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Prediction of severity of periodontal disease in pregnancy

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Discriminant analysis is commonly used to classify observations into one out of two or more populations on the basis of correlated measurements. The aim of this analysis was to estimate the severity of periodontal disease in women during pregnancy because of its potential effects on treatment and on pregnancy outcomes. Periodontal diseases are chronic inflammatory conditions of the gums resulting in destruction of connective tissue that is clinically manifested by varying degrees of recession of the gingival tissues and the creation of periodontal pockets. Diagnosis is largely clinical and based on periodontal probing where the depth of periodontal pockets is measured on 6 sites per tooth and the presence of deep pockets (≥3.5mm in depth) above a threshold indicates clinically significant disease. Manual and computerised periodontal probes are used to measure pocket depths. Computerised probes have been shown to minimise the effects of operator pressure applied during probing and leading to more accurate assessment of disease; however this is achieved at a considerable increase in probing time (30 minutes compared to 3 minutes for manual probes).

Periodontal disease was examined in pregnant women during a randomised controlled trial investigating if hygienist-based treatment during pregnancy reduces rate of preterm birth. Several operators screened 3727 women for periodontal disease using manual probe, and 1082 women with significant disease were randomised to receive periodontal treatment either in mid-pregnancy (treatment group) or in postnatal period (control group). Computerised periodontal probing was also performed prior to treatment, so that women in the treatment group were assessed with both probes during pregnancy. Considerable variability between manual and computerised periodontal probing was found with disagreement in rate of deep pockets exceeding 10% occurring in 95 out of 480 women (20% cases). Estimation of severity of disease was interpreted as a discrimination problem, and the severity of disease (classified as mild, moderate and severe) was predicted using the manual probe measurements, operator specific effects and reported clinical symptoms. Due to a high rate of outliers, the standard linear estimation methods and an alternative set of non-parametric classifiers based on linear programming approaches were implemented. Estimation and validation of the classification procedure was based on sample of women treated during pregnancy.