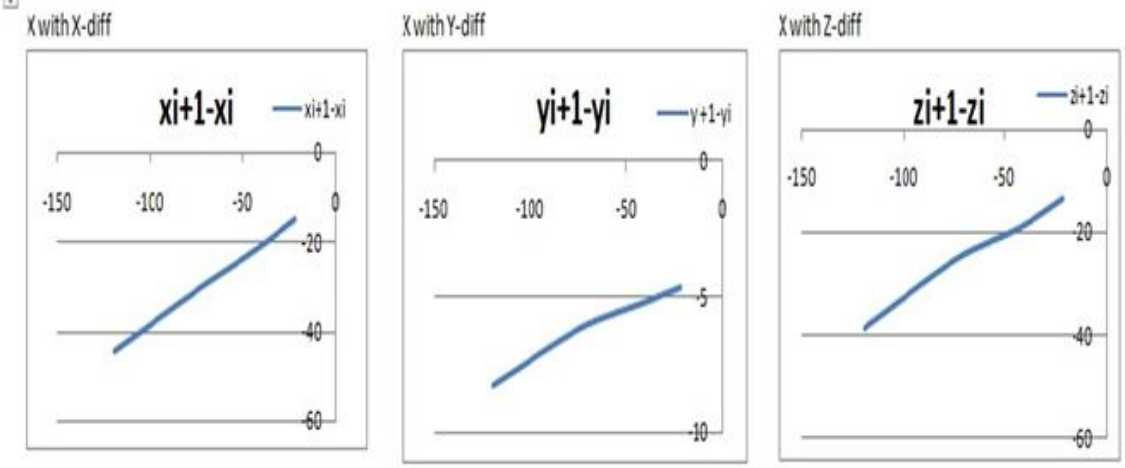


Difference values of x, y and z

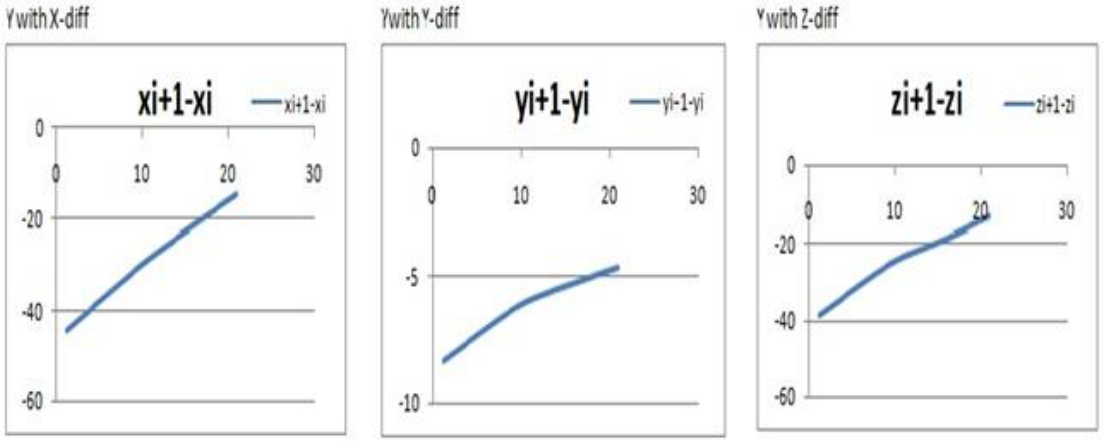
t	x	y	Z	xi+1-xi	yi+1-yi	zi+1-zi
0.1	-7.1	25.56	12.73			
0.2	-21.9	20.93	-0.6	-14.8	-4.63	-13.33
0.3	-43.8	15.65	-19.825	-21.9	-5.28	-19.225
0.4	-74.5	9.466	-45.1	-30.7	-6.184	-25.275
0.5	-119	1.1660	-83.75	-44.5	-8.3	-38.65

GRAPH-II

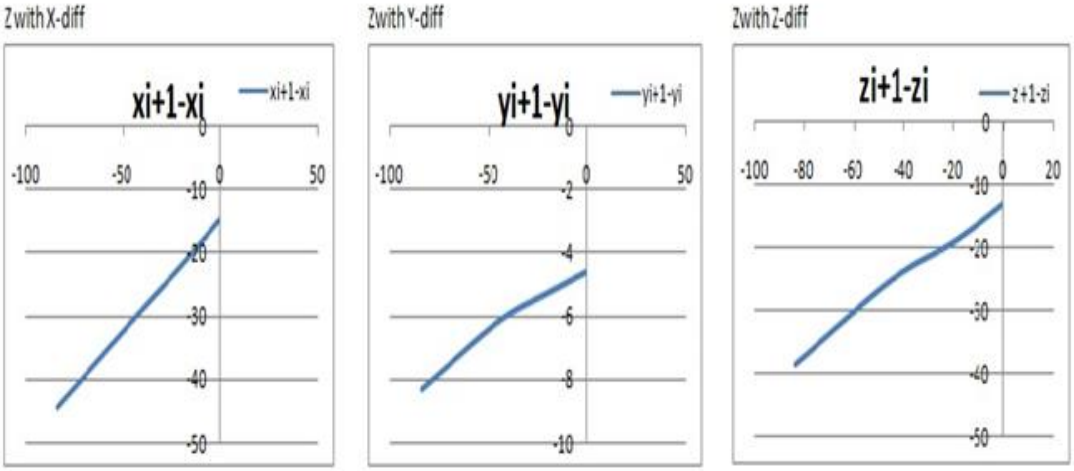
(a). Difference values of x.



(b). Difference values of y.



(c). Difference values of z.



CONCLUSION

Persons with each of the three diseases had significantly lower life expectancy as shown in the graphs. Because the prevalence of diabetes and hypertension has increased significantly in the last two decades, the burdens of these two conditions, measured as increased 83% and 29% from 1993 to 2009 respectively. Also, by examining changes at different ages using our model, physicists can identify age groups most affected by particular diseases and suggestions can be made accordingly.

REFERENCES

[1] Cha-Kuang Chen and Shing-Huei Ho. Application of differential transformation to eigen value problems. Applied Mathematics nd Computation, 79(2-3):173 – 188, 1996.

[2] H. Abdel-Halim Hassan and V. Ert¨urk. Applying differential transformation method to the one dimensional planar bratu problem. International Journal of Contemporary Mathematical Sciences, 2(29-32):1493 –1504, 2007.

[3] Isham, V. (1988). Mathematical Modelling of the Transmission Dynamics of HIV Infection and AIDS - A Review.J. Roy. Statist. Soc. Ser. A 151, 5-30.

[4] Reza Attarnejad and Ahmad shahba, Application of differential transform method in free vibration analysis of rotating Non-primatic Beams, world Applied Sciences journal 5(4):441-448, 2008.

[5] VedatSuatErturk, Differential Transform method for solving differential equations of lane-emden type, mathematical and computational Applications Vol.12, (2007) No.3, 135-139.

[6] Applied Mathematical Sciences, Vol. 7, 2013, no. 74, 3695 – 3702, HIKARI Ltd, www.m-hikari.com, http://dx.doi.org/10.12988/ams.2013.212648, Hybrid Dynamical System Analysis in Space Using SCBZ Property, M. G. Fajlul Kareem and P. S. Sehik Uduman, B. S. Abdur Rahman University, Chennai, India.

[7] International Mathematical Forum, Vol. 7, 2012, no. 23, 1135-1142, Analysis of Hybrid Dynamical Systems Using SCBZ, M. G. Fajlul Kareem and P. S. Sehik Uduman, B. S. Abdur Rahman University, Chennai, India.