



COMPARISON OF CHLORAMINE CONCENTRATION IN SWIMMING POOL WATER DEPENDING ON FUNCTION OF SWIMMING POOL

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The primary purpose of this paper is to present the distribution of chloramines concentrations (monochloramine and dichloramine) in the pool water, depending on the function of the pool (sports pool, paddling pool, pool with hydromassage and water tunnel). Analysis of the results of research takes into account the swimming pool water treatment systems, exploitation parameters and the number of people bathing. Comparison of parameters (physical, chemical and bacteriological) defining the quality of the pool water, with particular emphasis on the chloramines concentrations, allows to assess the efficiency of the treatment system and the usefulness of the water to swim and bath in relation to the DIN 19643 standards.

Characteristics of tested swimming pools

Analyzed object includes: sports pool (BS), recreational pool (BR), 2 baths with hydro massage jets filled with fresh water (WSK), 2 filled with sea water (WSŁ) and the water tunnel (TW). The object has five water treatment circuits, each for a pool of a different function. Water treatment is performed in the system as presented in Fig. 1.

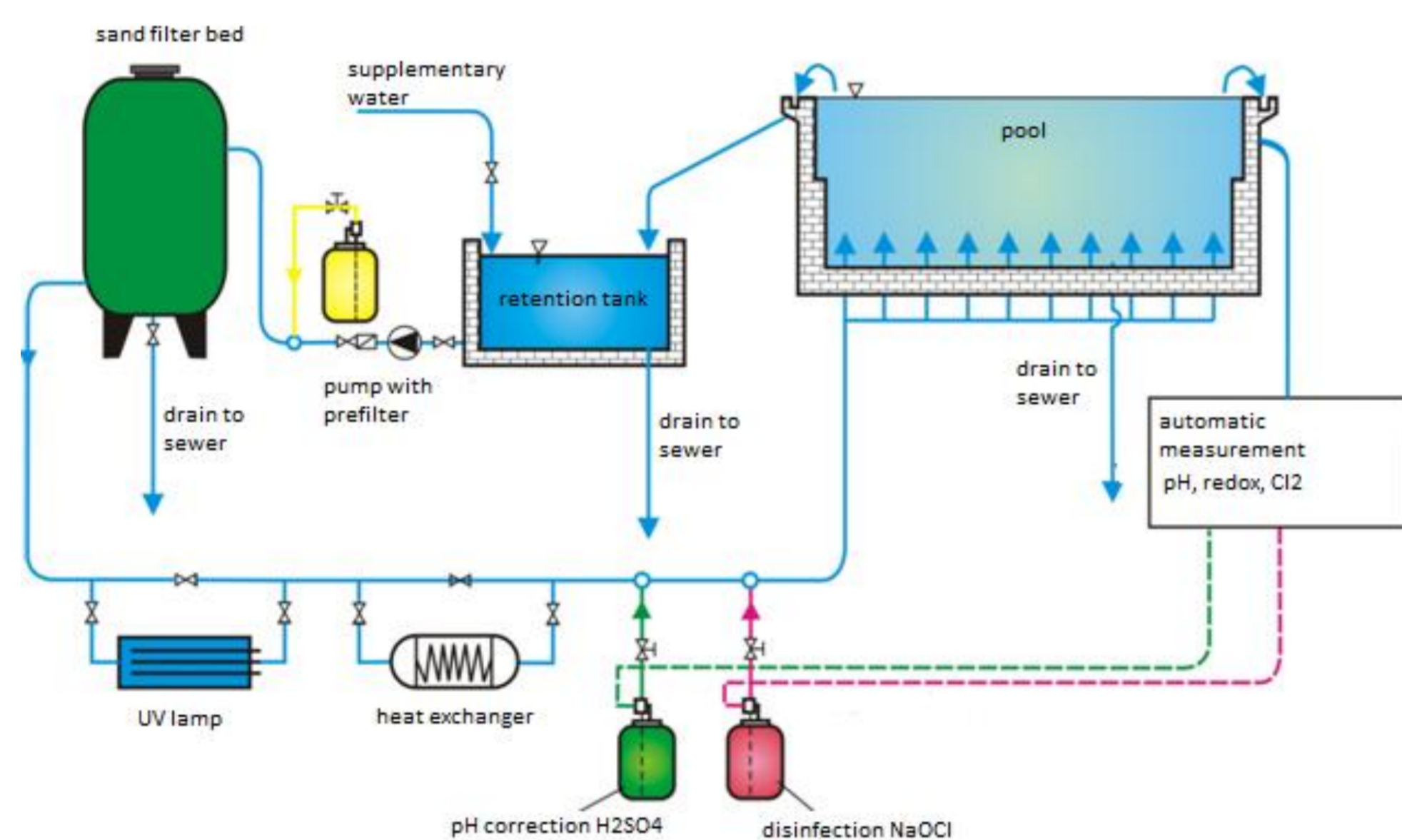


Fig. 1. Pool water treatment system

- The comparison of the content of chloramines in tested pools showed that the used disinfection system does not guarantee the maintenance of chloramines at concentrations $\leq 0,2 \text{ mgCl}_2/\text{dm}^3$.
- Varied doses of sodium hypochlorite (Fig. 2) did not reduce chloramines significantly. E.g.: in pools WSK and WSŁ, despite high concentrations of free chlorine ($0,40\text{-}0,75 \text{ mgCl}_2/\text{dm}^3$) in all the samples content of chloramines were obtained far above $0,2 \text{ mgCl}_2/\text{dm}^3$.
- The lowest concentration of chloramines ($0,12\text{-}0,31 \text{ mgCl}_2/\text{dm}^3$) was found in the water from TW, where contact bathers - water was the shortest (about 1 min.), and the highest in the WSK ($0,36\text{-}0,79 \text{ mgCl}_2/\text{dm}^3$), and WSŁ ($0,33\text{-}0,49 \text{ mgCl}_2/\text{dm}^3$), where the bathers use relatively small volumes of water in a relatively short time (approx. 10-15 minutes) – Fig. 3.
- The wide variation in the content of chloramines was observed in pools BS and BR. In BS pool with a large capacity (562 m^3) and time of the exchange of water approx. 3,6 hours with an average content of chloramines $0,47 \text{ mgCl}_2/\text{dm}^3$. In BR pool with small capacity ($86,6 \text{ m}^3$) and time of the exchange of water approx. 0,5 hours with an average content of chloramines $0,25 \text{ mgCl}_2/\text{dm}^3$ (Fig. 3).
- In 12 samples higher concentrations of monochloramine was shown and in 16 samples higher concentrations of dichloramine. In case of WSK and WSŁ much higher concentrations of dichloramine than monochloramine was observed (Fig. 4).

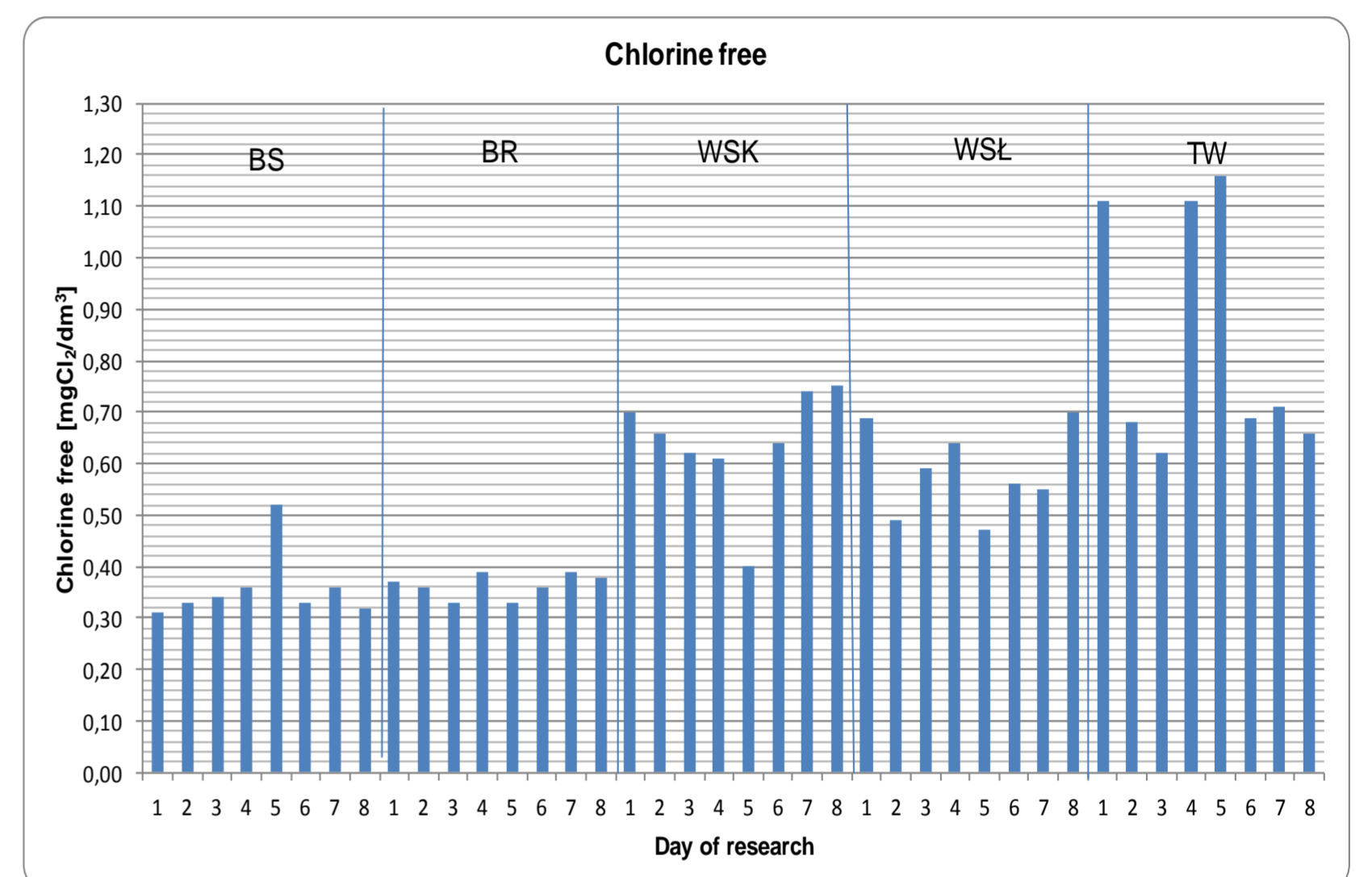


Fig. 2. Distribution of the free chlorine content

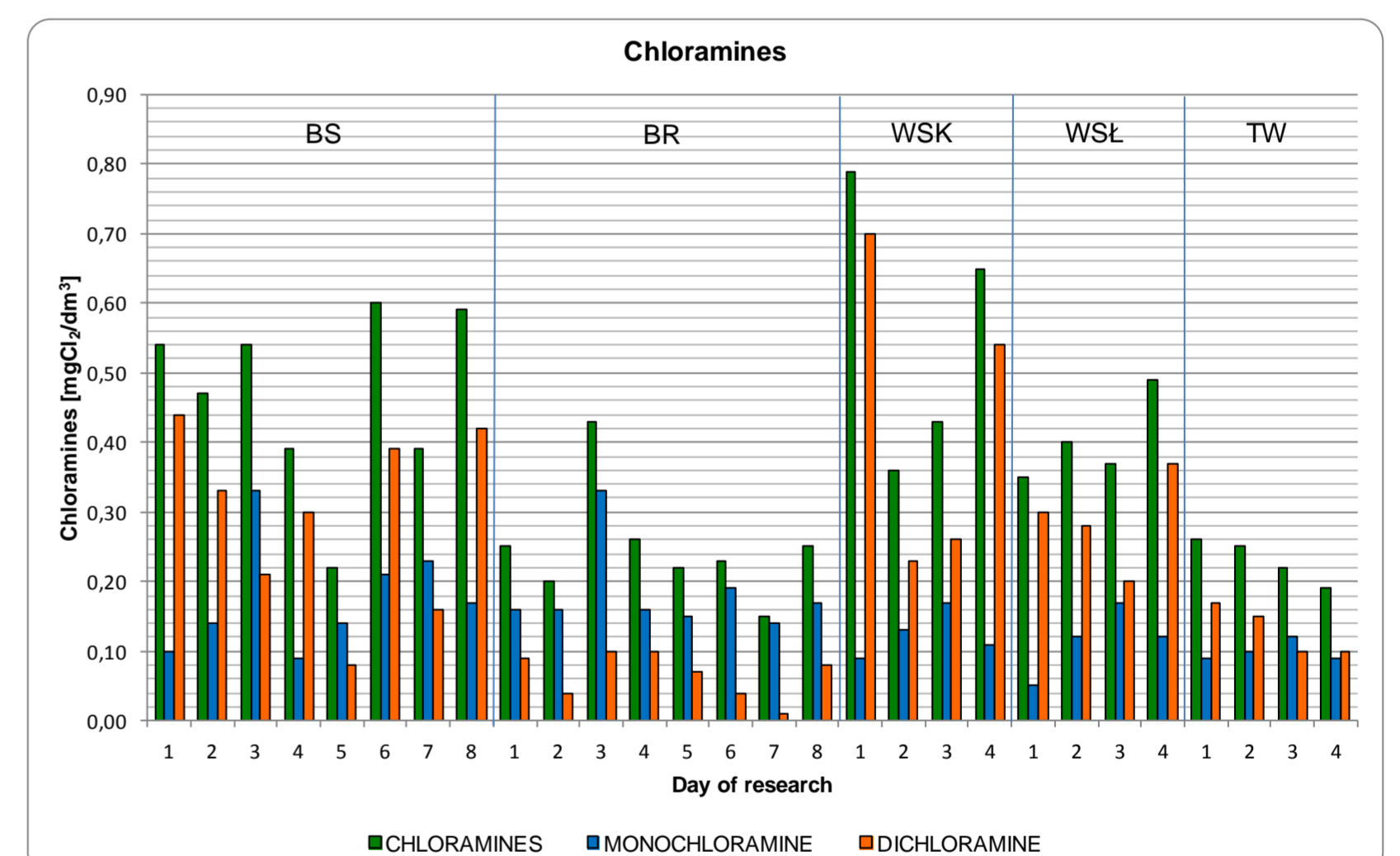


Fig. 3. Distribution of the chloramines content

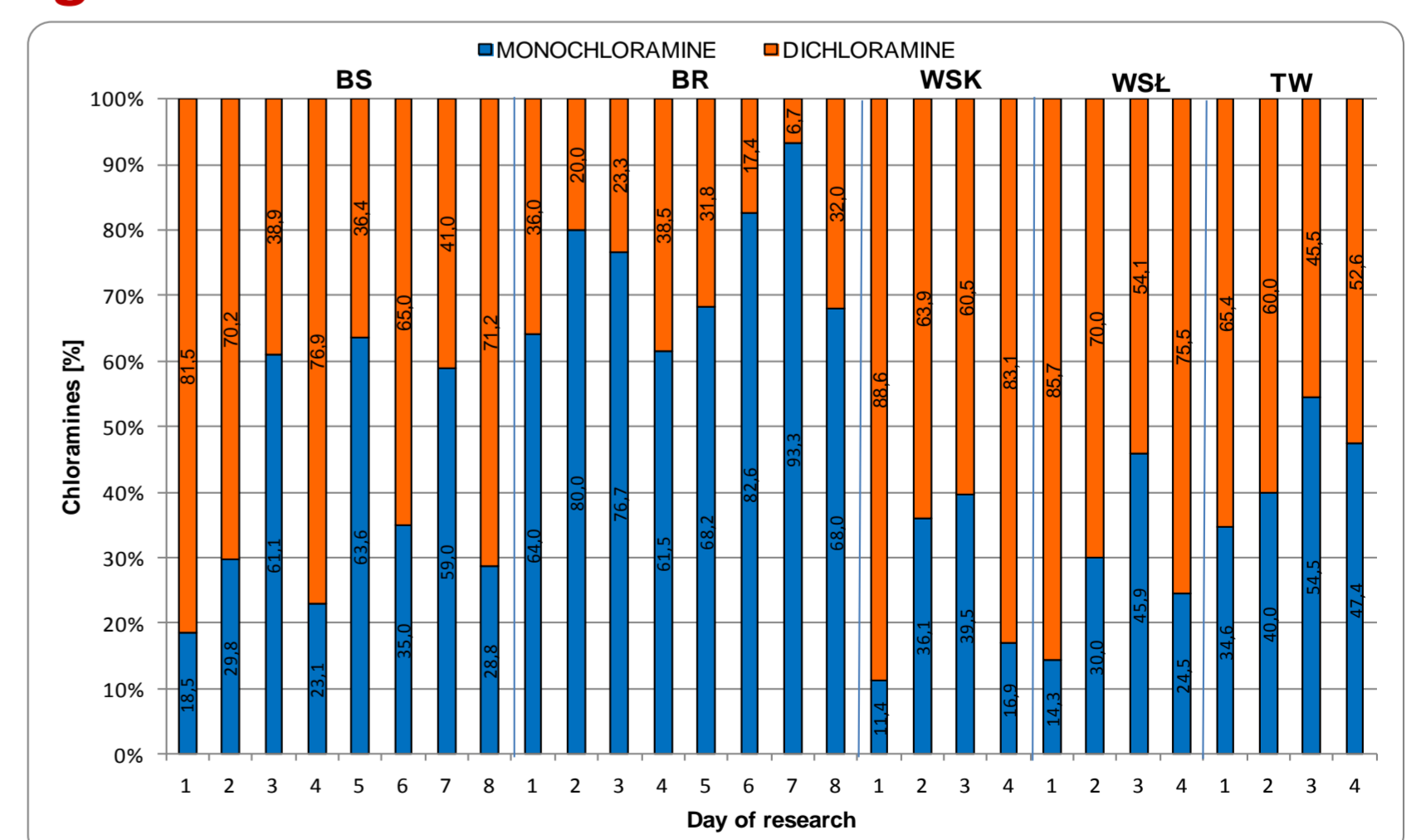


Fig. 4. Percentage of mono- and di-chloramine in the total content of chloramines

Conclusion: It was found that the function of the pool - always associated with attendance factor, the surface of the water, the capacity of the pool and the intensity of its use - has an important impact on the content of chloramines in the water.