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Alkaline phosphatase determinants of liver patients

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Objectives: Alkaline phosphatase is a well-known biomarker of liver disease. The article attempts to locate the determinants of alkaline phosphatase of some liver patients.

Background: Many previous research reports have considered alkaline phosphatase (ALP) as a continuous, homogeneous and Normally distributed response variable. In practice, ALP is positive, heterogeneous and non-Normally distributed response variable. There is a little study considering the real fact that the ALP as a non-Normal, heterogeneous and positive response variable.

Materials and Methods: The current report considers a real data set of 579 subjects with 9 continuous variables and 2 attribute characters. The considered data set was obtained from the North-East of Andhra Pradesh, India. The considered response ALP is positive, heterogeneous and non-Normally distributed continuous variable. So, it should be analyzed using statistical joint generalized linear Gamma or Log-normal models.

Results: The mean alkaline phosphatase (ALP) value is higher for the liver patients ($P<0.001$) than non-liver patients. The mean ALP value is high at senior ages ($P=0.030$) than the junior ages. The mean ALP decreases as the total bilirubin (TB) ($P=0.006$) increases, while it increases as the SGPT ($P<0.001$) increases. The mean ALP decreases as the albumin to globulin ratio (A/G) ($P<0.001$) increases. Interaction effect of age with total bilirubin (TB) (Age*TB) ($P<0.001$) is directly correlated with the mean ALP, while the joint interaction factor of age with total proteins (TP) (Age*TP) ($P=0.010$) is inversely correlated with the mean ALP. Again, the interaction effects of albumin to globulin ratio (A/G) with the total bilirubin (TB) (A/G*TB) ($P<0.001$) and with total proteins (TP) (A/G*TP) ($P=0.003$) are directly correlated with the mean ALP. The variance of ALP is higher for liver patients ($P<0.001$) than non-liver patients. The variance of ALP increases as the SGPT ($P<0.001$), or total bilirubin (TB) ($P=0.088$) increases. The variance of ALP increases as the albumin to globulin ratio (A/G) ($P<0.001$), or age ($P=0.055$) decreases.

Conclusions: The response alkaline phosphatase (ALP) is identified as heterogeneous and Lognormally distributed. Many factors such as age, SGPT, interaction effects of albumin to globulin ratio with total bilirubin and separately with total proteins and also the interaction effect of age with total bilirubin are directly correlated with the mean ALP. The present findings, especially the interaction effects and the variance determinants of ALP are completely new inputs in the liver disease literature.

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