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Geomagnetic Storms in Relation to Suicide Incidents in India During the Period of 2000-2010

KEYWORDS: Geomagnetic storms, Suicide incidents.

P .L Verma

Department of Physics Govt.Vivekanand P.G.College Maihar Satna M.P.India

ABSTRACT *I have studied the relation between the death due to suicide in India and with geomagnetic storms magnitude ≤-50nT ,observed during the period of 2000-2010.It is seen that male, female, total and rate of death due to suicide incidents are well correlated with frequency of occurrences of geomagnetic storms . Very large negative correlation with correlation coefficient -0.87,-0.83 .-0.89 and -0.62 has been found between frequency of occurrences of geomagnetic storms and male, female, total, rate (per 1000000) of suicide incidents.*

1-Introduction

In the last two decades heliobiological studies have been carried out by researchers in many parts of the world .The history of heliobiological studies are well described in [Palmer, et al 2006, Breus, 2003 Ragulskaya,2007,] and in reviews such as the joint U.S./Russian publication [Davydov, et al 1996]. The relationship between geophysical factors and the physiological and psychological states of human beings were analyzed in Persinger's review [Persinger 1987] and, in Zhadin's review [Zhadin, 2001] .Palmer et al. [Palmer, 2006] summarized some of the major works performed in the field of heliobiology and solar-terrestrial relations, over the last 30 years. They reviewed different parameters used as measures of human health and the methodology used for the statistical analyses in heliobiological studies. They have conclude that the geomagnetic effects are more pronounced at higher magnetic latitudes; extremely high as well as extremely low values of Geomagnetic Activity (GMA) seem to have adverse health effects; and a subset of the population (10–15%) is predisposed to adverse health due to geomagnetic variations. Concerning the heliogeophysical activity level and the human physiological health state the following two quantifiable measures were considered [Palmer, 2006]. The cardiovascular system plays an important role in human physiological processes and in the adaptation of the human organism to its environment. Ineffective adaptation can lead, for example, to the development of arterial hypertension (AH), especially in high latitudes. AH is a significant risk factor for the development of vascular heart and brain affections [Gogin, 1997] leading to early invalidism and even mortality. At the same time, blood pressure (BP) dynamics also depends on the state of external factors, in particular, extreme changes in heliogeophysical conditions which can cause deterioration in the state of the cardiovascular system [Stoupel, et al 1998]. In periods of GMA, the state of microcirculation deteriorates, the capillary blood flow decreases, platelet aggregation enhances, and blood clots tend to form [Pikin,1998]. Gurfinkel et al. [Gurfinkel, 1995] investigated the effect of geomagnetic disturbances on blood flow in 80 patients (47 male, 33 female) with Ischemic Heart Disease (IHD) - inadequate blood flow leading to a lack of oxygen in the cardiac tissue. Capillary indices were examined for perivascular edema ,red blood cell aggregation and blood flow velocity. These data were compared with geomagnetic indices (A and K) and also with atmospheric pressure. Changes in capillary blood flow in 71.5% of patients with Acute Myocardial Infarction (AMI) were associated with geomagnetic storms. They have observed the appearance of perivascular edema, red blood cell aggregation and reduced capillary blood flow. Similar changes were detected in 64.8% of patients with angina pectoris - "heavy" chest pain due to the lack of oxygen in the heart muscle. Ghione et al. [Ghione, 1998] tried to answer the question of whether or not geomagnetic disturbances of solar origin affect arterial blood pressure (ABP). They compared ambulatory mean daytime, nighttime and 24-hour BP and heart rate (HR) measurements from 447 consecutive untreated out-patients in Italy for diagnostic purposes over 5 years, with the geomagnetic K-sum index obtained at the nearest geomagnetic observatory (at low magnetic latitudes). Significant to highly significant positive correlations were observed for K-sum with systolic (the maximum arterial pressure during contraction of the left ventricle of the heart) daytime and 24-hour, and diastolic (the pressure during the period between contractions) daytime, nighttime and 24-hour blood pressures, but not with HR. No correlations were found with the K-sum of 1 or 2 days before the monitoring. Multiple correlations, which took into account other factors such as date and age of the examined subject, confirmed a significant effect of K-sum on BP. Compared with quiet days, geomagnetically disturbed days always showed significantly higher values for all BP parameters except systolic nighttime pressure. The authors concluded that the results seem to reflect a real relation between GMF disturbances and BP and, in their opinion; the results are unlikely to be due to unrelated secular trends. Charmaine Gordon and Michael Berk [2003] 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).In this investigation an attempt has been made to get possible relationship between suicide incidents and geomagnetic storms observed during the period of 1989-2010.

2-Observational Data

In this study number of suicide incident of male, female total and rate of suicide (per1000000) in India, and geomagnetic storms for the period 1989-2010 has been taken into consideration. The data of suicide incident has been taken from the National Crime Records Burea records, ministry of home affairs of India (NCRB) 2011,. Data of geomagnetic storms has been taken from OMNI Web data system (http://omniweb.gsfc.nasa.gov). .

Table-1-Shows Suicide Incidents and Frequency of occurrences of Geomagnetic storms Magnitude≤-50nT during the period of 2000-2010

Years	Yearly Male Suicide Incidents	Yearly Female Suicide Incidents	Yearly total Suicide Incidents	Rate of Suicide Incidents (per 1000000)	Frequency of occurrences of Geomagnetic Storms ≤-50nT
2000	66032	42561	108593	10.8	41

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2001	66314	42192	108506	10.6	31
2002	69332	41085	110417	10.5	36
2003	70221	40630	110851	10.4	31
2004	72651	41046	113697	10.5	32
2005	72916	40998	113914	10.3	30
2006	75702	42410	118112	10.5	26
2007	79295	43342	122637	10.8	31
2008	80544	44473	125017	10.8	12
2009	81471	45680	127151	10.9	9
2010	87180	47419	134599	11.4	10

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

$$r = \frac{N\sum XY - \left(\sum X\right)\left(\sum Y\right)}{\sqrt{\left[N\sum X^2 - \left(\sum X\right)^2\right]\left[N\sum Y^2 - \left(\sum Y\right)^2\right]}}$$ 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 .2or .0to -.2 (weak or no relationship)

4-Main results

We studied the relation between deaths due to suicide accident in India and geomagnetic storms It is seen that death due to suicide incident is closely related to frequency of occurrences of geomagnetic storms

Very large negative correlation with correlation coefficient -0.87 between male suicide incident and frequency of occurrences of geomagnetic storms.

Very large negative correlation with correlation coefficient -0.83 between female suicide incident and and frequency of occurrences of geomagnetic storms.

Very large negative correlation with correlation coefficient -0.89 between total suicide incident and and frequency of occurrences of geomagnetic storms.

Large negative correlation with correlation coefficient -0.62 between rate of suicide incident and and frequency of occurrences of geomagnetic storms.

5-Conclusion

Changes in the environmental magnetic field, which are directly associated with solar activity as well as different types of variations including geomagnetic storms in the earth's magnetic field strengths are capable of disturbing the electrical activity of the brain and could lead to various neuropsychiatric disturbances, , depression and suicide. Due to the influence of magnetic fields on the pineal gland, it is possible that these effects are mediated through alterations in pineal melatonin functions [Sandyk R,et al 1991]. The significant correlation with correlation coefficient -0.87, -0.83,-0.89,-0.62 between male female total and rate of suicide incident and frequency of occurrences of geomagnetic storms of this study shows that there is strong strong relationship between moralities due to suicide and frequency of occurrences of geomagnetic storms. The weakness of this study that I have studied the yearly suicide events and yearly geomagnetic storms .To get picture more clear, weekly and daily suicide events and geomagnetic storms should be considered .Also the events should be considered for the global level.

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