

Lip Parameters in Nigerian Children

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This is a study of lip dimensions in normal Nigerian children. It was carried out at University College Hospital, Ibadan, Nigeria, between January of 1986 and January of 1987. Two hundred and forty children of both sexes and aged from birth to 12 years had parameters relating to the anatomy of the human lip evaluated.

The parameters determined included length of the upper vermilion arc, width of the mouth, and heights of the cutaneous upper lip and upper vermilion. All measurements were taken with the lips at rest.

The length of upper vermilion arc and mouth width demonstrated a steady increase with age, mean male values being significantly greater than female values at 2 to 3 and 8 to 9 years. The heights of the cutaneous upper lip and upper vermilion showed an initial steady growth up to 6 years, followed by a decline in the rate of growth of the lip. There was a linear relationship between weight and height of the children and upper vermilion arc length, mouth width, and height of the cutaneous upper lip.

Objective assessment of the size of the lip and mouth and surgical planning based on established standards are recommended. (*Plast. Reconstr. Surg.* 91: 446, 1993.)

The most visible and accessible sphincter in the human body is the lip.¹ Despite this, the lip has received little attention in contrast to other sphincters. Reports of successful reconstructive surgery for various types of lip defects abound in literature. Most of these have been judged on a purely subjective basis. In addition, the character of the operated lips in these reports was not compared with any established standards. There is therefore a need for establishing reference standards that could constitute a baseline in assessing results of these reconstructive procedures. These normal values are also useful in delineating syndromes that present with abnormalities of lip height and size of the oral opening.

Up to 1979, there had been few reports of lip measurements. These involved small-scale studies of mouth width,² height, and vertical growth

of the lips.³ The pioneering works of Farkas et al.⁴ and Fogel and Stranc¹ were comprehensive studies of lip parameters and function in both sexes and in all age groups. However, there have been few published studies of lip parameters in blacks. The present study has therefore been undertaken to obtain normal values of upper lip parameters in Nigerian children and to compare these with values obtained in other studies.

SUBJECTS AND METHODS

The subjects consisted of 240 children with normal lips divided equally between both sexes. The youngest was 10 hours old, while the oldest was 12 years old. The subjects were selected by cluster sampling method⁵ from a population of patients attending surgical and children outpatient departments of University College Hospital, Ibadan, Nigeria, neonates in lying-in wards, children in pediatric wards of the same hospital, and children from three nursery/primary schools within Ibadan. Children with noticeable lip anomalies or who had previous lip operations were excluded from the study.

The following measurements were carried out on each child: weight, height, length of upper vermilion arc (cheilon-labiale superioris-cheilon, *ch-ls-ch*; Fig. 1); mouth width (cheilon-cheilon, *ch-ch*; Fig. 1); midline height of the cutaneous upper lip (subnasale-labiale superioris, *sn-ls*; Fig. 2); and height of upper vermilion (labiale superioris-stomion, *ls-sto*; Fig. 2). All measurements were obtained using Vernier calipers, except in the case of upper vermilion arc measurement, in which a tape measure was draped gently along the upper lip.

The children were divided into six groups comprising 20 males and 20 females each. Mean values and standard deviations were calculated for each parameter. Mean values between the

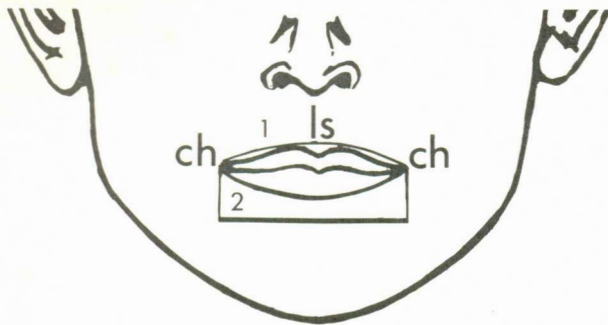


FIG. 1. (1) Upper vermilion arc, *ch-ls-ch*. (2) Mouth width, *ch-ch*.

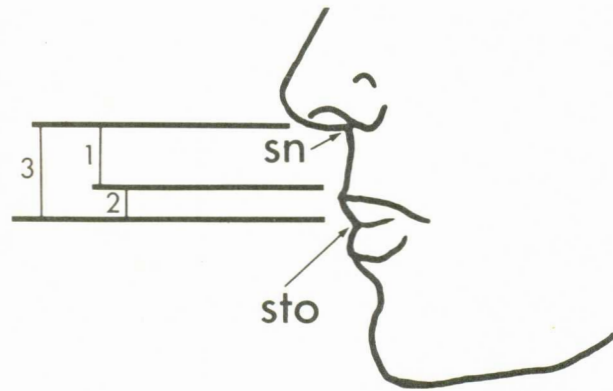


FIG. 2. (1) Height of cutaneous upper lip, *sn-ls*. (2) Upper vermilion height, *ls-sto*. (3) Height of the upper lip, *sn-sto*.

sexes were compared using student's *t* test. Level of significance was taken to be $p < 0.05$. Linear regression and multiple linear regression were used to study the relationship between normal lip parameters on one side and the age, height, and weight of the children on the other side. The level of significance was taken to be $p < 0.05$.

TABLE I
Mean Height (cm) and Weight (kg) of 240 Children Whose Lip Parameters Were Evaluated in Ibadan

Age (years)		Male		Female		<i>t</i>	<i>p</i>
		Mean	SD	Mean	SD		
Below 2	Height	65.9	15.5	63.1	14.5	0.9	>0.1
	Weight	6.9	3.3	5.5	2.8	2.25	<0.05*
2-3	Height	93.6	7.9	94.1	10.8	0.22	>0.1
	Weight	13.3	2.8	13.5	2.7	0.32	>0.1
4-5	Height	112.3	7.2	111.3	10.4	0.43	>0.1
	Weight	18.1	2.4	18.0	4.5	0.1	>0.1
6-7	Height	121.0	5.0	123.8	5.6	1.68	>0.1
	Weight	21.3	2.5	21.9	3.2	0.84	>0.1
8-9	Height	131.5	7.4	134.3	8.1	1.56	>0.1
	Weight	25.4	4.3	25.2	3.7	0.24	>0.1
10-11	Height	138.0	8.2	145.6	7.1	4.84	<0.005*
	Weight	29.4	5.1	33.0	5.4	3.0	<0.01*

* Significant value.

TABLE II
Length of Upper Vermilion Arc (mm) in 240 Children in Ibadan

Age (years)	Male		Female		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Below 2	39.3	6.6	36.1	5.4	2.07	>0.05
2-3	48.9	5.6	44.7	3.7	5.40	<0.005*
4-5	48.6	4.6	48.0	4.5	0.60	>0.1
6-7	51.7	6.3	53.1	6.2	1.01	>0.1
8-9	56.2	2.0	53.6	4.3	2.72	<0.025*
10-11	58.6	6.5	56.5	5.1	1.85	>0.05

* Significant value.

RESULTS

There was a significant difference between mean height of males and that of females only in the 10- to 11-year age group (Table I). This age group also displayed a significant difference in mean values of weight in males and females. The length of upper vermilion arc (Table II) and mouth width (Table III) increased with age. Mean male values were significantly greater than female values at 2 to 3 and 8 to 9 years, as well as in children under 2 years old in the case of mouth width measurement only.

The midline height of the cutaneous upper lip demonstrated an interesting feature of rapid growth up to 6 years (Table IV). This growth then slowed down. A significant difference between male and female means was observed only in the 10- to 11-year age group. The trend in growth of height of the upper vermilion was similar to that observed in the case of the midline height of the cutaneous upper lip, namely, rapid growth up to age 6 (6.7 to 9.3 mm) and a slowing down afterwards, when the mean ranged from 9.0 to 9.7 mm (Table V).

Lip parameters can be predicted significantly better using height and weight than using age alone (Tables VI and VII). The linear relationship of height and weight to the length of upper vermilion arc, mouth width, and the midline height of the cutaneous upper lip was found to be

TABLE III
Mouth Width (mm) in 240 Children in Ibadan

Age (years)	Male		Female		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Below 2	31.0	5.3	28.5	4.4	2.56	<0.05*
2-3	37.3	3.3	35.7	2.8	2.57	<0.05*
4-5	39.5	2.7	40.2	3.3	0.95	>0.1
6-7	41.3	3.2	40.8	3.8	0.58	>0.1
8-9	44.2	2.9	42.8	3.0	2.10	<0.05*
10-11	45.6	3.8	45.1	4.0	0.56	>0.1

* Significant value.

TABLE IV

Midline Height of the Cutaneous Upper Lip in 240 Children in Ibadan

Age (years)	Male		Female		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Below 2	10.8	2.3	10.0	2.1	1.71	>0.1
2-3	12.1	2.3	11.6	1.6	0.71	>0.1
4-5	12.8	2.3	12.7	1.6	0.28	>0.1
6-7	12.8	1.3	12.4	2.1	0.76	>0.1
8-9	13.0	2.3	13.4	1.7	1.06	>0.1
10-11	13.9	2.0	12.6	1.6	3.65	<0.005*

* Significant value.

significant in both sexes (Table VI).

It can be observed from the slope coefficients of the equations that a significant effect of height alone exists for the width of the mouth. Also, the regression equation for the midline height of the cutaneous upper lip is due almost solely to the child's weight. The occurrence of negative coefficients of the height or weight in the equations obtained for upper vermilion arc, midline height of the cutaneous upper lip, and height of the upper vermilion suggests an inverse relationship given a constant value of the other variable.

Mouth width measurements obtained by Hajnisova⁶ from Czechoslovakian youths aged 6 to 12 years were found to be insignificantly longer than those in this study (Table VIII). The width of the mouth and midline height of the cutaneous upper lip were significantly greater in full-term Israelis⁷ during the neonatal period than those in Nigerians of the same age (Table IX).

DISCUSSION

Parameters evaluated in this study demonstrate certain features which hitherto would not have been obvious to the subjective assessor. Male values are higher than those of females in most of the parameters. Although the reason for

TABLE V

Midline Height of the Upper Vermilion (mm) in 240 Children in Ibadan

Age (years)	Male		Female		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Below 2	7.5	1.9	6.7	1.6	2.25	<0.05*
2-3	8.3	0.8	8.2	1.1	0.41	>0.1
4-5	9.3	1.2	8.7	1.2	2.25	<0.05*
6-7	9.0	1.1	8.9	1.3	0.52	>0.1
8-9	9.7	1.6	9.1	1.4	1.93	>0.05
10-11	9.4	1.2	9.6	1.3	0.69	>0.1

* Significant value.

this is not obvious from this study, the trend does not conform with that of the height and weight in children, in which there is no significant difference between the sexes up to puberty.⁸

The increase in the length of the upper vermilion arc and mouth width with increasing age is expected when compared with the linear growth pattern in children.⁹ Differences between lowest and highest values in the midline height of the cutaneous upper lip and height of the upper vermilion are small. This is a point to be noted because an enthusiastic overcorrection of a lip anomaly in early childhood can give rise to too long a lip. Since the lip continues to grow after correction, it may become more obvious as the child grows older.

Based on analysis-of-variance results, the length of upper vermilion arc, mouth width, and midline height of the cutaneous upper lip are predictable given the height and weight of the child. Different values obtained in this study when compared with those from Czechoslovakia⁶ and Israel⁷ confirm the racial dependence of facial measurements.¹⁰ Local reference values should therefore be used in syndrome delineation and assessment of surgical procedures.

The practicing physician's primary goal is not that of establishing a specific syndrome diagno-

TABLE VI

Relationship of Lip Parameters to Height and Weight in 240 Children in Ibadan (Using Multiple Linear Regression)

Parameter		<i>n</i>	Regression Coefficient			
			<i>B</i> ₁	<i>B</i> ₂	<i>A</i>	<i>F</i>
Upper vermilion arc, <i>ch-ls-ch</i>	Male	120	0.18	0.22	14.88	92.00*
	Female	120	-0.27	1.69	15.66	373.83*
Width of mouth, <i>ch-ch</i>	Male	120	0.14	0.15	4.57	101.01*
	Female	120	0.19	0.00	13.83	139.66*
Midline height of cutaneous upper lip, <i>sn-ls</i>	Male	120	0.04	-0.01	4.08	14.25*
	Female	120	0.00	0.09	8.25	33.34*
Height of upper vermilion, <i>ls-sto</i>	Male	120	0.03	0.15	0.69	1.82
	Female	120	0.04	-0.03	3.01	42.22*

N = The regression equation is $y = A + B_1x_1 + B_2x_2$, where *y* is lip parameter, *x*₁ is height of child (cm), and *x*₂ is weight of child (kg); *n* = sample size, *A* = the intercept, *F* = observed *F* value; the tabulated *F*_{.05 (2,117)} = 3.076.

* Significant value.

TABLE VII
Relationship of Lip Parameters to Age in
240 Children in Ibadan (Using Linear Regression)

Parameter		n	Regression Coefficient		
			B	A	F
Upper vermilion arc, <i>ch-ls-ch</i>	Male	120	1.74	41.87	6.45*
	Female	120	1.91	39.11	6.60*
Width of mouth, <i>ch-ch</i>	Male	120	1.36	33.00	7.72*
	Female	120	1.50	31.36	5.59*
Midline height of cutaneous upper lip, <i>sn-ls</i>	Male	120	0.26	11.27	5.27*
	Female	120	0.26	10.82	2.81
Height of upper vermilion, <i>ls-sto</i>	Male	120	0.19	7.91	3.56
	Female	120	0.25	7.29	4.75*

Note: The regression equation is $y = A + Bx$, where y is lip parameter, x is the age of child (years); n = sample size; A = the intercept; F = observed F value; the tabulated $F_{.05} = 3.951$.

* Significant value.

TABLE VIII
Mouth Width (mm) in Ibadan and Prague Compared

Age (years)	Sex	Mouth Width (mm)		<i>t</i>	<i>p</i>
		Ibadan	Prague		
6-7	Male	41.3	42.5	1.68	>0.10
	Female	40.8	42.3	1.77	>0.05
8-9	Male	44.2	44.6	0.62	>0.10
	Female	42.8	43.3	0.75	>0.10
10-11	Male	45.6	46.8	1.41	>0.10
	Female	45.1	46.1	1.12	>0.10

sis. His or her major responsibility is to separate abnormal from normal findings. He or she particularly will find clinical measurements useful, especially since the tools are usually at his or her disposal. Patients with trisomy E, for example, present with features that include microstomia,¹¹ expressed by a short mouth width. Di-Georges anomalies¹² consist of a short philtrum in addition to other features, while Hurler's syndrome¹³ is characterized by prominent, full lips. Other congenital causes of upper lip hypertro-

TABLE IX
Mouth Width (mm) and Midline Height (mm) of the Cutaneous Upper Lip in 15 Nigerian and 87 Israeli Neonates Compared

	Ibadan		Petah Tique		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Mouth width (<i>ch-b</i>)	25.6	1.9	27.0	1.8	2.76	<0.05*
Midline height of cutaneous upper lip (<i>sn-ls</i>)	8.6	0.9	10.4	1.0	7.48	<0.005*

* Significant value.

phy include congenital double lip, hemangioma, and lymphangioma. Among the acquired causes are those due to streptococcal infection and glandular macrocheilia. Lip dimensions are useful in delineating such syndromes.

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