Application of multivariate analytical methods in assessment of factors responsible for waterborne Kashin-Beck disease in Sichuan, China

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Abstract This study investigates the relationship between water chemistry and Kashin-Beck disease (KBD) within the Ruo’ergai County of Sichuan Province using multivariate statistical techniques. A total of 38 groundwater and surface water samples were collected in 2008. The data sets obtained were processed using Principal Component Analysis (PCA) and Factor Analysis (FA). The results indicate four factors for major constituents in groundwater that accounted for 91.2% of the variance in the data set. In surface water, five factors accounted for 89.9% of the total variance. Regression analysis of the KBD prevalence and factor scores reflect the relationship between the factors and the Kashin-Beck disease. Combined with the geological and hydrological evidence, it can be concluded that the major reasons for the occurrence of Kashin-Beck disease in the study area are the relatively low concentrations of F, P, Mn, and Se in drinking water. These low concentrations are greatly related to the acid and reduced environment caused by the organic matter.

Key words groundwater/surface water quality; multivariate analytical method; Kashin-Beck disease; Sichuan, China