

# Assessment of the Risk Factors for Deceased Patients in Pediatric Clinic I

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**Purpose:** The evaluation of the risk factors in patients deceased in Pediatric Intensive Care Unit (PICU) during January 1 to December 31, 2009.

**Material and method:** This is a retrospective study in which we evaluated the risk factors of the 29 deceased patients admitted in PICU. We followed the age groups, gender, environment, prior treatments, number of hospitalization days, the patient flow, the associated comorbidities, the mothers' age and the anatomico-pathological concordances.

**Results:** From all 29 deceased patients, 34.48% were between 3–12 months, the average age being 27.3 months. 79.31% came from rural areas. The number of deaths was almost equally distributed between sexes. Etiological, nosological, location-related and complication-related consistencies were found. The main cause of death was the respiratory disease. In the cold season, the number of deaths was increased. Most children were admitted in Pediatric Clinic I from other clinics, were hospitalized for more than 72 hours and presented at least one comorbidity.

**Conclusions:** The main risk factors that concluded in children's death were: association with at least one comorbidity, the age group of less than 1 year, as well as the patient's flow through multiple sections. The main cause of death was respiratory infection. Etiological, nosological, location-related and complication-related consistencies were present.

**Keywords:** risk factors, infant mortality, anatomico-clinical consistencies, comorbidity.

## Introduction

"Children are not supposed to die... Parents expect to see their children grow and mature. Ultimately, parents expect to die and leave their children behind... This is the natural course of life events, the life cycle continuing as it should. The loss of a child is the loss of innocence, the death of the most vulnerable and dependent. The death of a child signifies the loss of the future, of hopes and dreams, of new strength, and of perfection." (Arnold and Gemma, 1994).

Many risk factors are involved in mortality among children [1,2]. They can be divided into:

- ▶ general factors: comorbidities (malnutrition, congenital malformations, genetic syndromes, neurological disease), poisoning, accidents, socioeconomic factors, patient flow,
- ▶ parent related factors: mothers under 19 years old or over 35 years, parity, abortion history, accidents during childbirth, general and obstetric pathology
- ▶ child related factors: low birth weight, child rank, age.

We defined infant mortality as the number of infant deaths (one year of age or younger) per 1000 live births. Perinatal mortality only includes deaths between the fetal viability (22 weeks gestation) and the end of the 7th day after delivery. Neonatal mortality only includes deaths in the first 28 days of life. Post-neonatal mortality only includes deaths after 28 days of life but before one year. Child mortality includes deaths within the first five years after birth.

The most common cause of deceases worldwide has traditionally been due to dehydration from diarrhea. However, the spreading information about Oral Rehydration

Solution (a mixture of salts, sugar, and water) to mothers around the world has decreased the rate of children dying from dehydration. Currently the most common cause is pneumonia. Currently, pneumonia and other lower respiratory tract infections are the leading cause of death worldwide. Approximately 150 million new cases of pneumonia occur annually among children younger than 5 years worldwide, accounting for approximately 10–20 million hospitalizations [4]. Pneumonia is the leading cause of death in children worldwide. Pneumonia kills an estimated 1.8 million children every year – more than AIDS, malaria and measles combined [5].

We started this study when we noticed a significant increase in deaths among children hospitalized in the Pediatric Intensive Care Unit (PICU) through the Pediatric Clinic I in 2009 compared with 2006–2008.

## Purpose

The evaluation of the risk factors in patients deceased in PICU during January 1 to December 31, 2009 and the evaluation of the number of deaths in the same unit during 2006–2009.

## Material and methods

This is a retrospective study conducted over a period of 12 months in which we evaluated the risk factors in the deceased patients admitted in PICU through Pediatric Clinic I during January 1 to December 31, 2009. We followed the age groups, gender, environment, prior treatments,

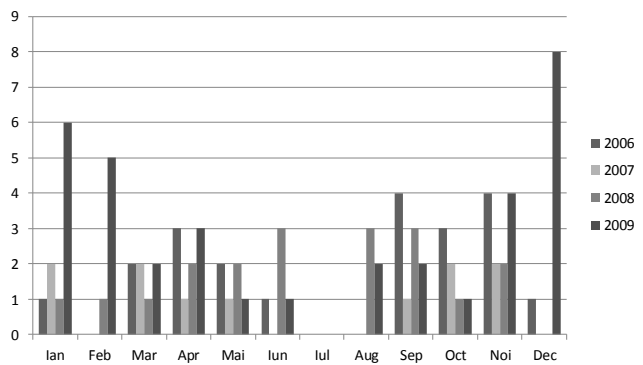


Fig. 1. Monthly distribution of number of deaths

number of hospitalization days, the patient flow, the associated comorbidities, the mothers' age and the anatomicopathological concordances. From the data acquired during 2006–2009, we analyzed the number of deaths per month. We conducted a full analysis of 29 deaths from the 35 identified ones (6 cases were deaths due to traumatic or without necroptic examination results).

## Results

During 2009, 2086 children were admitted in Pediatric Clinic I. Deaths during this period were 1.39% of total admissions. 82 children (3.93%) were hospitalized in the PICU through the Pediatric Clinic I in 2009, from which 35 (42.68%) died. In 2006, 2007 and 2008, the numbers of deaths were 21, 11 and 19 respectively. Of the 35 fatalities in 2009, 29 (82.86%) were non-traumatic. The remaining 6 cases (17.14%) were: 2 cases of drowning (5.71%), 1 case of multi-drug intoxication (2.86%), 1 suicide (2.86%), 1 traumatic event (2.86%) and 1 case in which necropsy was not performed (2.86%).

Regarding the monthly distribution, we noticed an increase in the number of deaths in winter of 2009 compared to previous winters. In the summer months, in all the four years, we noticed a reduction in the number of deaths; in July no death was noticed (Figure 1).

Compared with 2006–2008 period, in 2009 is a noticeable increase in the number of deaths, both under 1 year age group and over 1 year age group (Figure 2).

Allotment after age groups shows: no cases in 0–1 month, 7 cases (24.14%) in 1–3 months, 10 cases (34.48%) in 3–12 months, 7 cases (24.14%) in 12–36 months and 5 cases (17.24%) over 36 months. The average age is 27.3 months.

Of the 29 deaths, 14 (46.28%) were females and 15 (51.72%) males. In females, most of the deaths (5 cases; 35.71%) occurred in the 3–12 months age group, followed by 4 cases (28.57%) over 36 months; 3 cases (21.43%) were identified in the 1–3 months age group and 2 cases (14.29%) in the 12–36 months age group. In males, most of the deaths (5 cases; 33.33%) occurred equally both in 3–12 months and 12–36 month age groups, followed by 4 cases (26.67%) in the 1–3 months age group and 1 case (6.67%) over 36 months age group.

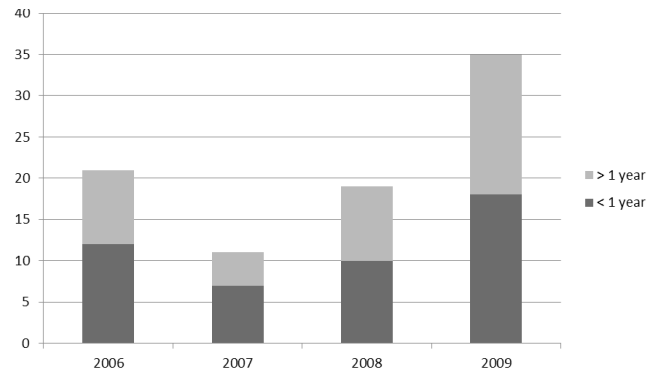


Fig. 2. Distribution of number of deaths by age groups

Most deaths occurred among children in rural areas (23 cases, 79.31%).

Regarding the patient's flow, 4 children (13.79%) were admitted directly to the Pediatric Clinic I, 11 children (37.93%) were transferred in Pediatric Clinic I from other clinics in Tg.Mureș, 11 children (37.93%) from extra-territorial clinics and 3 children (10.34%) from the Mobile Emergency Service for Resuscitation and Extrication (SMURD).

Of the four children who have presented directly to the Pediatric Clinic I, three were initially hospitalized in this clinic, but their condition worsened, so they were transferred to the PICU. The other child was a girl of 6.4 years old, which along with respiratory complaints to this hospitalization, associated epileptic encephalopathy, chronic infection with of the central nervous system with cytomegalovirus, profound retardation of the psychomotor system and retardation in language development; a high suspicion of respiratory infection with H1N1 virus was raised, which was subsequently confirmed by examination of nasopharyngeal secretion.

Children admitted from extra-territorial clinics originated from Mureș, Brasov, Bihor and Harghita counties. The hospitals in Tg.Mureș from which the children were hospitalized in PICU through the Pediatric Clinic I are the following: Infectious Diseases Clinic I: 3 children (27.77%), Pediatric Clinic II: 3 children (27.27%), Premature Clinic and Neurology and psychiatry Clinic: 2 children each (18.18%) and one child from Pediatric Cardiology Clinic (9.09%). Of these, a case from the Premature Clinic, initially admitted to the Pediatric Clinic I for two hours, has worsened and thus was transferred to PICU.

20 of the hospitalized children received treatment before admission to our clinic: 3 at home, 15 in a hospital unit and 2 both at home and in hospital unit.

Regarding the period of admission, 21 children (72.41%) were hospitalized more than 72 hours, 1 child (3.45%) under 72 hours, 2 children (6.90%) under 48 hours and 5 children (17.24%) under 24 hours.

At the time of children's birth, most of the mothers (65.52%) were aged 19–35 years, the rest being equally under 19 and over 35 years old respectively (17.24% each).

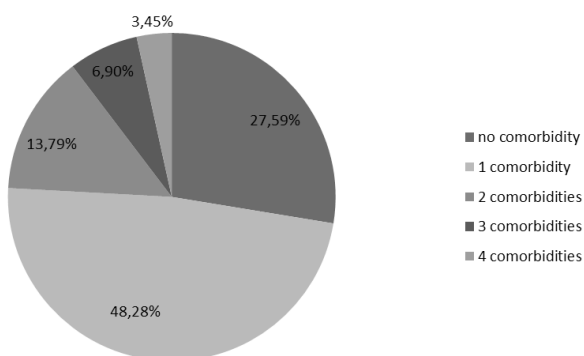


Fig. 3. Distribution of number of comorbidities

By studying the diseases associated to the cause of death we noticed that 13 children (44.83%) were dystrophic, 11 children (37.93%) assigned a neurological disease, and 4 children (13.79%) had a heart or genetic disease.

From all 29 death cases, 8 children (27.59%) did not show any comorbidity, 14 children (48.28%) presented one comorbidity, 4 children (13.79%) presented 2 comorbidities, 2 children (6.90%) presented 3 comorbidities and one case presented (3.45%) four comorbidities (Figure 3).

Combinations of comorbidities that were met were:

- ▶ neurological and dystrophic
- ▶ cardiological, genetical and dystrophic
- ▶ cardiological, genetical, dystrophic and neurological

If we define a multi-malformed patient as a patient with more than three associated comorbidities, our study identifies three multi-malformed patients.

The main cause of death was the respiratory disease: 26 cases (89.66%), from which 20 cases at admission (68.97%), with acute respiratory failure.

Twenty-six cases (89.66%) presented nosological, complication-related and location-related consistencies; 25 cases (86.21%) presented only etiological consistencies (Figure 4).

The cardiac malformations were: The common atrio-ventricular channel Rastelli A type, coarctation of the aortic arch, persistent arterial canal, Ostium secundum atrial septal defect and membranous ventricular septal defect.

The neurological disorders were: Werdnig-Hoffmann disease, microcephaly, hydrocephalus, arachnoiditis bilateral gyral underdevelopment with congenital arachnoid cysts in the left cerebral hemisphere, complete agenesis of the corpus callosum, spastic tetraparesis, epilepsy and scaphocephaly.

The genetic comorbidities were: Down syndrome, male-type pseudohermafroditism and Pierre-Robin syndrome.

### Conclusions

1. The main risk factors that concluded in children's death were: association with at least one comorbidity, the age group of less than 1 year, as well as the patient's flow through multiple sections.
2. Most children associated dystrophy as comorbidity (44.83%).

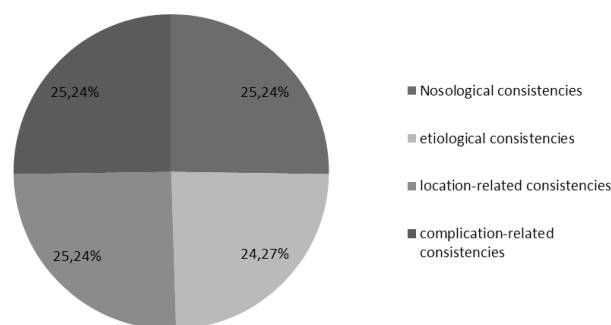


Fig. 4. Anatomic-pathological consistencies

3. Most deaths occurred in girls of 3–12 months and in boys equally both at the age groups of 3–12 months and 12–36 months.
4. Most children were hospitalized for a period exceeding 72 hours.
5. The main cause of death is the respiratory infection.
6. Etiological, nosological, location-related and complication-related consistencies were found.
7. In 2009 there were an increasing number of deaths compared with 2006, 2007 and 2008.

### Discussions

Globally, according to the last data from the CIA World Factbook from February 2010, during 2006–2009 a progressive reduction in the number of deaths at the age group of less than 1 year has been noticed. In Romania, the same descending number of deaths in this period is observed. From the same source, the countries with the highest mortality rate in the age group of under 1 year are Angola, Sierra Leone and Afghanistan; the lowest mortality rate is described in Japan, Sweden and Singapore. In Europe, the countries with the highest mortality are: Turkey, Romania and Albania; the lowest mortality in Europe is described in Sweden, Iceland and France. Romania is ranked 94, with 22.9 deaths/1000 births [6]. According to Romanian Yearbook 2008, infant mortality rate is decreasing in the period 2006–2008, as follows: 3052 deaths (13.9‰) in 2006, 2574 deaths (12‰) in 2007, and 2434 deaths (11‰) in 2008. In Mureş county, the numbers of deaths are: 75 (11.7‰) in 2006, 74 (11.7‰) in 2007 and 77 (11.5‰) in 2008 [9].

Regarding the birth rate in the world, during 2006–2008 there are no variances, but in 2009 a slight decrease is registered. In Romania, a slight decrease in birth rate is observed during 2006–2009. The countries with the highest birth rate are Niger, Mali and Uganda, and the countries with the lowest birth rate are Hong Kong, Japan and Germany. In Europe the countries with highest number of births are Turkey, Albania and Ireland; the European countries with the lowest birth rates are: Germany, Italy and Austria. In Romania, the birth rate is 11 ‰. In Romania, the birth rate is low comparing to the number of deaths [7]. The studies conducted in Romania

described: 219,483 births (10.2‰) in 2006, 214,728 births (10‰) in 2007 and 221,900 births (10.3‰) in 2009. In Mureş county, the numbers of births are: 6392 (10.9‰) in 2006, 6307 (10.8‰) in 2007 and 6670 (11.5‰) in 2008 [9].

WHO, notorious for promoting the 'one death one disease' concept through the Global Burden of Disease literature, acknowledges that in children malnutrition is associated with over half the number of deaths in each of the major categories and is by implication, an important contributory factor [8]. Malnutrition increases the risk of pneumonia, persistent diarrhea, and dysentery and the likelihood of a fatal outcome [3].

According to UNICEF, most child deaths (and 70% in developing countries) result from one the following five causes or a combination thereof:

- ▶ acute respiratory infections
- ▶ diarrhea
- ▶ measles
- ▶ malaria
- ▶ malnutrition

Probably the reducing number of deaths in summer is due to a better supervision by parents or because of the low number of respiratory diseases in this season. As in the rest

of the world, in our study, the respiratory causes of death of children prevailed.

An important element is the patient flow. In this paper we have seen how the access to a high standard therapy is hampered by lack of a direct circuit. It is absolutely necessary to organize in our hospital a service for selecting the ill children. After the proper selection, the ill children will be sent in the right place: at home, at hospital or intensive care unit.

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