

Dental age estimation in India: Do we have a role beyond publishing scientific evidences?

Sir,

The United Nations Children's Fund reports that only 72% of births of children below 5 years of age are registered in India. Out of 26 million children born every year, around 10 million children go unregistered.^[1] The National Crime Records Bureau (NCRB) report indicates that the number of juveniles in conflict with the law under the Indian Penal Code section alone had increased from 17,819 in the year 2003 to 31,725 in 2013.^[2] A news report pointing out the NCRB statistics showed that the number of rapes by juveniles had risen by 143% from 2002 to 2012. It also points out that there was 500% increase in the number of kidnappings of women and girls by minors and the murders by minors went up to 87%.^[3] The proportion of children involved in age disputes is higher in number, and those cases are seen mostly in the domains of child labor and child marriage. According to common law, the 18-year-olds are of particular importance as this age demarcates a child from an adult. Accordingly, trial or sentencing of the accused in this age threshold will be conducted in the adult or juvenile justice courts.

Age estimation is an integral part of forensic dental and medical practice. A search term of "dental age" and "estimation" in the National Library of Medicine-National Institutes of Health (NLM-NIH) retrieves around 900 peer-reviewed articles dedicated to this topic. In India, there are about 200 scientific articles in the NLM-NIH database on dental age estimation from radiographs. This clearly demonstrates the importance of this research in the medical field.^[4] Several methods of age estimation are available in the literature. Any forensic age method must adhere to four criteria: first, the work must be presented to the scientific community through peer-reviewed publication; second, it should contain well-defined methodology; third, it should provide a sufficiently accurate result; and fourth, it should comply with the principles of medical ethics and legal regulations.^[5] Overall, it should benefit the individual or population when applied in practice, and any individual or organization must adhere to employing a method satisfying the above criteria.

It is a routine practice that many organizations seek help of dentists and medical practitioners to estimate age of participants under investigation. For example, the Sports Authority of India (SAI) and the Ministry of Youth Affairs and

Sports approach for help from dental and medical experts to estimate the age of players involved in age frauds. In their report on "National Code against Age Fraud in Sports," age estimation evaluation includes dental examination and radiographs from orthopantomogram (OPG) and medical examination from hand-wrist radiograph and/or CT scans (SAI, National Code against Age Fraud in Sports, Age Estimation Format, Annexure II).^[6] Similarly, the Board of Control for Cricket in India has adopted bone age tests using hand-wrist radiographs (Tanner Whitehouse – TW3 method) to estimate the age of players in the 16-year-old thresholds.^[7] It is to be noted that court of law also calls for the expertise of dental and medical practitioners to estimate age of the accused involved in civil or criminal cases. Kindly refer to a legal proceeding at the Delhi High Court on attempted murder case where the appellant underwent bone and dental ossification test, and the verdict was given in favor of the appellant (as juvenile) based on the test report given by the dentist and medical doctor (Crl. Appeal No. 925/2010 and Crl. M. B. 1093/2010).^[8] There are several such cases available in the legal archives. Age estimation using radiographs is also routinely conducted in the department of forensic medicine attached to medical and dental institutes in India. The Ministry of Health and Family Welfare of the concerned state governments approves age estimation using dental radiographs. For example, refer to "Forensic Examination of Sexual Assault Cases: An Instruction Manual and Proforma" published by the Ministry of Health and Family Welfare, Director of Health Services, Government of Maharashtra.^[9]

Estimation of age using dental radiographs is an approved procedure in several countries including Italy, Belgium, Norway, Spain, Germany, Denmark, Portugal, Hungary, Austria, and New Zealand. This was the case in India until recently, the Atomic Energy Regulatory Board (AERB) issued an official statement disapproving the use of radiographs for dental age estimation. They indicated that exposure of radiographs can be justified only for medical diagnostic application and not for medicolegal purposes.^[10] A further inquiry to AERB through Right to Information Act reconfirmed their standing on radiographic exposures for age estimation (Mr. S. Harikumar, Secretary, AERB – personal communication).^[11] Exposure of radiographs for medicolegal purposes is included in the International Regulatory Body-Ionizing Radiation Medical

Exposure Regulations (IRMER) 2000 guidelines.^[12] It defines “medicolegal procedure” as a procedure performed for insurance or legal purposes without a medical indication. Furthermore, it states that the procedure can be justified by the medical practitioner provided “the total potential diagnostic or therapeutic benefits, including the direct health benefits to the individual and the benefits to society, of the exposure” (IRMER 2000, Page 4, Justification of Individual Medical Exposures,^[2] [b]).^[12] Although the procedure does not have a direct medical benefit, it certainly has physical, emotional, and social benefit to the individual and the society at large. For better understanding, refer to a comprehensive review titled “Estimation of age using dental radiographs is a justifiable procedure” written by a team of international experts.^[13] The participant on “age estimation” has been included in the dental curriculum set forth by the Dental Council of India (DCI) and published in the “Gazette of India.”^[14] Radiographic method of age estimation has been included with a note “Advantages of tooth calcification over eruption in estimating age.” Based on the inclusion of the participant in the curriculum, it can be implied that dentists, in their capacity, can prescribe radiographs for dental observation and age estimation. This can be conducted alone or in conjunction with the medical team with power invested by the DCI, the supreme regulatory authority that monitors dental practice in India. For further details, refer to article that collates legally important ages, birth registration, and age estimation practices across the world.^[5]

It is univocally agreed that every radiation exposure carries certain amount of risk. However, the actual risk should be adequately balanced with the net benefit. It is to be noted that only a single OPG radiograph is used to estimate age of a child. The radiation exposure from a single OPG is only 0.01 mSv that is equivalent to only 1½ days of background sunlight exposure.^[15] In simple terms, it is the amount of radiation exposure incurred on one-way flight journey from Mumbai to Delhi. Moreover, OPG taken for dental age estimation is a one-time exposure and very low doses of radiation have negligible proportional effect. The radiation exposure from dental radiographs is much lower as compared to several other skeletal radiographic techniques. The lifetime risk of developing cancer from a single OPG radiograph is a <1:2,000,000 (2 million) and the lifetime odds of death is totally “negligible.”^[15] Authorities imply on the use of nonradiation methods such as magnetic resonance imaging or ultrasound, but to date, these methods have not shown to be accurate and none of the methods have been validated.^[16]

The number of research conducted in the area of dental age estimation in India is ever increasing, and most of the studies have shown to estimate age of participants with reasonable accuracy. In addition to estimation of age, probability of a child above or below a specific age

threshold can also be determined.^[17] Age estimation research is of particular significance in India considering poor birth registration practices and issues relating to child rights. There is urgent need to safeguard the rights of children without birth records and those involved in falsified age claims. Considering the recent controversies, scientists working on the area of dental age estimation must strive to achieve universal consensus on age estimation involving public health authorities, law enforcement agencies, social workers, and stakeholders. Can we take a step forward toward securing the rights of vulnerable children in India?

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

Jayakumar Jayaraman


*Faculty of Pediatric Dentist, School of Dentistry,
International Medical University, Kuala Lumpur, Malaysia
E-mail: jayakumar83@hotmail.com*

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