Congenital Anomaly in the Structure of Stillbirth and Deaths of Newborn Children in Chisinau: Epidemiological Study

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Abstract

The frequency, structure and dynamics of congenital malformations in stillborn and deceased newborn children were studied at the level of the territorial medical association Rishcani, Chisinau municipality for 2013–17. The dependence of the congenital anomaly frequency on demographic indicators and the presence of risk factors are characterized.

The study allowed us to establish that the largest percentage of CAs are isolated, that CAs is more common in mothers aged 18 to 30 years old who live in rural areas, during repeated births, in full-term newborns, in girls, and in women who had harmful habits (smoking) or taking medications. In the structure of the CDF, the CAs of the heart, face and central nervous system occupy the leading place.

Key words: congenital malformations, congenital anomaly, newborn, stillbirth, perinatal mortality
J.E.L. classification: I15

1. Introduction

Congenital anomalies are also known as congenital malformations, birth defects or congenital disorders. According to the WHO definition, congenital anomalies (CAs) are can be defined as structural or functional defects that occur during fetal development and can be detected before birth, during birth, or in later life stages (WHO, 2016)

Congenital malformations today represent an actual problem of modern medicine, given their frequency, high mortality rate, and psycho-emotional stress on the family and society as a whole, in which such children are born.

Formation of malformations is determined by a complex of exogenous and endogenous factors, which is of interest to this problem among pediatricians, geneticists, epidemiologists, obstetricians and gynecologists, ecologists and other specialists.

The relevance of CA epidemiological studies is associated with an increase in their specific percentage of infant mortality, infant morbidity and disability, and the use of population-based learning materials to identify the causes and conditions that make up this pathology in a particular area. It should be noted that WHO experts claim that preventive measures can reduce the SA level by 10% in neonates, even in developing countries.

The purpose of this study was to study the structure of mortality and birth factors of children with congenital malformations in the Rishcani Medical Territorial Association in Chisinau for a period of five years (20013-2017), for to provide public health authorities the information's for developing plans of further research and scientifically based preventive measures.

2. Theoretical background

Congenital malformations of the fetus (CDF) - one of the most dangerous complications of pregnancy. According to EUROCAT data, the proportion of congenital and hereditary pathologies in the structure of morbidity and mortality in newborns and young children in the late XX - early XXI century is steadily increasing (Loane M. Et al.,2011, p.31).

According to the long-term observation, more than 5.5% of children with CAs are born in the world. This indicator varies, depending on the country, from 2.7% to 16.3% (Corsello G. et al., 2012, WHO, 2016). About 7.9 million children are born annually with CAs, which is 6% of all births worldwide (Chanaku D. et al., 2014, p. 2, Kaur A. et al., 2010. p.1). Congenital anomalies [malformations] occur in 3-5% of newborns in live (Brent RL., 2004, p.961) and 20-30% of stillborn newborns (Ahmed AM et al., 2011, p. 907, Serra-Juhe C, 2012, page 6). The dependence between the prevalence of congenital anomalies with race, ethnicity and geographical region was identified ((Brent RL. 2004. p.957., Kaur A. et al. 2010 p.1, Bailey LB. et al.2005, p.1213, Prajapati V. et al., 2015. p.30).

Congenital anomalies (CAs) occue the second place in the causes of infant mortality. Mortality among newborns from CAs is about 30% .In absolute figures, the annual more than 270 thousand children die before the age of 28 days of life (Brent RL., 2004, p.963). Studies conducted in different countries have shown that 25-30% of all perinatal losses are due to anatomical organ defects (WHO, 2016). Even in countries with a high level of medical care and with a low infant mortality rate (6.7–8.5%), congenital malformations and hereditary diseases rank first in the structure of infant mortality. However this situation is not due to a real increase in their frequency, but due to a decrease in mortality from another disease.

In the structure of perinatal mortality, congenital malformations in term infants occupy the first place. 30-50% of infant mortality in the postneonatal period is due to congenital malformations (WHO, 2016)

About 10% of conceptions in the human population are accompanied by congenital abnormalities of the fetus. Approximately 0.5% of cases are chromosomal diseases, 0.7% are molecular pathologies, 1.8% are hereditary polygenic diseases, and about 7% are hereditary predispositions. During habitual miscarriages, chromosomal abnormalities occur in 6–12%, with late abortions in 0.5–1% of cases (Opitz J.M. , 2002, p. 204).

It is worth mentioning that a child with congenital malformations can be born absolutely in any family - young, healthy, with no bad habits, with a normal pregnancy.

The causes of congenital malformations are different. This pathology can be caused by both hereditary factors (genes, chromosomal, genomic and zygotic mutations). In other cases, the source of the problem are various harmful factors: unfavorable environmental and occupational factors, infections, frequent use of alcohol, drugs (Sun G. et al. 2011, p.333, Kaur A. et al., 2010. p.1). Most congenital malformations cannot be explained by any one genetic cause or one environmental factor. It is assumed that they are the result of either the interaction of many genes (polygenic causality), or the joint action of genes and environmental factors (polyfactorial causality) (Butt F. et al., 2013, p. 234, Basso O et al., 1999, p. 604).

At the same time, there are reserves to reduce the mortality rate of newborns with this pathology through the introduction of organizational measures. It is known that 40-50% of children with developmental abnormalities can be saved life with timely diagnosis and surgical correction of a birth defect in the fetus and newborn baby in the first hours of life (HG RM, Nr. 988 of 06.12.2013).

The spread of congenital malformations in the Republic of Moldova ranks second in the structure of infant mortality and is characterized by a stable level. In the period from 2004 to 2014, there was a significant increase in the number of malformations caused by chromosomal aberrations and cardiovascular system, with an average annual rate of 0.1 and 0.5%, respectively (Buta G. et al.2017, p.129).

Thus, congenital malformations are one of the serious problems not only of health care, but also of the state as a whole, since their treatment, as well as the high level of disability of children, require huge material costs. At the same time, up to 80% of serious birth defects lead to the death of a child in infancy, without justifying society's expenses for treatment and care, and rehabilitation

assistance for the survival of a sick child may not fully ensure the quality of his health for full integration into society.

The lack of trends to reduce the overall frequency of congenital anomalies, despite preventive measures, noted M. Loane et al. (Loane M. Et al.,2011, p.42) According to the authors, the introduction of new knowledge into the practice regarding the causes and mechanisms of the development of defects may in the future change this situation.

Evidence-based information on specific risk factors for CA development is very important for decision-makers in the field of public health surveillance to develop strategic plans for primary prevention, recovery environmental factors, health promotion and education for health, especially for women of reproductive age.

3. Methodology

To carry out this work, we carried out an epidemiological investigation of emergency notices for a child with congenital malformations in the Rishcani district of Chisinau municipality. The following materials were used for the study: "Notification for a child with congenital malformations" (form No. 025-11 / e-98), protocols of autopsy (form No. 013 / e), observation cards of pregnant women (form 111 / e) and data of the number of newborns contained in the open database of the National Agency for Public Health.

The study period was 5 years: from 2013 to 2017.

All cases of congenital malformations among live-born and stillborn children weighing more than 500 g and 22 weeks gestation were analyzed. Earlier death of fetuses, as well as prenatally identified cases of CDF in induced abortions, were not considered in this study.

The congenital defects, which, according to the International Classification of Diseases of the Tenth Revision, fall into the 17th grade "Congenital anomalies (malformations), deformities and chromosomal anomalies", were analyzed. Thus, information was obtained not only about the evidences of mandatory accounting, but also about other identified congenital malformations.

According to the literature, the observed fluctuations in the frequency of occurrence of CDF in different countries are due to the heterogeneity of this group, different approaches in diagnostics, different possibilities for detecting CAs, completeness of data collection, etc. In this connection, it is difficult to compare the obtained data with each other and with estimates from literature since a comparison must always be made with the confidence that the like is compared with the like. At the same time, according to EUROCAT, the total frequency of CAs should not be lower than 20 per 1000, otherwise, incomplete detection or underregistration of developmental defects takes place. In order to reduce the uncertainty about the completeness and quality of the information gathered in the epidemiological research, a registration form, designed as a questionnaire, was developed. The questionnaire contains 138 closed and open questions, structured in 9 sections, which provide the opportunity to identify risk factors for CAs.

Epidemiological investigation was conducted in a personal interview with the mother, when discharged from the maternity hospital, after a preliminary study of the data of the pregnancy observation card. The accuracy and quality of the information contained in the report was evaluated by the family doctor. In case of discrepancies, the mother was invited to the family doctor's center for clarification. The responsible researcher, when receiving the epidemiological investigation report from family doctor, also checked the quality of the form filling. It was also rechecked during data entry.

The data were coded and entered and analysed into Epi-Info version 3.5.1.

To determine the frequency of defects, the data on the total number of live and stillborn children in the studied population were used as a denominator. The frequency of CAs is calculated for 1000 births. The pattern of change in the indicators of general and specific frequencies of CAs by year is determined using regression analysis. The alignment of dynamic series was carried out by the method of least squares. The direction and strength of the relationship between phenomena is determined using the Pearson correlation coefficient. Significance level was considered at less than 0.05 p-value.

A total of 62 protocols of epidemiological questionnaires of stillborn and deceased newborn were analyzed.

4. Findings

In the past five years, mothers who received primary medical care in institutions of the territorial-medical association Rishcani, gave birth to 62 stillborn children, with a total of 84 congenital malformations.

The frequency of the CAs during the study period ranged from 0.52% to 0.92% and averaged 0.74 ± 0.161%. The large fluctuations of the recorded variable do not make it possible to reliably determine the mortality trend by CAs. By sex, more than half (55.7%) of the losses with congenital anomalies were stillborn and newborn men, slightly less (44.3%) - women. According to the gestation period, 51.4% of cases are premature births and 48.6% are premature births. Regarding the order of birth of children, it should be noted that 32.9% were first, 46.3% second and 20.8% third and above (3+) in the account of children to their families.

It was found that the frequency of stillborn and deceased children in the neonatal period with CAs increases with the aging of the mother. Thus, 4% of children were born from mothers under the age of 18, 64% from mothers aged 18 to 30 years and 32% from mothers over 30 years of age.

It was important to analyze data on the socio-demographic and socio-economic conditions of families in which children with AS were born, since the literature referents on the role of relevant factors in the formation of this type of pathology.

The distribution the cases of CAs in relation to the mother's place of residence shows that most cases were recorded in the rural area (64%), compared to the urban areas (36%) ($p<0.05$). However, it should be noted that the anthropogenic pressure on the environment in rural areas is less pronounced compared to urban areas. This fact should be borne in mind when expanding subsequent studies to determine risk factors.

From the point of view of nuptiality, 93.5% of mothers of children are married. More than half of parents had a higher level of education (63.6% of mothers and 58.9% of fathers) and more than a third had specialized secondary education (36.4% of mothers and 41.3% of fathers).

The frequency of stillbirth and deaths of newborn children with CAs according to the occupation of parents has highlighted some important peculiarities, which require further study in the future to identify occupational exposure to risk factors, namely: most mothers are employed in state institutions, private or self-employed (89.7%), while most fathers (59.4%) are workers. 1.3% of mothers and 8.5% of fathers are involved in agriculture. Activity and exposure to risks of the 5% and 4% of mothers who have declared himself housewives and unemployed should be studied in more detail in the future. CAa cases were recorded at 47.8% in families with middle income, 37.2% - in low-income families and 15% - in high-income families. The recorded differences are statistically significant ($p <0.001$).

It cannot be denied that the lifestyle of mothers has a direct impact on the development and health of newborns. In this regard, the current study stresses the fact that 57.4% of women had bad habits: tobacco smoking (57.4%) and alcohol consumption (2.8%) during pregnancy. In addition, the frequency of passive smoking is also high - 17.9%.

Occupational exposure to chemical risk factors was reported by 32% mothers. To determine the spectrum of chemicals and physical factors of the occupational environment and to assess the intensity of their impact on the worker, in each case, the results of instrumental and laboratory studies conducted in the framework of occupational health will be used.

In the immediate period of conception, 17.6% of mothers consumed contraceptives, both in the form of pills and injections. In 7.1% cases, pregnancy was undesirable, and mothers took medication to get rid of the baby. It is regrettable that 3% of mothers, due to illiteracy, have taken various pills, including those of Chinese origin, for weight loss.

In 16% of cases, the parents themselves had congenital malformations that indicate the hereditary genesis of CAs.

In addition, the influence of adverse environmental factors of the Chisinau city is considered to be important. The nature of air pollution is determined by high concentrations of dust, carbon monoxide, nitrogen dioxide, formaldehyde. The number of residents of the Ishinau municipality is increasing every year at the expense of residents of various regions of the republic. Thus, a high population density contributes to an increase in the percentage of vehicles that pollute the

atmosphere with exhaust gas from petrochemical processing. According to literature data, all these substances have teratogenic properties.

An analysis of the anamnestic data revealed that the course of pregnancy and childbirth in mothers of stillborn and deceased newborns with CAs was accompanied by such pathological conditions as gestosis (45.9%), pre-eclampsia (16.8%), the risk of miscarriage (58.8%), acute respiratory viral infection in the first and second half (41.1%), polyhydramnios (14.7%), presence of chronic placental insufficiency (46.1%), chronic intrauterine hypoxia (61.5%) and intrauterine growth retardation fetus (15.4%) according to ultrasound, anemia (57.6%), exacerbated chronic pyelonephritis (23.0%), urogenital infection (55.7%), premature birth (22.9%), premature rupture of amniotic fluid (19.0%), stimulation of labor activity (41.3%), premature placental abruption (3.2%), green amniotic fluid (11.4%). It should be noted that in most cases (86.5%) there were various combinations of these symptoms.

As regards the supervision of pregnant women by the family doctor it is worth mentioning that 100% of the pregnant women were taken into visibility by the family doctor, examined according to the national protocol. Currently, mass triple ultrasound examinations are provided in terms of 10-14, 20-24, 30-34 weeks of gestation with determination of serum markers of blood in certain periods of pregnancy and medical genetic counseling for women with threatened fetal damage, with the necessary diagnostic manipulations according to indications. All pregnant women was taken the follic acid in the first 3 months of gestation and Sorbiferum. After ultrasonographic results, 32.6% pregnant were consulted by the geneticist.

In the structure of CAs in stillborn and deceased children in the neonatal period of isolated malformations are 69.3%, multiple malformations – 28.6%, chromosomal anomalies - 2.1%. Whereas, according to National Agency for Public Health, in the general structure of congenital pathology among newborns and fetuses, the leading ones were isolated 80.36%, multiple 11.18% and chromosomal 8.46% anomalies. The multiple developmental defects in each case were presented by congenital heart disease in combination with other congenital pathology.

70% of multiple malformations were observed in males. CAs of the urinary system and the osteo-articular system were more often registered in girls (86%). No significant difference was found in the ratio of born in term (51.4%) and premature babies (48.6%). The CAs of the gastrointestinal tract were more common in term births (70%, 60%, respectively), while the CAs of the central nervous system and the CAs of the osteo-joint system were found in prematurely born (80%; 100%, respectively).

We noted the effect of seasonality on perinatal losses. Thus, the peak of perinatal mortality occurred in the autumn-winter period (27.1-41.4%), which can be explained by the rise in respiratory viral infections that contribute to the reactivation of persistent infections in the gestational period.

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5. Conclusions

Congenital malformations are a pressing public health problem not only at the national level, but also at the global level.

The development and implementation of programs for the prevention of congenital malformations is one of the main tasks of the health authorities and the state as a whole, since, according to WHO experts, they can help reduce their prevalence by 10%.

Knowledge of the specificity of the spread of malformations and risk factors is a prerequisite for

the development of adequate and effective preventive measures. In this regard, in-depth epidemiological studies are needed with monitoring of indicators included in international registries, as well as taking into account national circumstances.

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In the structure of stillbirth and death of newborn with CAs in district Rishcani of Chisinau municipality, one third is associated with several developmental defects. Multiple malformations are a combination of congenital malformations and other congenital abnormalities.

Among the risk factors, in the first place is the history of motherhood in mothers (86.5% of cases), a combination of pathological symptoms in the gestational period, indicating infection.

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