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The Social Analysis on the Age Estimation of Living Body in Jeollabuk−Do

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Purpose: Age estimation is often used in the identification of living persons. Various methods are used for age estimation using teeth, and there are many studies on the methodology. But the study of changes in the social aspects of age estimation with the passage of times is still insufficient. Therefore, the purpose of this study is to analyze the age estimation cases in the social aspects and to investigate the changes of age estimation cases in Jeollabuk-do.

Methods: From January 2008 to December 2015, 76 cases of age estimation were collected. The collected data were organized and analyzed. The distribution of patients by age and year, the difference between alleged and registered age, the purpose of age estimation, and regional distribution were examined. In addition, we compared the previous study which analyzed the age estimation cases in Jeollabuk-do from 2000 to 2007.

Results: According to the distribution by age, the age distribution was the largest in the 50s and 60s, with 69.8%. The most reason to correct age was related to welfare benefits (38.2%), and most of the people who corrected for welfare benefits were over 50 years old. The age correction for purpose of welfare benefits existed every year during the study period. As the result of comparison with previous study, total number of age estimation cases was decreased very sharply, and distribution by age group was also changed.

Conclusions: Changes in age estimation cases were observed when compared to the previous study. A significant decrease in the total number of age estimation cases was observed, but the number of age estimation in the 50s did not decrease. Although the total number of age estimation requests decreases, age estimation in the elderly are likely to persist. Thus, it is necessary to study new age estimation methods suitable for the elderly.

Key Words: Age estimation; Social welfare; The aged society

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INTRODUCTION

Age estimation is used in a various situations, such as identification of individuals at a crime or accident scene, and is widely used to estimate the age of children whose birth records are not known.[1,2] In addition, the age of people in particular community is important for social benefits, employment and marriage.[3] Thus, age estimation may be required to receive social welfare benefits or social security system and to obtain the rights of refugees who do not have acceptable identification documents.[3-5]

Especially in Korea, the demand for age estimation is very high due to the special social characteristics. In a short period of time, Korean society has undergone various social changes. As a result of various historical events, such as the Japanese colonial period (1910-1945), the establishment of the Korean government (1948), and the Korean War (1950-1953), the population has changed greatly. It is considered

that the influx and the movement of the new population occurred, the accurate recording of births and deaths registration were difficult, and many of the documents were lost or damaged. Also, the birth registration was not made immediately after birth due to the high infant mortality rate, and many cases were replaced by the birth registration of the deceased child. In addition, there were cases where false reports was made to adjust school age or to adjust the duty of military service, and in some cases of birth registration was wrong due to mistakes of a public official.[6-8] Today, since the social institutions are applied based on the registered age and may disadvantages can be experienced if actual age and the registered age do not match. When age is an important criterion, such as admission to schools, employment, military service, retirement, and social welfare benefits, it is necessary to correct to the actual age.

As the demands of age estimation increases, there are many studies on the method of age estimation using teeth. In Korea, Chung[9] and Ko and Chung[10] studied teeth eruption and development of permanent teeth using teeth of Koreans, it is known as a relatively accurate method for age estimation in children and adolescents. The age of the examinee can be estimated using the results of a Korean study that statistically investigated and analyzed the attrition of permanent teeth.[11-13] Meanwhile In Korea, Jang et al.[8], Eom and Suh[3], and Kwon et al.[7] have analyzed age estimation cases from the view of social aspects. Especially, Eom and Suh[3] analyzed the characteristic of age estimation in Korean society through analysis of age estimation cases from 2000 to 2007 in Jeollabuk-do area and proposed a new research direction.

Now, more than a half century later, Korean society is no longer confused. Therefore, there are not many inaccurate cases as before and the needs for age estimation is expected to decrease. In particular, age estimation for children and young people are gradually decreasing, and the age estimation for the elderly are expected to increase. We supposed that Jeollabuk-do will have such a characteristic because the aged-child ratio is much higher than the national average.[14] Therefore, the purpose of this study was to investigate the changes in the age estimation cases from the view of social aspects. We analyzed the age estimation cases of the Department of Oral Medicine in Chonbuk National University Hospital for 8 years from January 2008 to December 2015 and to compare with previous studies from January 2000 to December 2007. Furthermore, we also investigated to predict and propose for future direction of age estimation research.

MATERIALS AND METHODS

1. Subjects

From January 2008 to December 2015 for 8 years, we collected data on age estimation conducted by the Department of Oral Medicine in Chonbuk National University Hospital. A total number of age estimation was 76 cases.

2. Methods

Based on the data submitted for age estimation, we examined the gender of the patient, the age of the family register, the age of the alleged, the reason for correcting the age, and present address. Dental radiographs were taken, and intraoral impressions were made to produce dental cast model. Oral examinations were performed in the clinic, or additional photos were obtained. Periapical radiographs

Table 1. The number of age estimation cases in each year (2008-2015)

Year	Male (n=37)	Female (n=39)
2008	3	6
2009	4	6
2010	10	7
2011	4	3
2012	4	3
2013	1	5
2014	7	5
2015	4	4

Values are presented as number only.

Table 2. Gender and registered age distribution

Age group (y)	Male	Female	Total
<10	1	0	1 (1.3)
10-19	1	1	2 (2.6)
20-29	0	1	1 (1.3)
30-39	2	3	5 (6.6)
40-49	8	6	14 (18.4)
50-59	19	25	40 (52.6)
60≤	8	7	13 (17.1)
Total	37 (48.7)	39 (51.3)	76 (100)

Values are presented as number only or number (%).

Table 3. The number of age estimation cases by year and by age group

Age group (y)	2008	2009	2010	2011	2012	2013	2014	2015	Total
<10	0	0	0	0	0	0	1	0	1 (1.3)
10-19	0	0	1	0	0	1	0	0	2 (2.6)
20-29	1	0	0	0	0	0	0	0	1 (1.3)
30-39	1	1	2	0	1	0	0	0	5 (6.6)
40-49	2	3	5	0	1	1	2	0	14 (18.4)
50-59	4	3	7	5	5	3	6	6	40 (52.6)
60≤	1	3	2	2	0	1	3	2	13 (17.1)
Total	9	10	17	7	7	6	12	8	76 (100)

Values are presented as number only or number (%).

Table 4. The difference between alleged age and registered age by age group (n=76)

Age group (y)	Difference between alleged age and registered age										
	1	2	3	4	5	6	7	8	9	10	11≤
<10	0	0	0	0	1	0	0	0	0	0	0
10-19	0	2	0	0	0	0	0	0	0	0	0
20-29	1	0	0	0	0	0	0	0	0	0	0
30-39	2	2	0	0	0	0	0	0	0	0	1
40-49	1	7	2	1	0	0	0	0	1	0	2
50-59	3	7	6	4	5	1	2	3	1	5	2
60≤	0	4	1	2	2	2	2	0	0	1	0
Total (%)	7 (9.2)	22 (28.9)	9 (11.8)	7 (9.2)	8 (10.5)	3 (3.9)	4 (5.3)	3 (3.9)	2 (2.6)	6 (7.9)	5 (6.6)

Values are presented as number only or number (%).

Table 5. The relation between alleged age and registered age by sex

Sex	Registered <Alleged age	Registered age >Alleged age
Male	33 (89.2)	4 (10.8)
Female	31 (79.5)	8 (20.5)
Total	64 (84.2)	12 (15.8)

Values are presented as number (%).

Table 6. The purpose of age estimation

Purpose of age correction	Value
Welfare	29 (38.2)
Occupation	23 (30.3)
To find right age	14 (18.4)
Sibling-related	3 (3.9)
Friends-related	3 (3.9)
Enter a school	2 (2.6)
Employment	1 (1.3)
Enter a competition	1 (1.3)

Values are presented as number (%).

were taken for the assessment of the volume of pulp chamber. When the edentulous or remaining tooth were insufficient, a cephalometric lateral view was taken to observe changes in the age of the mandible. If necessary, the time of tooth loss was recorded through paper interviews.

The data were organized and analyzed. The distribution of patients by age and year, the difference between alleged age and registered age, the purpose of age estimation, the methods of age estimation, the proximity of estimated age, and regional distribution were examined.

RESULTS

1. Distribution of Age Estimation by Year, Age, Gender

The distribution of age estimation cases from January 2008 to December 2015 in Chonbuk National University Hospital by year, sex, age are shown in Tables 1, 2 and 3.

In total, 76 cases were asked for age estimation, with 2010 showing the highest level with 17 cases, and 2013 showing the lowest number with 6 cases. There was no significant difference in gender between patients who requested age estimation. Age was classified according to the registered

Table 7. The purpose of age estimation by age group

Age group (y)	Purpose				
	Welfare	Occupation	To find right age	Sibling related	Friends related
<10	0	0	0	0	0
10-19	0	0	1	0	0
20-29	0	0	0	0	1
30-39	0	3	1	0	0
40-49	4	7	2	0	0
50-59	17	9	9	3	2
60≤	8	4	1	0	0

Table 8. The purpose of age estimation by year

Purpose	2008	2009	2010	2011	2012	2013	2014	2015
Welfare	3	6	4	5	1	2	5	3
Occupation	2	2	7	0	2	2	5	3
To find right age	1	1	4	2	4	2	0	0
Sibling related	0	0	1	0	0	0	0	2
Friends related	2	0	0	0	0	0	1	0

Table 9. The distribution of present address and legal domicile

Region	Present address	Legal domicile
Jeollabuk-do		
Jeonju	31 (40.8)	6 (7.9)
Jeongeup	6 (7.9)	6 (7.9)
Gimje	6 (7.9)	9 (11.8)
Gunsan	6 (7.9)	3 (3.9)
Buan	4 (5.3)	5 (6.6)
Gochang	4 (5.3)	5 (6.6)
Wanju	4 (5.3)	9 (11.8)
Jangsu	2 (2.6)	4 (5.3)
Imsil	2 (2.6)	5 (6.6)
Iksan	1 (1.3)	1 (1.3)
Muju	1 (1.3)	2 (2.6)
Namwon	1 (1.3)	2 (2.6)
Sunchang	1 (1.3)	5 (6.6)
Jinan	0	3 (3.9)
Total	69 (90.8)	65 (85.5)
Region excluding Jeollabuk-do	7 (9.2)	9 (11.8)
Unknown	0	2 (2.6)

Values are presented as number (%).

age. The lowest age at the time of admission was 1 year old and the highest age was 69 years. In age distribution, 50s were absolutely major proportion of total cases (52.6%).

2. Distribution according to the Difference Between Alleged Age and Registered Age

Table 4 shows the difference between the alleged age and the registered age. The difference between the ages was the highest in the case of 2 years (29.0%), the second highest was in the case of 3 years (11.8%).

As for the difference between the alleged age and the registered age, 84.2% of the patients wanted to increase their age, and 15.8% of the patients wanted to reduce their age. The sex distribution for those intended to reduce or increase their age is shown in Table 5. 89.2% of males and 79.5% of females showed a tendency to increase their age.

3. Distributions according to the Purpose of Age Estimation

Table 6 shows the distributions according to the purpose of age estimation. The most frequent purpose were welfare benefits (38.2%), such as pensions and medical insurance etc., followed by occupational problems (30.3%), such as promotion in the work, postponing retirement, and business paperwork. The purpose of age estimation according to age group is as shown in Table 7. In particular, the majority of age estimation requests were found among those in their 50s for welfare purposes. Also, Age estimation were requested for the purpose associated with welfare for each year from 2008 to 2015 (Table 8).

4. The Distribution according to Present Address and the Legal Domicile

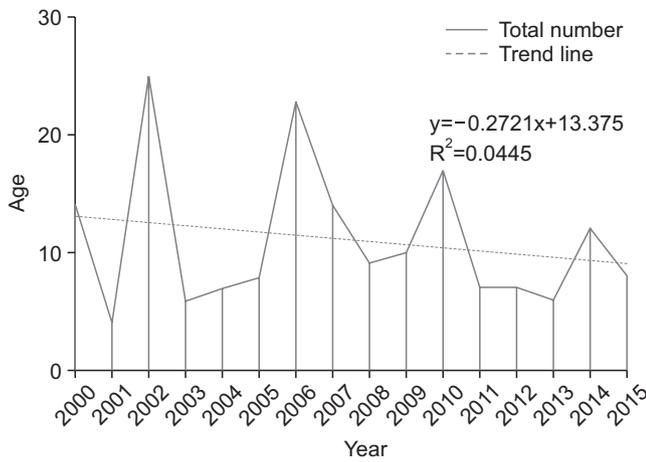According to the distribution of the current address of

Fig. 1. The number of age estimation cases in each year (2000-2007). The graph shows that the number of age estimation cases gradually decreased.
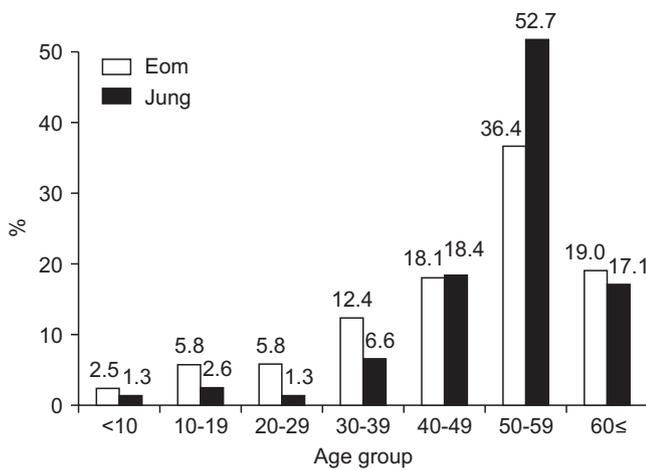

Fig. 2. The comparison chart of distribution by age group between two studies. The graph shows the percentage of age estimation cases by age group was changed. The ratio of over 50s is 69.8%, which is more higher than that of Eom and Suh[3].

clients who wanted age estimation, Jeonbuk area accounted for 90.8%, the most of which Jeonju City had 40.8%. Followed by Jeongeup, Gimje, and Gunsan were 7.9%. The area other than Jeollabuk-do was 9.2% (Table 9). Also, the distribution according to the legal domicile is shown in Table 9. The Jeonbuk area accounted for 85.5%, and it was distributed in various cities and counties in Jeollabuk-do.

5. The Comparison with a Prior Study

The total number of age estimation cases from 2000 to 2015 shown in Fig. 1. As simple linear regression, the number of age estimation can be predicted to gradually decrease
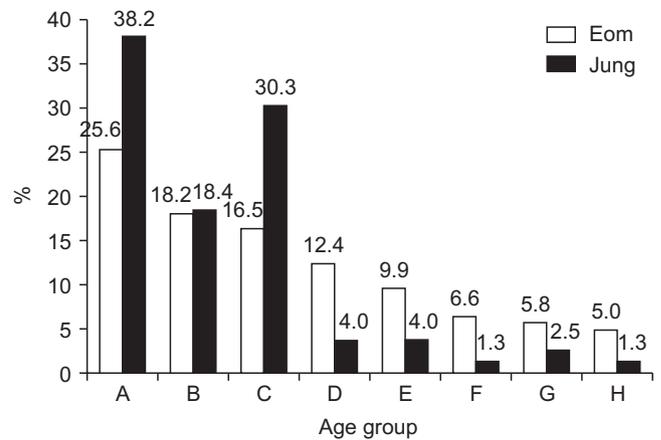

Fig. 3. The comparison chart of distribution by purpose of age estimation between two studies. The graph shows percentage of age estimation purpose look different two studies. Especially purpose A and C was very increased. A, welfare; B, to found right age; C, occupation; D, friend-related; E, sibling-related; F, employment; G, enter a school; H, etc.

in the future. Fig. 2 shows the differences of distribution by age between Eom's study[3] and this study. We examined whether there was any changes in the purpose of age estimation, and there is a difference in distribution for age estimation purpose (Fig. 3).

DISCUSSION

The demand for age estimation influenced by social characteristics. Therefore, it is necessary to analyze from the view of social aspects in studying age estimation. In this study, we examined the social aspect of age estimation cases performed at the Department of Oral Medicine in Chonbuk National University Hospital for 8 years form January 2008 to December 2015 and analyzed the trend of changes in age estimation.

A total of 76 cases of age estimations were performed and female (51.3%) were slightly more than male. As shown in Fig. 1 total number of cases is reduced. The mean average was 9.5 cases per year, which is significantly reduced compared to the previous study (on average 15.1 cases), performed from January 2000 to December 2007 in our department by Eom and Suh.[3] In simple linear regression results, the number of age estimation can be predicted to gradually decrease in the future. Actually, a sharp decline in the number of age estimation has already been seen. As for the

number of age correction of the national courts, it was decreased sharply over time 9,505 cases in 1989, 7,405 cases in 1991, and 5,336 cases in 1993.[6] It was almost half the level in 1993 compared to 1989, and it decreases further in the 2000s. The number dropped to 2,990 cases in 2000, and 3,109 cases in 2002.[15] It is seems to be due to a decrease in the incidence of false birth registration. Korea has experienced a number of large social changes in a relatively short period of time, and this particular situation made it difficult to accurately record births, deaths and migrations.[6] Also, in the past, due to the high infant mortality rate, birth registration were made several years after birth, or replaced by birth registration of other siblings who had already died from illness or accident. As a result, in the past, there have been common cases in which the actual age and the registered age are different, and it seems that there was a high need to correct age. However, as the social system gradually developed and the society stabilized, and due to the decrease in infant mortality, the frequency of inaccurate records or late birth registrations was reduced, leading to a decrease in the overall number of age-correction applications.

According to the number of age estimation by age group in this study, the under age of 10 and 20s were the lowest as 1.3%, and the most of them were over 50 years, the biggest portion, such as 69.8% of the total (Table 2). Compared with the past national age correction application cases, in a survey of 6 months from October 1993 to March 1994, the 50s or older accounted for only 12.9% while the under 10 years accounted for 51.7% of the total.[6] In the study of Jang et al.[8], 22.3% were in their 50s or older, 36.6% in their 20s or younger and 29.4% in their 30s. This shows a distribution that is significantly different from this study. Meanwhile, this study shows a general similarity with research by Eom and Suh,[3] but the ratio of over 50s is 69.8%, which is slightly higher than that of Eom and Suh (Fig. 2).

The difference in distribution by age group can be associated with a decrease in the total number of age estimation and a change in the purpose of age estimation. In the past, most of age correction cases were for children to school admission, and as a result, preschool children and young students under the age of 10 accounted for most of the total number.[6] However, as mentioned earlier, the need for age correction of preschool children has gradually disappeared

due to the decrease in inaccuracy in birth registration. As a result, it is thought that the number of cases under 10 years old was the lowest in this study. Most of the recent age estimation were over 50 years old, and the highest rate was 38.2% for the purpose of welfare benefits, such as pensions, basic living supply, and medical insurance (Table 6). Especially, the case where age estimation is requested for the purpose related to welfare exists within the study period each year (Table 8). Therefore, it can be seen that the demand for welfare is considerably high. In addition, job-related purpose (30.3%), such as promotion in the work or postponing retirement was the second highest percentage. It can be seen that the frequency (68.5%) of age estimation for utilitarian and economic purpose, such as welfare and job is higher than for previous study (42.1%) by Eom and Suh (Fig. 3).[3] This can be predicted that the age estimation request for welfare or economic purpose will continue to be generated in the future.

Meanwhile, the difference between the registered age and the alleged age was most often two years (29.0%) (Table 4). In the 50s, however, they showed various difference between the alleged age and the registered age. This is probably due to the social background mentioned above. In most cases, they were intended to increase their age (84.2%) and were observed in both males and females (Tables 5, 6). Especially in the 50s and 60s, the tendency to increase the age was very high, which is the same as the previous study.

Looking at the distribution by region, Jeonbuk province was the most residential area (90.8%), and the most frequency of legal domicile was also Jeonbuk province at 85.5% (Table 9). This is almost the same as the previous study by Eom and Suh,[3] and it seems that geographical factors have worked.

The actual age and the registered age did not often coincide after the social upheaval in the 1950s, and it seems to have increased the demand for age correction. In addition, as the average life expectancy gradually increase, life after retirement is getting longer, and society becomes more aging and welfare benefits become necessary. As of 2018, Korea has already entered 'the aged society' with over 65 years old accounting for 14.3% of the total population,[14] and there are various welfare systems for senior citizens to prepare for this. The term 'senior citizen' which is the

subject of the welfare for the elderly, refer to those who are generally 65 years or older, and age is an important criterion for receiving the benefits of the welfare system.[16)] In this study, most of the age estimation requests are over 50 years old, reflecting these social characteristics, and it seems that they tend to increase their age for welfare benefits. Especially, Jeollabuk-do has been ranked fourth among all provinces in aged society and the aged-child ratio of Jeollabuk-do is 150.6.[17)] These characteristics are likely to continue in the future. Therefore, even if the total number of age estimation requests decreases, age estimation in the elderly can continue. Although, we did not analyzed about method of age estimation in this study, there are many ways to age estimation using dentition. Age estimation in adults is mainly used pulp-to-tooth ratio method and the degree of teeth attrition.[11-13)] Considering the characteristics of the elderly who have often experience of tooth loss, it is necessary to study the age estimation methods using new features rather than using teeth like using loss of teeth, change of mandibular angle.[18-20)]

This study implies that it is possible to confirm the trend of age estimation cases over time in that it is a comparison of age estimation cases in past 8 years (2000-2007) and recent 8 years (2008-2015). However, there is a limitation of this study that we had analyzed very small number of cases and conducted only in specific area. Therefore, it is expected that an analysis of a wide range of age estimation cases for the whole of Korea will be necessary in order to analyze accurate trends of future age estimation and to determine research directions.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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