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**Czynniki wpływające na przeżycie pacjentów  
z nagłym zatrzymaniem krążenia**

Factors affecting the survival of patients  
with sudden cardiac arrest

**Rozprawa doktorska na stopień doktora w dziedzinie nauk  
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## Abstract

### Factors affecting the survival of patients with sudden cardiac arrest

**Background:** Nowadays, sudden cardiac arrest (SCA) remains one of the leading causes of death. Poor nutritional status, including malnutrition and obesity, can increase the risk of mortality after SCA. In addition, there are a number of factors affecting the return of spontaneous circulation (ROSC) in patients after out-of-hospital cardiac arrest (OHCA), and obesity may be one of them. Therefore, there is a need for further well-designed and qualitative studies feeding into clinical recommendations.

**Aims:** The main objective of the research project was the complementary analysis of factors affecting the survival of patients with SCA in the in-hospital (IHCA) and out-of-hospital (OHCA) settings. The specific objective of the first study was to evaluate the association between certain components of nutritional status and in-hospital mortality in patients admitted to the intensive care unit (ICU) for IHCA or OHCA as well as to evaluate the association between survival and body mass index (BMI), risk of malnutrition and high risk of malnutrition according to the NRS 2002 scale. In turn, the specific aim of the second study was to assess the effect of obesity on the return of ROSC in patients after OHCA.

**Material and methods:** The first study involved a retrospective examination and analysis of the medical records of 161 patients admitted to the ICU of the University Clinical Hospital in Wrocław. The patients included in the study were adults and were admitted to the ICU for SCA not due to excessive trauma. Data were collected on length of hospitalization, BMI, NRS 2002, comorbidities and laboratory tests. The second study also retrospectively analyzed 4,925,214 emergency medical system (EMS) records in Poland to include 33,636 patients with OHCA. Patients in whom OHCA occurred due to crime, suicide, trauma, or when death occurred before the arrival of the emergency medical team, or when the OHCA-initiating rhythm was not recorded, were excluded from the study. After selecting patients with and without obesity, age, gender, OHCA initiating rhythm, OHCA event site, and information on the presence of comorbidities (DM, HT, HF, ACS, stroke) were analyzed. This research project was approved by the Bioethics Committee of the Medical University of Wrocław (KB-776/2022). The study was conducted in accordance with the principles of the Declaration of Helsinki. The study protocol followed the reporting guidelines for STROBE observational studies.

**Results:** Within the first study, there were no significant differences in BMI and NRS 2002 values between non-survivors and survivors. Non-survivors had significantly lower albumin ( $p = 0.017$ ) and total cholesterol ( $p = 0.015$ ). In multivariate analysis, BMI and NRS 2002 scores were not per se associated with in-hospital mortality defined as the probability of death

(Model 1:  $p = 0.700$ ,  $p = 0.430$ ; Model 2:  $p = 0.576$ ,  $p = 0.599$ ). Univariate analysis showed significant associations between risk ratio (HR) and triglyceride ( $p = 0.017$ , HR: 0.23) and high-sensitivity C-reactive protein (hsCRP) levels ( $p = 0.018$ , HR: 0.34). In multivariate analysis, the risk of mortality over time was influenced by higher scores in parameters such as BMI (HR = 0.164;  $p = 0.048$ ) and hsCRP (HR = 1.006,  $p = 0.002$ ). According to the results of the second paper, univariate analysis confirmed the association between ROSC and age ( $p < 0.001$ , OR: 0.981), incident location – public place ( $p < 0.001$ , OR: 1.601), OHCA initial rhythm ( $p < 0.001$ , OR: 2.065), obesity ( $p = 0.003$ , OR: 1.1.06) and comorbidities such as HT ( $p < 0.001$ , OR: 0.970) and ACS ( $p < 0.001$ , OR: 1.153). In the first multivariate model for the entire population, significant predictors of ROSC were initial asystole / PEA rhythm ( $p < 0.001$ , OR: 0.516), age ( $p < 0.001$ , OR: 0.986), incident location – public place ( $p < 0.001$ , OR: 1.468) and obesity ( $p = 0.023$ , OR: 0.924). In the second model for patients without obesity, significant predictors of ROSC ( $p < 0.001$ ) were initial asystole / PEA rhythm (OR: 0.263), incident location – public place (OR: 2.158) and age (OR: 0.986). In the third model for obese patients, the significant predictors of ROSC were initial asystole / PEA rhythm ( $p = 0.02$ , OR: 0.443), age (OR: 0.981) and history of stroke ( $p = 0.005$ , OR: 2.047).

**Conclusions:** After completing the study, the first publication found that BMI and NRS 2002 independently and independently of the entire study group did not change the risk of mortality in patients admitted to the ICU for IHCA and OHCA. The risk of in-hospital mortality increased with increasing BMI, but not with increasing NRS 2002. In contrast, the main findings of the second article in the study population of OHCA patients confirm that obesity significantly affects the probability of pre-hospital ROSC, reducing it by 8.2%. In the entire study population and in the groups of patients with and without obesity, OHCA in public places and initial rhythm of VF / pVT were predictors of increased odds of ROSC, in contrast to older age, which reduced these chances.

**Key words:** sudden cardiac arrest (SCA), out-of-hospital cardiac (OHCA) arrest, in-hospital cardiac arrest (IHCA), obesity, mortality; body mass index (BMI), intensive care unit (ICU), return of spontaneous circulation (ROSC), cardiopulmonary resuscitation (CPR), observational study, retrospective analysis.