

OCCURRENCE OF EARLY FETAL DEATH BEFORE AND AFTER THE CHERNOBYL CATASTROPHE

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Abstract

The authors studied the possible reasons of the increased rate of missed abortions observed in the Heves County Hospital during the last four years in the city of Eger and its surroundings. They found that while in 1983—1985 there were only 127 missed abortions (1.1%) verified by clinical and biological tests, in 1986—1988 (till 31 Dec.) that number verified by clinical and ultrasonographic method has increased to 237 (1.8%). Considering the 57 000 female population of reproductive age 0.74 missed abortions/1000 women occurred in the first period of investigation; during the next 3-year period this ratio increased to 1.4%. In their opinion the reason of high ratio of missed abortions is the environment pollution. Gametic cells are very susceptible to chemical and radioactive substances and may induce spontaneous abortions. Further studies will clarify whether the radioactive pollution induced by the catastrophe was higher.

Key words: missed abortion, outcome of pregnancy, radioactive load, Chernobyl.

Introduction

In the past four years however, the occurrence of the intrauterine deaths during the first and second trimesters has markedly increased (FARKAS et al., 1989).

These observations made us to investigate the reasons of the increased frequency of missed abortions.

The occurrence of occult (inapparent) abortions supported by clinical and laboratory studies can reach 26—43% (LAMPÉ, 1987; SZILÁGYI and NAGY, 1985).

Spontaneous abortion ratio in most of the textbooks is given as 10—15%. Considering the inapparent abortions, however, increases this ratio to 28% (LAMPÉ, 1987).

Various reasons elicit spontaneous and incomplete abortions and fetal death, still in most of the cases the exact reason can not be exactly established post factum.

Ultrasonography plays a crucial role in proving the diagnosis of missed abortion. Negative findings showing that the embryo is alive occur in 79%, while the prognostic value of the pathologic positive findings was 100% (HERNÁDI et al., 1989).

Material and methods

Between 1983 and 1989 we followed up the outcomes of pregnancies of all the pregnant treated at the Department of Obstetrics and Gynaecology of the Heves County Hospital. Of the pathological factors preventing the normal outcome of pregnancy, an unusually high frequency of missed abortions occurred to the investigators. Thus we tried to elucidate its possible reasons. All the gestations of these seven years were assessed into two groups (3 years each). The gestations of 1989 were separately analysed.

We observed 127 missed abortions during the first period, with near similar yearly occurrence of these pathological events. During the second 3-year period there were 237 cases of missed abortions, their frequency showing an increasing tendency since 1986. We found 100 missed abortions in 1989. We have calculated the frequency of missed abortions/1000 women of reproductive age in each group using equations for linear ($y = a + bx$) and exponential ($y = \exp/a + bx/$) regression. Significant differences were calculated using a t-test.

All spontaneous abortions were subdivided into two groups: incomplete abortion and missed abortion.

Apart from the clinical study, two other possibilities exist for determination of the development and actual state of pregnancy: these are the determination of hormon levels and ultrasonography.

HCG is determined on the next day after admission from the first morning urine sample (Menotest-Chinoin). Ultrasonography is performed with a BRUEL-KJAER 1846 real-time sector system equipment with frequencies of 3 and 5 MHz.

Absence of heart beats is the most important feature of the diagnosis of missed abortion. Real-time equipment provides a possibility to determine heart function already on the 7th-8th gestational week. Over the 15 mm „sitting position” it can be determined in all cases.

Results

While between the 1983 and 1985 the occurrence of missed abortions supported by clinical and biological tests was only 127 (1.1%), it has increased from 1. Jan. 1986 to 31. Dec. 1988 to 237 (1.8%). Clinical diagnosis was always supported by ultrasonography and proved to be correct. By the time of the operation in most cases biological test also gave positive results. Histology always proved abortion.

It is noteworthy that while the yearly frequency of missed abortions during the first period was about the same, it showed an increasing tendency in the second period. The absolute value and frequency of missed abortions in 1987 was extremely high (89 = 2.2%). It was twice as high, as the mean value of the first period.

Between 1983 and 1985 127 missed abortions occurred (yearly frequency 42.3). Considering the 57 000 female population of reproductive age, there are 0.74 missed abortions/1000 women. After the Chernobyl catastrophe 237 missed abortions (79/year) occurred in the second 3-year period. As far as the female population of reproductive age remained unchanged, the occurrence of missed abortions/1000 women of fertile age increased to 1.4 (Fig. 1).

We found a significant increase in the occurrence of missed abortions in the period between 1983 and 1989 ($\chi^2 = 20.765$; $p < 0.05$). The following results were obtained with linear and exponential regressions:

1. Both, the linear and the exponential fitting showed significant correlation between the data obtained in June and July and the years of study.

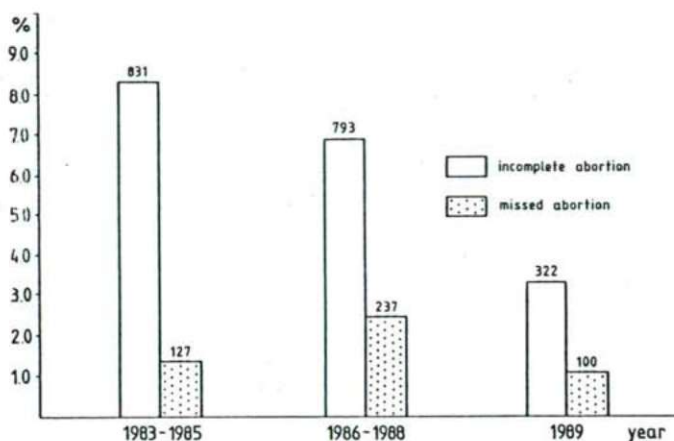


Fig. 1. Ratio of missed and incomplete abortions in 1983—1985, 1986—1988 and 1989

2. Linear fitting also showed significant relationship between the data obtained in September ($p < 0.05$) and the years of study.

3. In other cases we found no relationship between our data and the years or the number of the dead embryos.

Analysis of these data (1—3) indicates that a reliable prognosis for the same periods of the years of 1990, 1991, 1992 can be made only for the months studied in 1. and 2. (Fig. 2).

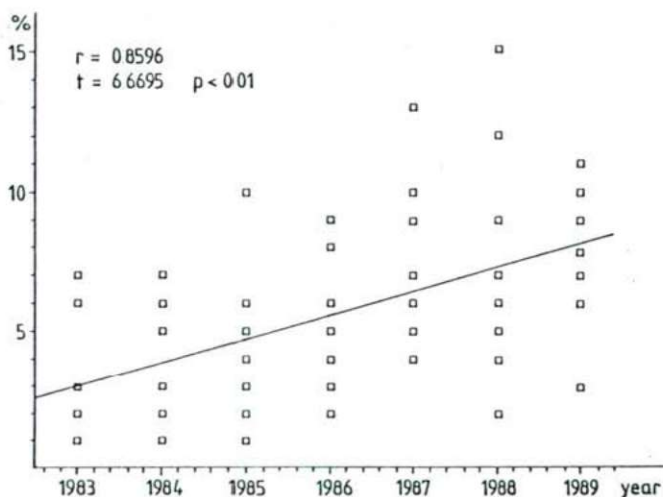


Fig. 2. Yearly and monthly occurrence of missed abortions between 1983 and 1989 (\square — monthly occurrence of missed abortions)

Discussion

A significant increase of missed abortions can not be incident, because other factors inducing possible damages of the gametes remained unchanged.

Missed abortions increasing since 1986 can be rather explained by the biological effects of the elevated radiation levels or may be the sequelae of the genetic mutations.

We have no data on the exact radiologic activity, however the increase of missed abortions interpreted as a „biological dose” indirectly suggests that the damage of the parental gametes might elicit the increased frequency of missed abortions.

Our data support the opinion of LÖNING *et al.* (1989), that factor of uncertainty makes the character of the effects of radioactive pollution on the human organism extremely complex. STEWART *et al.* (1958) showed that the small-dose radiation, for example a simple X-ray study can damage the fetus.

The increased rate of fetal and infant mortality and the malignant diseases of childhood are well documented in literature (STEWART *et al.*, 1958; KNEALE *et al.*, 1987). Perhaps the radioactivity level in several areas of the Heves County could induce more damages, compared to the other parts of the country.

Data of the National Institute of Radiobiology and Radiohygiene deny that many highly radioactive products would still occur in Hungary. According to these data long-life radioactive cesium could be observed in some nutrients till November 1988; in low concentrations in milk and chicken (below the detectable limit of 1 Bq/kg), and at the low level below 4 Bq/kg in pork, mutton and beef. Hungarian data indicate that the radioactive load of the population exceeded the natural yearly dose (about 1.75 mSv) by 3–50% in 1986. The teratologic threshold in Hungary is accepted at the value of 10 rad (100 mSv); at the values exceeding this threshold abortion is indicated. The level of the background radiation after Chernobyl catastrophe did not approach this critical value (CZEIZEL and BILLEGE, 1988).

MOSER and ROEDLER (1987) showed that following the Chernobyl catastrophe that 30% of radioactive substances detected in the soil consisted of I^{131} and 40% of Te^{132} together with the products of decay originating from I^{131} .

Thyroid gland was found to bind 10 times more iodide than the gonades.

Our results support the data of SARKAR *et al.* (1976): the average radioactivity level in these patients exceeded 7.3 GBq/day, and ovarium got 0.3 Sv (30 rem). The authors conclude that the gonade dose of the released I^{131} was so low, that been compared to the natural yearly radioactive exposition and its deviations it can not elicit any genetical effects.

LECHNER *et al.* (1986) found that the breast milk of a woman who has not limited her food consumption contained 7.4 nCi/l of gamma, and 7.6 nCi/l of beta activity.

GOLDMAN (1986) who has been sponsored by the Department of Energy (DOE) studied the medical sequelae of the Chernobyl catastrophe in the European countries outside the Soviet Union. His data indicate that during the following 50-year

period there will be 21 000 more patients with cancer. Cesium 137 is the most dangerous radionuclide, for its halflife period is 30 years (GOLDMAN, 1987). Using the data of MORE et al. (1981), MOLE and PATH (1987) evaluated the relationship between the in utero head circumference of human embryos and the first 100 days of pregnancy. Their next step was the evaluation of neonatal mortality of mice following intrauterine exposition of embryos to various doses of irradiation using the available data of RUSSEL (1954). The authors found that the rate of irradiational intrauterine damages of human embryos is rather due to the effect of the ionizing irradiation on cell colonies, than on the individual cells of the fetus.

TRICHOPOULOS et al. (1987) analyzing the birth trends in Greece calculated that 23% of the desired pregnancies have been terminated in May 1988 because of the fear of the consequences of Chernobyl catastrophe, despite the fact that the average radiation level in Greece did not exceed 1 mSv.

CZEIZEL and BILLEGE (1988) state that Chernobyl catastrophe had no teratologic effect on Hungarian population. They found however, that a significant, higher than 9%, frequency of live births of infants with body weight lower than 2500 g observed in May and June of 1986 had never occurred in the past decade. They explain this phenomenon by psychosocial stress induced by the catastrophe.

LÜNING et al. (1989) studied the effect of radioactive pollution of the Chernobyl catastrophe on the infants who have been born immediately after the catastrophe. The early infant and perinatal mortality closely followed the mathematical model. Between 1975 and 1985 the infant mortality showed an exponential decreasing tendency. After the Chernobyl catastrophe however, significant changes have been observed especially in the southern areas presumably more effected by the radioactive pollution. In the authors' opinion this phenomenon is due to the direct effect of the increased radiation level. Further studies will clarify whether the radioactive pollution induced by the catastrophe was higher, compared to the officially published data and show the necessity of the revision of the critical radioactive load values. The warning data of statistical analysis are worth further investigation.

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