

Modeling and Numerical Simulation of Bangladeshi Women's Depression Is a Function of Pressure to Get Married

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Abstract : Bangladesh is conventionally a radiant cultural country. Wedding ceremony is playing a vital role to its cultural norm and heritage. But the marriage issue creates depression among the young men and women. This article depicts a mathematical model with simulated result to visualize the trend and nature of the depression of Bangladeshi young women, who are in peer pressure to get married. There are some significant causes for creating depression, such as economic solvency, education, dynasty, beauty, media role (Print, electronic) etc. The model has been developed on the basis of media role (Print, electronic) to the beauty of the women, which affect the depression level of a woman who is about to be married. To recognize which women are more affected by these issues, the women are classified into two groups as extremely susceptible group and low susceptible group. These groups are defined by four non-linear differential equations on the basis of the impact of their corresponding treatment and depression. And the result shows that the role of media (Print, electronic) on beautification of the women has very negligible impact to their depression to get married.

Keywords: Depression, pressure, Equilibrium, Bifurcation

I. Introduction

Clinical depression is usually diagnosed, when feeling of worthlessness, self-blame, unhappiness, purposelessness last for several weeks and interferes with an individual's work and social life. There are different types of depression such that, Bipolar disorder, formerly referred to as manic depression, is a typical clinical depression that results in extreme mood fluctuations and another kind of depressions is classified as SAD (Seasonal Affective Disorder) [1].

Depression has played an imperative role in sexual category issue. The depression rate of the boys and girls are approximately alike prior to the age 13. After the age 13 men's and women's depression rate move away noticeably from the men more than two times. Bangladeshi Women turn into depressed for number of reasons including negative body image. Particularly sexual category dissimilarity in depression comes into view at the age of puberty. Women who suffer from depression are more likely to be unmarried and have a younger age at on set.

The clinical depression of Bangladeshi women is dissimilar from some context to the well developed country, in view of the fact that the social security of well developed country is very compared to Bangladeshi women. Every women of Bangladesh have a vision, that they will have an excellent family life by wedding ceremony, so wedding and wedding ceremony play an imperative role to their psychological nature. Because they believe that, pleasing marriage give them more security rather than living unaccompanied. Since Beautiful women get first-rate privilege to get a satisfactory matrimonial life. This paper is emphasized the beauty of young women is a factor to get a pleasing marriage or getting marriage within the range of young women 15-24. The depression of the girl start at the time of her puberty [2], since she can feel her gender difference to complete her role as a cultural pressure to be attractive physically to everyone, that means should be thin figure, complexion etc. There are trustworthy field work research by Bangladeshi Non Government Organization (NGO), BANAFUL, BRAC, Unnayan Porikolponay Manush (UPOMA), Rural Development Sangstha (RDS), Women Development Program (WDP) and Association for Social Advancement (ASA) find out that women are just about more than twice as likely as men to suffer from depression both medical and subclinical. There are significant number of medical and subclinical depression is directly related to beautification. This exerts pressure receiving until her a pleasing wedding. According to the law of Bangladesh, wedding age of a women start from the age 18, hence the model indicates that this initial age 15 is highly vulnerable. Our media (electronic, print etc.) imposed a negative impact to the beauty of women to their mental health and self-esteem to get marriage. For an example to expose the manipulated beauty of women celebrity and their life style for the related business purpose [3].

As example some subliminal messages for gender differentiations have exposed the following electronics or print media in Bangladesh are described below.

Some motivating Bangladeshi Television Advertisements that intended to change and misguided the perceptions of the identity of a woman.

Meril Splash: Fresh Manei Shundor TVC 2014:

This is the most well-known advertising campaigns this year so far. The advert explores and age old issue about Bangladeshi's having a rather distorted perception about complexion and a woman's beauty. The advertisement subtly portrays how media has been feeding the faulty superstition and tapping into it. The ad urges viewers to look at the concept of beauty with a "fresher" perspective.

Bangladesh Army TVC 2014:

This is one of the very few TV Commercials made in Bangladesh which does not directly emphasis the beauty of the women but this well-known advertising gives a subliminal message only beautiful women might have a chance to get in Bangladesh Army, it is notable that Bangladeshi women's are mixed-up different complexion, however this ad campaigns positively weighted that Bangladeshi women in a very different light from how we are used to bearing in mind them. Here, young women walk shoulder to shoulder, excelling at doing what is considered a man's job. She's no less talented of in front of the same dangers and challenges to excel and help shield the nation.

For the line of research according to the above complexity of distorted perception about complexion, women body shape and women's beauty forced by media (Print, electronic).And consequently this model is developed a deterministic endemic [4] epidemiological model. By using four non linear differential equations [5] where the variables are S_1 (Highly susceptible), S_2 (Low susceptible), D (Depression) and R (Recovery from depression) to find out the trend of depression stability of the system.

II. Model Flowchart

In this model the Fig.1 is depicted the entire system gradually. The system has resemblance with population dynamics. According to government law the matrimonial age of Bangladeshi young women start from age 18.For this reason in this model; the women are classified by highly susceptible and low susceptible women between the ages 15–25. According to socio-cultural pressure, such that media (electronic, print etc.) role for the beautification of the women. So It is taken the age 15 will be the probability q of highly susceptible women since they have just finished their puberty age and newly enter the age 15.And rest of the women will be probability of $(1-q)$ less susceptible group, these two groups are denoted in this model by S_1 and S_2 respectively. When a girl has finished her puberty age and turn into age 15, then she will enter in this model at per-capita rate η and also η is rate of leaving from the system. In the model highly susceptible women will going to depression (D) rapidly beside this ξ is the rate of women going from low susceptible to high susceptible women, since low susceptible group are at risk when they are keep in to touch to the highly susceptible group. The women who are depressed(D) are going to treatment for recovery(R) at the rate of γ and they recovery women also leave the system due to the death or get in to marriage at the rate η .And the probability of leaving form the recovery (R) treatment to less infected women(S_2) is p at the rate of τ .In this Model N is depicted as the total number of Bangladeshi-Women from age 15 - 25, where p is the Probability of successful rate of recovery from depression. The exit rate of probability from the system is denoted by q . Where σ is designate the rate of different type of media (example of Electronics, print etc.) influenced the women enter hooked on depression. Beside this τ is the probability rate of women leave from recovery treatment without successful recovery after taking medication. In addition η depicted as the rate of women leaving or enter in to the model. However γ is denoted the rate of infected women get into recovery. Moreover δ is defined as rate of pressure on highly infected women due to low infected women.

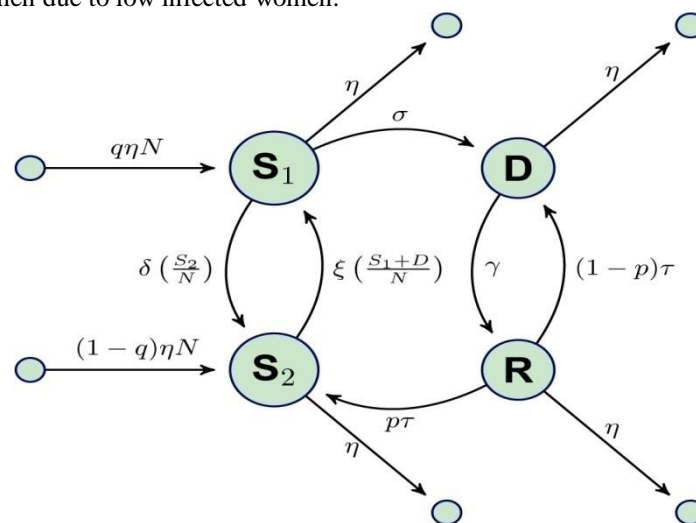


Fig. 1: model flowchart

III. Mathematical Equations Of The Model

From the model flowchart four set of ordinary nonlinear differential Equations is formed. These are the following.

$$\frac{dS_1}{dt} = q\eta N + \xi \left(\frac{S_1+D}{N}\right) S_2 - \delta \frac{V_2}{N} S_1 - \sigma S_1 - \eta S_1 \tag{1}$$

$$\frac{dS_2}{dt} = (1 - q)\eta N + \delta \frac{S_2}{N} S_1 + \tau p D - \xi \left(\frac{S_1+D}{N}\right) S_2 - \eta S_2 \tag{2}$$

$$\frac{dD}{dt} = \sigma S_1 + \tau(1 - P)R - \gamma D - \eta D \tag{3}$$

$$\frac{dR}{dt} = \gamma D - \tau(1 - P)R - \tau p R - \eta R \tag{4}$$

Where,

$$S_1 + S_2 + D + R = N \tag{5}$$

IV. Analytic Solutions Of The Model

Now rescaling the above four equations and putting into them to the equations (1) to (5).

$$\frac{S_1}{N} = u, \quad \frac{S_2}{N} = v, \quad \frac{D}{N} = w \quad \text{and} \quad \frac{R}{N} = r$$

And then we have the following equations.

$$\frac{du}{dt} = \eta q + \xi v(u + w) - \delta v u - (\sigma + \eta)u \tag{6}$$

$$\frac{dv}{dt} = (1 - q)\eta + \delta v u + \tau p r - \xi v(u + w) - \mu v \tag{7}$$

$$\frac{dw}{dt} = \sigma u + \tau(1 - p)r - (\gamma + \mu)w \tag{8}$$

$$\frac{dr}{dt} = \gamma w - \tau r - \mu r \tag{9}$$

$$v = 1 - u - w - r \tag{10}$$

$$\frac{du}{dt} = \eta q + \xi(1 - u - w - r)(u + w) - \delta(1 - u - w - r)u - (\sigma + \eta)u \tag{11}$$

$$\frac{dw}{dt} = \sigma u + \tau(1 - p)r - (\gamma + \eta)w \tag{12}$$

$$\frac{dr}{dt} = \gamma w - \tau r - \eta r \tag{13}$$

For stability solution, we have from equation (11), (12) and (13)

$$\frac{du}{dt} = 0, \quad \frac{dw}{dt} = 0 \quad \text{and} \quad \frac{dr}{dt} = 0$$

These implies that,

$$\eta q + \xi(1 - u - w - r)(u + w) - \delta(1 - u - w - r)u - (\sigma + \eta)u = 0 \tag{14}$$

$$\sigma u + \tau(1 - p)r - (\gamma + \eta)w = 0 \tag{15}$$

$$\gamma w - \tau r - \eta r = 0 \tag{16}$$

From equation (15) and (16), we have the following solutions,

$$w = \frac{\tau + \eta}{\gamma} r \tag{17}$$

$$u = \frac{(\gamma + \eta)(\tau + \eta) - \gamma \tau(1 - p)}{\sigma \gamma} r \tag{18}$$

Now by using the equations (17) and (18), we have from the equation (14)

$$\begin{aligned} & \left(\eta q + \xi \left[1 - \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} + 1 \right\} r \right] \times \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} \right\} r \right. \\ & \quad - \delta \left[1 - \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} + 1 \right\} r \right] \times \left[\left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} r \right] \\ & \quad \left. - (\sigma + \eta) \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} r \right) = 0 \end{aligned} \tag{19}$$

If we let,

$$l = \xi \left[\left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} \right\} \left[- \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} - \frac{\tau + \eta}{\gamma} - 1 \right] \right. \\ \left. - \delta \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} \left[- \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} - \frac{\tau + \eta}{\gamma} - 1 \right] \right] \tag{20}$$

m

$$= \xi \left[\left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} \right\} - \delta \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} \right. \\ \left. - (\sigma + \eta) \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} \right] \tag{21}$$

$$n = \eta q \tag{22}$$

Now the equation (19) can be written as

$$f(r) = lr^2 + mr + n \tag{23}$$

$$\begin{aligned} \Delta = & \left[\left\{ \xi \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} \right\} - \delta \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} \right. \\ & \left. - (\sigma + \eta) \left\{ \frac{(\gamma + \eta)(\tau + \eta) - \gamma\tau(1 - p)}{\sigma\gamma} \right\} \right]^2 \\ & + 4 \left[\left\{ \xi \left(\frac{\gamma\eta + \tau\eta + \eta^2 + \gamma\tau p}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} \right) \left(\frac{\gamma\eta + \tau\eta + \eta^2 + \gamma\tau p}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} + 1 \right) \right. \right. \\ & \left. \left. + \delta \left(\frac{\gamma\eta + \tau\eta + \gamma\tau p}{\sigma\gamma} \right) \left(\frac{\gamma\eta + \tau\eta + \eta^2 + \gamma\tau p}{\sigma\gamma} + \frac{\tau + \eta}{\gamma} + 1 \right) \right] \end{aligned} \tag{24}$$

V. Simulation Of The Model

By numerical method Solving the system of differential equation (11), (12), and (13) with estimated parameter, we have the following Fig. 2-4. Where q is the probability of highly infected women at the age of 15 and it is estimated $\frac{2}{3}$, that means 2 young women are highly susceptible out of 3 women, beside this $\frac{1}{\eta}$ mean life time of the model and η is anticipated $\frac{1}{10 \times 365}$, since the life span between the age 15 – 25 is 10 years, i.e. (10 × 365) days, δ is the product of two terms S_1 and S_2 that is rate of pressure on low infected women due to the highly susceptible women, which is anticipated by 6 women are contacted per days out of 36 women then $\delta = \frac{6}{36}$, beside this a is the media influenced women going to depression so $\frac{1}{\sigma}$ is the mean time of an women before going to depression, we estimated the time is 5 months so the value of $\sigma = \frac{1}{5 \times 30}$ is predicted for 150 days i.e. 5 month is going to be depression for a women, alongside $\frac{1}{\tau}$ is the mean time of treatment, we guess an individual susceptible women taking 11 months to completely cure from depression, so $\tau = \frac{1}{330}$ Moreover ξ is the rate of pressure of highly infected women due to low infected women. We guess a highly infected women get in to contact an less infected women and then they have a conversation of beauty of women or related topics, if the conversations takes 6 minutes per individual then we anticipated 6 women get a conversation each day and let 16 of them is infected, hence ξ will be $\frac{6}{16}$. However p is the probability of successful recovery from the depression, which is $p = 0.7$.

The model has the data from the Government Bureau of Statistic website of Bangladesh, Ministry of Health and Family Welfare Website of Bangladesh Government and Non Government Organization: (NGO)

BANAFUL, BRAC, Unnayan Porikolponay Manush (UPOMA), Rural Development Sangstha (RDS), Women Development Program (WDP) and Association for Social Advancement (ASA). And also took a comparison of Bangladeshi data with National Institute of Mental Health, USA [6].

According to the World Health Organization (WHO) the number of mentally ill people in Bangladesh is about to 7% [7] of the total population. And according to the Government of Bangladesh and NGO[8] census July 2013, the total population of Bangladesh is 163,654,860 and age wise female are 15– 25 years:16, 377, 785, which is our model value $N=16,377,785$. Hence the total number of disordered people = $163,654,860 \times 7\% = 11455840$. Another survey[9] find out 11% women are in major depression and two third young women are suffering mental disordered in Bangladesh, then the model determine the following values are $D = 11455840 \times 11\% \times \frac{2}{3} = 840095$, $R = D \times \frac{1}{3} = 280032$. Since $S_1 + S_2 = N - (D + R) = 15257658$, then $S_1 = (S_1 + S_2) \times \frac{2}{3} = 10171772$ and $S_2 = (S_1 + S_2) \times \frac{1}{3} = 5085886$ respectively. Now the scaling values are $u = S_1/N = 0.622$, $v = S_2/N = 0.31$, $w = D/N = 0.051$ and $r = R/N = 0.017$.

By using these estimated parameters value in the model and after simulation for different life span the model, have the following simulation figures.

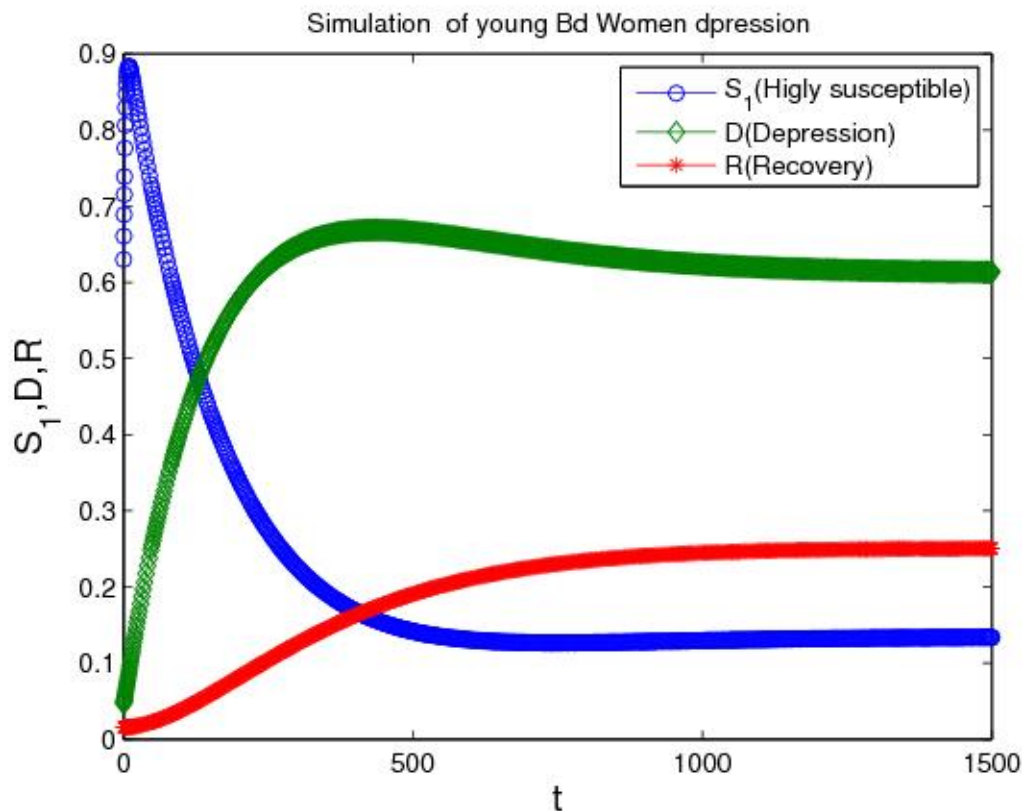


Fig. 2: Numerical Simulation of the model

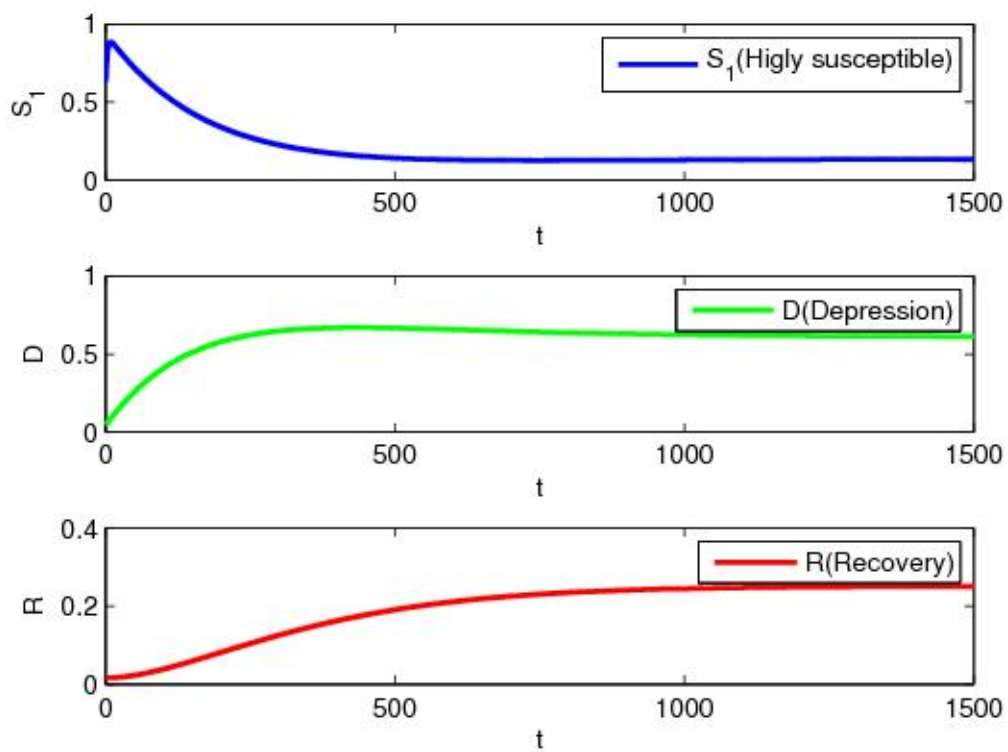


Fig. 3: Separate Numerical Simulation of the model

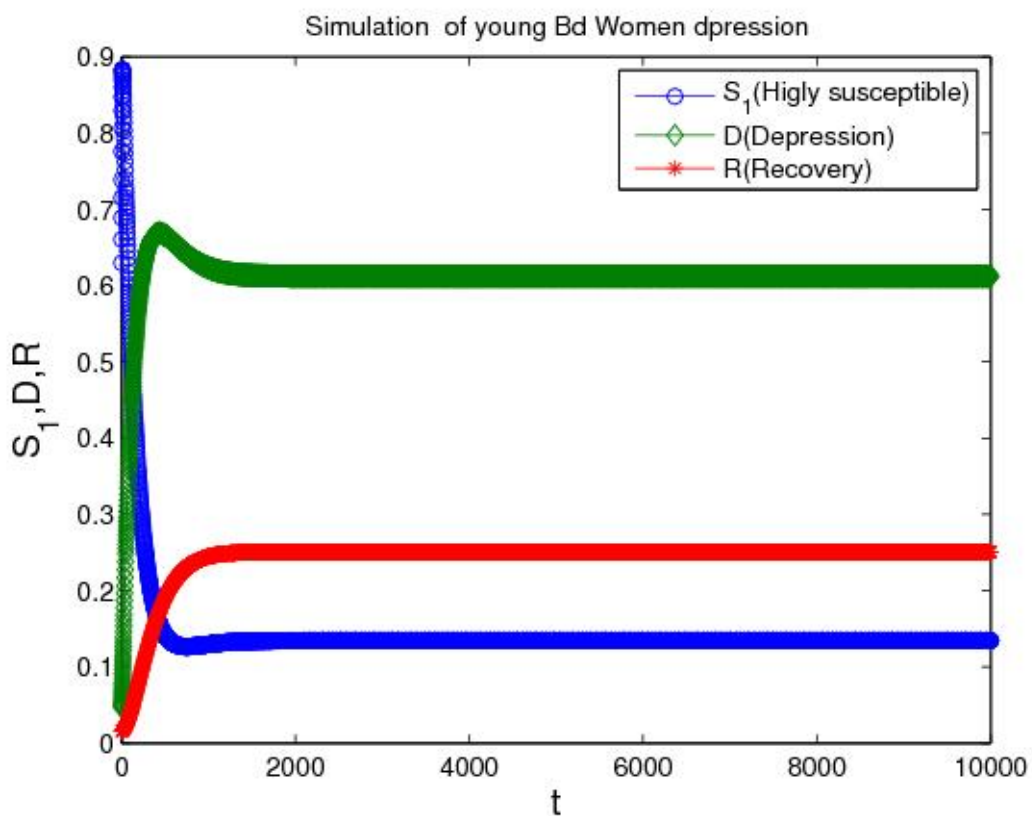


Fig. 4: Numerical Simulation of the model

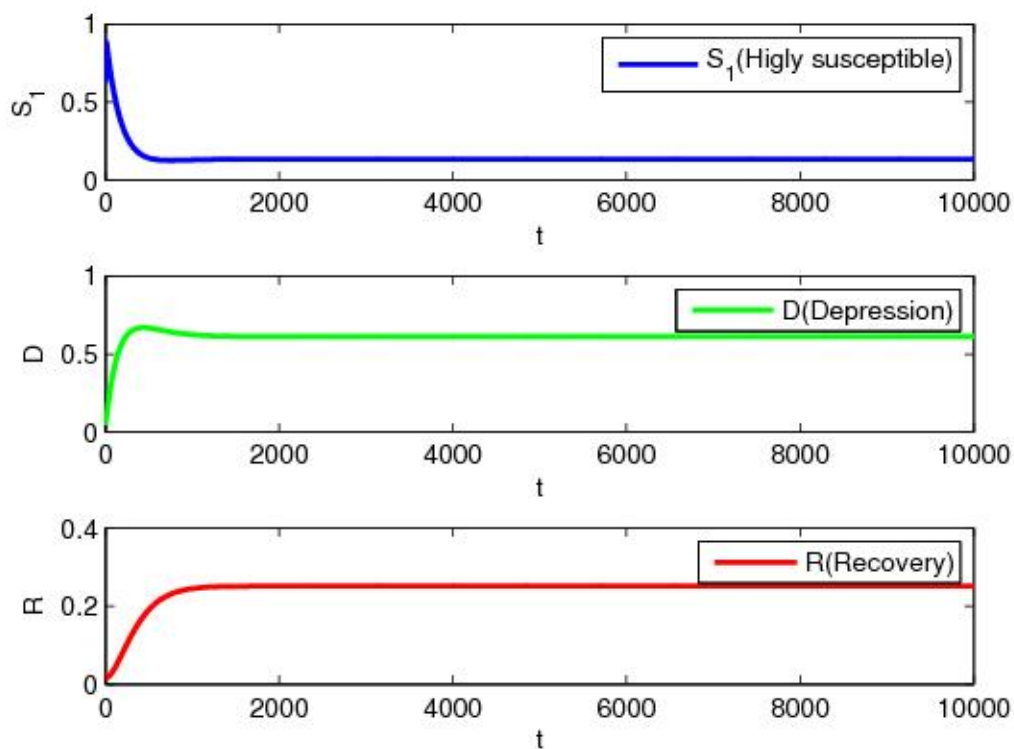


Fig. 5: Separate Numerical Simulation of the model

VI. Conclusion

It has been seen from the simulation Fig-2 and Fig-3, which are begin with sharply increased, the highly susceptible women (S_I) and corresponding depressed women. Although it is seen after that the system is going to stability and S_I decreases, though the population D and R boost up. In addition an analytical solution of the equation (14), (15), and (16) for equilibrium points and then after a long calculation, a Quadratic system of equation (23) is formed of recovery(R), which is rescaled by variable r . And then from the discriminant(Δ), it is apparent that the system has at least one positive real stable equilibrium point[10]. Consequently it is depicted from the simulation and analytic solution, that the depression has a very negligible effect by the media (print, electronic). However it is seen from the figure-2 and 3 that, if the recovery increase then the S_I (highly infected women) is dramatically decreased, so practically it is important to manage the depression of young women by proper treatment and counseling. And it is as well as important, if the media (print, electronic) campaigns positively that Bangladeshi women in a very different light from how we are used to bearing in mind them and beauty is not a criteria to justify the potentiality of a women. Beside this it has seen from figure-4 and 5 to the long time act of the depression and recovery give a steady state rate of alteration, so it is understandable that the model is stable for short time of life span.

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