ORIGINAL ARTICLE

# Height, Weight and the Number of Erupted Permanent Teeth in 12-Year-Old Female Students in Hamadan, Iran

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**Background and aim:** The aim of the present study was to determine the timing of eruption of permanent teeth and assess its association with the height and weight in 12-year-old female students in Hamadan (2004).

**Materials and method:**

This descriptive/cross-sectional study was conducted from September 2003 to April 2004**.** 1000 healthy female students were consecutively selected from 9 different secondary schools in Hamadan. Each student's data was recorded in the relevant questionnaire. Measuring their height, weight and date of birth were also obtained. The height was measured in centimeter, using wall-mounted ruler on the child's head with their back and knees completely straight, and their feet together. The weight was measured in kilogram using a commercial digital scale after removal of the shoes only. The date of birth was obtained from the school records. The dental examination was carried out using a tongue depressor under natural light for the selected child. The mean and standard deviation of tooth eruption time was estimated for all of the girls. Bivariate analysis was used to assess any significant association between tooth eruption time and demographic variables. Pearson and partial correlations were used to determine the significant relationship between tooth eruption times with height/weight.

**Results:** Generally, the means of height and weight of the subjects were 152 cm and 43.3 kg, respectively. The mean number of erupted teeth was 25.35. In partial correlation analysis, mean tooth eruption times were positively, but not significantly associated with height while controlling for weight, On the other hand, mean tooth eruption times were positively associated with weight while controlling for height. The correlation coefficients between height and weight and the number of erupted teeth were 0.321 and 0.25, respectively, indicating a weak correlation but significant at a level of 0.01.

**Conclusions**: It can be concluded that girls with a higher height and weight compared to their peers had more erupted teeth. Although the height and of weight the girls did not show any significant influence on the tooth eruption times.

**Keywords:** Permanent teeth, Height, weight

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## Introduction

Tooth eruption is defined as the movement of the tooth from its site of development in alveolar bone to the occlusal plane in the oral cavity. The tooth eruption is a complex and tightly regulated process which is divided into five stages: preeruptive movements, intraosseous stage, mucosal penetration, preocclusal and postocclusal stages. Preeruptive movements occur during crown formation and are so small that they could only be observed by vital staining experiments. (1) It has also been reported that some other variables like genetics, hormonal factors, geographical location, ethnicity, sex, economic status, nutrition and growth exert their influences on tooth eruption time. (2, 3)

Body tests, including determination height and weight for the evaluation of bodily growth and using the results to determine the nutritional status of community members is considered an important source of information. Routine measurements to determine the nutritional status of children during growth period consist of measurements to determine weight, height, chest circumference, arm circumference and the thickness of subcutaneous fat in the arm.

However, determination of weight is the simplest of these measurements, which can be used more than other tests if it is carried out correctly. The results of height and weight measurements should be compared with the specific standards of children or adults. Previous studies have shown that children with proper nutrition but with different ethnic backgrounds have no significant differences in weight and height; however, children with low social and economic status in developing countries have lower heights and weights up to almost 12% and 30% compared to their peers in developed counties and also compared to children from the same ethnic background in their aim country but with higher social and economic status. Therefore, the environment in general and nutrition in particular seem to play a more important role compared to heredity in the growth of the body and growth graphs which have been prepared using the standards of developed countries can be used in many communities. (4)

A few studies have indicated a relationship between the eruption times with the weight and height of the children. Children who are below average weight and height have been shown to have a later eruption times than those who are within the standard range. (5, 6)

Therefore, the present study was undertaken to determine the timing of eruption of permanent teeth and assess its association with height and weight of 12-year-old girls in Hamadan, Iran, in 2004.

## Material &Methods

This cross sectional study was conducted from September 2003 to April 2004 in Hamedan , western Iran. The sampling technique used in the present study was a cluster random sampling. Each school was considered as clusters that were selected by random selection in view of the total sample size. The author has visited by herself to the selected schools to explain the purpose of the projects and got the permission from the administration. Time and dates were arranged with administration. Parents were encouraged to give their written consent.

One thousand cases were selected from 9 different secondary schools and planned to obtain for the study. Ten percent more is added into this sum to make sure that minimum committed number is obtained.

The children were12-year-old female students in secondary schools in city of Hamadan. The selection criteria were that a child had to be a healthy, aged 12 years and consented to participate in the study. The age of the child were ascertained from school records. In order to be considered healthy, a child had no history of systemic or chronic disease(s).

After determining the schools and referring to the schools, student lists were used in a simple random technique to select the subjects.

The weight was recorded in kilogram by using a commercial digital scale after removal of the shoes and wearing light dresses. The balance was calibrated at the beginning of each working day and at frequent intervals throughout the day. The height was measured in centimeter, using wall-mounted ruler that fixed at 2 meter height, according to the following protocol: no shoes, child's head touching the ruler with their back and knees completely straight, and their feet together.

The dental examination was carried out by the same operator, was non – invasive (non magnifying mirror,

dental probes, cotton roll with day light). No x-rays were used.

A tooth was considered erupted when any part of its crown had penetrated the gingiva and is visible in the oral cavity. A questionnaire was used to mark eruption or lack of eruption of each permanent tooth. Extracted teeth were placed in the erupted teeth category.

Data collected from the questionnaires were classified and coded, analyzed with Pearson's correlation coefficient using Statistical Package for Social Science Inc. (SPSS, version….).

Paired't' test was used to compare the mean time of eruption upper and lower jaws. Pearson and partial correlations were used to determine the significant relationship between eruption time with height, weight and BMI of the children

To avoid subjective errors, all the measurements were done by the same person and by one observer.

## Results

The total number of secondary schools included in this study was 9. About 1000 girl aged 12 years were screened from these schools.

Table 1 give the information of number of erupted and ununrupted teeth.

**Table 1.** The statistics of teeth in 12-year-old female students in Hamadan

| Eruption status | Total number of subjects | Mean | SD | St error mean | Median | Mode | Min | Max |
|---|---|---|---|---|---|---|---|---|
| **Erupted** | 1000 | 25.35 | 3.72 | 0.12 | 27 | 28 | 2 | 28 |
| **Not erupted** | 1000 | 2.65 | 3.72 | 0.12 | 1 | 0 | 0 | 26 |

The average difference in mean eruption times of all teeth was 0.8 (range, 0–1.5) years. (table 2, 3)

**Table 2.** Frequency distribution of maxillary permanent teeth erupted in the oral cavity of 12-year-old female students in Hamadan

| Tooth number | Right side | | Left side | |
|---|---|---|---|---|
| | Percentage | No. | Percentage | No. |
| **Tooth #1** | 99.9 | 999 | 99.8 | 998 |
| **Tooth #2** | 99.1 | 991 | 99.4 | 994 |
| **Tooth #3** | 85.4 | 854 | 84.7 | 847 |
| **Tooth #4** | 94.5 | 945 | 94.2 | 942 |
| **Tooth #5** | 83.1 | 831 | 83.2 | 832 |
| **Tooth #6** | 99.6 | 996 | 99.7 | 997 |
| **Tooth #7** | 63.8 | 638 | 62.6 | 626 |
| **Total number of erupted teeth** | 89.34 | 6254 | 89.08 | 6236 |

**Table 3.** Frequency distribution of mandibular permanent teeth erupted in the oral cavity of 12-year-old female students in Hamadan

| Tooth number | Right side | | Left side | |
|---|---|---|---|---|
| | Percentage | No. | Percentage | No. |
| **Tooth #1** | 99.4 | 994 | 99.7 | 997 |
| **Tooth #2** | 99.7 | 997 | 99.7 | 997 |
| **Tooth #3** | 96.4 | 964 | 96.3 | 963 |
| **Tooth #4** | 94.6 | 946 | 95.4 | 954 |
| **Tooth #5** | 80.4 | 804 | 82.7 | 827 |
| **Tooth #6** | 99.3 | 993 | 99.6 | 996 |
| **Tooth #7** | 72.1 | 721 | 70.9 | 709 |
| **Total number of erupted teeth** | 91.7 | 6419 | 92.4 | 6443 |

The information presented in the table 4 shows a weak correlation between the two variables of height and the number of erupted teeth, i.e. almost 10% of changes in each of the two variables was correlated with the other, which is significant at a significance level of 1%. . (table 4)

**Table 4.** Correlation between height and the number erupted permanent teeth in 12-year-old female students in Hamadan

| Variable | Number | Mean | SD | R (correlation coefficient) | $R^2$ | P-value |
|---|---|---|---|---|---|---|
| **Height (cm)** | 1000 | 151.97 | 8.01 | 0.321 | 0.103 | 0.01 = P |
| **The number of erupted teeth** | 1000 | 25.35 | 3.72 | | | |

The information presented in the table 5 shows a weak correlation between the two variables of weight and the number of erupted teeth, i.e. almost 8.4% of changes in each of the two variables was correlated with the other, which is significant at a significance level of 1%. (table 5)

**Table 5.** Correlation of weight with the number of erupted teeth in 12-year-old female students in Hamadan

| Variable | Number | Mean | SD | R (correlation coefficient) | $R^2$ | P-value |
|---|---|---|---|---|---|---|
| **Weight (kg)** | 1000 | 43.33 | 10.2 | 0.290 | 0.084 | P=0.01 |
| **The number of erupted teeth** | 1000 | 25.35 | 3.72 | | | |

## Discussion

The term “tooth eruption” generally refers to the appearance of some part of a tooth above the surface of the gingiva. (7)

According to Table 2, in the upper arch of the subjects tooth right central incisors #1 was the most commonly erupted tooth (99.9%) and left mandible second molars #7 was the least commonly erupted tooth (62.6%). The most commonly erupted teeth, in descending order, in the maxilla were the teeth 1, 6, 2, 4, 3, 5 and 7.

According to Table 3, females showed significantly late eruption in left mandible second molars #7 (70.9%) and early eruption in lateral incisors #2 (99.7%). In addition,

according to this table, in the mandible, teeth 2, 1, 6, 3, 4, 5 and 7 were the most commonly erupted teeth in descending order.

Moslemi et.al (8) reported when the maxillary and mandibular arches were compared, there was a tendency for central incisors, and first molars to be chronologically advanced in the mandible when compared to their maxillary counterparts.

So (9) reported that, the early sexual maturers were significantly taller and heavier and had more erupted permanent teeth with p values ranging from < 0.01 to < 0.001 levels than the late maturers.

Comparison of Tables 3 and 4 shows that the rate of unerupted teeth in the upper jaw was significantly higher than that in the lower jaw. Furthermore, the eruption sequences were different between the upper and lower jaws.

Based on the results, the mean height of the female subjects was 152 cm, with a mean weight of 43.3 kg.

Moslemi et.al (8) showed that, the mean height of 12-year-old female students was 152.8 cm, with a mean weight of 44 kg; both means were higher than those in the present study.

Table 4 shows the correlation between the height and the number of erupted permanent teeth in the students under study. Based on the information presented by this table, there was a weak correlation between changes in each of the two variables of height and the number of erupted permanent teeth, i.e. almost 10% of changes in each of the two variables was related with the other variable, which was significant at a significance level of 1%.

Table 5 shows correlation between weight and the number of erupted teeth in female students. The information presented by the table shows that each of two variables of weight and the number of erupted teeth were weakly correlated with each other, i.e. almost 8.4% of changes in each of the two variables was correlated with the other variable, which is significant at a significance level of 5%.

In a study by Trinatana et.al (6) the eruption time of permanent teeth in malnutritional children of primary school Si Sa Ket province. The total sample size was 337, aged between 6-16 years. There was high correlation between age and height, weight and eruption time of permanent teeth. Age estimation can be done through Regression equation based on eruption time of permanent teeth scores. A study by Billewicz and Gregor (8) on 635 African children, aged 4.5–14, showed There was an association between the number of teeth erupted at a given age and height and weight of the children. Also children with fewer teeth at a given age contain a greater proportion of children below standard weight or height for that age. This effect disappeared when children were classified in terms of weight for height. Another study by Simech - Slomkowska and Jarnecka (10) were carried out in 876 children aged 7-10 years. In the studied material accelerated eruption of permanent teeth coexisted with excessive body mass or height, and delayed eruption was related to below normal body mass and height. Another study by Zadzinska (10) in 2002 aimed to evaluate the relationship between three criteria of biological maturity of children: body height, body weight and the number of milk teeth. children were evaluated, consisting of 981 boys and 920 girls, aged 2–36 months in 30 nurseries in Łódź (Poland). Through an analysis of regression (backward) equations for predicting the number of teeth from chronological age, body weight and body height were calculated. This observations demonstrate conclusively that there exists a highly significant relation between deciduous tooth age and morphological age.

## Conclusion

Based on the results of the present study and the data presented in Tables, it can be concluded that there was a correlation between height and weight on one hand and the number of erupted permanent teeth in female students on the other; although the correlation was weak, it can be claimed that the subjects with higher mean height and weight had more erupted permanent teeth compared to their peers. In addition, female students with higher BMI had more erupted mandibular teeth compared to those with lower BMI.

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