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# CHANGES IN LIP DIMENSIONS IN A MALE EASTERN NIGERIA POPULATION

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## ABSTRACT

*The aim of the study was to establish reference standards in lip anthropometry for eastern Nigerian males, which will serve as a guide to Maxillofacial, Plastic and Reconstructive Surgeons practicing in Nigeria. A cross – sectional study which lasted for 6 months was carried out on the anthropometric variables of the lips of 220 males, with ages ranging from 6 months to 55 years, in Enugu, eastern Nigeria. Result showed progressive increment in mean values of the intercommissural distance with the lips relaxed and measured in a straight line (ICD – Sc) with increasing age, from 6 months to 12 years. There was progressive increase in the mean values of the intercommissural distance with lips retracted maximally laterally, from 6.1 to 12 years, reaching a maximum at 10.1 to 12.0 years. The value became constant from 12.1 years. The height of the upper lip demonstrated a progressive increase from 6 months to 8 years. There was a progressive increase in the inter soft tissue gape (ISG) from 4.00 – 4.22 ± 4.80 cm in the 10.1 to 12.0 years age group, with a peak between 6.1 – 8.0 years. Subsequently the values decreased in a fairly constant pattern. This study has provided approximate values for lip parameters for Enugu males which can also be used as a guide in reconstructive surgery for other Nigerian male populations, due to their similar anthropometric and demographic profiles.*

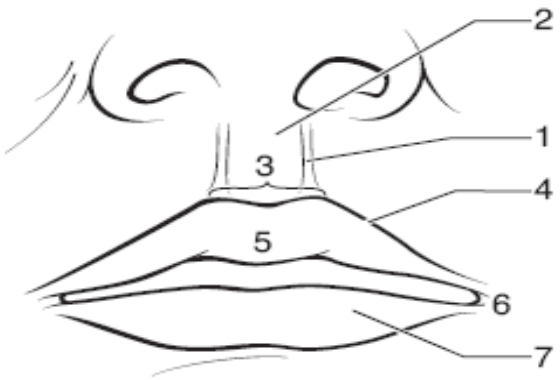
**Key Words:** Anthropometry, Lips, Intercommissural, Reconstructive

## INTRODUCTION

The lips are two fleshy folds which surround the oral orifice (Fogel and Stranc, 1984). They develop during the formation of the face with the genesis of the brachial arches and growth of the frontonasal prominence in the third week of intra-uterine life (Singh, 1976; Moore, 1988).They are complex, laminated structures consisting of skin, subcutaneous tissue, muscles, sub mucosa and mucosa (Trelles*et al.*, 2000). They are limited at the

top by the base of the nose; at the bottom by the mentolabial furrow and towards the sides by the nasolabial-genian furrow. Their junctions at the sides form the commissures of the mouth (Sinnatamby, 1999).

The lips have an exquisite contour with fullness in the central part of the upper lip located immediately below the appropriately named Cupid's bow. The upper lip protrudes anteriorly and overlies the lower lip. At the commissures, the vermillion narrows and is pulled inwards and lateral to the modiolus, where the muscles responsible for smiling blend with the muscles of oral competence. In the middle of the external surface of the upper lip is a shallow vertical groove named the philtrum; it ends below in a slight prominence (the tubercle) and is limited on each side by a ridge. The inner surface of each lip is connected in the median plane to the corresponding gum by a fold of mucous membrane, termed the frenulum- that of the upper lip being larger(Sinnatamby, 1999;Zide, 1990).




1: Philtral Ridge 2: Philtral Column 3: Cupid's Bow 4: White Roll
5: Tubercle 6: Commissure 7: Vermillion

**Fig. 1: External Anatomy of the Lips** (Source:Zide, 1990)

The mucous membrane is continuous with the skin at the margins of the lips, and here the stratified squamous epithelium changes from a non-keratinizing to a keratinizing type. The main bulk of the lip is the muscular layer which is formed by orbicularis oris and the various facial muscles which converge on it. The submucous layer of areolar tissue binds the mucous membrane to the muscle layer. The labial glands are situated between the mucous membrane and the orbicularis oris, around the orifice of the mouth.

The age of the person determines modifications in the muscles and cutaneous distension. Osseous resorption and the loss of teeth have dramatic consequences for the anatomic and aesthetic characteristics of lips. In the muscle apparatus of the oral sphincters, the internal and external orbicularis musclesrepresent the most important dynamic unit (Gray, 1978).The paired orbicularis oris muscle join in the midline of the lower lip in a raphe. In the upper lip, they cross the midline and insert into the opposite philtral column. The orbicularis also sends fibers to the skin at

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the base of the ala, nasal sill, and septum, and is the most important muscle for oral competence. It also provides for pouting and eversion of the lip, and some elevation of the lower lip. The second most important muscles are the paired mentalis muscles, which are the main elevators of the lower lip, required for lip competence. The superior extent of the mentalis muscles defines the labiomental fold (Thorne, 2007). The muscle adheres to the deep dermis and to the rest of the skin muscles that converge towards the lips, principally towards the mouth commissures, pulling and stretching together with the skin (Trelles*et al.,* 2000; Thorne, 2007). The Anatomy of the human lip adapts it to its functions of oral access, continence, vocalization and cosmesis (Gray, 1978;Edler, 2006).

The importance of the lips and chin in influencing the quality of the facial profile has been recognized and put into sculptural and artistic practices during the renaissanceand many aspects of ancient measurements can be found in modern clinical anthropometry. Fewer reports existed in literature prior to 1979 on scientific measurements of the lips and Hajnisova (1967) noted that between the ages of 11 and 13 years, the mean male and female lip values were close and that after the 14$^{th}$ year, the difference in both sexes became very distinct due to more intensive growth in boys, and that the growth of the mouth may be considered complete at 14 years in girls, and 16 years in boys. For reconstructive and cosmetic surgery, realistic sizes and proportions are assessed using anthropometric techniques and used as guidelines to correct deformities and disproportions (Tobin and O'Daniel, 1990).

The pioneering work of Farkas*et al.* (1994) and Farkas (1994), and Fogel and Stranc (1984) were comprehensive studies of lip parameters and function in both sexes and in all age groups. In another study by Ferrario*et al.* (2003)it was concluded that, the upper lip of adult patients operated on for cleft lip and palate differed from that of healthy controls of the same age, sex, and ethnic group. The analysis pointed out those parts of the lips and mouth, particularly the vermilion of the upper lip that differ the most from the norm. He suggested that this method may be used to indicate to the surgeon and patient where additional procedures might be performed to approximate the morphologic characteristics of a reference population.

Few reports have been undertaken amongst negroid race. Fasika undertook the study at Ibadan, Nigeria to obtain normal values of upper lip parameters in Nigerian children, comparing values obtained with other studies (Fasika, 2003). He noted that male values were higher in most of the parameters, the trend not conforming to that of height and weight in children, in which there is no significant difference between the sexes up to puberty (Aboucaya, 1973).Ferrario*et al.* (1996a) used imaging system to demonstrate the independence of the head posture and found the natural head position in the quantitative analysis of facial hard and soft tissues which had also been advocated by several researchers (Ferrario*et al.,* 1996b; Moorrees and Kean, 1958; Cooke and Wei, 1988; Lundström, 1992) as necessary to the provision of absolute measurements obtained by direct anthropometry(Ferrario*et al.,* 1996b; Ferrario*et al.,* 1997).Studies have previously been carried out using different measurement techniques. The intercommissural distance (mouth width) has been measured using three-dimensional techniques and two-dimensional

photographs or video recordings (Ferrario*et al.,* 1993; Nanda and Ghosh, 1995). Three-dimensional techniques are preferred because of the projection errors associated with the use of two-dimensional measurements. Lip posture is considered a possible source of differences in lip dimensions (Burstone, 1967; Mack, 1991).

Numata*et al.*, demonstrated the importance of the maturity of neonates and sucking pressure. The measurements of upper and lower lip thickness at its mid portion were statistically proportional to the strengths of maximum of sucking pressure (Farkas, 1994). Discrepancies may appear between measurements taken with relaxed lips, closed lips, and lips with several degrees of contraction in the circumoral muscles (Ferrario*et al.,* 1993).The dimensions of facial tissue structures (nose and lips), their reciprocal spatial positions, and their relative proportions are important components in the clinical analysis of orthodontic, maxillofacial, and plastic surgery patients. The quantitative analysis of facial proportionswas studied by artists well before modern surgery and dentistry(Ferrario*et al.,* 2000). Classic studies produced aesthetic canons in which the vertical and horizontal dimensions of nose, lips, and chin were stated to conform to more or less exact mathematical ratios (Ferrario*et al.*, 2000). It is of note that all anthropometric data were derived from separate assessments of the two lips, and no male-to-female comparisons could be calculated (Hajnis, 1994).

The only two-dimensional direct measurement of vermilion height was made by Ferrario*et al*., who noted highly significant sexual dimorphism in all linear, surface, and volume measurements(Ferrario*et al.,* 1993). However, the mouth ratio showed no sexual dimorphism.In the faces of normal, healthy young adults, three-dimensional quantitative characteristic (Ferrario*et al.,* 1996b; Cooke and Wei, 1988; Peck and Peck, 1995) sexual dimorphism (Ferrario*et al.,* 1996b; Cooke and Wei, 1988; Tanner*et al.,* 1998; Ferrario*et al.,* 1998) asymmetry (Ferrario*et al.,* 1994a), and aesthetics (Ferrario*et al.,* 1994b) have been quantitatively studied. The correlation of three dimensional facial measurements with conventional cephalometrics (angles, distances, and ratios) have also been tested (Ferrario*et al.*, 1995; Ferrario*et al.,* 1996c).

**Statement of the Problem**

The lips are the predominant structure responsible for the aesthetics of the lower third of the face and yet lip abnormalities, congenital or acquired are common.Traumatic defects are also common, usually resulting from assaults, road traffic injuries and gunshot wounds. *Noma* is a synergistic bacterial disease of the lip, found almost exclusively in young children in poor social living conditions. These lesions destroy the soft tissue and disfigure the lips, leaving serious functional and aesthetic sequelae.

With the racial and genetic variations of the normal lip worldwide, and the prevalence of lip defects and abnormalities, there is the need to establish normal anthropometric values to serve as a guide and reference for Plastic and Reconstructive Surgeons in the region for better restoration to normal, as standardbaseline in assessing results of reconstructive procedures and in the diagnosis of syndromes associated with the lips and oral opening.

Few studies have been published in Nigeria on the anthropometry of the lips,

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particularly the Eastern region of Nigeria. In Enugu, there are no known studies on the anthropometry of the lips. Lip repairs are carried out without standardized or reference values, resulting in poorer outcomes.

Repair of lip defects following either a congenital abnormality or acquired through trauma, burns, infection or malignancy deserves special clinical attention requiring scientifically-based normal anthropometric values. Repair in regions without baseline values usually leads to poor outcome. This study will help reduce significantly the incidence of revisional surgeries with its attendant reduction in patients' visit to the hospital and the associated financial burden.

Therefore the aim of the study was to determine the normal anthropometric dimensions of the lips for age among male in Enugu, east of Nigeria, so as to provide the basis on which Plastic and Reconstructive surgical lip procedures can be evaluated.

## MATERIALS AND METHOD

### Study Design and Population

This was a cross sectional study involving the anthropometric measurements of normal lip dimensions from subjects (pupil and staff) of three primary and three secondary schools in Enugu, East of Nigeria. The people of Enugu belong largely to the Igbo ethnic group, which is one of the three largest ethnic groups in Nigeria (Wikipedia, 2009). Enugu metropolis comprises three Local Government Areas: Enugu -North, Enugu-East, and Enugu-South. It has a population of 722,664 (National Population Commission, 2006) andis presently the capital of Enugu State (Nigerian Official Gazette, 2007).

### Sampling Method and Sample Size

The stratified sampling method was used(Centre for Disease Control (CDC), 2009; Araoye, 2003). Enugu metropolis was the sampling frame. The minimum sample size was calculated using the formula (Ferrario*et al.,* 1996):

$$N = \frac{Z^2 \times P(1-P)}{d^2} = 211.5.$$

Where N = sample size; z = standard deviation usually set at 1.96, which corresponds to 95% confidence level; p = proportion in the target population estimated to have a particular characteristic (i.e. prevalence); q = 1 – p; d = the degree of accuracy desired, usually set at 0.05.

During the 6 month-study period, a total of 220 males were recruited, with ageranging from 0.5 to 55 years. Those aged less than 18 years constituted 77.40% of the study population.

**Selection Criteria:** Males within the age frame work of the study found at the study site, who gave their informed consent directly or through their parents (<18yrs) and those with apparently normal lip were included in the study, while persons with lip abnormalities, craniofacial syndromes, history of trauma to the lips, were excluded from the study.

**Data Collection:** All subjects were interviewed and data collected using the study pro forma. All facial examinationswerein the Natural Head Position, using internationally accepted standards in anthropometry to obtain measurements on the Anthropometry of the lip. **S**ubjects were weighed, their heights and lip parameters measured to the nearest centimetre. The following lip measurements

were taken using a Venier calliper (figure 2):

1. **Intercommissural Distance Straight (ICDs):** In the horizontal plane, is the distance between the left and right commissures, at the mucocutaneous junction, with the lips in a relaxed state.
2. **Intercommissural Distance Relaxed (ICDr):** Measured using a tape draped over the vermilion border of the lip, using an arc just above the white roll.
3. **Lip Height:** The vertical distance between the white roll and the nasal sill in the midline.
4. **Lip Thickness:** The vertical distance between the mucocutaneous line (red line) and the white roll in the midline.
5. **Intercommissural Distance Contracted (ICDc):** The distance between the commissures with the orbicularis oris muscle maximally contracted.
6. **Intercommisural Distance Grimaced (ICDg):** The widest distance between the commissures with the subject grinning maximally.
7. **Inter Soft Tissue Gape:** The distance between the stretched lower lip mucosa and the mucosa of the upper lip, with the subject opening the mouth maximally so that the pillars of fauces and uvula could be visualized.
8. **Inter Dental Gape:** The distance between the upper and lower incisor teeth, with the subjectopening the mouth maximallyso that the pillars of fauces and uvula could be visualized.

The following variables were derived from the measurements:

1. **Coefficient of Upper Lip Curvature** = ICDrc – ICDrs/ICDrs
2. **Lip Elasticity Index** = ICDs-ICDg/ICDc
3. **Extent of Oral Access** = STG/2 x ICDm/2$\pi$

**Fig.2 Measurement of the Lip Height**

**Data Analysis:** The data were analysed using the Statistical Package for Social Sciences (SPSS) version 16. Mean values and standard deviation were calculated for each parameter. The degree of association of lip parameters with the variables such as age was computed by regression analysis. The mean values for the ageswere compared using the student's t-test. Tables and charts were constructed for presentation of the results. Statistical significance was set at 95% confidence level at a p-value less than 0.05 (p-value is < 0.05).

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**Ethical Considerations:** Ethical approval was sought andobtained from the Ethics Committee of the National Orthopaedic Hospital, Enugu.

## RESULTS

The results of this study are shown in figures 3-10.

### Intercommissural Distance Measured over the Arc of the Upper Vermillion with the Lips Relaxed

The mean intercommissural distances increased progressively in all ages from 0.5-20yrs and above but the rate of increase was small in the age groups 12.1-20.0yrs (fig. 3).

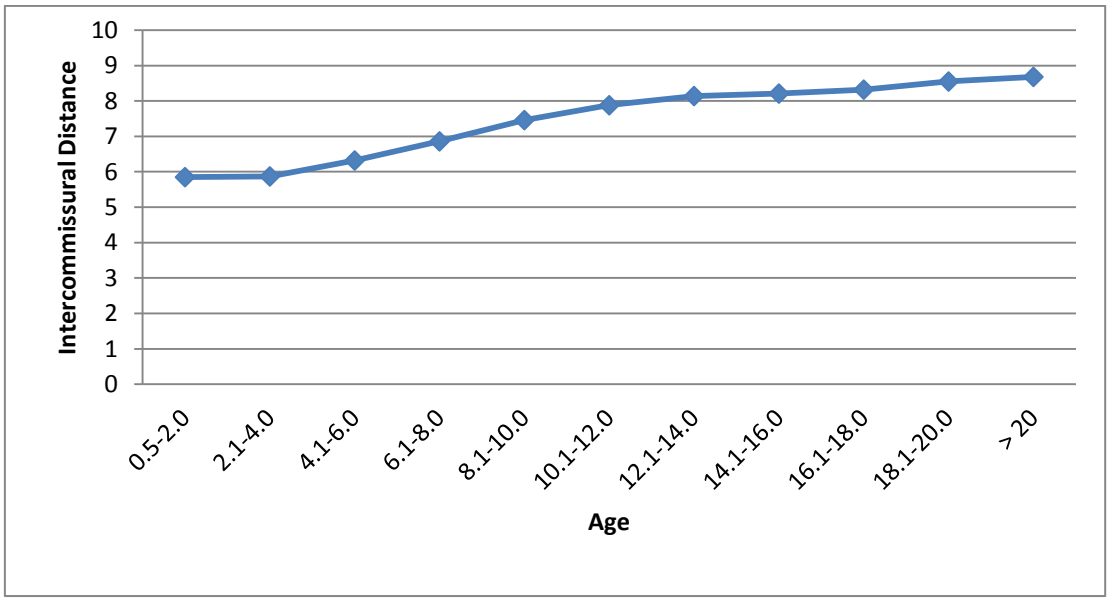


Fig. 3: Mean intercommissural distance amongmale Enugu subjects against their age

### Intercommissural Distance with the Lip Relaxed and Measured in a Straight Line (ICD-Sc)

The Intercommissural distance of the lips measured with the lips relaxed and in a straight line increased progressively with increasing age reaching a maximum in the 12.1 to 14.0 years age group and became fairly constant from 14.1 years to adulthood (fig. 4).

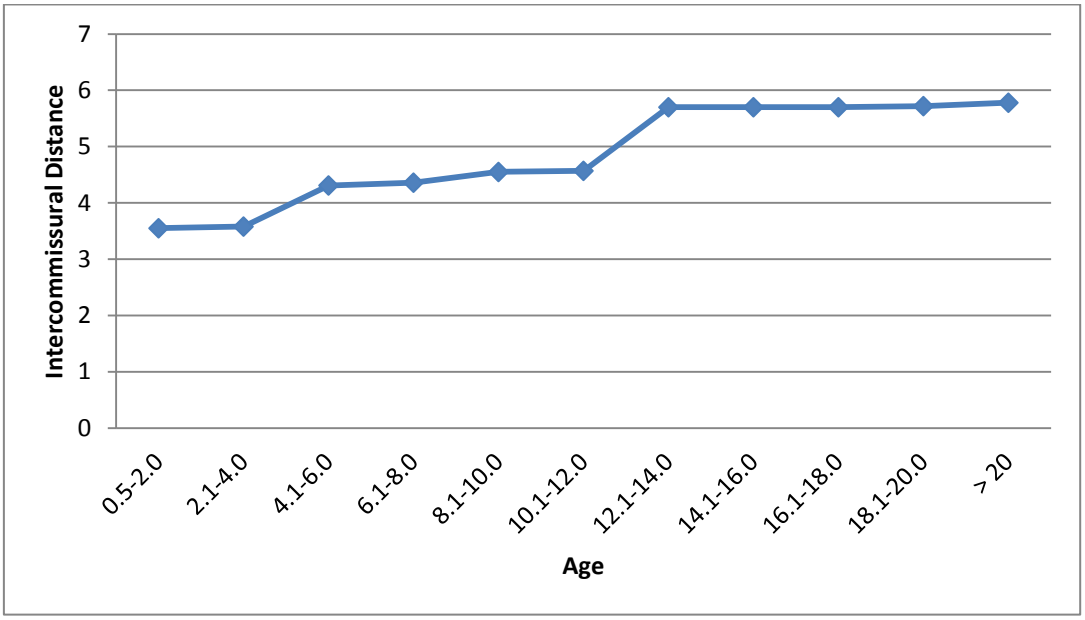


Fig. 4: Mean intercommissural distance with lips relaxed in a straight line among male Enugu subjects against their age

**Intercommissural Distance (ICDr) with the Lip Retracted Maximally, Laterally and Voluntarily**

The Intercommissural Distance (ICDr) with the lip retracted maximally, laterally and voluntarily could only be measured in those aged over 6.1yrs (fig. 5).

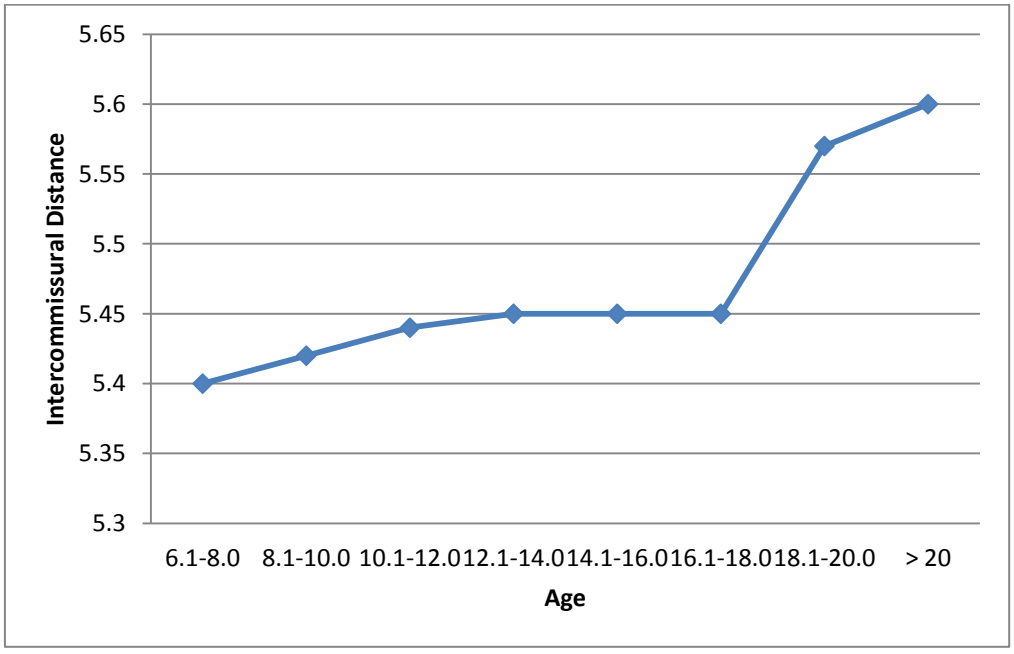


Fig 5: Mean intercommissuraldistance with the lips grinning maximally, laterally and voluntary among male Enugu subjects against age

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**Intercommissural Distance (ICDc) with the Lip Contracted**

The Intercommissural distance with the lips contracted could only be measured in persons aged over 6.1yrs. The mean value increased from 3.40cm ±1.55 at age 6.1 - 8.0yrs to 6.07cm ± 1.22 in the 20.1 and above age group (fig. 6).

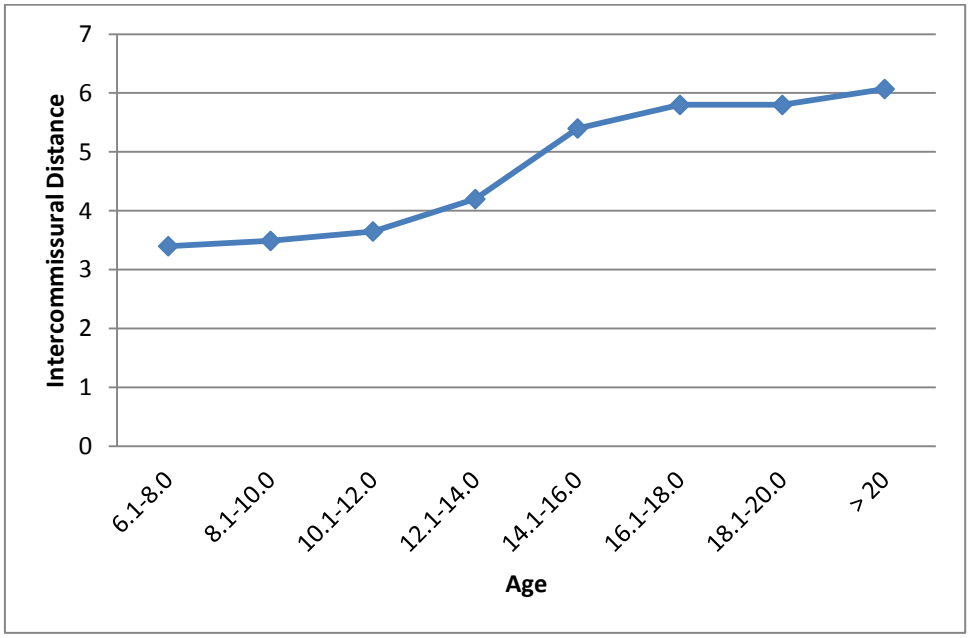


Fig. 6: Mean Inter-commissural Distance (ICD_SC) with the lips maximally contracted against ageamong Enugu male subjects

**Upper Lip Heights of Enugu Male Subjects**

Heights of the upper lips showed consistent and progressive increase from age 0.5yrs with a peak in the 14.1-16.0yrs age group. It subsequently becomes fairly constant from age 14.1yrs to adulthood (fig. 7).

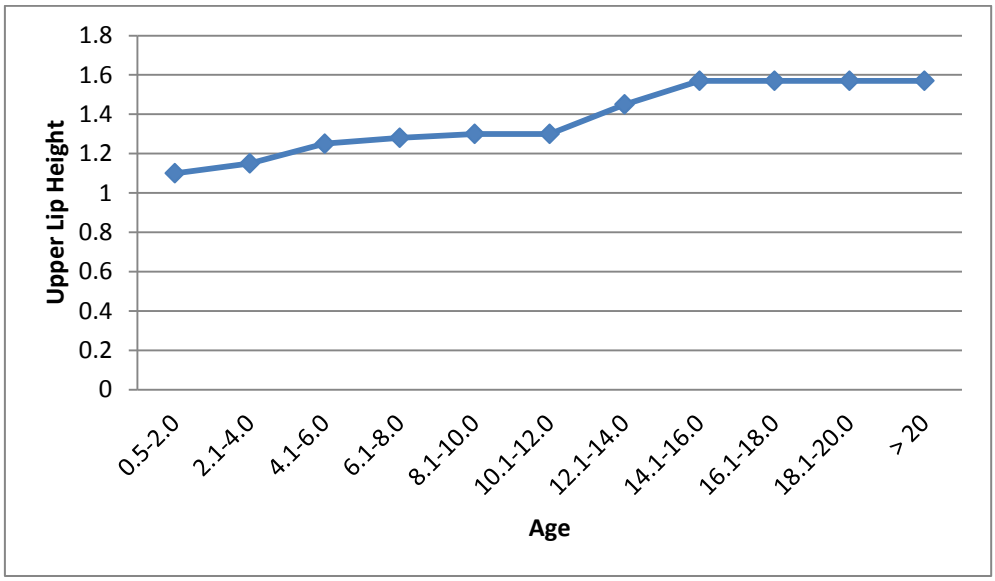


Fig. 7: Mean height of the upper lips among the study population according to their ages

**Midline Thickness of the Upper Lip in Male Enugu Subjects**

The Mean values of the midline thickness of the upper lip in this study demonstrates a progressive increase in the mean midline upper lip thickness, rising from 0.93cm at 6 months to 1.26cm at 14.1 - 16.0 years. It subsequently became constant, and plateau from 14.1 years into adulthood (fig. 8).

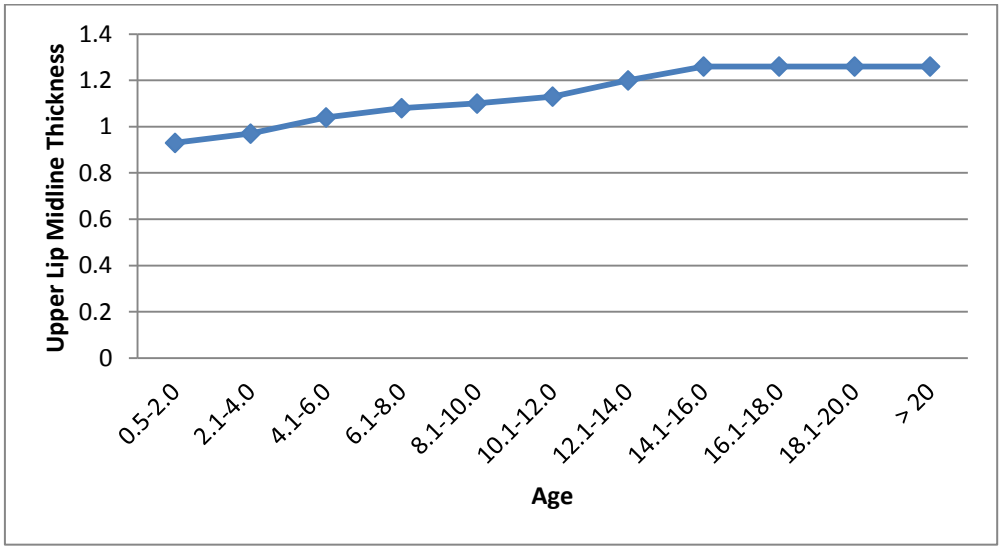


Fig. 8: Mean of the Midline Thickness of the Upper Lip in male Enugu subjects against Age

**Soft Tissue and Inter Dental Gape of the Oral Aperture**

Figure 9 (a) and (b) show the difference in the mean values of the inter-soft tissue and inter-dental gape of the oral aperture in Enugu males. The intersoft tissue gape increased steadily and progressively from 4.22cm at 4.1 years to 4.67cm at 14.1-16years, and subsequently remained constant into adulthood. The interdental gape progressively increased from 3.70cm at 4.1years to 4.20cm at 15 years to become constant into adulthood.

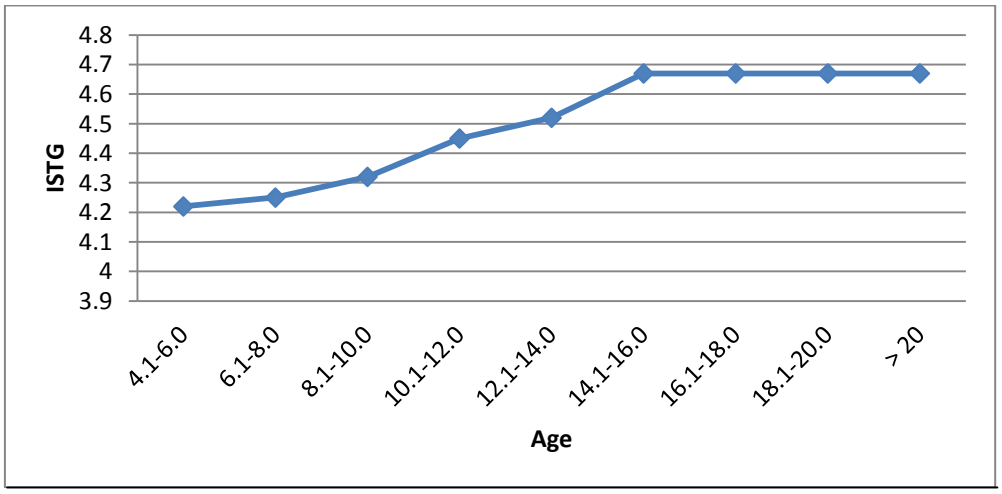


Fig. 9 (a): Mean Soft Tissue (ISTG) gape of the oral aperture against age inmale Enugu subjects

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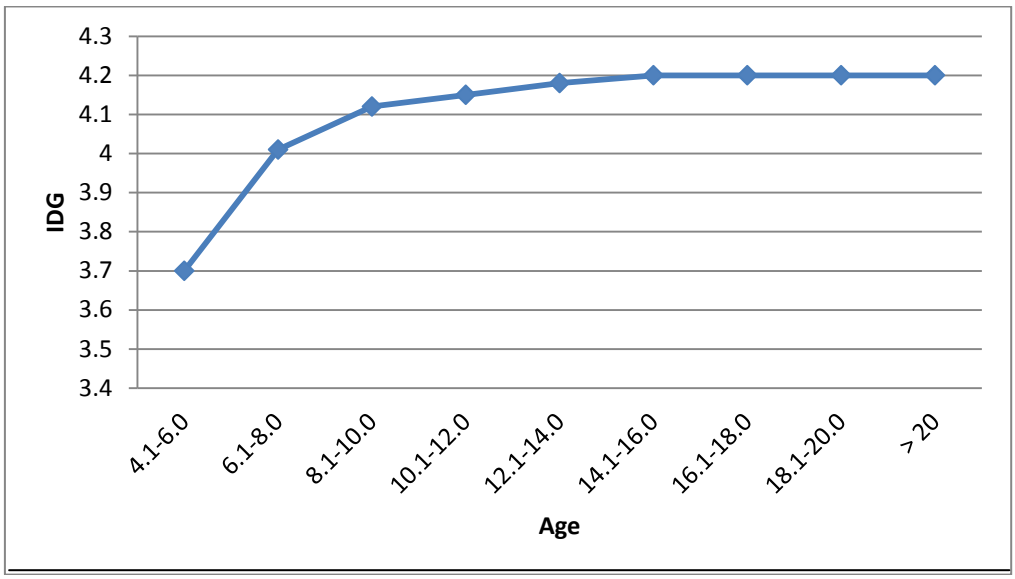


Fig. 9 (b): Mean Inter Dental Gape (IDG) of the oral aperture against age inmale Enugu subjects

**The Elasticity Index of the Lip in the study population**

Figure 10 shows the mean elasticity index of the lips of the study population. The mean elasticity index for males in the 6.1 to 8.0yrs age group was 0.44. It regressed gradually as the age increased to 0.34 in the 12.1 - 14.0yrs age group. Thereafter it sharply dropped from 0.34 to 0.20 at 14.1 - 16.0 yrs, and remained constant with increasing age.

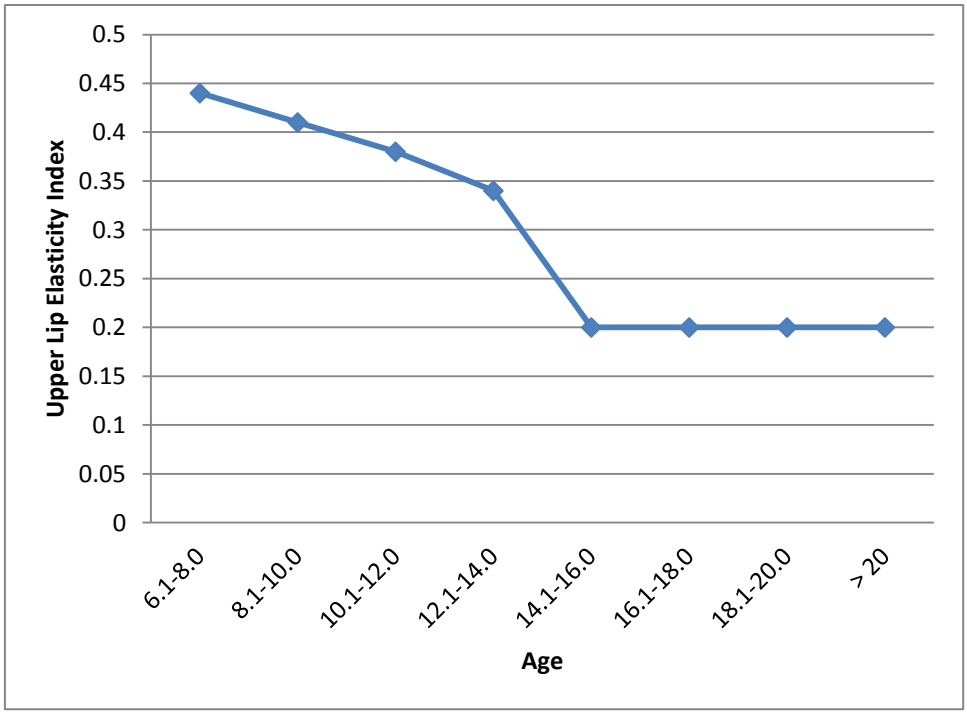


Fig. 10: Mean values of the Elasticity Index of the Lip against age among Enugu males

**The Coefficient of Upper Lip Curvature**

The mean of the coefficient of upper lip curvature varied from 0.46cm ± 0.18 to 0.50cm ± 0.12 in the age group 6.1 to 20.1yrs and above. There was a very minimal change in value of the coefficient of upper curvature (fig. 11).

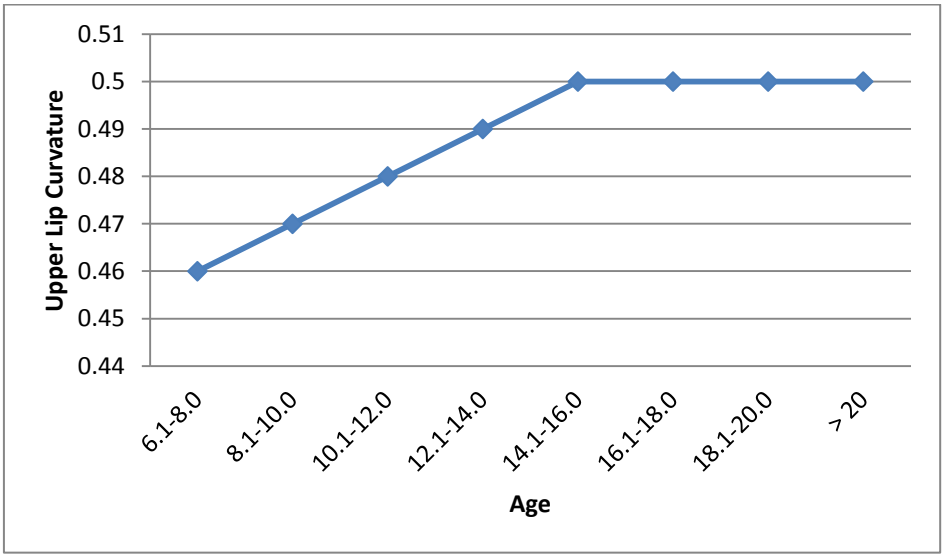


Fig. 11: Mean Co-efficient of Upper Lip Curvature against age among Enugu males

**Comparison of Values of Mean Intercommissural Distance between Enugu Males with that of Previous Study**

Figure 12 are Bar Charts comparing the intercommissural distance obtained in this study with that from a previous study carried out in Prague, Czechoslovakia. The mean ICD in the age groups considered ranged from 6.1 to 12.0 years and the values ranged from 4.36cm - 4.57cm in Enugu compared to 4.48cm - 4.67cm in the Prague.

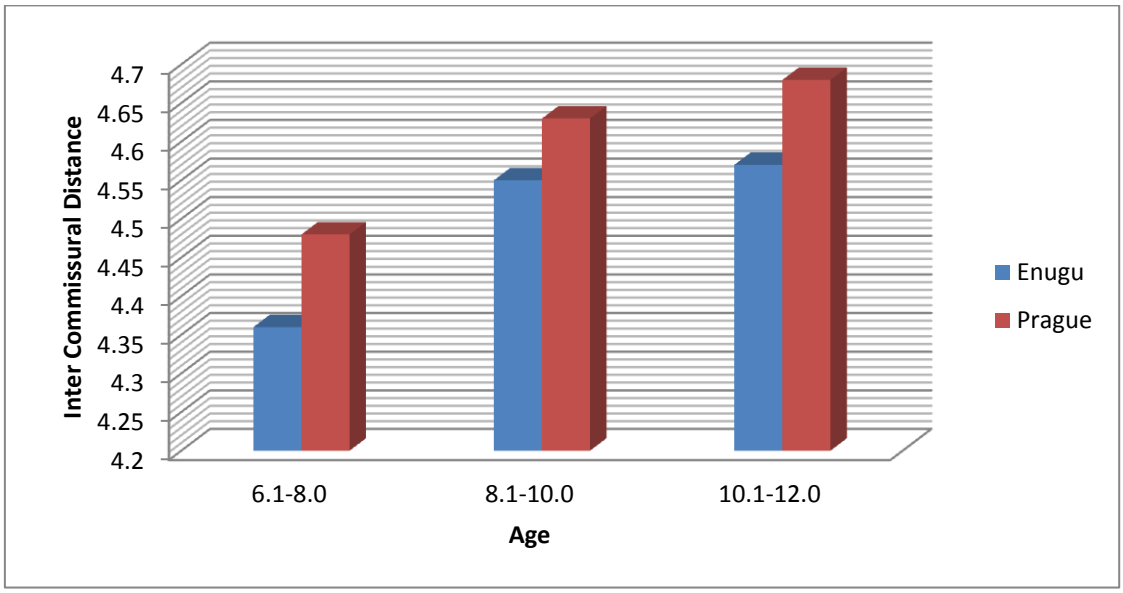


Fig. 12: Comparison of Mean values of Intercommissural distance measured in a straight line against age between male children in Enugu, Nigeria and Prague, Czechoslovakia

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## DISCUSSION

The mean demographic parameters of height and weight obtained were similar to those obtained from other parts of the country (Ayoola*et al.*, 2009; Uche, 1981).A similar study by Fasika (1993) was restricted to children where congenital lip defects are a major concern. However, this study included all age groups prone to assaults and road traffic injuries hence constituting a much larger population of persons who would benefit from lip reconstruction. With similar demographic characteristics, the lip parameters measured would be similar and can be applied to normal lip parameters in the southern part of Nigeria, with reasonable degree of accuracy. Another observation from this study is the pre pubertal spurt of growth at 6.1-12.0 years. Tanner*et al.* (1965) observed growth spurt at 6 – 7 years and cessation of growth as the long limb bones' epiphysis and metaphysis fuse between 18-20 years. Tanner*et al.* (1965) also observed differences in the sexes with males having a significant mean difference in height two years later than females (Ferrario*et al.*, 1996).

Data collected in the present investigation could therefore represent a baseline data for the quantitative description of human lip morphology in adultmaleEnugu subjects. These data could be used in computerized simulations of surgical or orthodontic treatments (Skinazi, 1994). Moreover, the same protocol for data collection and analysis could be applied to normal children and adolescents, as well as to older adults, in order to analyze age-related modifications in lip morphometry. Obviously, the inclusion of patients with craniofacial alterations might require a modification of the set of soft tissue landmarks.These differences agree with the overall progressive increase observed in Fasika's study regarding the growth of the lips. There is progressive moulding of the lips and alveolus with age, reaching maturity as the skull bone growth ceases between 7 and 9 years of age (Gray, 1978; Ferrario*et al.*, 2003).

The growth of the cranium and surrounding soft tissues also peaks between 7-9 years (Ferrario*et al.*, 2003).The constancy of values for the lip parameters after 15 years was not observed by Fasika (1993) whose study included only children aged less than 14 years.This study demonstrates that the mean value of the intercommissural distance measured with the lips contracted maximally and voluntarily (6.40±0.20cm) showed an increasing trend from ages 6-15 years. There is paucity of literature in this area. Some of the studies include those of Hajnisova (1967),Fasika (1993) and Sivan *et al.* (1983). The Prague and Ibadan studies were done among children (Fasika, 1993). Their findings were that the mouth width (intercommissural distance) of school children aged 6-12 years was consistently shorter than that in Czechoslovakians of the same age group. In the same vein, the height of the upper lip and the intercommissural distance were smaller in Nigerian neonates than in their Israeli counterparts. These findings tend to support previous reports of Juberg*et al.* (1975) that these measurements show racial differences.There are different degrees of variations observed in the measurements of lip parameters in various studies. Several reasons have been postulated for these differences. Head and lip postures, techniques of measurements and the activities of the lip muscles are possible reasons (Juberg*et al.*, 1975; Bardach, 1984).

The dimensions of the lip aperture measured relaxed and contracted as demonstrated by the lips being actively contracted or relaxed varies with the anatomy of the face which is an index of the facial bony anatomy and the soft tissues lining the oral cavity. Different races are marked with the peculiarity of the projection of their maxilla and mandible, hence varying degrees of prognathism which would reflect in the lip height and thickness dimensions (Fogel, 1984; Hajnis*et al.,* 1994). Some races are known for different shapes of the face: squared face, oval face and flat faces. The predominant soft tissue surrounding the oral aperture is the orbicularis oris muscle which could vary in thickness (could be hypertrophic). In this study, the two dimensional measurements done were subjective in that each individual contracted and relaxed the circum-oral muscles at will without any form of standardization. The development of this muscle could depend on the individual's general physique and diet pattern may lead to the fullness of development of these circum-oral muscles. The alveolar and teeth dimensions and presence of dental diathesis and projections could tense or relax the lip thickness and height, hence influencing its two dimensional measurements.

The lip elasticity index of the upper lip in this study reduces as the age of the subject advances. At age 6.1 – 8.0years, it was maximal with a mean of 0.44. The mean values were high at 6 years and progressively rose to a maximum at 10 years, then subsequently fell with increasing age. The circum-oral muscles are skeletal in origin and are permanent cells, their pliability may reach a maximum at age 6 - 10 years and subsequently lose their elasticity as age progresses. Fasika (1993) also noted that elasticity of the lips decreased with age from 4-12 years. Lip elasticity is conferred by the elastic fibres that are present in the dermal layer of the skin and also by the muscles acting around the oral aperture. The lip elasticity index is thus likely to be altered in diseases involving the orbicularis oris, buccinators, zygomaticus major and the depressor angulioris muscles or their nerve supply through the mandibular or buccal branches of the facial nerve.

The coefficient of upper lip curvature has been stated by Bardach*et al.* (1984)to depend on the lips, nostril floor and on the age of the subject which are indices of lip elasticity index. In this study, the mean coefficient of upper lip curvature was fairly constant with a slight increase from 0.46 at 6.1 – 8.0 years to a maximum of 0.50 at 14.1 – 16.0years.

Some of the limitations of this study were the inability of children below 6 years of age to easily carry out instructions on lip changes and modifications causing difficulty in taking some of the measurements, and the use of two dimensional direct measurements rather than three dimensional digitizers and lasers which are more precise and less cumbersome. Both methods however give comparable results.

The study concluded that the approximate reference values for lip parameters in Enugu males for ages ranging from six months to fifty-five years are as follows:

The intercommissural distance ranged from 5.85cm for the 0.5 – 2.0 years age group to 9.00cm for the 20.1years and above age group, the lip height ranged from 1.10cm for the 0.5 – 2.0 years age group to 1.60cmfor the 20.1years and above age group, while the lip thickness ranged from 0.88cmfor the 0.5 – 2.0 years age group to 1.60cmfor the 20.1years and above age group, and the mean intercommissural distance 3.40cmfor the 0.5 – 2.0 years age

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group to 6.40cmfor the 20.1years and above age group.

No statistically significant increase in the lip parameters was noticed with the tape draped along the vermilion border of the upper lip at different ages. The lip parameters in the different age groups were similar to findings from other studies, and can be used asreference values for individuals seeking surgical reconstruction of the lips following lip deformity in our environment and the country at large.

It is recommended that similar studies be carried out on other ethnic groups in Nigeriato generate normative values for these populations.

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