Geomagnetic Disturbances as Factor of Cardio - Vascular Risk in the North

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ABSTRACT

We analyzed possible correlation of ischemic coronary disease (ICD) and stroke frequency with level of geomagnetic activity in Sakha (Yakutia) Republic, the Far North region of Russia. We found that during calm geomagnetic activity and in the absence of geomagnetic storms (186.3 days) the frequency of ICD and strokes was 2.9 and 3.29 lower than in days with high geomagnetic activity (geomagnetic storms), respectively. This data may be of interest to specialists of Far East, who plan preventive measures of cardiovascular events.

Keywords: ischemic coronary disease, myocardial infarction, stroke, geomagnetic disturbances in Far North.

INTRODUCTION

Currently cardiovascular diseases account for ½ death causes in Russia, and ¼ to 1/3 of references to medical institutions are caused by ischemic attacks associated with atherosclerosis of the brain and heart. In the North growth of cardio - vascular patients in hospitals is recorded at the spring and autumn periods [6]. Comparative clinical - instrumental and morphological studies among the non-indigenous contingent in the North have shown that the more expressed atherosclerosis in this group develops at the earlier age than in the indigenous population [1-3, 8, 9, 12, 15]. Herewith visit to the North from the southern and eastern regions of Russia as well as from Europe of young healthy subjects and residence in the Far North is accompanied by the development of hormonal changes with lipidemia of atherogenic type amid growth of lipid peroxidation in the organism [4] assessed as manifestations of stress reaction. In some of them during the first few years, there is increased sensitivity to weather changes. [13] However, there is little research devoted to the influence of the features of the geomagnetic factor Far North on the body of its inhabitants. In this regard it should be noted that the Republic of Sakha (Yakutia) - Russian region , where more than 40 % of the area is situated at the Polar Circle and on the territory of which more than half a century are large mining factories. The main labor extractive industries represented contingent visitors. Because analysis of the frequency of disease -related ischemic attacks due to the peculiarities of geomagnetic activity on the territory of the republic is one of the important socially significant scientific problems. The results of these works allowed to clarify during geomagnetic risk for cardio - vascular patients, thereby, help hospitals in such periods to optimize secondary prevention of adverse outcomes in such diseases. Purpose - by comparing the frequency of complaints of patients suffering from cardio - vascular pathologies with levels of geomagnetic activity on the territory of Yakutia, set periods of increased risk of cardio - vascular diseases as reasons for forming the leading cause of death in the Far North . The goal is achieved analyzing data uptake ambulance patients with CHD and cerebrovascular disease , hypertension , as well as a comparison of the data obtained with the magnetic activity of the Earth, registered on the territory of the Yakut Republic.

MATERIALS AND METHODS

We used data collected from 1990 - 2006 years by fluctuations of the geomagnetic field. It is known that geomagnetic activity (K) in biomedical research made judging by the amount of daily indicators (ΣK) denominated credit (standard unit). At calculating ΣK keeps records 29 activity parameters of the geomagnetic field. Three of them are important for biomedical purposes: horizontal direction is - H, the center - Z (measured nanoteslas or gamma), directed to the east (+) - D (measured in minutes). These parameters characterizing the amplitude intensity of terrestrial magnetism, varying in time, constantly observed observatories at different points of the earth. On the variability of these three indicators set for 8 three-hour intervals in the day, which are sensitive to the human body, are judged on the level of magnetic activity of land is determined depending on solar activity . Materials on the geomagnetic activity on the land

territory of Yakutia presented laboratory staff of terrestrial magnetism and earth currents Institute of Space Physics and Aeronomy SB RAS (Yakutsk). On the frequency of exacerbations of common cardiovascular diseases and complications of the Far North judged by motives station appeals to accident and emergency and outpatient clinics in the city of Yakutsk above mentioned period. In interpreting the data used in reports of medical institutions of the Ministry of Health of the RS (I) and analysis of the deaths in these diseases compiled by MD, Professor VP Alexeyev. Statistical data processing was carried out in programs designed Computer Centre, Russian Academy of Sciences (Krasnoyarsk) , Information Computing Centre NEFU .

RESULTS AND DISCUSSION

Analysis of the VP Alexeyev materials showed that in Yakutia in 1969 – 1983 contribution CHD cardiovascular mortality were - 46,8 ± 0,4%, and cerebrovascular disease - 23,2 ± 0,4%. CHD often noticed in men than in women. While men in the Polar regions more likely to suffer coronary heart disease compared with men in Central Yakutia (respectively: 341.8 against 328,6 ‰). CHD among women Arctic is 303,0 ‰ in the group older than 20 years, and in Central Yakutia -224,6 ‰. Contribution of CHD mortality in the heart of men in the Polar regions more (64,4 ± 2,4% of cardiovascular deaths) than their figures for the country (46,8 ± 0,4%,), whole. Against this background, found the question: Does the number of vascular events (heart attacks and strokes) increases, recorded during the day indicators of geomagnetic activity during magnetic storms ? It is known that a small geomagnetic storm is considered with amplitude scales at 360 ΣK be 8 - 12 points, moderate - to 600 gammas at ΣK 13-17 points , large - up to 1000 gammas at ΣK to 24 points , a very large - 1500 gam at ΣK to 32 points and a giant - over 1500 scales at ΣK equal more than 33 points. Analysis comparing the number of strokes (during the day according to the ambulance station) and levels of geomagnetic activity, registered in the periods of different levels of disturbance of the magnetic field of the earth, registered on the territory of Yakutia. Level of communication between themselves indicators ranged from r = +0,14 to 0.58 + 0.69 and in different seasons during magnetic disturbances. Established fact is explained by existing cause - effect relationship between the magnetic activity of the earth and seasonal variations in solar activity, as well as cycles of solar activity, repeated in every 11. During the years that stand out Bole active sun (blue line), followed with some lag is growth periods of geomagnetic disturbances (red line) in Yakutia (Fig. 1) and afterwards the number of exacerbations of cardiovascular disease (the number of emergency calls) which are a major cause of mortality and improve load emergency aid . During 1990 and 2006, is registered 1 cycle 11 -year-old set the level of geomagnetic disturbances (r = +0,59). In May this relationship becomes closer (r = +0,81). This situation is confirmed by the fact that in the polar regions of Yakutia with severe climate in 2.33 and 1.95 CAD more frequently recorded than in Central Yakutia. These data do not contradict the results of studies carried out by various divisions of the SB RAS, show that the conditions of the Far North - extreme for the body to the new arrivals [6, 11], as well as its natives . While the risk of acute vascular pathology (judging by the number of calls about the deteriorating health in hypertension , coronary heart disease and brain) in Yakutia increased after chromospheric flares during the sharp rise in geomagnetic activity .

Negative role of geomagnetic disturbances on the higher nervous system proved experiments installed deterioration formation of conditioned reflexes in animals during magnetic storms. The people in the result of this decrease in the amount of influence, as well as outstanding quality of mental tasks and increase the number of errors in solving complex problems [7, 10]. During magnetic disturbances in the Far North in those days on the part of individual VI Hasnulin recorded growth of anxiety and other manifestations of psycho-emotional stress, negatively impacting performance of work requiring mental stress. The author explained that the development of stress, caused by the growth of geomagnetic activity [13, 14]. Data set can explain the increased incidence of stroke (according to the ambulance station) directly depending on the level of geomagnetic disturbance (r = +0.6 to + 0.69). Confirms the

role of voltage rise during geomagnetic disturbances in the Far North, contributing quickening cerebrovascular disease exacerbations, under certain circumstances, causing strokes. Growth years of solar activity and solar magnetic storms with high amplitude , repeated every 11 years (Fig. 1) , accompanied by an increase in Yakutia number of calls from patients with cardiovascular disease . Intra- ups geomagnetic activity in Yakutia accompanied by differences in atmospheric pressure , not only in the cold season , but in the transitional seasons , as well as on hot summer days. During such periods, observed increase in the number of calls from patients referred to pathology, and also increases the number of heart attacks and strokes.

While among indigenous people of Yakutia in periods of large and very large giant magnetic storms, number of adverse outcomes (myocardial respectively with 0 - 0.5 2 - 5 and 6 per day in Yakutsk) increases (respectively 4 and more times). At the visitor contingent amount quickening heart attacks and strokes observed from December to January, with the re- growth in the month of May. Significantly increases the number of such patients not only during periods of very large and large storms in the winter (respectively: 3-3.3 per day and 1.3 - 2.0 per day on average). In the transitional seasons, not only during very large, large, but moderate and even small number of such magnetic storms becomes smaller (1.3-1.6 per day, but in general from 5 to 6 times more), but well above, any late geomagnetic indices.

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