

G43 Morphological Examinations of the Teeth and Jaw Fragments Retrieved From an Ajnala Skeletal Assemblage: A Forensic Odontological Study

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Learning Overview: After attending this presentation, attendees will be sensitized regarding the postmortem longevity of dental remains and the significant contributions teeth and jaw fragments make toward identification of badly damaged and commingled human remains found in forensic situations.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by informing attendees how teeth serve as crucial markers of identity of the victims whose badly challenged human remains were excavated by amateur archaeologists or curiosity-seekers.

Bones and teeth have been increasingly used to figure out the biological profile of an individual(s) who lived in the past as they have the longest postmortem longevity to serve as crucial markers of human form and identity after death. Fragmented and commingled skeletal remains retrieved during mass disasters, archaeological excavations, construction activities, criminal submissions, forensic contexts, etc., pose a serious challenge for their identification endeavors in forensic anthropology. Odontology has contributed significantly in identification strategies of such unknown human remains as teeth remain minimally affected by biological, physical, or taphonomic destructions such as fire, chemicals, trauma, burial environments, etc.¹ Teeth contain invaluable biological, physical, and chemical information, crucially needed for responding to various forensic anthropological parameters such as provenance, biological identity establishment, exposure to pollutants or taphonomic/traumatic insults, estimation of dietary practices and subsistence patterns, paleopathology, etc. It is the small size and mineralized status of human teeth that impart their resistance against most types of decompositions and degradations.

Mankind has witnessed several heinous crimes against humanity, and some pre-existing structures such as abandoned wells, waterways, sewage systems, potholes, caves, pits, natural ravines, and roadside trenches have been commonly used as preferred burial sites for the clandestine disposal of human cadavers to avoid the attention of human rights watch-groups. In one such incident, thousands of badly damaged and commingled human remains, along with numerous contextual items of personal identity, were excavated non-scientifically by amateur archaeologists from a disused well found underneath a religious structure at Ajnala, India, in April, 2014.²⁻³ The written records mention that the exhumed human remains belonged to 282 Indian-origin soldiers killed in August 1857 whose corpses were immediately dumped into a bricked well due to the contemporary socio-political situation in the area. Only teeth and a few jaw fragments could survive the taphonomic destructions during the hurriedly carried-out excavation of the site by the local curiosity seekers.

In this presentation, 1,527 teeth (1,200 dislodged and 327 present in 93 jaw fragments) collected from Ajnala skeletal assemblage were assessed for their age at death, sex characteristics, population attributes, traumatic and pathological signatures, occupation markers, health conditions, and other attributes. The application of three methods of adult age-at-death estimations (Johanson attrition grades, Average Stage Attrition (ASA), and Pulp-to-Tooth area Ratio (PTR)) found that the Ajnala remains belonged to individuals who were most likely from 32 years to 53 years of age (approximately). Johanson and PTR methods provided higher and lower age estimates, respectively, whereas the ASA method gave age estimates in-between the two other methods.^{4,5} The anatomical discrete dental traits of jaw fragments revealed that at least 84% of them belonged to males, suggesting the vast majority of remains exhibit very prominent and obvious male characteristics. The odontometric values of dislodged teeth were substituted in the available logistic regression formulas generated from tooth metrics of known biological credentials, and it was found that about 78% of tooth measurements were categorized as males. Eleven non-metric dental traits, as defined by Scott and Turner, were evaluated following Arizona State University (ASU) Dental Anthropology System to estimate their population affinity.⁶ It reaffirmed that predominance of relatively unique non-metric dental traits in Ajnala teeth allude them to be of Indians.⁷ Only 4.2% of the dislodged teeth and 14% of the jaw fragments exhibited dental caries, which is in stark contrast to the 78% caries in present-day Indian populations; 4.9% of the teeth exhibited fracture of the crown or root, probably owing to their prolonged burial and possible ambient pressure exerted by soil and its components. The tooth wear in anterior teeth and premolars of jaw fragments may be attributed to some influence of biting of cartridges for probable loading into rifles/muskets (perhaps). Extrinsic blackish-brown or reddish staining on a few teeth were suggestive of nicotine consumption, smoking of any form, or betel-nut chewing/eating habits.⁸ These observations correspond to the biological and geographic identity of the Ajnala skeletal remains as described in the written records. The detailed results will be presented in the textual, graphical, tabular, and diagrammatic forms.

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Forensic Odontology, Ajnala Skeletal Remains, Age and Sex Estimations

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