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and male child laborers in South India

ORIGINAL PAPER

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ABSTRACT

*Introduction: Children around the world are engaged in forms of work and were forced into prostitution every year. **Material and methods**: Physical examination, radiographs depicting skeletal and dental parameters have been used to estimate the biological age of 85 male child laborers and 19 female commercial sex workers. The radiographs analyzed by two separate forensic experts using skeletal and dental assessment methods. A statistical analysis was performed to analyze differences between reported and assessed ages. **Result**: 33(39%) out of 85 individuals had reported ages lower than the estimated biological ages. In 24 cases, the reported age was less than 14 years, but only 20 individuals were confirmed. It was observed that the 8 out of 19 individuals were identified minors (below 18 years). **Conclusion**: The results showed a significant difference between reported and assessed ages (p < 0.001); however, no statistical difference was shown between skeletal and dental age.*

Keywords: Forensic science, Dental age, skeletal age

INTRODUCTION

Cross border migrations, criminal investigations, asylum seekers, employment, claiming social benefits, unavailability of valid documentations is named to be few among many reasons for age estimation. These makes age assessment as an integral part of forensic practice. In criminal investigations, the authorities promptly request the forensic experts to determine whether if the person attained the age of importability. As per Indian constitution and article 24 dealing with fundamental rights of children, "Prohibition of Employment of Children in Factories, no child below the age of 14 years shall be employed to work in any factory or mine or engaged in any other hazardous employment."[1]According to this law the child must attain "majority" for the purpose employment at the age of 14 years, which means that children from 14 to 21 years are permitted to work and their labour is legal.

Children around the world are engaged in various paid and unpaid forms of work and are classified as child laborers. An estimate of 150 million children worldwide is engaged in child labour. Around 13 per cent of children aged 5 to 14 in developing countries are involved in child labour.[2] In India there are close to 4.3 million child labors working as per census 2011 by ministry of labour and employment.[3] Most of these children were sent to work by compulsion and not by choice, mostly by parents.

Child prostitution is another major problem in India. There are approximately 2 million child commercial sex workers between the age of 5 and 15 years and about 3.3 million between 15 and 18 years. Section 375 Indian Penal Code considers age of 16 years as the right age of consent to decide the criminality of the offence of rape. In the case of marriage, sex with a female of 16 years or younger is considered rape.[1] Thousands of children were forced into this profession every year and unknowingly they get trapped into this trade even before puberty.

This study involves the ascertainment of the ages of children rescued from child labour and prostitution. The objective is to assess the skeletal and dental ages and to verify the similarities or differences between the skeletal and dental assessments. To achieve this, orthopantamograms (OPGs) and Left hand/wrist radiographs were taken, analyzed and then statistical analysis was done to compare the reported and assessed ages.

METHODS

The authors have carried out a retrospective review on a sample of 85 male child laborers and 19 female commercial sex workers

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(CSWs). These children were intercepted by the police during investigation as a part of Operation Muskaan. Its objective is to trace down missing and destitute children and to reunite them with their families.[4] These children were arrived from various parts of the country mostly the southern India which includes Andhra Pradesh, Telangana and Orissa. Forensic age determination was requested by local authorities and the Department of Forensic Medicine & Toxicology of Osmania Medical College was contacted in order to ascertain if the subjects in question have achieved the required legal age. Data gathered from January 2014 to December 2015 were used in our analysis. The age determination procedure began with a clinical assessment of the individuals, which consisted of a physical examination, which recorded anthropometric data, signs of sexual maturity. Skeletal development BMI, which was evaluated by means of radiologic examination of the left hand/wrist, and the dental examination, which included the inspection of the oral cavity and the assessment of an OPG, were also used in determining the biological age of the individuals. An additional shoulder and pelvic X-ray was also carried out.

Physical maturity was assessed based on height and weight of the individual, using Tanner Staging System. This system is commonly used to determine the status of genital development, breast development and level of pubic hair growth.[5] Skeletal age estimation was carried out using the hand/wrist radiographs of the left hand. These x-rays used to evaluate the shape, size and fusion/ degree of ossification of the bone elements using an atlas method named, Greulich and Pyle method.[6] The pelvic and shoulder X- rays were taken as supplementary to skeletal assessment of the age of the individual.

To check the eruption status and maturity of the developing teeth, a clinical (intraoral) examination was carried out followed by the analysis of OPGs. For younger individuals, age estimation was more accurate due to the presence of many developing teeth; particularly the canines, premolars, as well as first and second molars that make dental age estimation of these subjects more accurate.[7] Hence for younger individuals, the Schour and Massler[8] classification method, the Demirjian et al. method[9] were used. In case of older individuals, where all the teeth were matured except third molars, the ABFO (American Board of Forensic Odontology) classification guidelines were used. This classification system utilizes Demirijan's schematic definitions of crown and root formation and thus evaluates the radiological development of the third molar.[10]

The procedures for skeletal and dental examinations were carried out separately by two different specialists: forensic medicine specialist and a forensic Odontologist. Their results were compared in order to determine the probable age of the individual. This was achieved by a concord decision taking all evidence into account. BMI and secondary sexual traits were analyzed so that they can be used as a means of supplementary information for age assessment. In cases where it was the subjects obtained 14 years age through skeletal and dental methods, they were given the benefit of the doubt and assigned the younger age.

Statistical analyses were performed in order to verify differences or similarities between skeletal and dental ages and those of reported and assessed ages. To determine if the age was distributed along a normal curve, the Kolmogorov–Smirnov test was used. To test normality p-values less than 0.01 were considered significant. Following this, a comparison of the two groups (reported age and biological age) was performed by means of the t-test. P-values less than 0.05 were considered significant. Statistical analysis was performed using SPSS 20 statistical software package.

RESULTS

CHILD LABOURERS

Results has revealed that 33(39%) out of 85 individuals had reported ages lower than the estimated biological ages. In 24 cases, the reported age was less than 14 years, but only 20 individuals were confirmed by radiographic examinations (OPGs and hand/wrist X-rays). The agreement between the reported and the estimated biologic ages was seen in 17 individuals, out of which 15 subjects belongs to 14- 18 years, one is less than 14 years and one is above 19 years. (**Table 1**)

The results of tests of normality (Kolmogorov–Smirnov test) has revealed that samples were distributed along a normal curve (p=0.042). The result of student's t- test has revealed statistically significant difference between the alleged age and the estimated biologic age ($t= 10.447; p< 0.001$).

COMMERCIAL SEX WORKERS (CSWs)

The estimated biologic age of the CSWs ranged from 14 to 21 years of age. It was observed that the 8 out of 19 individuals were identified minors (below 18 years). 3 individuals who reported as majors were confirmed minors by skeletal and dental radiographic examinations. But one subject, who reported as a minor, was confirmed as major with a greater discrepancy of 6 years (**Table 2**).

The results of tests of normality (Kolmogorov–Smirnov test) has revealed that samples were distributed along a normal curve (p = 0.031). The result of student's t- test has revealed statistically significant difference between the alleged age and the estimated biologic age ($t= 10.132; p< 0.001$).

Age	Reported No. of subjects	Assessment confirmed biologic age	Agreement between reported & estimated ages
< 14 years of age	25	33	1
14 to 18 years of age	59	51	15
> 18 years of age	2	1	1

Table 2 Results of investigations of female commercial sex workers

Age	Reported No. of subjects	Assessment confirmed biologic age	Agreement between reported & estimated ages
< 18 years of age	7	8	1
> 18 years of age	12	11	1

Figure 1 Estimated skeletal and dental age of female CSWs
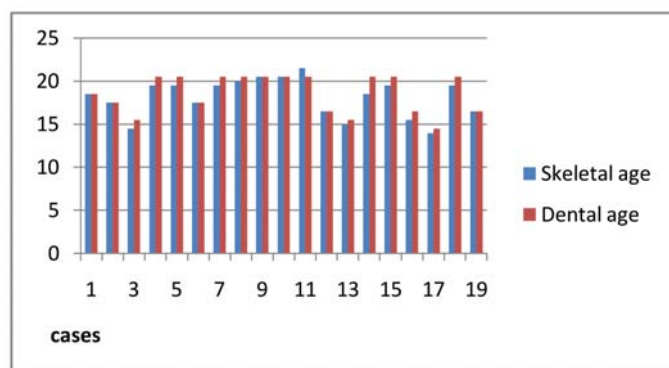
Figure 1 Estimated skeletal and dental age of female CSWs

DISCUSSION

Child labour is a pure violation of huge range of rights of children which are being snatched perhaps every nook and corner that can be associated with the labour work. Child prostitution is another major problem in India. Sex workers who involved in this line of work are named call girls, escort girls; a gigolo (role reversal) etc., And in some places of southern India this practice named Devadasi system or sacred prostitution.[11] These practices of prostitution are deeply rooted in India, with children are forced to enter into this profession at younger ages (even before puberty). Entry into this profession in India is 3 fold. Firstly, born and brought up into this trade as family profession. Secondly young women from rural areas and other countries are deceived, sold and dragged against their will. Finally, some women chosen this area of work because of given limited options they had and to support their families.[12] Once entered into this trade they are subjected to physical and mental torture and cannot abscond easily. It is of paramount importance to save these children from these professions and to create an enabling environment for them.

Analysis of the data disclosed significant correlation between the ages determined using the skeletal and dental structures. Age assessment using teeth is into practice since longtime. The initiation of tooth development and various phases that follow through in this process are used as markers in age determination. Skeletal age assessment goes hand in hand with dental analysis along with other methods, as age determination of an individual is an interdisciplinary approach in forensic approach. This involves the services of forensic pathologists, Odontologist, anthropologists, radiologists and legal medicine.[13] All these methods recommended to use in combination for the purpose of increasing the accuracy in age estimation and to facilitate the identification of age relevant developmental disorders.[14] The process of dental development correlates with morphological stages of tooth development that can be seen using radiographic techniques. These stages follow uniform and gradual changes, which are more controlled by genetics and less influenced by external factors than all other measurable criteria of maturity.[15] Unlike skeletal and sexual maturity indicators, dental development is less susceptible to hormonal, nutritional ad pathological changes.[16]

Physical examination includes measuring body height and weight, BMI and in times it also describes any signs suggestive of pathological conditions which effect the maturation of the individual. But this additional information can be quite useful for individual's younger than 14 years of age as the elders have already gone through puberty.[17] In the present study, physical examination and signs of sexual maturation were used to gain additional information particularly for child laborers who claimed to be below 14 years. The results of this study revealed that there is no discrepancy is seen in only 17 out of 85 individuals between reported and estimated ages (**Table 1**). Remaining all subjects (80%) either over or under reported their ages. This mandates the application of decisive methods for age estimation and to obtain unerring results. Most of these child laborers during examination mentioned that they want to get back to their professions because of their family economic issues.

For older individuals, whose all teeth were mature at 14 years of age, the authors adopted classification guidelines proposed by ABFO for age assessment of for commercial sex workers. This method is based on the sole evaluation of radiological developmental of 3rd molars which sub divides the tooth development into eight stages of A- H. (10) Pelvic x- rays were taken for sub adult individuals assuming that iliac crest usually appears at 16 years in males and 15 years in females, and fuses with the iliac bone at 19 years.[18] The results revealed that 8 out of 19 individuals were minors (below 18 years). The range of variation between the skeletal and dental ages is in the range of +/- 12 months (**Figure 1**). But one subject, who reported as a minor, was confirmed as major with a greater discrepancy of 6 years. Many studies stated that around 30 to 90 percent of women and girls are below 18 years of age at the time of exploitation. In India, it assumed that the number of women and children in this trade ranged from 70,000 to 1 million. Out of this 25% are below 20 years, 15% are entering at age of 15 years and 25% of them are between 15 to 18 years.[19] A study carried on 26 CSWs with HIV reported that the 1/3rd of them were minors.[20] Like other studies our results also suggested that 47% (9 out of 19 individuals) are minors.

The child laborers in this study are from southern India which includes Andhra Pradesh, Telangana and Orissa. The CSWs are from the state of Andhra Pradesh and Telangana. All the young individuals that are rescued were sent to juvenile homes for rehabilitation.

CONCLUSION

The findings of this retrospective analysis demonstrate the vital role of standardized methods for age estimation in living individuals. Dental age estimation using the Demirjian's population specific formula for Indian population and ABFO classification guidelines showed reliable outcome as they did not show much variation from the skeletal age. Our study further highlighted the imperative role of utilization of multiple indicators for age assessment. Results showed that 39% of children were below 14 years of age and 47% of the females were minors who trapped into these professions under various circumstances.

Credible efforts must be made at administrative level to eliminate the problem of child Labour. Rescue, rehabilitation and providing education for these children are of greatest importance.

Ethical clearance: Taken.

Conflict of interest: None.

Authors contribution: We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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