

# Applying an artificial neural network to predict osteoporosis in the elderly.

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## Abstract

Osteoporosis is an essential index of health and economics in every country. Recognizing asymptomatic elderly population with high risks of osteoporosis remains a difficult challenge. For this purpose, we developed and validated an artificial neural network (ANN) to identify the osteoporotic subjects in the elderly. The study population consisted of 1403 elderly adults (mean age 63.50 +/- 0.24 years ranged from 50 to 91 years old, 157 male and 1246 female) randomly selected into 3 sets, 703 participants in training set, 350 participants in selection set, and the remaining 350 participants in test set. The input variables included demographic characteristics, anthropometric measurements, and clinical data. The outcome variable was dichotomous, either non-osteoporotic (T-score of greater than -2.5) or osteoporotic (T-score of -2.5 or less) groups classified by the measurement from dual energy X-ray absorptiometry. ANN was constructed with data from training and selection sets and validated in test set whose outcome variable was unknown to the network. The performance of ANN was evaluated by discrimination and calibration simultaneously. After training processes, the final best ANN was a multilayer perceptron network which determined seven input variables (gender, age, weight, height, body mass index, postmenopausal status, and coffee consumption) as significant features. The discriminatory power of ANN for test set was excellent (area under receiver operating characteristics curve = 0.82 +/- 0.03). ANN also had statistically good fit represented by statistically insignificant Hosmer-Lemeshow statistic ( $p = 0.24$ ). These results suggested that our final ANN concurrently had good discriminatory power and good-fit calibration. ANN can be used as a promising tool for the elderly to stratify high risk subjects into osteoporotic group.