



Suicide Incident in India in Relation with Geomagnetic Activity Parameters During the Period of 1989-2010

KEYWORDS

Ap Index, Kp Index, Dst Index, Suicide Incident

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ABSTRACT It is known that solar activity parameter and Schumann resonance signals are related to solar activity parameters and Schumann resonance signals is detected by human brain which is related to serious depression and suicide. The increased and decreased of solar and geomagnetic activity produces homeostatic relationship with morality rates anxiety depression and suicide. I have studied the relation between the death due to suicide in India and geomagnetic activity parameters Kp, Dst and Ap indices, observed during the period of 1989-2010. It is seen that male, female, total and rate of death due to suicide incidents are well correlated with yearly average of geomagnetic activity parameter Kp, Ap and Dst indices. I have found negative correlation with correlation coefficient -0.72, -0.72, -0.47 and -0.63 between yearly average Kp index and male, female, total, rate (per 1000000) of suicide incidents. Negative correlation with correlation coefficient -0.75, -0.77, -0.55 and -0.70 has been found between magnitude of yearly average of Dst index and male, female, total, rate (per 1000000) of suicide incidents. I have also found negative correlation with correlation -0.65, -0.69, -0.43 and -0.60 between yearly average of Ap index and male, female, total, rate (per 1000000) of suicide incidents.

1-Introduction

It has been observed by some previous investigators [5, 6, 7] that geomagnetic activity (GMA) could be considered as an indicator of space weather related to its influence on human physiological and psychophysiological state. Some other investigators have observed geomagnetic activity effects on arterial blood pressure (ABP), heart rate variability (HRV), electrical conductivity of biologically active points, etc. [1,2,3, 10, 12, 14, 17] as well as geomagnetic activity effects on cardio-vascular diseases, myocardial infarctions morbidity and mortality, cardiac arrhythmia, brain strokes, occupational and traffic accidents [11, 13,15]. Some studies revealed that the most significant effects on myocardial infarctions, brain strokes, and traffic accidents were observed on the days of geomagnetic disturbances accompanied with Forbush decreases [15,22,] and especially during the declining phase of Forbush decreases [8,16]. At the same time it was shown that very low geomagnetic activity affects also adversely human cardio-vascular system [18, 19, 20, 21]. The cosmic ray variations also effects different human physiological activity. It has been noticed by some investigators [16] that during geomagnetic ally quiet days the heart rate and the cosmic ray intensity variations are positively correlated. When intense cosmic ray variations, like Forbush decreases and relativistic proton events produced by strong solar phenomena occur, cosmic ray intensity and heart rate get minimum values and their variations also coincide. During these events the correlation coefficient of these two parameters changes and follows the behavior of the cosmic ray intensity variations. Papailiou et al [16] have studied different cosmic ray intensity variations with different physiological parameters. In this investigation different human physiological parameter will be studied with different solar geomagnetic and cosmic ray activity to know the serious effects of these parameters on human physiological activity. Charmaine Gordon and Michael Berk [4] have studied geomagnetic activity and suicide rates. They have correlated geomagnetic activity with suicide rates for 13 year period from January 1980 to 1992. They have found a significant correlation ($r = 0.6964$) between the mean total of suicides and the mean average of geomagnetic storm activity. This correlation have been found true of both male ($r = 0.6301$) and female ($r = 0.7544$). Elchin S. Babayev [9] have studied possible effects of solar, geomagnetic and cosmic ray variability on the human physiological and cardiovascular health state in middle latitudes and concluded that weak and severe geomagnetic storms affects the functional state (bioelectrical activity) of the human brain in a different way. Geomagnetic storms amplify the negative emotional back-

ground of an individual. They have further concluded that heart rate variations of a human are affected by variations in geomagnetic activity and cosmic ray intensity. Different types of geomagnetic storms (i.e. magnetic-cloud origin or caused by high-speed solar wind streams) affect cardio-vascular system in different ways. In this investigation suicide incidents recorded during the period of 1989-2010 have been studied with geomagnetic activity parameters Ap, Kp and Dst index to know the possible influence of geomagnetic activity on human brain and suicide incidents.

2-Observational Data

In this study number of suicide incident of male, female total and rate of suicide (per1000000) in India, yearly average of geomagnetic activity parameters Ap, Kp, Dst indices for the period 1989-2010 has been taken into consideration. The data of suicide incident has been taken from the National Crime Records Bureau records, ministry of home affairs of India (NCRB) 2011,. Data of Ap, Dst and Kp index values have been taken from OMNI Web data system (<http://omniweb.gsfc.nasa.gov>). Data of Ap index came from Space Weather Prediction Centre at NOAA, Boulder, (http://www.swpc.noaa.gov/ftpmenu/indices/old_indices.html) has also been used.

Table 1-Shows yearly average of Dst, Ap, Kp index and death due to suicide incident in India during the period of 1989-2010.

Years	Yearly average of Dst index in [nT]	Yearly average of Ap Index	Yearly average of Kp index	Yearly death of Male due to Suicide incidents	Yearly death of Male Due to Suicide incidents	Total death due to Suicide incidents	Suicide Rate (per100,000)
1989	905.42	593.83	843	40212	28532	68774	8.47
1990	638	496.17	775.42	43451	30460	73911	8.94
1991	932.83	714.75	918.5	46324	32126	78450	9.23
1992	617.75	504.42	787.5	47481	32668	80149	9.24
1993	501.42	459.67	723.1	49851	34393	84244	9.53
1994	629.92	553.13	822.67	52752	36443	89195	9.91
1995	511.67	386.33	657.92	52357	36821	89178	9.74
1996	331.92	286	578.1	51206	37035	88241	9.47
1997	440.42	257.5	496.42	56281	39548	95829	10.03
1998	518.67	367	613.67	61686	43027	10713	10.79
1999	398.17	382.75	665.25	65488	45099	110587	11.21
2000	581.33	460.33	718.42	66032	42561	108593	10.8
2001	539.75	393.67	637.42	66314	42192	108506	10.6
2002	638.67	400.42	686.33	69332	41085	110417	10.5
2003	527.25	663.83	870.33	70221	40630	110851	10.4

2004	372.58	409.67	663.33	72651	41046	113697	10.5
2005	480.17	412.1	643.25	72916	40998	113914	10.3
2006	353.1	260	490.58	75702	42410	118112	10.5
2007	250.1	229.25	460.83	79295	43342	122637	10.8
2008	239.58	213	444.1	80544	44473	125017	10.8
2009	337	120.92	274.17	81471	45680	127151	10.9
2010	186.92	177.42	382	87180	47419	134599	11.4

3-Method of analysis and results

In this study statistical method of correlation has been used. The correlation is one of the most common and most useful statistics. A correlation is a single number that describes the degree of relationship between two variables. Correlation coefficient, symbolized as r, is a numerical summary of a bivariate relationship and can range from -1.00 to +1.00. Any r that is positive indicates a direct or positive relationship between two measured variables. Negative r indicates indirect or inverse relationship. The formula for the correlation is

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Where:

N= number of pairs of scores, $\sum XY$ = sum of the products of paired scores, $\sum X$ = sum of x scores, $\sum Y$ = sum of y scores, $\sum X^2$ = sum of squared scores, $\sum Y^2$ = sum of squared score

The scale of correlation coefficient is

.8 to 1.0 or -.8 to -1.0 (very large relationship), .6 to .8 or -.6 to -.8 (large relationship), .4 to .6 or -.4 to -.6 (good medium relationship), .2 to .4 or -.2 to -.4 (weak relationship), .0 to .2 or .0 to -.2 (weak or no relationship)

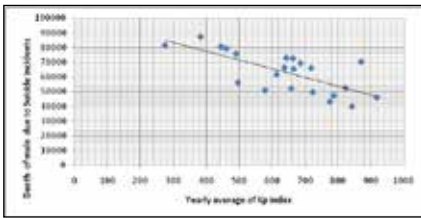


Fig-1-Yearly average of geomagnetic activity parameter Kp index and death of male due to suicide incidents in India during the period of 1989-2010 showing large negative correlation with correlation coefficient -0.72.

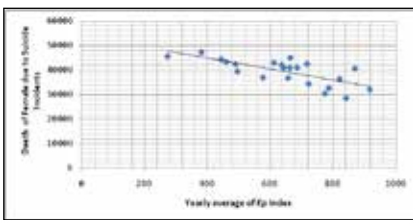


Fig-2-Yearly average of geomagnetic activity parameter Kp index and death of female due to suicide incidents in India during the period of 1989-2010 showing large negative correlation with correlation coefficient -0.72.

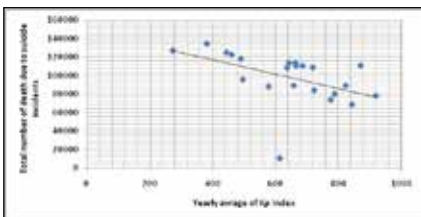


Fig-3-Yearly average of geomagnetic activity parameter Kp index and total number of death due to suicide incidents in India during the period of 1989-2010 showing negative correlation with correlation coefficient -0.47.

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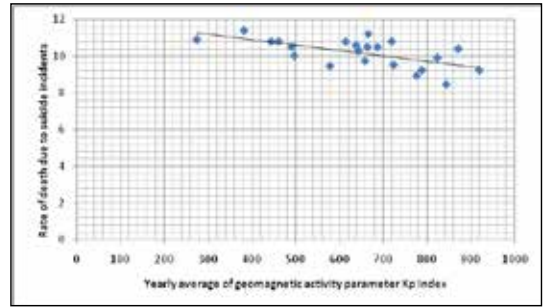


Fig-4-Yearly average of geomagnetic activity parameter Kp index rate of death due to suicide incidents in India during the period of 1989-2010 showing large negative correlation with correlation coefficient -0.63.

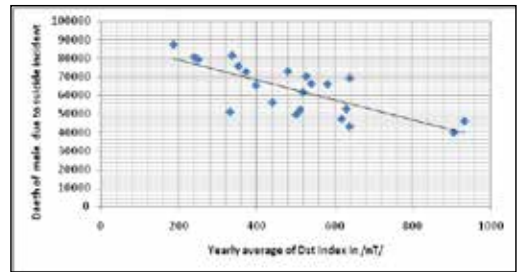


Fig-5-Yearly average of geomagnetic activity parameter Dst index and death of male due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.75.

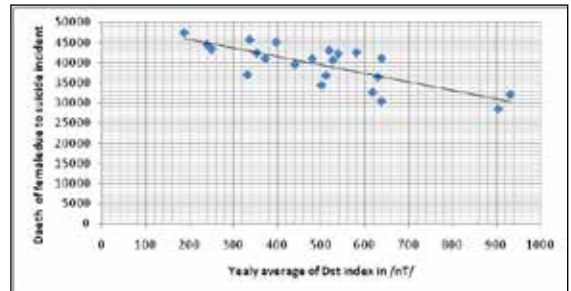


Fig-6-Yearly average of geomagnetic activity parameter Dst index and death of female due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.77.

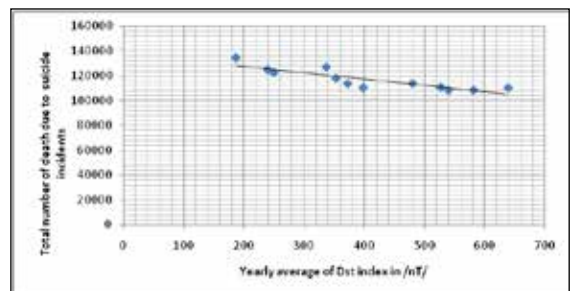


Fig-7-Yearly average of geomagnetic activity parameter Dst index and total number of death due to suicide incidents in India during the period of 1989-2010 showing negative correlation with correlation coefficient -0.55.

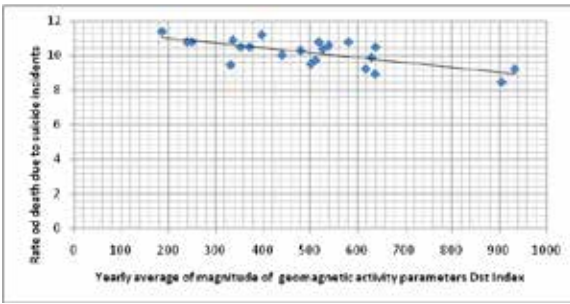


Fig-8-Yearly average of geomagnetic activity parameter Dst index and rate of death due to suicide incidents in India during the period of 1989-2010 showing large negative correlation with correlation coefficient -0.70.

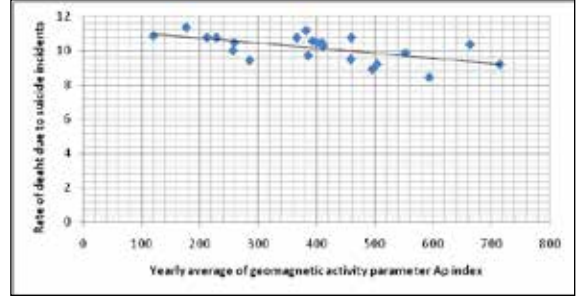


Fig-12-Yearly average of geomagnetic activity parameter Ap index and rate of female due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.70.

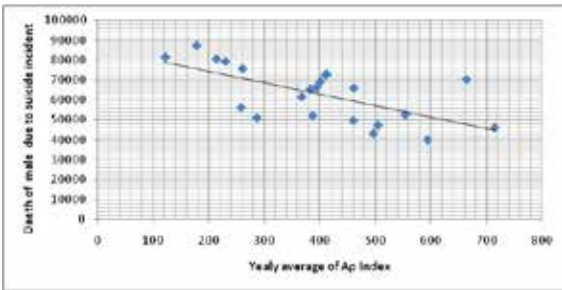


Fig-9-Yearly average of geomagnetic activity parameter Ap index and death of male due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.65.

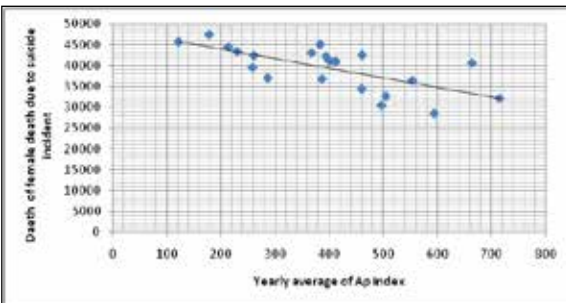


Fig-10-Yearly average of geomagnetic activity parameter Ap index and death of female due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.69.

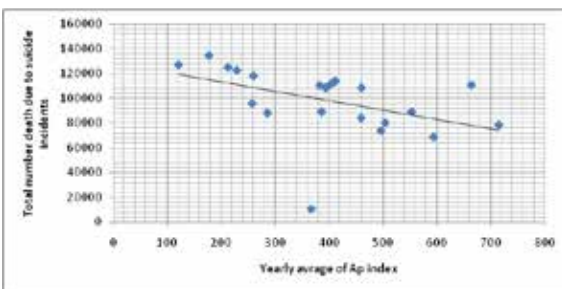


Fig-11-Yearly average of geomagnetic activity parameter Ap index and total number of death due to suicide incidents in India during the period of 1989-2010, showing large negative correlation with correlation coefficient -0.60.

4-Main results

We studied the relation between deaths due to suicide accident in India and geomagnetic activity indices Kp, Ap, Dst. It is seen that death due to suicide incident is closely related to geomagnetic activity parameter Kp, Ap and Dst Index .

Large negative correlation with correlation coefficient -0.72 between male suicide incident and Kp index.

Large negative correlation with correlation coefficient -0.72 between female suicide incident and Kp index.

Negative correlation with correlation coefficient -0.47 between total suicide incident and Kp index.

Large negative correlation with correlation coefficient -0.63 between rate of suicide incident and Kp index.

Large negative correlation with correlation coefficient -0.75 between male suicide incident and Dst index.

Large negative correlation with correlation coefficient -0.77 between female suicide incident and Dst index.

Negative correlation with correlation coefficient -0.55 between total suicide incident and Dst index.

Large negative correlation with correlation coefficient -0.70 between rate of suicide incident and Dst index.

Large negative correlation with correlation coefficient -0.65 between male suicide incident and Ap index.

Large negative correlation with correlation coefficient -0.69 between female suicide incident and Ap index.

Negative correlation with correlation coefficient -0.43 between total suicide incident and Ap index.

Negative correlation with correlation coefficient -0.60 between rate of suicide incident and Ap index.

5- Conclusion

The long term study confirms results of number of previous observations on links between timing of human death and environmental physical factors [8, 9, 12 13]. Results of this study are also shows that there is strong relationship between mortalities due to suicide and geomagnetic activity parameters. The significant correlation with correlation coefficient -0.72, -0.72,-0.47,

-0.63 between male female total and rate of suicide incident and Kp index[Fig 1,2,3,4],-0.75,-0.77,-0.55,-0.70 between male female total and rate of suicide incident and Dst index[Fig 5,6,7,8] .-0.65,-0.69,-0.43,-0.60 between male female total and rate of death due to suicide and Ap index

Fig9,10,11,12]. Although the results obtained in this investigation are very much interesting but not sufficient. Efforts must be made and continued towards not only describing the results obtained but also interpreting them and understanding the mechanisms whereby the influence occurs. Further this study is limited to the India; there is a need in

conducting a world-wide and more complete survey of existing knowledge of the physical links between human health and geomagnetic activity sources, and identifying what types of studies are missing to arrive at final conclusion between death due to suicide incident and geomagnetic activity parameters.

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