

Predicting diabetic neuropathy risk level using artificial neural network based on clinical history of subjects with diabetes.

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Aim: To develop a patient-specific intelligent tool for predicting risk levels of diabetic neuropathy depending on the risk factors.

Methods: Vibration perception threshold (VPT) measured using a Neurothesiometer to identify the level of diabetic neuropathy and potential VPT predictors were obtained from a clinical database (n = 5088). A regression model was used to identify significant predictors of VPT. Predictors were linearised using a Box-Cox transformation, and VPT was log transformed to reduce skewness. To provide data with properties similar to the patient data but with improved precision, 4159 cases were simulated with patient means and covariance's but with reduced standard errors. A Neural Network based on a Proportional Odds Model (NNPOM) was trained using the patient data set as well as the simulated patient data set where VPT in Volts (V) was encoded into three categories low risk (0 to 20.99 V), medium risk (21 to 30.99 V) and high risk (≥ 31 V).

Results: Age, height, weight, HbA1c, cholesterol and duration of diabetes were identified as the major risk factors of diabetic neuropathy. The proposed method was applied for the prediction of VPT risk categories. The NNPOM achieved an accuracy of 54 % on real patient data and 68 % on simulated patient data.

Conclusion: The results show that increased predictor precision improves classification success. Using this neural network trained model, risk assessment tool was developed for VPT prediction with moderate accuracy in terms of diabetic neuropathy risk levels based on clinical history of the subject.