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ADVANCED STATISTICAL TECHNIQUES FOR HEMATOLOGICAL DATA

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ABSTRACT

Hematologic diseases comprise a diverse set of disorders affecting the cellular components of the blood, including leukemias, lymphomas, myelomas and myelodysplastic syndromes, among others. These diseases significantly impact the physical, emotional, and social well-being of patients, requiring comprehensive care that combines biomedical treatment with emotional support and access to reliable information. This study presents an applied research project, developed through a Service-Learning experience, in which university students analyzed clinical and psychosocial data of hematological patients and their caregivers provided by the association AELCLÉS (Spanish Network of Entities Against Leukemia and Blood Diseases). This association is a non-profit group that was created from a group of entities related to blood diseases, in order to help restore the health of people affected by oncohematological diseases and support their families and caregivers. In order to make leukemia and other hematological diseases more visible, and to raise public awareness of the importance of blood, bone marrow and umbilical cord blood donation, a structured survey was passed to patients and caregivers to collect key information about their clinical situation, the emotional impact they experience, the support resources available to them and their unmet needs, with the ultimate goal of designing actions to improve their quality of life and strengthen the psychosocial support network.

The database, which includes 234 records and 60 variables related to sociodemographic, clinical, emotional and behavioral aspects, was cleaned and analyzed by students of different degrees under academic supervision. First-year statistics students were in charge of data cleaning and preparation. The statistical analyses were distributed according to academic profile: Engineering students applied descriptive techniques to characterize the sample; second-year Labor Relations students carried out inferential tests to identify significant differences and relationships between variables; finally, fourth-year Statistics students developed multivariate analyses, highlighting Multiple Correspondence Analysis (MCA) and logistic biplots, which allowed the identification of relevant associations between clinical and emotional variables. The analyses were performed with statistical software such as R, Python and SPSS.

The results revealed a greater representation of women in the sample, with an age distribution covering a wide range of ages. There were differences between sexes in the perception of immunological status and in the manifestation of emotional sequelae. Likewise, territorial variations in the prevalence of the different hematological diagnoses were observed. Multivariate analyses made it possible to identify key variables and explore the interrelationships in the data set, thus contributing to a better understanding for the possible personalization of therapeutic interventions and the strengthening of psychosocial support. This experience highlights the potential of Service-Learning to integrate

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rigorous technical training with the generation of applied knowledge of high social value, promoting scientific competencies and ethical commitment in students.

***K*eywords** Hematological diseases · Service-Learning · Statistical analysis · Multivariate analysis · Patient profile · Psychosocial care

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