NON-VIOLENT CAUSES OF DEATH IN CHILDHOOD - FORENSIC ASPECTS AND STATISTICAL ANALYSIS OF THE PROBLEM

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ABSTRACT:

Introduction: Good health is a prerequisite for personal and social well-being. Child death largely reflects the impact of social conditions on the health of the population and serves as a criterion for assessing the quality of therapeutic and prophylactic activities in the country. Materials and Methods: We performed a complete forensic autopsy, histological examination, chemical analysis of blood and urine samples for each of the cases investigated, with a subsequent statistical analysis of the results obtained. Results: In the Department of Forensic Medicine and Deontology, Medical University of Sofia, for the period 2006 - 2015 a total of 10443 autopsy of deceased on the territory of Sofia-city and Sofia-region were performed, out of which 292 were cases of people under the age of 18. In about a third of them the cause of death was a result of a disease. Discussion: In infancy, the most common non-violent causes of death are those of the respiratory system, followed by diseases of the nervous system, the cardiovascular system, genetic, infectious, malignant diseases and conditions. In some cases, no significant clinical manifestations have been identified, requiring forensic autopsies to clarify the cause of death and the exclusion of a violent one as well as improper treatment, which is why the diagnosis is often histological in these cases. Conclusion: Prophylaxis and prevention of congenital diseases, as well as the early detection and treatment of acquired diseases, are the basis of reducing the mortality in children. The joint action of parents, doctors and the health system is the basis for better and more effective measures to preserve the lives and health of children in each age group.

Key words: *child mortality, non-violent death, forensic medical aspects*

INTRODUCTION:

Good health is a prerequisite for personal and social well-being, protecting health through health functions is one of the fundamental human rights [1, 2, 3]. Child death largely reflects the impact of social conditions on the health of the population and serves as a criterion for assessing the quality of therapeutic and prophylactic activities in the country [1]. The goal of any society is to reduce child mortality. Death in childhood can be violent (injury, intoxication, etc.) or non-violent (different kinds of diseases) [1, 4, 6].

MATERIALS AND METHODS:

We performed a retrospective analysis of the cases of deceased on the territory of Sofia city and Sofia-region, subject to forensic autopsy in the Department of Forensic Medicine and Deontology at Medical university of Sofia, Bulgaria, for the period 2006 – 2015. For this ten year period, a total of 10 443 forensic medical autopsies have been made. In 292 of them, the deceased were under 18 years: 102 were cases of non-violent death, 161 died of various violent causes of death, and in 29 of the cases, were stillborn.

RESULTS:

Non-violent causes of death account for 39% of all causes of death in live births subject to study in the Department of Forensic medicine and deontology, medical University of Sofia, Bulgaria for the period 2006-2015. (Figure 1).

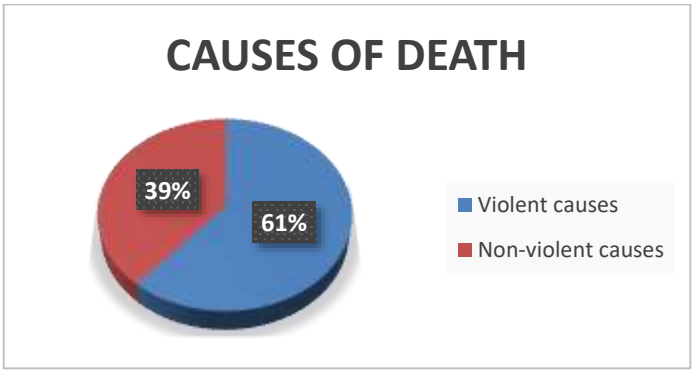

Figure 1.

The most common non-violent causes of death are those of the respiratory system, followed by diseases of the nervous system, the cardiovascular system, genetic, infectious, malignant diseases and conditions. The percentage distribution is shown on Figure 2.

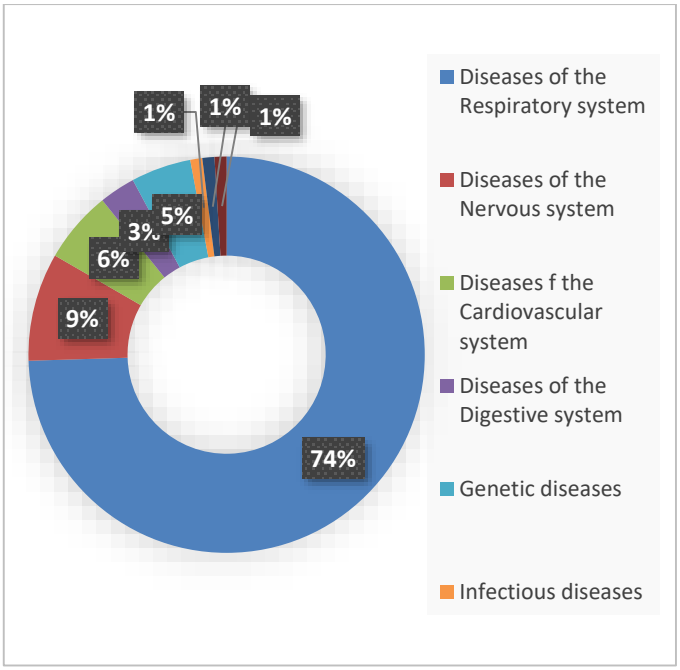

Figure 2.

2006 Year: NON-VIOLENT CAUSES OF DEATH: 11 cases of non-violent death were identified, of which:

- As a result of respiratory disease - a total of 10 children, of whom:

• 6 cases of acute bronchitis - 4 of them in the age group below 1 gram and 2 cases in subjects 1-4 years old;

• 4 cases of bronchopneumonia - 3 of them in the age group under 1 year and 1 case in a person 1-4 years old;

- Deceased of genetic disease - 1 case of a polymorphic syndrome with a person under 1 year of age.

2007: NON-VIOLENT CAUSES OF DEATH: 9 cases of non-violent death were identified, of which:

- Died as a result of respiratory disease - a total of 7 children, of whom:

• 6 cases of bronchopneumonia - 4 of them in the age group below 1 year and 2 cases in a person 1-4 years old;

• 1 case of acute viral infection of a child in the 9-12 age group;

- Deceded as a result of a SAC disease - 1 case per person under 1 year of Tetrology of Fallo.

- Left as a result of nervous system disease - 1 case of meningitis and encephalitis per child in the 9-12 age group.

2008: NON-VIOLENT CAUSES OF DEATH: 14 cases of non-violent death were identified, of which:

- Died as a result of respiratory disease - a total of 8 children, of which:

• 7 cases of bronchopneumonia - 5 of them in the age group under 1 year and 2 cases in a person from 1-4 years;

• 1 case of bronchiolitis per child in the age group of less than 1 year;

- Deceded as a result of SAC disease - 1 case per person under 1 year of congenital heart defect.

- One of a child with Crohn's Disease died of digestive tract illness, he died of blood loss from the age group 13-18 years;

- Diseases resulting from nervous system diseases - 1 case of a child who died of epilepsy in the age group 1-4 years;

- 1 case of a child with Timilolimphatic status and polyorgan deficiency in the 9-12 age group;

- 2 cases of children with genetic diseases 1-4 years of age.

2009: NON-VIOLENT CAUSES OF DEATH: 14 cases of non-violent death were identified, of which:

- A total of 13 children died of respiratory disease, of which:

• 8 cases of bronchopneumonia - 7 of them in the age group under 1 year, 1 case in subjects from 9-12 years and one from 13-18 years;

• 1 case of bronchiolitis per child in the age group 1-4;

• 2 cases of children with acute respiratory distress syndrome - 1 per person under one year and one per child 1-4 years;

• 1 case of a child with small bowel disease involving the lungs and the heart in the 9-12 age group;

- As a result of diseases of the nervous system - 1 case of a child died of hydrocephalus in the age group 1-4 years;

2010: NON-VIOLENT CAUSES OF DEATH: 10 cases of non-violent death were identified, of which:

- Died as a result of respiratory disease - a total of 8 children, of which:

• 6 cases of bronchopneumonia - 4 of them in the age group under 1 year, 1 case in subjects of 1-4 years and one of 13-18 years;

• 1 case of bronchiolitis per child in the age group of less than 1 year;

• 1 case of children with acute viral infection (influenza) per person 5-8 years;

- As a result of diseases of the nervous system - 1 case of a child died of hydrocephalus in the age group of 5-8 years;

- Deceded as a result of cardiovascular disease - 1 case of aortic dissection of a person 13-18 years;

2011: NON-VIOLENT CAUSES OF DEATH: There were 8 cases of non-violent causes of death of which:

- Diseased as a result of respiratory disease - a total of 3 children, of which:

• 2 cases of bronchopneumonia - subjects under an intimate year and a person 1-4 years old;

• 1 case of a child with acute respiratory distress syndrome under 1 year;

- As a result of diseases of the nervous system - 1 case of a child died of hydrocephalus in the age group 1-4 years;

- Left as a result of malignant oncology - 1 case - medullinum neuroblastoma;
- Diseased as a result of digestive system diseases - 1 case of hepatitis per person 5-8 years and 1 case of peritonitis as a result of acute appendicitis in the face of 13-18 years;
- Deceived as a result of genetic disease - 1 case of Rubenstein's Tegui syndrome per person 9-12 years.

2012: NON-VIOLENT CAUSES OF DEATH: 10 cases of non-violent death were identified, of which:

- Died as a result of respiratory disease - a total of 8 children, of which:

• 5 cases of bronchopneumonia - 4 of them in the age group under 1 year, 2 cases in subjects 1-4 years old;

• 1 case of hyalinomembranous disease of a child in the age group of less than 1 year;

• 1 case of children with acute viral infection (influenza) per person aged 13-18;

• 1 case of a child with mucopolysaccharidosis with developed pneumonia in the age group of 9-12 years;

- As a result of diseases of the nervous system - 1 case of a child died of hydrocephalus in the age group of 9-12 years; 1 case of spina bifida per child under one year of age;

2013: NON-VIOLENT CAUSES OF DEATH: 10 cases of non-violent death were identified, of which:

- 2 cases of bronchopneumonia in the age group of less than 1 year have died as a result of respiratory disease;
- As a result of diseases of the nervous system - 1 case of a child who died of haemorrhagic stroke in the age group 1-4 years;
- Resuscitated from diseases of the cardiovascular system - 1 case of a child aged 9-12 years, from hypertrophic cardiomyopathy;
- Cured as a result of genetic diseases - 1 case.

2014: NON-VIOLENT CAUSES OF DEATH: 14 cases of non-violent death were identified, of which:

- A total of 10 children died of respiratory disease, of which: 10 cases of bronchopneumonia - 8 of them in the age group of less than 1 year, 1 case in a person 1-4 years old and 1 case in the face of 13-18 years;
- As a result of diseases of the nervous system - 1 case of a child died of hydrocephalus in the age group of 5-8 years;
- Deceded as a result of cardiovascular diseases - 1 case of a person's 13-18 years of myocarditis and 1 case of sudden cardiac death of a child under 1 year of age;
- Cured as a result of sepsis - 1 case.

2015: NON-VIOLENT CAUSES OF DEATH: 10 cases of non-violent death were identified, of which:

- A total of 7 cases resulted from respiratory disease, of which:

• 6 cases of bronchopneumonia: 3 at 1 year old, one at age 1-4, one - 9-12 years and one 13-18 years;

• 1 case of primary pulmonary hypertension in a child aged 13-18 years.

All causes of death are presented on Figure 3.

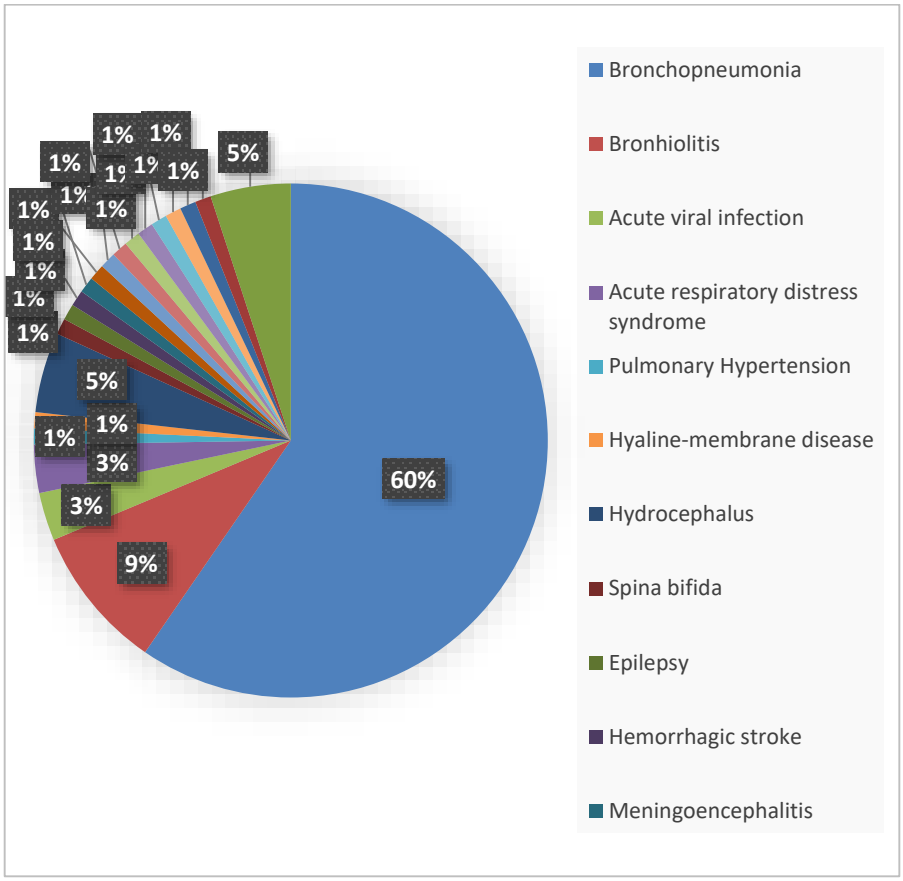

Figure 3

DISCUSSION

In childhood especially during the period of the newborn, most often sudden death occurs as a result of respiratory diseases – hyaline-membrane disease, bronchopneumonia, catarrhal-purulent bronchitis and bronchiolitis, etc. They were observed in 63% of the examined cases of live births. In a majority of cases before death, the children revealed no significant clinical symptoms, except a slight rhinitis, coughing or a slight increase in body temperature, restlessness, frequent crying and denial of food intake. This was the reason for a forensic autopsy to be requested by the police in such cases to clarify the cause of death and to exclude a violent one or negligence by the doctors treating these children. Because of the poorly expressed symptoms in these cases, the diagnosis was histological.

The leading cause of death in children under the age of one is bronchopneumonia of different etiology, which occupy 78% of all deceased due to diseases of the respiratory system. In second place is bronchiolitis, followed by acute respiratory distress syndrome (ARDS) and hyaline-membrane disease (HMD) – Figure 4.

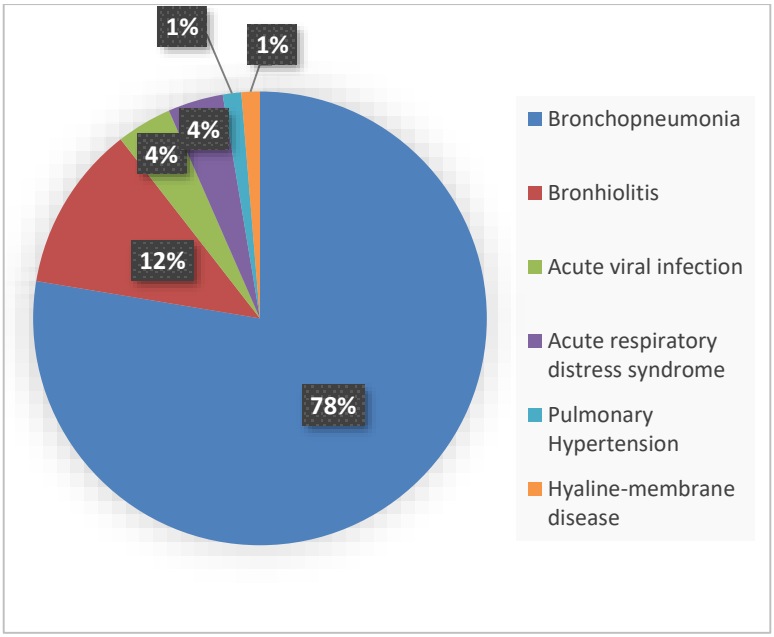

Figure 4.

A large percentage of respiratory diseases can be explained by some anatomical features in young children [1,5.7]:

♦ The sternum of the newborn and infant has the shape of a truncated cone, the ribs are soft, prone to pressure; Interfacial spaces are narrow and inter-costal muscles are poorly developed; the lower aperture is wider.

♦ The breathing paths are very thin.

♦ The nose of the newborn is relatively small, short, with undeveloped nostrils and narrow strokes; its mucosa is tender and rich in blood, which in inflammation processes leads to a pronounced swelling and blockage of nasal strokes, which makes it difficult not only for breathing, but also for sucking; the nasal cavities in the infant are underdeveloped and develop gradually; the sinuses are visible radiographically after three months of age but have a practical significance after 1-2 years of age.

♦ The pharynx is small and tender with poorly developed lymphatic tissue.

♦ The larynx initially has a spindle-shaped form and is narrower; its cartilage is underdeveloped, the voice slit is narrow, the lining is rich in blood.

♦ The trachea and bronchi are narrow and their cartilage is soft and the lining is well vascularized; in the main bronchi, the lobar and the sub-segmental bronchi lacks fibrotic tissue; has a well-developed layer of smooth muscle fibers, whose contraction reduces the lumen of the bronchus and thus promotes the occurrence of bronchospasm.

♦ The lungs grow continuously and intensely up to 16 years of age when their ultimate structural unit - the acinus is finally formed; in the newborn, the lungs weigh about 50g, and at the age of 10 they increase their mass 10 times; the lung is poor in elastic fibers but rich in connective tissue, lymph and blood vessels.

♦ The child's mediastinum is easily suppressed and shifted from pathological processes in the chest cavity; enlarged lymph nodes can press trachea, bronchi and large vessels.

♦ The thorax of the infant is barrel-shaped due to the horizontal position of the ribs with large front and rear dimmer, i.e. the chest is constantly in an inspiratory position; This greatly

limits the possibility of deepening the respiratory movements and explains the so-called physiological tachypnea in the infant.

Diseases of the cardiovascular system were 3.8% of all the examined deceased. In 67% of the cases, we observed congenital heart defects. In child cardiology there is a branch of "fetal cardiology" - the cardiology of the fetus. The cardiovascular system is the first one to form almost entirely in the developing organism. About the 20th week of gestation, it is almost entirely shaped. This is the earliest period in which congenital heart malformation could be detected through ultrasound examinations of pregnant women. Good knowledge of obstetricians can help early detection of some defects and in-situ surgery could be performed in order to restore them.

The other non-violent causes of death in individuals under one year were diseases of the nervous system (NS), genetic diseases (seizures) and sepsis, each represented 1.3% of the examined cases.

In our study, we found that 44% of cases of deceased children in the age range of 1-4 years were non-violent causes of death - various diseases of the respiratory and nervous system as well as genetic diseases. Most common were the respiratory diseases - 70% of deceased children in the age group 1-4 years, similar to the causes of death in the previous age group. Again, the leading cause of death was bronchopneumonia, followed by bronchiolitis, acute respiratory distress syndrome (ARDS) and neoplastic diseases. The diseases of the nervous system 17% of all deaths in the age range of 1-4 years. In 50% of cases, the cause of death was related to congenital malformations of the brain such as hydrocephalus. In addition, in this age group there were deaths from genetic malformations and chromosomal aberrations - 13% of all deaths in the age range of 1-4 years.

In the age group of 5-8 years, the deceased children from respiratory diseases are significantly less than those in the previous two periods, mainly due to acute viral infections - only 25%. This could be explained by the maturation of the child's immune system. In 50% of all deaths in this age range death was a result of diseases of the nervous system - hydrocephalus.

In children aged 9-12 years, there has been some increase in the incidence of respiratory illnesses leading to death - 60% of the deceased children in this age group. It is mainly due to infectious diseases - bronchopneumonia and acute viral infections. In 20% of all deaths in this age period, we have observed diseases of the nervous system - meningoencephalitis and hydrocephalus. Genetic diseases and cardiovascular diseases that result were rare 10% of all deaths.

In the age range of 13-18 years, non-violent causes of death are predominantly caused by respiratory diseases - pneumonia and acute viral infections - 60% of non-violent causes of death in the group.

We have seen cases of deaths from ARDS - 20% of non-violent causes of death. The same percentages were observed for digestive system (DS) diseases.

CONCLUSIONS:

Prophylaxis and prevention of congenital diseases as well as the early detection and treatment of acquired diseases, especially those of the respiratory system, are the basis of organizing and reducing the mortality of children in each age group. Changes in child mortality indicators are among the most sensitive features of economic and cultural development and are

directly linked to poverty and social exclusion, which have a direct impact on the access to health care and qualified medical assistance. The joint action of parents, doctors and government is the basis of better and more effective measures to preserve the lives and health in early childhood. In older age groups, child death due to illness is most often the result of poor parental control, as well as underestimation of symptoms. Performing prophylactic examinations is essential for the proper development of children. Demand for medical assistance and timely treatment can prevent most of these causes of death.

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