Correlation of Nutritional Status with MP3 and Dental Developmental Stages.

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Objective: The aim of this study was to evaluate the correlation between maturation stages of middle phalanx of third finger and mandibular right canine and their association with nutritional status.

Material and Method: A total of 40 periapical radiograph of mandibular right canine and middle phalanx of third finger (MP3) was taken and assessed according to Demirijian's stages of Dental calcification and Hagg and Taranger's MP3 stages. Nutrition status was evaluated by using BMI for age (z score) index recommended by World Health Organization.

Result and Discussion: Maturation stages of MP3 and mandibular right canine shows highly significant correlation regardless of their nutrition level in different age group and no significant correlation were found between nutrition index and maturation stages.

Conclusion: As Mandibular canine calcification and MP3 stages were significantly correlated they can be used as a maturity indicator for growth assessment. Nutrition status was not at all correlated with maturation stages; it will not hamper diagnosis and treatment planning in orthodontic practice.

Keywords: Middle phalanx 3, skeletal maturity, dental stages, nutritional level.

Introduction

The role of interceptive orthodontics in recognizing and eliminating potential irregularities and malpositions in the developing dentofacial complex is well documented. The scope ranges from interception of dental anomalies like cross bite, abnormal habits, space maintenance etc. to interception of developing skeletal malocclusion. Among the different treatment modalities for skeletal malocclusion, growth modification is the interceptive procedure undertaken in a growing child[1].

Growth modification procedures done at right time will give you excellent and esthetic results. Pubertal growth spurts need to be identified accurately to take advantage

of growing age, Since chronological age is not a reliable indicator in assessing the skeletal maturity, other indicators like dental age, skeletal age, sexual maturity, body height and weight can be used for the purpose.[2,3] Among them the clinically relevant and reliable method is the assessment of skeletal maturity.[4-7]

The disadvantages of the routine methods[8] of skeletal maturity were that, they required elaborate equipments, were expensive and the radiation exposure time and dose were high. Krailassiri et al.[10] have reported that tooth calcification stages from panoramic radiographs might be clinically useful as a maturity indicator of the pubertal growth period.

This study was, therefore taken up to provide a simple and practical method for assessing skeletal maturity using a dental periapical radiographic film and a standard dental X‑ray machine, to compare the developmental stages of the mandibular canine with that of known methods like skeletal developmental stages of MP3[(8,9)] and to find out if the developmental stages of the mandibular canine alone can be used as a reliable indicator for assessment of skeletal maturity.

Material and Method

Periapical radiographs of MP3 and mandibular right canine of 40 subjects (male) between 9 and 16 years of age were selected.

Criteria for selection

Selection of the subjects was based on the following criteria

1. The subjects were randomly selected from school

2. The subjects had undergone neither previous orthodontic treatment nor extraction of any permanent teeth

3. The subjects had normal dental conditions, for example, no impaction or transposition of teeth

4. The subjects had no previous history of trauma or injury to the face and the hand and wrist regions.

A total of 40 periapical radiographs of the mandibular right canines were taken using bisecting angle technique with a standard size (31 mm × 41 mm Kodak) periapical dental X‑ray film.

A total of 40 periapical radiographs of the MP3 region were taken using the following procedure:

1. The subject was instructed to place the right hand with the palm downward on a flat table

2. The middle finger was centered on a 31 mm × 41 mm periapical dental X‑ray film, parallel with the long axis of the film

3. The cone of the dental X‑ray machine (70 kVp and 8 mA) was positioned in slight contact with the middle phalanx, perpendicular to the film. Exposure time was 0.4 s.

Nutritional status was determined by using BMI for age index, height and weight of the subject were measured and values were entered in the WHO Antro plus software. Reference curve given by world health Organization was used to divide the samples into normal weight, under weight, overweight.
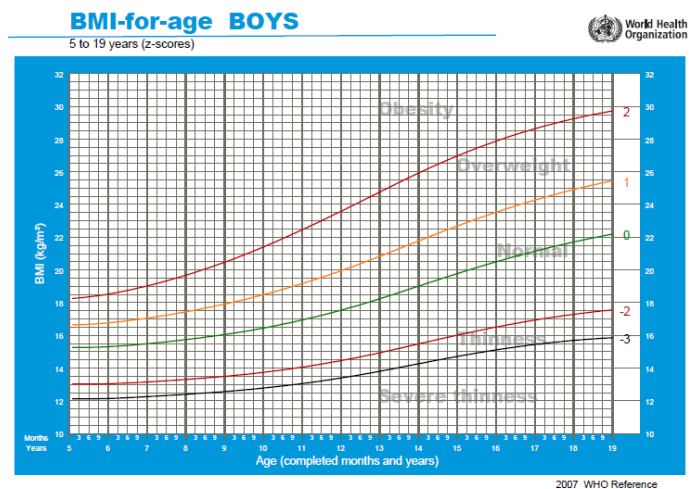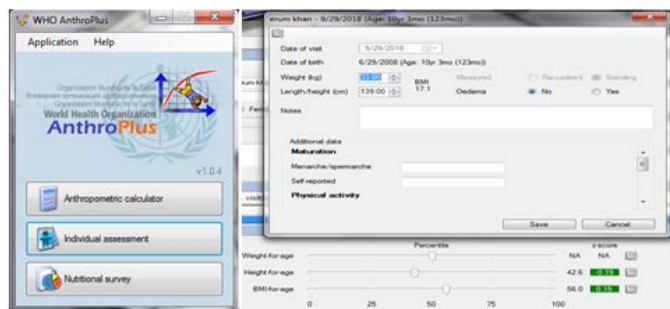
Radiographic interpretation of this study was made as per the system developed to interpret skeletal and dental maturation.

• The development of the MP3 stages of the hand were evaluated using Hagg and Taranger's classification [11,12]

• The development of mandibular canine was assessed according to Demirjian's stages of dental calcification[13]

Subject grouping (TABLE I)

Group	Group age	No of sample
1	9-10	5
2	10-11	5
3	11-12	5
4	12-13	5
5	13-14	8
6	14-15	6
7	15-16	3
8	16-17	3

Table 2

Group	Age(yr)	Total sample	Male Nutritional status		
			Normal	Under weight	Overweight
1	9-10	5	2	1	2
2	10-11	5	4	0	1
3	11-12	5	3	0	2
4	12-13	5	4	0	1
5	13-14	8	3	2	1
6	14-15	6	3	2	1
7	15-16	3	1	1	1
8	16-17	3	2	1	0

Result

The distribution of the sample according to nutrition status is provided in Table 2.

There was a statistically significant correlation for the skeletal maturation stage and dental development stage (P-<0.001) (Table 4) in different nutritional status group(Table 5). There was no influence of nutrition on maturation stages of MP3 and mandibular canine calcification (Table 6) and (Table 7).

Table 3

Skeletal maturity stages	Dental development stages						Total (%)
	D	E	F	G	H	I	
F	3	4	3	0	0	0	10(25%)
F G	0	4	6	3	0	0	13(32.5%)
G	0	0	1	3	5	0	9(22.5%)
H	0	0	0	0	5	0	5(12.5%)
I	0	0	0	0	2	1	3 (7.5%)
Total (%)	3 (7.5%)	8(20%)	10(25%)	6(15%)	12(30%)	1(2.5%)	40 (100%)

Table 4: Association between skeletal maturity sages and dental development stages.

Skeletal maturity stages	Dental development stages						Total (%)
	D	E	F	G	H	I	
F	3 (30%)	4 (40%)	3 (30%)	0 (0%)	0 (0%)	0 (0%)	10(25%)
F G	0 (0%)	4 (30.8%)	6 (46.2%)	3 (23.1%)	0 (0%)	0 (0%)	13,32.5%)
G	0 (0%)	0 (0%)	1 (11.1%)	3 (33.3%)	5 (55.6%)	0 (0%)	9(22.5%)
H	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (100%)	0	5(12.5%)
I	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (66.7%)	1 (33.3%)	3 (7.5%)
Total (%)	3 (7.5%)	8(20%)	10(25%)	6 (15%)	12(30%)	1(2.5%)	40 (100%)
	Chi square test value = 56.261, p < 0.001**						

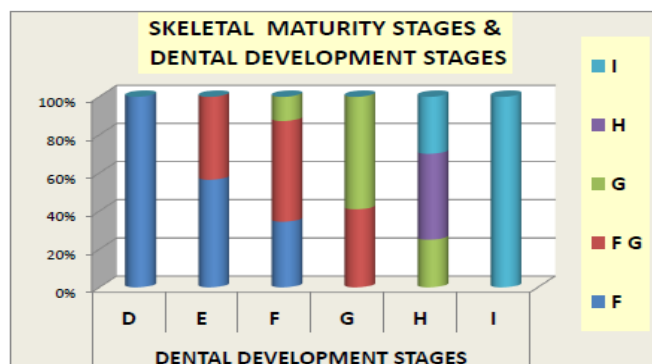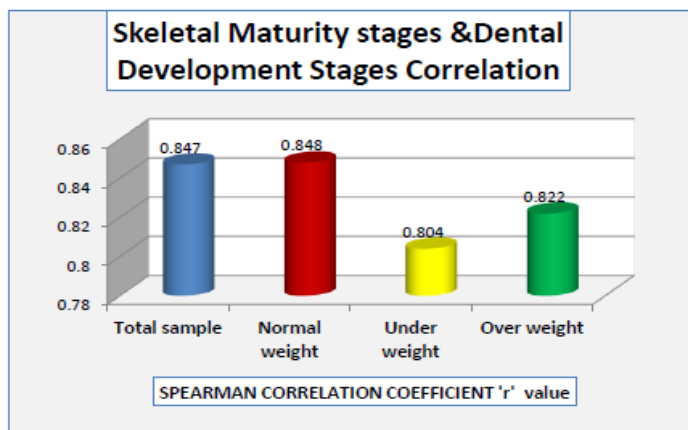P > 0.05 – not significant   ,   * p < 0.05 – significant,   **p < 0.001 –highly significant

Table 5: Spearman Correlation And P Value Between Skeletal Maturity Stages And Dental Development Stages In Different Groups.

NUTRITION STATUS	Dental development stages						Total (%)
	D	E	F	G	H	I	
NORMAL	2 (8.7%)	5 (21.7%)	6 (26.1%)	3 (13%)	7 (30.4%)	0 (0%)	23 (100%)
UNDERWEIGHT	1 (12.5%)	0 (0.0%)	1 (12.5%)	3 (37.5%)	2 (25%)	1 (12.5%)	8 (100%)
OVERWEIGHT	0 (0%)	3 (33.3%)	3 (33.3%)	0 (0%)	3 (33.3%)	0 (0%)	0 (100%)
CHI – SQUARE TEST VALUE = 12.391, p = 0.260							
SPEARMAN CORRELATION = r = 0.037, p = 0.821							

P > 0.05 – not significant   * p < 0.05 – significant   **p < 0.001 –highly significant

Table 6: Association of nutrition status and skeletal maturity stages

NUTRITION STATUS	SKELETAL MATURITY STAGES					
	F	FG	G	H	I	TOTAL
NORMAL	6 (26.1 %)	9 (39.1%)	3 (13%)	3 (13%)	2 (8.7%)	23 (100%)
UNDERWEIGHT	1 (12.5%)	1 (12.5%)	4 (50%)	1 (12.55)	1 (12.5%)	8 (100%)
OVERWEIGHT	3 (33.3%)	3 (33.3%)	2 (22.2%)	1 (11.1%)	0 (0%)	9 (100%)
CHI –SQUARE VALUE = 6.667, p = 0.573						
SPEARMAN CORRELATION VALUE = 0.014, p = 0.930						

P > 0.05 – not significant   * p < 0.05 – significant   **p < 0.001 –highly significant
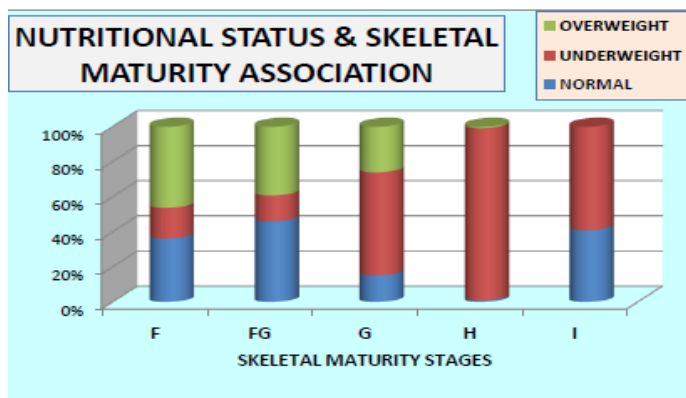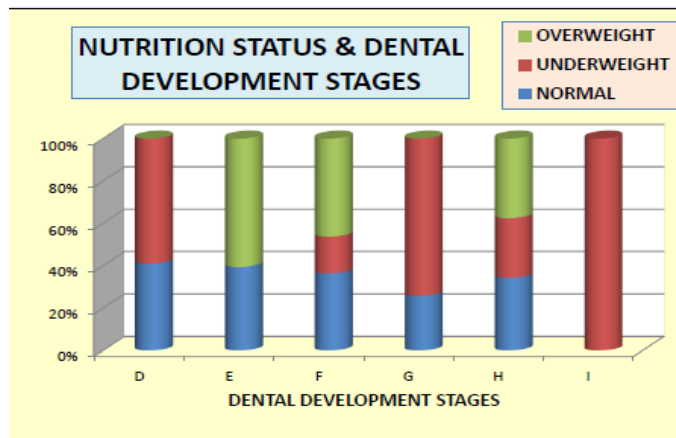

Table 7 : Association between nutritional status and dental development stages

Discussion

Skeletal maturity assessment and growth prediction is an important tool in the interceptive orthodontic diagnosis and treatment planning.[15-17] It is also a well‑documented fact that, growth modification treatment procedures that control the growth of bones were most effective when started 2 or 3 years prior to the peak in the pubertal growth spurt. Stages of maturation can be identified by chronological age, sexual maturation characteristics, body height and weight, skeletal development, and dental development age.[15, 19] among these skeletal age assessment is the most accurate method. In skeletal age assessment, Hand wrist radiograph, CVMI, MP3 have been used as popular method. but this technique require major equipments and radiation exposure. In this study mandibular canine calcification stages was highly

correlated to MP3 stages, hence can be used in growth assessment[14].

Nutrition is nourishment or energy that is obtained from food consumed or the process of consuming the proper amount of nourishment and energy. It was considered important to determine the amount of association between nutrition status and maturation stages and dental development in a sample of randomly selected children. If nutritional status is associated with altered skeletal and dental maturity, the nutritional status may potentially affect the timing of growth modification treatment planning. This study did not identify an association between nutrition and altered skeletal maturation stage[20].

Conclusion

From this study following conclusion can be drawn

- Correlation between canine calcification and MP3 stages was found to be of high significance.

- Correlation of both maturation stages were significant in three nutritional status group(normal weight, under weight, over weight).

- There was no influence of nutrition on maturation stages of MP3 and canine calcification stages.

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