
Age Determination at Tikur Anbessa Specialized Hospital, Addis Ababa University.**S. Hailu¹, R. Fikre¹, H. Yohannes², A. Daniel², L.W Biruk¹.**¹Addis Ababa University, Department of orthopedic surgery,²Addis Ababa University, Department of Radiology.*Correspondences to:* L.W. Biruk, Email: lbiruklw@yahoo.com

Background: African doctors, besides their enormous work load, are frequently involved in indirect clinical practices like age determination, disability evaluation and writing various kinds of certificates. This is a retrospective study aimed at assessing profile of subjects presenting for age determination. It determines different characteristics of subjects and the process of age determination. Age determination board/clinic of "Tikur-Anbessa" Specialized Hospital, School of Medicine, Addis Ababa University.

Methods: This is a retrospective descriptive study from January 2008 to June 2010. Age is estimated at age determination board using medical and skeletal criteria's by a committee consisting of physicians from internal medicine, radiology and orthopedic departments. All subjects were having elbow and wrist x-rays, sexual maturity assessment and dental examinations. The final age (also referred as "board-age") is determined/assigned based on the consensus made between the three physicians. This document is signed and strictly/confidentially compiled by the head of outpatient department. Data was collected based on prepared questioner through retrieval of subjects' records/documents.

Results: A total of 976 subjects, with male predominance 67.7%, have been evaluated by the board in the two years. Almost all had stated age range 5-22 years. Majority's stated age falls in the age group 9-15(66.1%). 92% of subjects claim they are below 18 years of age. 838(85.9%) subjects are from Addis Ababa. The board decided that 461 (47.2%) were between 16 and 17 years of age. There was less agreement between stated age and board age with (Kappa) k score of 0.147. Radiologic age and board age had excellent agreement with k score of 0.976

Conclusion: Radiologic age is cornerstone of age determination in our circumstance. Age determination is crucial for prosecution of young population using skeletal and clinical method. Most subjects tend to lower their age, hence attention should be given for evidence based age determination.

Introduction

Doctors in Africa, besides their enormous work load, are frequently asked to be involved in practices like age determination, disability evaluation, writing many various kinds of certificates and etc. The main reason is under developed Medico legal infrastructure to handle these separately from the main clinical practice. In law the crime and punishment are entirely based on criminal responsibility and this is in turn dependent on the age of the person. In the modern society, crimes committed against children and by children are increasing. Thus pediatric age group has got significant medico-legal importance^{1,2}.

In Ethiopia, the Labor Proclamation prohibits the employment of a child under 14 years of age (art. 82 (2)). Children between 14 and 18 years of age are categorized as young workers and the Proclamation provides that this category of children can work under strict conditions. According to the Civil Code (art. 581 (1)), a man who has not attained the full age of 18 years and a women who has not attained the full age of 15 years may not contract marriage³.

The Penal Code of 2004 classifies child offenders into three distinct age groups and prescribes distinct measures for their reform and rehabilitation. The first group, called “infants”, is totally exonerated from application of the penal law on ground of responsibility. According to article 52 of the Penal Code infants not having attained the age of 9 years are not criminally responsible for their acts and where an offence is committed by an infant appropriate steps may be taken by the family, school or guardianship authority to ensure their proper upbringing. The second group, addressed as “young persons” in the Penal Code, are children between the ages of 9 and 15 inclusive. For them, the Penal Code provides special punishments and measures upon conviction. They are not subject to the ordinary penalties applicable to adults nor shall they be kept in custody with adult offenders (art. 53). The third group is comprised of young persons between the ages of 15 and 18 and is treated under the ordinary provisions of the Penal Code as having the full prima facie liability of persons aged 18 and above (art. 56 (4)). However, the Penal Code provides that mitigation of the penalty is always permitted, the death penalty may never be imposed and, under certain conditions, the measures of the penalty scheme for young offenders are applied in toto. (arts. 56 (2), 118 and 182)⁴.

In Ethiopia, school certificates, birth certificates by religious institutions and municipalities are the ones usually used for proving the age of an individual which, however, are often liable to forgery. Hence, child offenders are required to pass through relevant medical examinations to ascertain their actual age^{5,6}. Accurate age estimation is also vital to ensure that local authorities fulfill their obligations in providing support and services to vulnerable groups such as unaccompanied minors less than 18 years of age⁷. Determination of chronological age has been the focus in sport to ensure appropriate participation⁸ In sport, in particular football, competitions have been designed according to age groups to guarantee equal chances within the spirit of “fair play”⁹.

Guidelines for estimating age in living individuals have been proposed and are based on the combination of general clinical, skeletal and dental examinations¹⁰. A careful physical examination, examination of teeth and ossification at wrist joint provide valuable data for age estimation in children and adolescents^{1,11}. Estimates of sub-adult skeletal age are typically based on long bone length, epiphyseal fusion, and dental development or eruption sequences¹². A skeletal examination is considered more reliable. In the reference radiological method, x-ray examination of the left hand and wrist is compared with standard images from an atlas published by Greulich and Pyle, who collected standards obtained in the 1930s and 1940s from an American white, middle-class population. Dental age estimation of adolescents is largely based on the presence of third molars (‘wisdom teeth’), and in most people eruption of all third molars is observed after the age of 18 years¹⁰.

The present study was designed to investigate the profile of subjects at TASH age determination board and assess the process of age determination at TASH.

Subjects and Methods

This was a retrospective descriptive study conducted from January 2008 to June 2010 in Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia. Age determination was done by a board/committee formed by assigned doctors from three departments of the University: Internal medicine, Radiology and Orthopedics. Subjects

were brought to age determination board by Police with an order paper written by the court.

All subjects had left wrist and elbow x-ray then brought to the board. The radiologist and orthopedic surgeon made a decision on the radiologic age based on presence of the secondary ossification centers in the different parts of body and by seeing of the epiphyseal fusion. The methods most widely used for bone age determination were those described by Tanner and Whitehouse and Greulich and Pyle^{13,14,15}. The main reference of x -ray age estimation was the text book of radiology and imaging Vol 2, page 1847-1849,2003 which is based on the works of Greulich-pyle. Another reference was the "Radiographic Atlas of skeletal development of the hand & wrist"¹⁶.

Medical age was assessed by a doctor from Internal Medicine and was based on Sexual Maturity Rating (SMR) or Tanner grading system. This consisted of pattern of development of pubic hair, breast development, penile size, testicular size and Eruption of dentition. Finally "board age" was decided based on the agreement between these three departments. On rare occasions, when there were gross "disagreements" between the doctors from these three departments, senior consultants would re-evaluate the case. A signed and sealed official age range was assigned and the document would be given to the responsible police so that he hands it to the court. As the matter was serious, copies of this letter were securely kept by our hospital-hence our document retrieval rate is nearly 100%. The court considers this age decided by the board and declares it as the subject's age hereafter. Again on rare occasions, the judge may call the responsible doctors to the court to give explanations of how they determined that specific age.

Data was retrieved by the authors. Information was gathered from copies of the letters to the court, charts and logbooks and was filled on a prepared questionnaire. Data was entered and analyzed using SPSS version 15. A presentation was made at the surgical society of Ethiopia to further receive comments from colleagues in the region.

Results

There were a total of 976 subjects, out of which 661 (67.7 %) were males and 315(32.3%) were females (Male:Female ratio 2.1:1). The stated age by subjects ranged from 5 to 45 years of age, with one case stated of 45 rests have stated age range of 5-22 years of age. The mode and mean of the stated age was 15 years of age (332(34%)). 92% (830) subjects claimed their stated age below 18 years of age. A total of 74(7.6%) subjects had unknown stated age.

There were 838(85.9%) from Addis Ababa and 134(13.7%) were out of Addis. Fourteen (1.4%) had board age of less than 9 years, 184(18.9%) were between 9 and 15 inclusive, 461(47.2%) were between 16 and 17 and the rest (317 or 32.5%) were 18yrs and above.

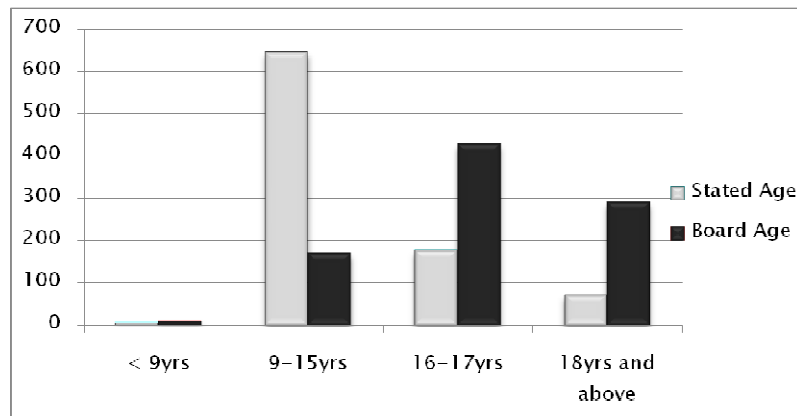
A total of 363(37.2%) of the subjects had same stated and board age, while 218 (22.3%) had 1 year less, 182(18.6%) 2 yrs less and 206(21.1%) had 3 and more years less stated age than their estimated board age. The majority (681 or 69.8%) of the subjects had their age estimated for criminal proceedings, while 17 were accused of rape and 41 were raped females.

Table 1. Frequency of “stated ages” Grouped According to Legal Land Marks in Ethiopia by Applicants for Age Determination.

Stated age	Frequency	Percent
<9	7	0,7
9-15	645	66.1
16-17	178	18.2
18 & above	72	7.4
UK	74	7.6
Total	976	100.0

Table 2. Cross-tabulation between stated and board ages that are grouped according to legal significance in Ethiopia

		Grouped Board Age (in yrs)				Total
		<9	9-15	16-17	18 and above	
Grouped stated Age (in yrs)	<9	7	0	0	0	7
	9-15	4	166	338	137	645
	16-17	0	4	88	86	178
	18+	0	1	3	68	72
Total		11	171	429	291	902

**Figure 1.** Number of grouped ‘board age’ and grouped ‘stated age’.

The details of the accusations and offences are not the focus of this study, hence are left aside. Among 681 subjects who had their age estimated for criminal proceedings 244 had same stated and board age while, 432(63.4%) of the subjects had 1 year or less stated age and 5 stated their age to be more than the estimated board age.

The Cohen’s Kappa agreement score between stated and board age was 0.147.

Table 3. Cross-tabulation Between Radiologic and Board Ages

Radiologic age in Years	Board Age in Years				Total
	<9	9-15	16-17	18+	
<9yrs	14	0	0	0	14
9-15yrs	0	181	2	0	183
16-17yrs	0	3	454	5	462
18+yrs	0	0	5	312	317
Total	14	184	461	317	976

Discussion

Most of the subjects 645/902(66.1%) claimed to be in the age group 9 to 15yrs inclusive. According to the 2004 Ethiopian penal code this age group is labeled as young persons who will have special punishment. Among them 338 (52%) had estimated board age between 16 and 17yrs, whose punishment would be same as adults except for death sentence and life imprisonment while 137 (21.2%) had estimated board age 18 years and above which would make them liable to be punished as adults. Most of the subjects (62%) claimed their stated age to be less than that of the estimated board age. The stated age and board age had poor agreement with Cohen's Kappa score of 0.147. This discrepancy could be attributed to the intentional stating of lower age to decrease their punishment. This number could be much smaller than the real figure for the fact that the atlas of Greulich and Pyle for skeletal maturity and epiphyseal closure in sub-Saharan African set ups has been shown to significantly underestimate age in skeletally immature Malawian children¹⁷.

Most of the subjects who came to our age determination board came from Addis Ababa, but considerable number of subjects 134(13.7%) are out of Addis Ababa just for age determination. This implies that there is strong need for establishment of other centers for age determination. Almost all subjects had similar radiologic and board age with an excellent Cohen's agreement score of 0.976. Hence, it might be possible to decrease the need for presence of three physicians in age determination board.

Most of the subjects who came to our hospital for age determination were for criminal proceedings. Significant number (237 of 976 or 24.3%) of subjects presented with no stated details of their offences. There were 17 male rapists, 41 raped females but there were no female rapists. Rape is one of the serious reasons in court for age determination as raped ones suffer physically, socially, psychologically and emotionally¹⁸. Hence accurate and timely determination of age for this group of people should be give great emphasis.

Conclusion

- Age determination is crucial step in prosecution of young offenders.
- Though clinical and skeletal age determination are the two main tools, radiological age determination is cornerstone for estimation of age.

- Almost all subjects tended to lower their age, hence the need for evidence based on vital statistics based age assessment.

Recommendations

We recommend:

1. Having standard birth certificate/vital statistics and age recording system. This can easily be achieved with help of Health Extension workers in Ethiopia, who monitor & report health conditions among all villages in the country in house-to-house surveillance.
2. Mutual training between the physicians and the lawyers. The penal code of Ethiopia should be taken in to consideration during age determination process and the judges as well as the lawyers should know at least the basic principles of age determination.
3. Documentations should be kept permanently and should be networked, so that someone's age stated somewhere some time will help to increase the accuracy of age estimation.
4. Further study to assess accuracy of age determination process. Because most of the age determination criteria were established for the westerns and inaccuracy of the atlas of Greulich and Pyle for skeletal maturity and epiphyseal closure has been shown in Malawi.
5. All stake holders should continue preventing incidence of rapes in our country.
6. Age determination practice (together with MRI) to be considered by the athletics federation of our country to select and screen for appropriate athletes.
7. Having nationwide guideline which can easily be used throughout the country by a well trained physician; hence age determination can be done easily in regions as well - avoiding unnecessary referrals.

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