SUMMARY

The Impact of selected Individual, effort-related, and functional factors on the effectiveness of Water Rescue Procedures and Cardiopulmonary Resuscitation

Keywords: effectiveness of water rescue, respiratory muscle fatigue, cardiopulmonary resuscitation (CPR)

Introduction: It is important to emphasize that drowning is classified by the World Health Organization (WHO) as a preventable cause of death through preventive measures (WHO 2012). Analyzing the current state of knowledge about drowning and its determinants in Poland, it still appears to be insufficient, as evidenced by the minimal number of publications dedicated to the epidemiological analysis of these events. Some studies, whose results verified knowledge and skills in cardiopulmonary resuscitation, have shown that knowledge regarding life-threatening situations can sometimes be forgotten, and practical skills may lose their effectiveness (Roppolo et al. 2007, Woollard et al. 2006).

Purpose of research: The primary objective of this study is to assess the effectiveness of water rescue operations and cardiopulmonary resuscitation (CPR) procedures under the influence of selected individual, effort-related, and functional factors.

Material and method: The study included 5 professional groups of water rescuers, comprising 78 individuals, representatives of uniformed services, among whom 15 belonged to the Water Rescue Volunteer Service (WR WOPR), 17 to GROM, 16 to BOA, 15 to the Mountain Volunteer Search and Rescue Service (GOPR), and another 15 to the Fire Department (STRAŻ), taking into account only males aged 20–30, 30–40, and 40–50 years. The effectiveness of CPR procedures and water rescue operations was assessed twice – both before the rescue operation (rescuer rested) and after (rescuer fatigued) – sing the Ambu MAN W manikin with the program and training set Ambu Defib Trainer W (Wireless). Additionally, spirometric tests were conducted twice (rescuer rested and fatigued) to evaluate the level of respiratory muscle fatigue (IMF) using a wireless diagnostic spirometer, the Micro Loop, with associated software and diagnostic equipment (reusable adapter for single-use mouthpieces, nose clip, connection to a laptop). The following rescue tests were applied in the study, corresponding to the established parameters determining the intensity of effort in the water: 50 m rescue method – supramaximal effort intensity, 75 m water rescue operation – maximal effort intensity, 100 m freestyle – submaximal effort intensity, 400 m freestyle – moderate effort intensity, 600 m rescue run – low effort intensity.

Results and conclusion: The results of the study clearly show that the intensity of physical exertion has a significant impact on the effectiveness of cardiopulmonary resuscitation (CPR) and the functioning of rescuers' respiratory muscles. Significant changes were observed in key parameters such as minute ventilation (VmV), ventilation index (IV), breathing rate (VR), tidal volume (VV), and the time of effective chest compressions (ECCR) after physical exertion. These changes were noted both in the overall group of participants and in the individual rescue groups. Younger rescuers (aged 20–30) exhibited greater variability in parameters after exertion but were able to maintain higher CPR effectiveness despite fatigue. The older age groups (41–50) had difficulty maintaining precision and quality in CPR, suggesting the need for individualized training programs based on age.