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A Mathematical Model for a Novel Corona Virus Disease

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Abstract:- Presented herein are in the studies of corona virus disease. This model taken in account of special characteristic to awareness the infection of corona virus infection. It has been observed that suspected person increases with the increase the value of chain person. Again we observed that the number of infected person increases with the increase the value of chain person.

Keywords:- *Human History, Societies, Pandemic, Suspected Person, Infected Person, Chain of Person.*

I. INTRODUCTION

In entire history of human kind pandemic was an outbreak. Pandemic[3] have decimated societies, determined outcomes of was wars out entire populations. The history of medicine pandemic have been closely examined through the lens of humanities. Plagues affected the individual and group psychology of affected societies. Plague is a single word that can serve as a fitting point of history. Pandemic outbreak are bookends of human existence. The fundamental accounts have been rooted in societal responses to pandemics in western societies and continue to shape public sentiment.

The Athenian plague oriented in Ethiopia and it spread throughout Egypt and Greece. Initial symptoms of the plague headaches, conjunctivitis a rash covering the body and fever. The victims would then cough up, blood, and suffer from painful stomach clamping. Infected peoples would generally die in Eight day. The plague of Anthen's affected over crowd city and claimed lives of more than twenty five percent of the population.

The Antenine plague occured in the duration of Roman Empire and it is a small pox. It has affected the Asia, Egypt, Greece and Italy. Geographically the plague affected limited region. The Anteon plague affected ancient Roman tradition. Plague may well have created the conditions for the decline of the Roman Empire.

Justinian plagues that oriented in mid-sixth century AD and moving through Egypt. The plague quickly spread throughout the Roman world. The first system of the plague followed fever and fatigue and afterwards buboes appeared in the groin area beside the ears. From this point decrease affected rapidly and person died within day. Many person died painfully and other died vomiting blood. Within a short time all gravesites were beyond capacity and living resorted to throwing the bodies of victims out into the streets. Streets were deserted and all trade was abandoned.

The first quarantine was enacted in Ragusa. The institution quarantine was one of the effective measures that took place during the Black Death and it use throughout Europe. In present time quarantine is high effective.

Pandemic was also the first one where the effect could be observed and quantified. The study of US found that the children born to woman exposed to the pandemic had more physical ailment.

HIV/AIDS is a slowly progressing global pandemic. HIV affects about 40 million people globally and has killed. 79% people[4] HIV has received formidable public health attention both by national and international. HIV treatment can be managed by medicine.

In twenty first century serve acute respiratory syndrome was first outbreak. It started in china and affected fever. The mortality rate of SARS about ten percent corona public health.

Corona virus case found in china Wuhan city in December 31, 2019, according to WHO. Novel corona virus was identified 11 feb 2020. The corona virus coincided with the largest human migration in the world. The Wuhan local government suspended all public traffic in city. Covid-19 spread when largest human migration in the world. In this infection patient with fever dry cough, headache, and hypoxemia[1,2].

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The purpose of this paper is to develop a mathematical model to know about the infected and suspected person of this disease.

➢ *Formulation of the problem*

This model is of relevance studies in particularly in the real world.

Let N be the size of a population which is closed.

Let $S_\circ$, $I_\circ$ and $C_\circ$ be the initial number of suspected, infected and chain of infected corona virus person. The basic equation,

$$\frac{dS}{dt} = -\alpha SI + \beta I - CI \quad (1)$$

$$\frac{dI}{dt} = \alpha SI - \beta I + CI \quad (2)$$

The solution of the equation subject to the boundary condition

$$S = S_\circ \quad \text{at} \quad t = 0$$
$$I = I_0 \quad \text{at} \quad t = 0 \quad (3)$$
$$C = C_\circ \quad \text{at} \quad t = 0$$

And

$$S + I + C = N \quad (4)$$

Using equation (2) and (4) we get

$$\frac{dI}{dt} = \alpha(N - I - C)I - \beta I + CI \quad (5)$$

$$= (\alpha + \alpha C + C - \beta)I - \alpha I^2 \quad (6)$$

$$= KI - \alpha I^2 \quad (7)$$

Where $K = \alpha + \alpha C + C - \beta$

and

$$\frac{dI}{dt} = KI\left(1 - \frac{\alpha}{K}I\right) \quad (8)$$

➢ *Solution of the problem*

Integrating equation (8) with boundary condition (3), we get

$$I = \frac{e^{Kt}}{\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}} \quad (9)$$

Or

$$I = \frac{e^{(\alpha+\alpha C+C-\beta)t}}{\frac{\alpha}{(\alpha+\alpha C+C-\beta)}\left[e^{(\alpha+\alpha C+C-\beta)t}-1\right]+\frac{1}{I_0}} \quad (10)$$

But

$$-\frac{dS}{dt} = \frac{d}{dt}\left[\frac{e^{Kt}}{\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}}\right] \quad (11)$$

$$-\frac{dS}{dt} = \frac{e^{Kt}}{\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}} - \frac{\alpha e^{2Kt}}{\left[\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}\right]^2} \quad (12)$$

Integrating equation (14) and using the condition (3), we have

$$S = \frac{\frac{S_0}{I_0}+\left(\frac{K}{\alpha}+S_0-I_0\right)\left[\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}\right]}{\frac{\alpha}{K}(e^{Kt}-1)+\frac{1}{I_0}} - \frac{2K}{\alpha}\log\left[\frac{\alpha I_0}{K}(e^{Kt}-1)+1\right] \quad (13)$$

Or

$$S = \frac{\frac{S_0}{I_0}+\left[\frac{(\alpha+\alpha C+C-\beta)}{\alpha}+S_0-I_0\right]\left[\frac{\alpha}{(\alpha+\alpha C+C-\beta)}e^{(\alpha+\alpha C+C-\beta)t}+\frac{1}{I_0}\right]}{\frac{\alpha}{(\alpha+\alpha C+C-\beta)}\left[e^{(\alpha+\alpha C+C-\beta)t}+\frac{1}{I_0}\right]}$$
$$-\frac{2(\alpha+\alpha C+C-\beta)}{\alpha}\log\left[\frac{\alpha I_0}{(\alpha+\alpha C+C-\beta)}\left\{e^{(\alpha+\alpha C+C-\beta)t}-1\right\}+1\right] \quad (14)$$

II. RESULT AND DISCUSSION

The present paper proposes a realistic model for explaining infected person and suspected person from corona virus. The result of infected and suspected person has been examined for different values of parameter. It has been observed that the suspected person increases with the increase the value of chain person. It has also been observed that the number of suspected person increases with the increase the value of infected person. Again we observed that the number of infected person increases with the increase the chain of person.

Value I at I_0=1, $\alpha = 1, \beta = 0.5$

C	0.1	0.2	0.3	0.4
0.5	1.0487	1.0946	1.1374	1.2134
1.0	1.1530	1.3091	1.4632	1.7486
1.5	1.2673	1.5615	1.8669	2.4400
2.0	1.3924	1.8573	2.3594	3.2876
2.5	1.5293	2.2018	2.9503	4.2715

Table 1

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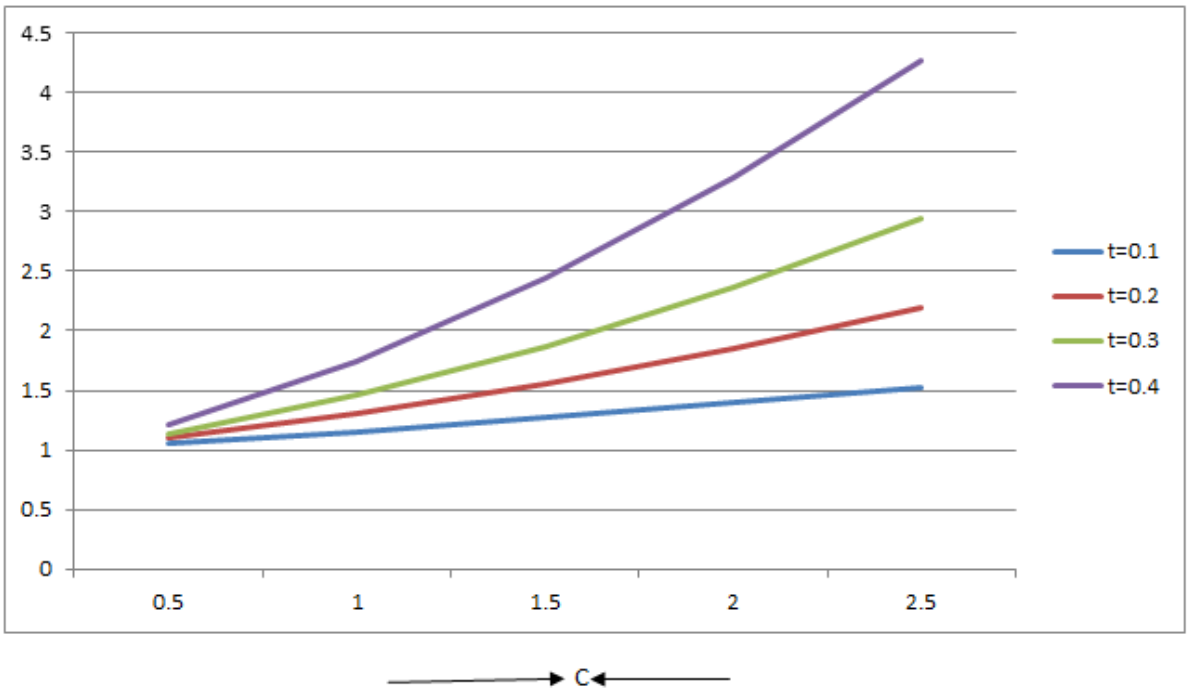

Fig 1

Value of Infected Person for Different values of t, at $\alpha = 1$, $\beta = 0.5$ & I_0=1

Value S at I_0=1, S_0=1 & $\alpha = 1, \beta = 0.5$

C / t	0.5	1.0	1.5	2.0
0.1	2.4072	5.0027	8.2200	11.9197
0.2	3.0875	6.4819	8.8986	11.9644

Table 2

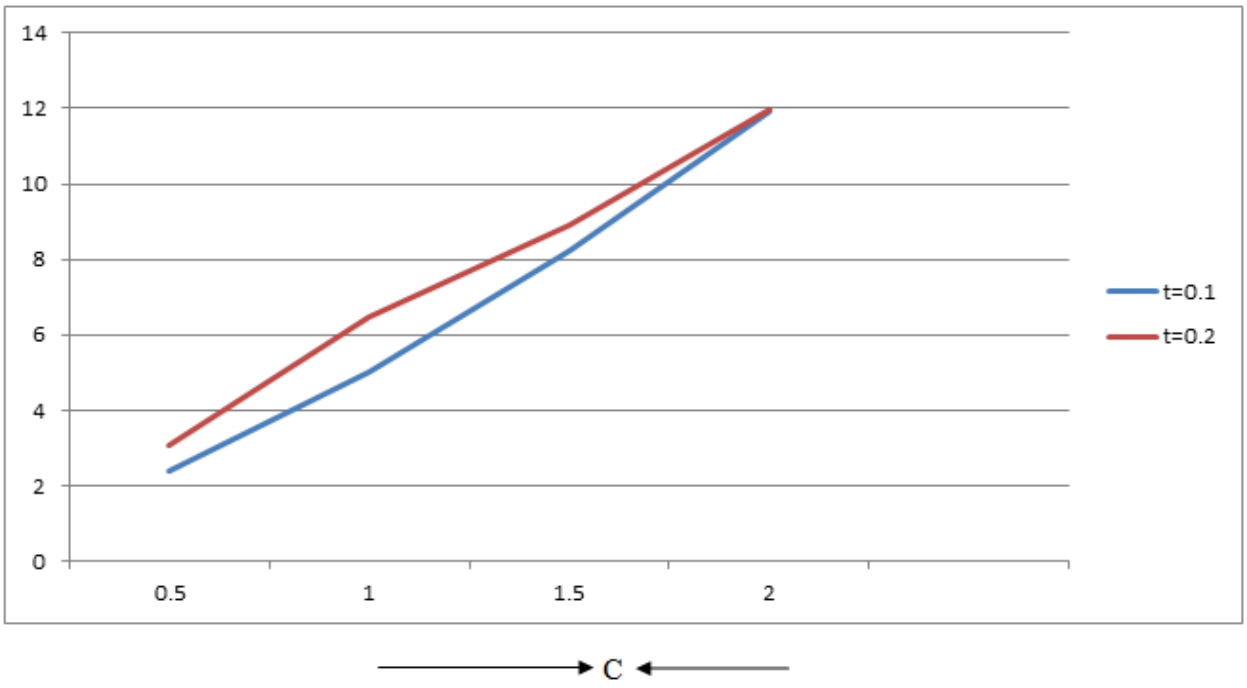

Fig 2

Value of Suspected Person for Different values of t, at $\alpha = 1$, $\beta = 0.5$ & I_0=1, S_0=1

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