



**“LUCIAN BLAGA” UNIVERSITY OF SIBIU
FACULTY OF MEDICINE**

**SUDDEN DEATH ROOT CAUSE IN FORENSIC
PRACTICE**

SUMMARY OF THE Ph.D THESIS

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Sudden death is both an area of major interest to medical research, a phenomenon of paramount importance for the entire field of public health, but also a social phenomenon, with serious consequences not only at individual level but at family, community and society level as well. If at society level, the impact of sudden death translates into estimable health and social costs, the social, emotional and financial long-term consequences are impossible to quantify.

According to the literature, sudden deaths represent 14% of global deaths and affect all age groups and all genders and can occur even in children, some of sudden deaths being avoidable deaths. Although the magnitude of this phenomenon is directly linked to the level of socio-economic development of a country, which influences the health system performance, worldwide, a significant proportion of sudden deaths remain hermetic in terms of their causality until autopsy. Given that avoidable deaths have been proposed as a measure of performance and quality of health care, we can say that the phenomenon of sudden death overcomes the possibilities of intervention of the current health system.

From the medical point of view, the phenomenon of sudden death is representative of a debate through the differences related to the nosological classification of the term itself, with a major impact on how the phenomenon is approached, statistically evaluated and reported. In the sense of most authors and of the Romanian medical schools, sudden death is understood from a broader perspective, as an epiphenomenon which includes all deaths that occurred secondary to a pathology with negative prognosis, and it has not been diagnosed only posthumously [18], including the cases in which a person dies at a given time, having a medical history or even in its absence. Unexpected deaths can occur in apparently healthy individuals or in individuals with a disease known and the condition does not explain the death. [22.29]

The gravity of the phenomenon of sudden death lies in its appearance in a person without any symptom/sign of illness, so death is in fact the first symptom of the disease. Due to lack of premonitory signs, candidates to sudden death do not benefit from any of the classical methods of prevention (primary, secondary, tertiary) addressed to population groups known to be at risk for various somatic or mental illness. Identification of population groups at risk of sudden death is essential in order to formulate early medical interventions. Also, by researching the

phenomenon at community level, significant variations in the causes of sudden deaths can be identified, which allow not only a global intervention, but also their focusing depending on the bio-psycho-social particularities of communities.

The literature offers variable data on sudden deaths in different parts of the world, data which is not supported by a unified and integrated methodology for monitoring and reporting, partly due to the nosological controversies. Research conducted in different regions approach sudden deaths through different study parameters, so that a holistic picture of the phenomenon is not possible. In Romania, the clinical and statistical data on the phenomenon is few and is obtained from research on specific groups (nonrandomized) and relatively low in number. However, the efforts of those addressing this phenomenon bringing their specific contribution to elucidate different epidemiological, clinical, pathophysiological effects is welcomed because these studies at community level allow developments and extrapolations at national level, as well as the connection to international studies.

The aim of research is to evaluate the clinical and epidemiological peculiarities of sudden death at community level with a view to identify the population groups at risk of sudden death.

Research objectives:

Objective I: The dynamic clinical and statistical characterization of the phenomenon of sudden death in Sibiu County.

Objective II: Clinical and epidemiological features of sudden cardiac deaths in Sibiu County.

Objective III: Clinical and epidemiological features of sudden non-cardiac deaths in Sibiu County.

This work observes the design of the traditional research in medical sciences, being composed of a general part and a special part which presents the results of the personal research.

The general part of the work comprises three chapters approaching sudden death in terms of nosological classification and epidemiological and physiopathological aspects (Chapter I). Chapters II and III present the clinical and statistical features of the two ethiopathogenetic classes: sudden cardiac death or sudden death of non-cardiac origin. Theory and practice notions in investigating sudden deaths were the result of a systematic review and meta-analysis of the critical apparatus composed of 166 reference titles, bringing together the most relevant publications related to the subject, 119 of which were communicated in the past decade.

The personal contributions part is structured in four chapters. The research is the result of an interdisciplinary cooperation, which has harnessed the health professionals' expertise of several clinical specialties from Sibiu Clinical County Emergency Hospital and the Forensic Service of Sibiu County.

General research methodology is presented in Chapter IV. The research is based on an observational study, the research method being the ambispective longitudinal epidemiological investigation (retrospective and prospective), with the full research of the study material. The study material was represented by a total of 3.134 forensic autopsies performed over a period of 10 years within the Forensic Service of Sibiu County.

Personal research design: Each research objective has been devoted a chapter which was structured according to the model of communicating medical research (Chapters V, VI, VII). Each pathological entity/class of diseases/disease was studied in relation to the following parameters: biographical data (gender, age, residence), annual frequency and dynamics, weight, place of death, seasonality and, where applicable, the amount of alcohol. There were presented the most relevant results identified that were discussed in the context of the data communicated by other researchers at European or global level, too.

Objective I: The dynamic clinical and statistical characterization of the phenomenon of sudden death in Sibiu County. The research has led to the following partial conclusions: In the casuistry of Forensic Service of Sibiu County, in the period 2006-2015, there have been conducted a number of 946 autopsies for sudden deaths (30.18% of all autopsies), the proportion of sudden deaths being about three times greater for males and two times higher among residents of urban areas, over 70% of these being due to cardiac pathologies. Annual distribution of deaths was relatively stable around the average of 95 sudden deaths /year. The peak incidence of sudden deaths was recorded in the age group between 50-59 years old, but in lower proportions, this phenomenon also affected children and adolescents (5% of sudden deaths). Over two thirds of sudden deaths occurred at home or in a hospital before any manoeuvre for the preservation of life to be performed. Most sudden deaths were recorded in the cold season (565 cases).

Objective II: Clinical and epidemiological features of sudden cardiac deaths in Sibiu County. Partial conclusions: The first rankings of mortality in sudden cardiac death were occupied by: acute myocardial infarction, hypertrophic cardiomyopathy/dilated and non-

traumatic rupture of the aorta. 80% of all sudden cardiac deaths were encountered in men, with about two thirds of them coming from urban areas with a high incidence (about three-quarters of cases) at the age of more than 50 years. 80% of deaths occurred before the units of pre-hospital medical assistance could intervene, with a maximum weight (36%) during the cold weather. In about one-third of sudden deaths secondary to cardiac pathologies, alcohol contents had a positive value. The annual distribution of sudden cardiac death showed an initial downward trend of deaths until the middle of the study period, followed by a growing trend in the second half thereof.

Among the causes of sudden deaths within the study group, the first ranking was represented by the acute myocardial infarction (72% of cases), followed by cardiomyopathy (24% of cases) and non-traumatic aortic rupture (4% of cases).

The maximum incidence of sudden deaths secondary to acute myocardial infarction (387 of 483 cases) were found in men, two thirds occurring in residents of urban areas, 75% occurring in people older than 50 years with a high frequency (38% of cases) during the cold season. Analysing the annual dynamics of sudden deaths due to coronary cause has revealed an upward trend during the period under study.

Cardiomyopathies occupy the second rank of mortality (24% of cases) among sudden cardiac deaths in the study group. Dilated cardiomyopathy, as one of the causes of sudden death, recorded a share significantly higher than the hypertrophic one (130 cases vs. 35), both having a maximum incidence (over half of cases) in men with an increased weight in the winter months (46% for hypertrophic cardiomyopathy, respectively 35% for the dilated cardiomyopathy). Hypertrophic cardiomyopathy share was highest in young adults (75% in the II-IV decades) and the weight of dilated cardiomyopathy in middle-aged adults (about 75% in the V-VII decades). The annual distribution of sudden deaths secondary to cardiomyopathies showed a progressively downward trend for both types of cardiomyopathy.

Among the causes of sudden cardiac death of the studied cases, the third ranking was occupied by non-traumatic aortic rupture (4% of cases). Sudden death secondary to non-traumatic aortic rupture had a maximum incidence (20 of 27 cases) in males with increased weight in urban areas (19 of 27 cases). All sudden deaths secondary to non-traumatic aortic rupture were found in people older than 50 years and the annual distribution of cases showed an upward trend in the studied group.

Objective III: Clinical and epidemiological features of sudden non-cardiac deaths in Sibiu County. Regarding sudden death of non-cardiac origin, the first rankings of mortality were occupied by digestive causes (39%), followed by the respiratory ones (32%), respectively, meningoencephalitis (27%).

Among the digestive causes of sudden deaths, from the analysed cases, the first ranking was occupied by acute pancreatitis (48%), followed by peptic ulcer (42%). 80% of deaths due to acute pancreatitis were recorded among men, with a preponderance of residents in urban areas (57%). Three quarters of sudden deaths secondary to acute pancreatitis have been recorded in people aged 30-59 years and in 51% of cases, alcohol value was positive. In the study group, a downward trend of sudden death secondary to acute pancreatitis secondary was recorded.

Three quarters of sudden deaths secondary to peptic ulcers were identified in men, with a maximum weight (57%) in urban areas. Two-thirds of sudden deaths due to peptic ulcer occurred in the population aged over 60, the same percentage being recorded in winter and spring months. Sudden deaths secondary to liver cirrhosis was found to be four times more common in males, with a maximum incidence (9 of 10 cases) in urban areas, half of them occurring in the summer season. All of sudden deaths due to liver cirrhosis, identified in our study belonged to 40-69 years age range, and in two thirds of cases, alcohol had positive values. There was noted a constant share of sudden deaths due to cirrhosis in recent years in the study group.

Among the respiratory causes of sudden death, of the analysed cases, the first ranking was represented by broncho-pulmonary infections (84%), followed by pulmonary thromboembolism (9%) and lung tuberculosis (7%).

Bronchopulmonary infections were twice as common in men compared to women with an increased incidence in the autumn (36%) and summer (31%), with an approximately equal distribution by residence, but with a slight predominance of urban area (60%). 41% of patients who died suddenly due to bronchopulmonary infections were represented by children aged 0 to 9 years. Annual distribution of sudden death secondary to pulmonary infections, in the studied casuistry, showed a roughly constant share (9%) of them throughout the study.

Deaths secondary to pulmonary thromboembolism had a considerable share in females (7 out of 8 cases), with the same number of cases occurring in the winter months, with a maximum incidence (6 of 8 cases) in the eighth decade of age. The results of this study confirm the downward global trend of sudden death due to pulmonary thromboembolism.

In our study, all of sudden deaths due to TB were recorded among males (6 cases), with a total of five of the six cases in the age range 20-49 years; 4 of 6 sudden deaths secondary to TB occurred in the hot season.

Among the meningoencephalic causes of sudden deaths, the only cause identified in the studied cases was the stroke (73 cases).

58% of sudden deaths consecutive to stroke were met in males with three quarters of cases in urban residents. The age decade of 70-79 years recorded the highest rate of sudden death from stroke, namely twice the number of cases registered in each of the previous decades. Winter and spring seasons were holding more than two-thirds of sudden deaths due to cerebrovascular disease. Distribution by years of sudden deaths secondary to stroke revealed a peak incidence in the middle of the study period, with relatively stable values in the remaining period.

Conclusions:

The end of the paper outlines the **novelty** brought by the research, being one of the few studies on sudden death in Romania and the only one that attempts to correlate the clinical and statistical results with the vulnerability of a given population group. It is a pilot study that attempts to substantiate a hypothesis based on clinical and statistical observations. The research may be continued, developed and connected to the pan-European research, providing a country profile that will contribute to understanding the phenomenon and its peculiarities in various regions of Europe and the world.

The research can be applied at county, regional, national level, which would enable a comparison of the results achieved among different study communities and to extrapolate the conclusions for a community and national profile. Research findings may provide a foundation for protocols and practice guidelines with a view to identify and effectively monitoring the risk groups, as well as for primary, secondary and tertiary prevention strategies. The study can be developed through the research of more parameters and validated by statistical analysis, so as to provide a solid database for monitoring the phenomenon.

The research carried out has some objective and subjective limits: the real weight of sudden death, according to the definition of sudden death agreed by most authors and applied in the present study, may be higher than that identified, due to the fact that some sudden deaths for which the general practitioner has issued the Certificate of the Fact of Death had not undergone

autopsy, so they were not included in the study group; on the other hand, some cases of sudden death occurred in patients with pre-existing somatic pathology, but unknown to the patient or his entourage were included in the study group and were considered unexpected/unexplained due to the lack of access to medical history (medical records, accounts of entourage).

Doctoral research results were disseminated through four scientific papers published in journals indexed in IDB.