

CORRELATION OF SEXUAL MATURATION WITH STATURE AND BODY WEIGHT & DENTAL MATURATION IN SOUTHERN CHINESE GIRLS

Author:

Lisa L.Y. So, B.D.S. (Hong Kong), M.D.S. (Hong Kong), F.H.K.A.M. (Dental Surgery), F.R.C.D. (Canada), F.R.A.C.D.S. (Orth)*

Correlation of stature and body weight and the eruption of permanent teeth with four sexual maturity criteria (menarche, pubic hair, axillary hair and breast development) was studied in 102 Southern Chinese girls aged between 11 years, 9 months and 12 years, 3 months and born and brought up in Hong Kong. With respect to all four selected criteria, 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.

Key Words: Sexual characteristics, Stature, Weight, Dental eruption

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* Lecturer in Orthodontics
Department of Children's Dentistry and Orthodontics
Faculty of Dentistry
The University of Hong Kong
Hong Kong

Introduction

Hong Kong is a small colony on the southern coast of China with a population of about 5.7 million living in an area of 1,000 square kilometres with almost homogenous geographic and climatic conditions. The majority of the population came from Southern Chinese provinces. Due to the foreseeable instability and changes in the political future of Hong Kong before the end of this century, there has been a recent massive emigration exodus of the local people to the western world. They will eventually constitute a number of minority Chinese ethnic groups living in these western countries. Hence, anthropometric data related to this population should be useful as references.

Materials and Methods

The initial sample consisted of female patients registered in the Department of Children's Dentistry and Orthodontics of the Prince Philip Dental Hospital. Exact chronological age was verified with the birth certificate upon initial registration at the hospital.

The selection criteria were:

1. A chronological age of 12 years ($\pm$ 3 months) on the day of examination.
2. The subject must be a local resident of Hong Kong; that is, born and brought up in Hong Kong.
3. Both parents are of Southern Chinese province ancestry.
4. The subject is physically and mentally healthy without a past history of chronic or severe illnesses, such as b-thalassaemia, tuberculosis, congenital heart diseases and Down's syndrome.
5. The subject is right-handed with no previous history of trauma or injury to the left hand and wrist region.

6. The subject has neither received orthodontic treatment nor had extraction of any permanent teeth.
7. The subject has normal dental conditions: that is, no impaction or transposition of teeth.

Measurements

Stature was measured using a Harpenden Stadiometer which was calibrated using the 600-millimetre rod supplied by the manufacturer. The subject was told to stand up straight with buttocks and shoulders in contact with the vertical backboard of the stadiometer and with the head aligned with the Frankfort Horizontal Plane parallel to the floor. The verbal command: "take a deep breath and stretch tall" was given to encourage the subject to straighten the spine. This was assisted by gentle upward pressure applied beneath the subject's mastoid processes and gentle tapping on the shoulders to relax them. Such a stretching manoeuvre and gentle lifting pressure under the mastoid processes during the measurements could minimise the diurnal variation in stature.^{1,2} The horizontal wooden headboard was moved slowly downward by means of miniature ball-bearing rollers under the influence of gravity to rest lightly on the vertex of the subject's head. Three measurements were taken at five-minute intervals of each subject to minimise variability of the operator and the positioning.³ In order to minimise errors, measurements of all subjects were made and recorded by the same trained operator using a standardised and consistent recording method.

A beam-balance machine calibrated to the one-tenth of a kilogram was used to measure the weight of the subjects.

The graduations were facing the observer for ease of operation. The subject, with minimal clothing, was placed on the centre of the platform. Three readings were recorded for each subject.

It was considered preferable that the subjects be weighed naked, or else with the minimal standard clothing supplied by the investigator and allowance made for it by adjusting the machine to read zero when the clothing was placed on it; or by adjusting the recorded measurements. The subjects in this experiment were weighed with minimal clothing as weighing naked would have invited embarrassment and hence jeopardise their participation.

Sexual Maturation

Estimation of sexual maturation was based on four secondary sexual characteristics: (1) age of menarche, (2) age of first appearance of pubic hair, (3) age of first appearance of axillary hair, and, (4) breast development.

In order to ensure the privacy of the subjects, the above were investigated by questionnaires after the clinical examination which was performed in a dental surgery. The subjects were asked to put down the dates of menarche and the first appearance of axillary and pubic hairs. Occasionally, some subjects did not understand the questions; the operator would explain or help with the recall of the dates. Breast development was done by clinical observation and was classified as either: with, or without, breast development.

Data on the sexual maturation were obtained by the recollection method. No physical examination was performed to ascertain the data. It was believed that these girls could still remember fairly well the data of such changes which should not be so remote as to have become obscured by the impact of later events of life.⁴

Eruption of Permanent Teeth

The eruption of permanent teeth was defined as: when any part of a tooth had emerged and penetrated the gingivae and, hence, was clinically detectable; otherwise, the tooth was classified as unerupted. Permanent incisors and first molars were not counted as these are fully erupted at the age of twelve in normal healthy individuals. It has already been shown that there is minimal difference between the numbers of erupted left and right

teeth;³ hence, the left permanent canines, first and second premolars, and second molars were studied.

Results & Discussions

One hundred and thirty-five girls of 12 years $\pm$ 3 months were invited to participate and were examined. Twelve girls were excluded from the study on the grounds that two were born and brought up in China, nine were of non-Southern Chinese ancestry, and one was mentally

retarded; hence, 123 subjects were studied with respect to stature and weight in the correlation to the four sexual maturity criteria. Of these 123 subjects, six had trauma to the hand and wrist region; ten had extractions of premolars for orthodontic treatment; four had one or more congenitally missing premolars; and one had an impacted upper canine. Therefore, 102 girls were studied with respect to the dental eruption status.

Table 1. Comparison of stature between the early and late maturers with respect to each sexual maturity criterion (n = 123).

Maturity Criteria	No. of Subjects	Stature (cm)				Difference
		Mean	$\pm$ S.D.	Standard error of mean	Range	
Menarche	Yes (33)	152.35	$\pm$ 5.57	0.970	144.2 - 164.4	6.95***
	No (90)	145.40	$\pm$ 6.13	0.646	130.9 - 160.5	
Pubic Hair	Yes (45)	150.38	$\pm$ 6.12	0.913	138.9 - 164.4	4.93***
	No (78)	145.45	$\pm$ 6.37	0.722	130.9 - 160.5	
Axillary Hair	Yes (29)	151.73	$\pm$ 5.75	1.067	138.9 - 164.4	5.73***
	No (94)	146.00	$\pm$ 6.37	0.167	130.9 - 160.5	
Breast Development	Yes (40)	151.26	$\pm$ 6.53	1.032	130.9 - 164.4	5.93***
	No (83)	145.33	$\pm$ 5.80	0.648	132.3 - 158.2	

***p < 0.001

Table 2. Comparison of body weight between the early and late maturers with respect to each sexual maturity criterion (n = 123).

Maturity Criteria	No. of Subjects	Body Weight (kg)				Difference
		Mean	$\pm$ S.D.	Standard error of mean	Range	
Menarche	Yes (33)	42.82	$\pm$ 7.06	1.229	28.5 - 57.0	7.86***
	No (90)	34.96	$\pm$ 6.28	0.662	25.0 - 53.5	
Pubic Hair	Yes (45)	40.86	$\pm$ 7.27	1.083	28.5 - 57.0	5.70***
	No (78)	35.16	$\pm$ 6.64	0.752	25.0 - 53.5	
Axillary Hair	Yes (29)	41.16	$\pm$ 7.84	1.457	28.5 - 57.0	5.20***
	No (94)	35.96	$\pm$ 6.81	0.702	25.0 - 53.5	
Breast Development	Yes (40)	41.95	$\pm$ 7.34	1.161	25.0 - 57.0	7.06***
	No (83)	34.89	$\pm$ 6.28	0.689	25.1 - 53.0	

***p < 0.001

Table 3. Comparison of number of erupted left permanent canines, premolars and second molars between the early and late maturers with respect to sexual maturity criterion (n = 102).

Maturity Criteria	No. of Subjects	Number of Erupted Permanent Teeth				Difference
		Mean	$\pm$ S.D.	Standard error of mean	Range	
Menarche	Yes (27)	7.30	$\pm$ 1.71	0.302	0 - 8	1.51***
	No (75)	5.79	$\pm$ 2.20	0.251	0 - 8	
Pubic Hair	Yes (38)	6.89	$\pm$ 1.56	0.252	4 - 8	1.12**
	No (64)	5.77	$\pm$ 2.39	0.299	0 - 8	
Axillary Hair	Yes (23)	6.55	$\pm$ 1.73	0.361	4 - 8	0.51***
	No (79)	6.04	$\pm$ 2.30	0.258	0 - 8	
Breast Development	Yes (35)	7.29	$\pm$ 1.05	0.177	4 - 8	1.51***
	No (67)	5.78	$\pm$ 2.21	0.270	0 - 8	

**p < 0.01

***p < 0.001

The subjects were sub-divided into early or late sexual maturers, depending on the presence of each sexual maturity criterion. The differences in the stature, body weight and dental eruption status between each two subgroups were studied. Early sexual maturers were found to be significantly taller at the $p < 0.001$ level than the late maturers with respect to all four sexual maturity criteria studied (Table 1). The differences between the subgroups ranged from 4.93 centimetres to 6.95 centimetres. Similar highly significant differences were also demonstrated in their body weights: with the early sexual maturers being heavier than the late maturers (Table 2). The differences between the subgroups ranged from 5.20 kilograms to 7.86 kilograms. The differences in both stature and body weight were greatest between the subgroups when the subdivision criterion was menarche. As a conclusion, the present study agrees with the series of hypotheses which relate menarche to the threshold levels of weight or body composition.^{5,8}

Girls who were more sexually mature were also shown to have more erupted permanent canines, premolars and second molars than the late sexual maturers with respect to all four sexual maturity criteria. The differences were statistically significant at either the $p < 0.01$ or $p < 0.001$ levels (Table 3). These results agree with some previous studies which demonstrated girls with advanced dental development tended to have an early menarche.^{9,13}

Summary

Correlation of stature and body weight and eruption of permanent teeth with four sexual maturity criteria (menarche, pubic hair, axillary hair and breast development) was studied in 102 Southern Chinese girls aged 12 years ± 3 months who were born and brought up in Hong Kong. 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 with respect to all four selected criteria.

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Address for Correspondence and Reprints:

Dr Lisa LY So
Department of Children's Dentistry and Orthodontics,
Prince Philip Dental Hospital
34 Hospital Road,
Hong Kong.