

FORENSIC AND EPIDEMIOLOGICAL RESEARCH OF LETHAL TRAUMATISM CAUSED BY ATMOSPHERIC ELECTRICITY IN THE DISTRICT OF VARNA

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Summary. World literature describes single cases or small series of cases on this topic. In spite of our meticulous search through literature, we did not find references to such cases in Bulgaria, including the district of Varna. These circumstances initiated our research. Our purpose was to present the forensic and epidemiological characteristics of the victims of atmospheric electricity (VAE) in the district of Varna. Subject of this study were 27 death cases caused by atmospheric electricity. The data had been put to alternative- (mean \pm SEM), variation- (Student t test) and graphical analysis. The calculations had been made by statistical software (SPSS 11.0). The building of a linear trend had been accomplished by the method of the least squares. Values of $P < 0.05$ had been accepted as significant. VAE account for 9.71% of all death cases resulting from atmospheric electricity and represent 0,16% of all forensic medical autopsies, or 0.13 per average 100 000 residents of the district of Varna of average age 42.22 years. Out of these males account for 92.59% or 0,126 per 100 000. Their average age was 39.44 years. Females account for 7.41% or 0.01 per 100 000. Their average age was 50 years. Children and adolescents aged between 0 and 17 account for a total of 22.22% out of which 100% were boys of average age 13.83 years. The research of circumstances at which the lethal end appeared revealed that in 92.59 % of the cases the death was not connected with the exercising of occupational activities; in 7.41% of the cases, the death resulted from accidents at work.

Key words: lightning, death-rate, epidemiology, district of Varna

Burns caused by atmospheric electricity affect annually between 800 and 1000 persons [7]. Contact between lightning and human body can be described as a reaction between atmospheric electricity of ex-

tremely high charge and human body. World literature describes single cases or small series of cases. In spite of our meticulous search through literature, we did not find references to such cases in Bulgaria, including the district of Varna. These circumstances served as a direct cause for the conducting of our research.

Purpose:

Our purpose is to present the forensic and epidemiological characteristics of the victims of atmospheric electricity (VAE) in the district of Varna.

MATERIALS AND METHODS

The forensic medical documentation of 16780 autopsies made in the Department of Forensic Medicine and Deontology at the Medical University of Varna through the period 1965-2006 has been studied. Out of these 278 deaths caused by electrical current (EC) were found. Subject of this study are 27 death cases caused by atmospheric electricity. The data have been put to alternative- (mean \pm SEM), variation- (Student t test) and graphical analysis. The calculations have been made by statistical software (SPSS 11.0). Values of $P < 0.05$ have been accepted as significant data. The building of a linear trend has been accomplished by the method of the least squares.

RESULTS

VAE account for $9.71 \pm 3.48\%$ of all death cases resulting from atmospheric electricity (AE) and represent $0.16\% \pm 0.06\%$ of all forensic medical autopsies.

The distribution of VAE through the 40-year period of the study varies strongly. In individual years, it is within 0 to 5 cases and the linear trend shows an insignificant descending trend (fig. 1).

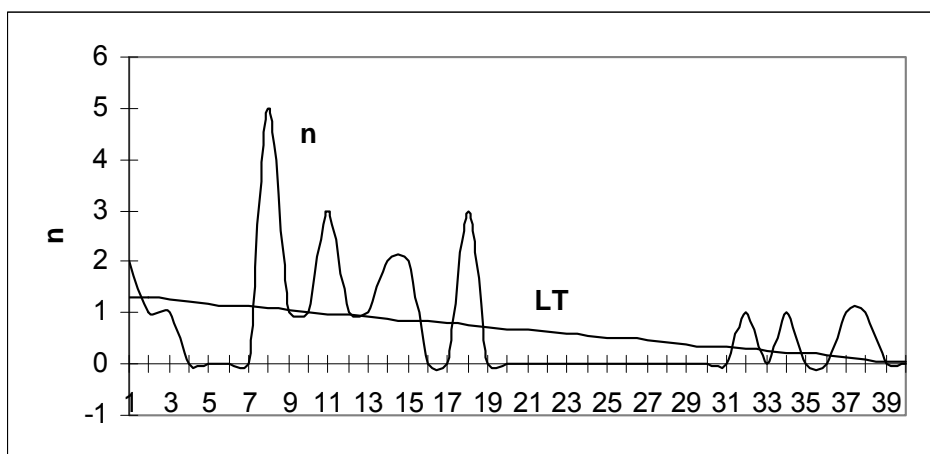


Fig. 1. Distribution of the number of victims (n) through the studied period and their linear trend (LT)

The total average annual number of Varna district residents was 495 056 for the studied period. VAE are 27, which makes an average of 0.65 per year, thus representing 0.13 per 100 000 residents for the district of average age 42.22 ± 11.58 (SD=21.48) years. Out of these males were 25 ($92.59 \pm 9.88\%$) at an average annual number of 0.625 or 0.126 per 100 000. Their average age was 39.44 ± 12.02 (SD=21.48) years. Females were only 2 ($7.41 \pm 9.88\%$) at an average annual number of 0.05 or 0.01 per 100 000. Their average age was 50 ± 12.02 (SD=21.83) years. The difference between the relative share of males/females is significant ($t=4.43$, $p< 0.001$) (fig. 2).

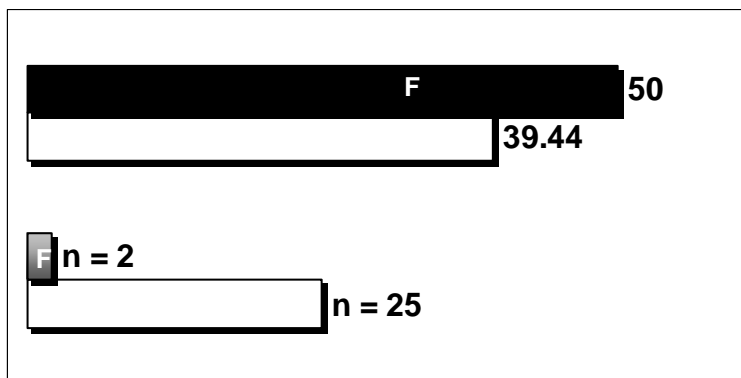


Fig. 2. Average age and number of victims by gender

Children and adolescents between 0 and 17 years old were 6 ($22.22 \pm 15.68\%$), out of which 100% were boys of average age 13.83 ± 24.16 (SD=21.06) years.

The research of circumstances at which the lethal end appeared revealed that in 25 (92.59 ± 9.88) of the cases the death was not connected with the exercising of occupational activities; and only in 2 ($7.41 \pm 9.88\%$) cases the death was a result of accident at work; the differences in relative share are statistically significant ($t = 4.43$, $p< 0.001$) (fig.3).

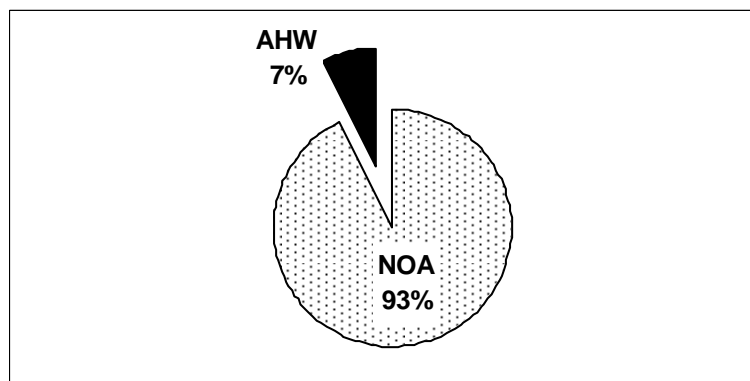


Fig. 3. Relative share of death cases, which are not connected with occupational activities (NOA) and accidents at work (ATW)

DISCUSSION

Data about the number of lightning-struck victims worldwide are rather controversial. Annually 1000-1500 persons worldwide receive burns inflicted by lightning [2], while in one studied area the authors [11] observe 1000 VAE. Totally different are the data reported by [6] according to which 1318 persons died by lightning in the USA in the period from 1980 to 1995. Most compromising are the research results according to which death caused by lightning is infrequent and varies between 0.2 and 0.8 per 1 000 000 per year [4]

With regard to the deaths per 100 000 residents per year, our result of 0.13 differs from the results presented by other authors [1] where this index has been calculated to be 0.023 per 100 000 residents per year.

17 (2.43%) electrical shocks have been caused by lightning out of 700. Death rate is highest in these cases (17.6%) [3] According to another clinical study, in 4% of the cases present are symptoms of injuries caused by electricity. In 98% of the cases, the victims are males of average age 27.5 years old. [10] According to others, the average age of victims is 32.9 years old [4]. While comparing our data (9.71%) to the data quoted by other authors, we find that the lightning victims are 1.7 times less compared to the results quoted by [3], and as regards the relative share of males, our results (92.59%) are by 5.41% lower than the results cited by [10] and by 13.59% higher than the data quoted in forensic medical studies [5] 79%. The average age of victims according to our data is 39.44 ± 12.02 years, which is by 11.94 lower than [10]; by 6.54 years lower than [4], and the value of 6.8 was obtained in a similar manner upon the forensic medical material [5], which falls within the limits of the statistical error obtained by us. This research, as well as the other quoted studies, finds that there are differences of age and gender between VAE. Beyond doubt, this circumstance is accounted for by the risky behaviour of young men as well as other factors still unknown at this date.

CONCLUSIONS

VAE account for 9.71% of all death cases resulting from atmospheric electricity (AE) and for 0.16% of all forensic medical autopsies and occur at frequency of 0.13 per 100 000 average number of residents in the district per year.

The distribution of VAE over the studied period of 40 years is rather uneven.

Males of average age of 41.58 years old prevail among the number of lightning victims.

Accidents at work occupy only a small relative share.

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