A4   Assessing the Utility of Vertebral Body Heights as a Sex Indicator in United States Whites and Koreans

Yangseung Jeong, PhD*, Middle Tennessee State University, Murfreesboro, TN 37129; Eun Jin Woo, Sejong University, Seoul, Gwangjin gu, SOUTH KOREA; Simon Pergande, Middle Tennessee State University, Murfreesboro, TN 37132; Omar Aly, Middle Tennessee State University, Murfreesboro, TN 37132

Learning Overview: After attending this presentation, attendees will understand that the vertebrae have a potential to be used for sex estimation in United States Whites and Koreans. However, their utility differs between the two populations.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by testing for the utility of United States White and Korean vertebral body heights as a sex indicator, which has not been studied previously. Sex estimation using the vertebrae will enhance the likelihood of identification of unknown skeletal remains, particularly when other sex indicators are missing or damaged. Additionally, this study emphasizes that the vertebrae-based sex estimation methods need to be population-specific.

Sex estimation is a crucial part of a biological profile in forensic anthropology. The cranium and pelvic bones are regarded as the most useful sex indicators. Other parts of a skeleton are also used for sex estimation, mostly due to size differences between sexes. The vertebrae have been studied for this purpose, but it has been reported that the accuracy of sex estimation using the vertebrae may vary in different populations.[1] This study explores how significant the contributions the vertebrae can make to sex estimation are in United States Whites and Koreans.

Vertebral body heights from C2 to L5 were measured from 140 Koreans (75 males and 65 females housed at eight institutions in South Korea) and 102 United States Whites (51 males and 51 females at the Bass Donated Skeletal Collection of the University of Tennessee) following Raxter et al.[2] Then, the discriminant function analyses were conducted on the individual vertebrae, followed by the stepwise analyses to find a set of the most influential vertebrae.

Discriminant equations using the Korean samples yielded decent-to-good Correct Classification Ratios (CCRs) ranging from 65% (L2)–92.1% (stepwise analysis). The CCRs of 75% or greater were obtained from 19 out of 24 equations (i.e., equations with the C2–T11, L1, and stepwise analysis). On the other hand, the performance of the equations using the United States White samples was poorer, with the CCRs ranging from 48% (L2)–81.4% (stepwise analysis). Only four equations (i.e., equations with the C4, C6, T2, and stepwise analysis) yielded the CCRs of 75% or greater. For both the United States Whites and Koreans, the lumbar-involved equations tend to yield lower CCRs, except for the Korean equation with the L1.

In this study, the United States males (176.2cm) and Korean males (162.2cm) are taller than the United States females (163.3cm) and Korean females (148.4cm) by 12.9cm and 13.8cm, respectively. The summed vertebral body heights correspond to approximately 30% of the total stature in both populations. In Koreans, the difference in the summed vertebral body heights between sexes (4.2cm) explains 30.3% of their stature difference; however, in the United States Whites, only 20.2% of the stature difference can be explained by the difference in the vertebrae (2.6cm). These findings indicate that the vertebral column of the United States Whites does not contribute to the stature difference as much as that of the Koreans. Poorer performance of the United States discriminant equations may also be explained by the smaller differences in the vertebral body heights between the United States males and females. Vertebral body heights have potential as a sex indicator. However, their utility appears to depend on the biological characteristics of the target population. Therefore, if the vertebrae are used for sex estimation, population-specific methods need to be generated and validated before use.

Reference(s):

1. Hora M., Sládek V. 2018. Population specificity of sex estimation from vertebrae. *Forensic Science International* 291:279e1-279e12.
2. Raxter M.H., Auerbach B.M., Ruff C.B. 2006. Revision of the Fully technique for estimating statures. *American Journal of Physical Anthropology* 130(3):374-384.

Sex Estimation, Vertebrae, Population Specific