

**Impact of Chronobiological Factors on Chromosomal Anomalies Rates -
Ethical Consideration**

Abstract

Background. In recent years, there is an increasing number of data supporting the relation between lunar cycle and alterations in human body. For instance, it has been proved that hospitalized spontaneous abortions are significantly associated with the lunar cycle . Given that the most common cause of spontaneous abortion is chromosomal abnormalities of the embryo, we presumed that the lunar cycle could influence the occurrence of chromosomal diseases. From the point of bioethics it is a question if it is applicable to talk with patients about possible impact of chronobiological factors on their case of chromosomal anomaly

Patients and methods: We have selected 52 patients, who were bearing a fetus with a prenately diagnosed chromosomal disorder, which included Down, Turner, Klinefelter, Patau and Edward syndromes. The control group (n=92) consisted of families, that were prenately tested for chromosomal abnormalities and the results were negative. Then we gathered and analyzed information from patients' medical histories about various factors, which could have predisposed chromosomal disorders: age of both progenitors, consumption of medications during pregnancy, number of miscarriages, number of abortions, cases of genetic disorders in relatives, lunar phase on the day of conception.

Conclusions: Our study showed there were no associations between lunar phase and month at the time of conception with the rates of chromosomal mutations. Possible explanation for current results could be, that mechanisms (especially meiotic) for chromosomal mutations can begin much earlier than the process of conception.

Keywords: cosmobiology, ethical consideration, chromosome anomaly

INTRODUCTION:

Calendar factors affecting human diseases and the occurrence of certain conditions have been known for many decades. In recent years, there is an increasing number of data supporting the relation between lunar cycle and alterations in human body. By now it is evidently known how moon phases influence the duration and structure of the sleep [1,2]. Also there exists a relation with life-threatening conditions. For example, there is an association between admission to the acute stroke unit with a diagnosis of medically unexplained stroke symptoms and lunar phase [3,4]. Another study shows that admissions to intensive care unit because of status epilepticus varied significantly across the lunar cycle [5].

Furthermore, lunar cycle has been proved to have an impact on human reproduction, in particular fertility, menstruation and birth rate. Even hospitalized spontaneous abortions are significantly associated with the lunar cycle [6]. Given that the most common cause of spontaneous abortion is chromosomal abnormalities of the embryo, we presume that the lunar cycle could influence the occurrence of chromosomal diseases. To our knowledge, this relation has not yet been explored.

METHODOLOGY

This study was approved by the Center of Bioethics at Lithuanian University of Health Sciences. This was a retrospective case-control study. We have selected 52 patients, who were bearing a fetus with a prenataly diagnosed chromosomal disorder, which included Down, Turner, Klinefelter, Patau and Edward syndromes. The control group (n=92) consisted of families, that were prenataly tested for chromosomal abnormalities and the results were negative. We enrolled patients from the Hospital of Lithuanian University of Health Sciences from year 2007 through year 2014.

We gathered and analyzed information from patients' medical histories about various factors, which could have predisposed chromosomal disorders. These factors included age of both progenitors, consumption of medications during pregnancy, number of miscarriages,

number of abortions, cases of genetic disorders in relatives, lunar phase on the day of conception. The date of conception was determined according to the ultrasound testing of the fetus.

Statistical analysis was performed using the SPSS 20.0 program. Quantitative variables were expressed as means with standard deviation (SD). The differences for their statistical significance were analyzed with the *Mann-Whitney* test. A P value of less than 0.05 was considered significant.

RESULTS:

Complete data for 144 patients were analyzed. Average age of the test group's female parents at the time of labor was 35.88 ± 5.69 years, with a range of 20 years to 46 years; the control group's average age at the time of labor was 35.08 ± 5.54 years, with a range of 19 years to 45 years. Average age of the test group's male parents was 38.98 ± 7.51 , with a range of 25 years to 67 years. Average age of the control group's male parents was 37.75 ± 7.19 , with a range of 21 years to 55 years. The consumption of possibly teratogenic medications was observed in 7.7 percent of the patients in the test group and in 12 percent of the patients in control group. In the test group 19.23 percent of female parents have had a spontaneous abortion (13.46 percent once; 5.77 percent twice). In the control group 21.7 percent of female parents have had a spontaneous abortion (16.3 percent once; 4.3 percent twice; 1.1 percent three times). In the test group 26.9 percent of female parents have had an induced abortion (19.2 percent once; 5.80 percent twice; 1.9 percent three times). In the control group 20.7 percent of female parents have had an induced abortion (9.8 percent once; 7.6 percent twice; 3.3 percent three times). Hereditary diseases in families occurred in 9.6 percent of test group's parents and in 20.7 percent of control group's parents. Both test and control groups were statistically equal according to the age of both female and male parents, occurrence of spontaneous and induced abortions, consumption of possibly teratogenic medications and hereditary diseases in families.

Lunar phases at the time of conception in the test group distributed as following: new moon 32.7 percent, first quarter 25.0 percent, full moon 28.8 percent, third quarter 13.5 percent. In the control group lunar phases distributed as following: new moon 29.3 percent, first quarter 27.2 percent, full moon 26.1 percent, third quarter 17.4 percent. There was observed no statistically significant difference between test and control groups ($p > 0,05$). The month of conception in the test group distributed: January 3.8 percent, February 9,6 percent, March 9,6

percent, April 3.8 percent, May 5.8 percent, June 5.8 percent, July 15.4 percent, August 7.7 percent, September 9.6 percent, October 5.8 percent, November 5.8 percent, December 17.3 percent; while in the control group: January 10.9 percent, February 7.6 percent, March 7.6 percent, April 7.6 percent, May 7.6 percent, June 12 percent, July 6.5 percent, August 10.9 percent, September 12 percent, October 6.5 percent, November 5.4 percent, December 5.4 percent. 48.1 percent of conceptions in the test group were registered from March 21 to September 21, and 51.9 percent were registered from September 22 to March 20; respectively in the control group: 58.7 percent and 41.3 percent. We haven't found any statistically significant difference between test and control groups ($p>0.05$).

Table 1. Demographic data and consumption of medications during pregnancy, miscarriages, abortions, cases of genetic disorders in relatives in test and control groups.

Patient characteristics	Test group	Control group
Female parents average age, yrs	35.8 ± 5.6	35.8 ± 5.5
Male parents average age, yrs	38.9 ± 7.5	37.7 ± 7.1
Consumption of possibly teratogenic medications, %	7.7	12.0
Percentage of female parents, who had spontaneous abortions	19.2	21.7
Percentage of hereditary diseases in parents' relatives	9.6	20.7

Table 2. Distribution of conceptions among lunar phases, months, year periods

	Test group	Control group
Lunar phases according to date of conception, %		
New moon	32.7	29.3
First quarter	25.0	27.2
Full moon	28.8	26.1

Third quarter	13.5	17.4
Distribution of months according to time of conception, %		
January	3.8	10.9
February	9.6	7.6
March	9.6	7.6
April	3.8	7.6
May	5.8	7.6
June	5.8	12.0
July	15.4	6.5
August	7.7	10.9
September	9.6	12.0
October	5.8	6.5
November	5.8	5.4
December	17.3	5.4
Percentage of conceptions between March 21st and September 21st	48.1	51.9
Percentage of conceptions between September 22st and March 21st	58.7	41.3

DISCUSSION:

There are various cosmobiological factors that have been proved to have influence on human's health. For example, there is a possibility that geomagnetic activity can affect human health at the Earth's surface. E. Stoupel in his study has found, that periods of low geomagnetic activity show a related increase in in-hospital non-myocardial infarction-related cardiovascular deaths. Only in times of lowest geomagnetic activity did inferior wall myocardial infarction exceed anterior wall myocardial infarction. Low geomagnetic activity was also associated with higher levels of growth hormone and 11-ketosteroids in the peripheral blood, more sudden deaths, some increase in electrical heart instability/hourly number of ventricular and supraventricular extrasystoles and higher rate of ventricular tachycardia [7]. Another study

shows, that the number of sudden cardiac death is rising on the highest and lowest daily levels of geomagnetic activity. The relatively rare geomagnetic activity storms concentrate most of sudden cardiac death at days of lowest geomagnetic activity [7].

Meanwhile, in our study, statistically significant results were not obtained due to several reasons. First of all, our sample may have been too small. Secondly, we investigated specifically lunar phase link with aneuploidy induction, but we had not set the goal to find the link between lunar gravitational forces applied to the Earth and the occurrence of aneuploidies.

The idea that the moon affects human physiology and behavior is based on the fact that 80 percent of the body weight is water [8]. Since the gravitational force of the moon causes the tides, it is believed that the same gravitational forces can operate on the human body. However, there are two reasons why the moon phase should not affect the processes of the human body. In particular, gravitational forces do not depend on the phases of the moon, but on the distance between the Earth and the moon, and the alignment of the Sun, the Earth and the moon [9]. Secondly, the lunar gravity is an extremely weak force. Although the moon obviously affects the oceanic tides, it does not cause these effects in smaller bodies of water - seas, lakes, especially human [10].

The third goal to improve our study would be to investigate male parents more extensively, while the majority of sex chromosome aneuploidies in live births have a paternal origin. You YA et al. study revealed the novel finding that the frequency of aneuploid spermatozoa with fertilization capability significantly increased compared to that of euploid spermatozoa over 3 days, suggesting that aneuploid spermatozoa can survive longer than euploid spermatozoa and have a greater chance of fertilizing oocytes [11].

CONCLUSIONS:

Our study showed that lunar phase at the time of conception has no influence on the occurrence of chromosomal diseases. Furthermore, there is no link between the month of conception or the period of year (from March 21 to September 21 and from September 22 to March 20) and the occurrence of chromosomal diseases. Possible explanation for current results, that showed no causative relation between lunar and solar cycle and the rate of chromosomal mutations could be, that mechanisms (especially meiotic) for chromosomal mutations can begin much earlier than the process of conception. However from the point of bioethics it remains a

question if it is applicable to talk with patients about possible impact of cosmobiological factors on the case of chromosomal anomaly in their family.

DISCLAIMER. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT. As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL. As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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