F18 Optimal Dental Age Estimation Practice in United Arab Emirates (UAE) Children

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After attending this presentation, attendees will understand how there is a need to develop a United Arab Emirates (UAE) reference model, or that the Willems model can be used to perform dental age estimations in UAE children.

This presentation will impact the forensic science community by imparting knowledge that verifies the Willems model on a UAE sample and comparing the outcomes with the verification of a UAE specific model revealing no or negligible differences.

Willems et al. dental age estimation method for children was developed on a Belgian reference dataset of 2,523 subjects.[1] The goal for this study was to detect if this method could be used for age estimations on UAE children or if it should be modified using a large UAE reference dataset. Furthermore, verification was needed to determine if adding third molars development information to permanent teeth development information in children provides more accurate age predictions.

Retrospectively, panoramic radiographs of 1,900 children with UAE origin and nationality were collected (950 female, 950 male). The selected individuals were homogeneously distributed in the age range between four and twenty-three years. All included individuals who had no medical history and no obvious dental pathology affecting the development of permanent teeth or third molars. The development of left mandibular permanent teeth was registered according to the eight-stage technique described by Demirjian et al.[2] The third molars development was registered using the ten-stage technique developed by Gleiser et al. and modified by Köhler et al.[3,4] The registrations of the tooth development was tested with Kappa statistics on inter and intra observer reliability after rescoring 100 randomly selected panoramic radiographs. The obtained permanent teeth data were used to validate the Willems et al. method. Next, these data were randomly, but stratified on age and sex, divided in a reference and a test dataset. The reference dataset was used to develop a UAE specific model according to the Willems et al. method. The established UAE specific model was verified using the test dataset. Multiple regression models with the scores of permanent tooth development, third molar development, and permanent tooth and third molar development as an independent and age as a dependent factor were developed. These models allowed detecting if adding in child third molar development to permanent tooth development, providing more accurate age predictions.

Almost perfect agreement was detected for intra and inter observer agreement (Kappa >0.86). Verifying the Willems et al. method on the UAE children dataset provided a difference in mean chronological age minus mean predicted age for males and females combined of -0.01 year (overestimation). The verification of the Willems et al. method compared to the verification of the UAE specific model revealed differences in: mean error of -0.12 (F) and 0.12 (M) year, mean absolute error of -0.07 (F) and 0.02 (M) year, and root mean squared errors of 0.08 (F) and 0.01 (M) year. The accuracy of age prediction adding third molar development to permanent teeth development was expressed in an increase of root mean squared errors of 0.02 years for males and a decrease in root mean squared errors of 0.02 years for females.

The results indicate that the Willems et al. model developed on a Belgian reference dataset can be used with negligible error for dental age estimations in UAE children. Adding third molars development information to the permanent teeth information in UAE children does not provide an overall gain in accuracy of the age predictions.

References:

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Age Determination, Willems Method, United Arab Emirates

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