Journal of Experimental Research

September 2021, Vol 9 No 3

Email: editorinchief.erjournal@gmail.com editorialsecretary.erjournal@gmail.com

Received: *10th April, 2021*
Accepted for Publication: *20th June, 2021*

RELATIONSHIP BETWEEN LIP PRINT AND SEASON OF BIRTH AMONG A NIGERIAN POPULATION

Alabi AS[1], Olagbaye BA[1], Aniyikaye BA[1], Lewu FS[1], Adigun FM[1], *Adeleke OS[2], Kareem BS[1], Aigbogun E[3]

[1]Department of Anatomy, University of Ilorin, Ilorin, Nigeria
[2]Department of Anatomy, Osun State University, Osogbo, Nigeria
[3]Department of Anatomy, Kampala International University, Western Campus, Uganda

***Author for Correspondence:** opeyemi.adeleke@uniosun.edu.ng*

ABSTRACT

Some factors have been found to influence lip print patterns in individuals. The aim of this study is to evaluate the relationship between lip print pattern and season of birth in a Nigerian population. A total 764 adults were purposively selected from a two closely related tribe in the north central geopolitical zone of Nigeria. There lip prints were obtained by applying lip gloss and print on a glass slide. Each lip was divided into 6 quadrants and studied under magnifying lens. Lip print patterns were grouped using Hassan Fahmy (1977) classification. Statistical analysis was done using Statistical Package for Social Sciences (SPSS version 23). Lip print types were expressed as frequency and proportion for each lip quadrant. Correlations between male and female lip print pattern and their season of birth was done using Chi-square test. The confidence level was set as 95% while statistical significance was set at $p<0.05$. Results showed a consistent prevalence of type III and IV in the entire upper and lower quadrant, while the least expressed were type I' and II. Qualitative analysis of association between season of birth and lip print pattern showed no significant distributional difference between those born during wet and dry season in the entire upper and lower quadrant but established that types III and IV were more prevalence in the tribe of study. These finding has provided further fact to prove that cheiloscopy is a reliable tool for personal or tribe identification.

Keywords: Lip, prints, cheiloscopy, season, birth,

INTRODUCTION

The use of finger print technique in forensic investigation has gained such a huge awareness that criminals are now quite conscious to avoid leaving their finger prints on crime scenes (Kumaran et al. 2017). Though there are other common methods for resolving identity disputes such as DNA comparison, dental structures etc. there is still the need to find a more accessible tool for crime scene investigation. Lip print also known as Cheiloscopy is one of such tools. It was first recommended in 1932 as evidence in court by Edmond Locard in France (Syndar, 1950), and ever since, it has come under strong consideration over the years as a much reliable method for personal identification just like finger prints (Singh et al. 2011).

Lip prints were first described by Fischer as the lines that form furrows or grooves on the sulci labiorum (red part) at the transition zone (vermillion border) of the human lips (Singh et al. 2011). It was Tsuchihashi and Suzuki, two Japanese scientists in the period 1968-71, that later established that the arrangement of these lines are unique to each person after examining 1364 individuals (Suzuk and Tsuchiahashi, 1971; Tsuchihashi, 1974). There have also been more recent studies across different population to establish the uniqueness of lip print as a tool for personal identification (Bindal et al. 2009; Kapoor and Badiye, 2017; Naik et al. 2017), sex determination (Vahanwala, 2005; Sharma et al. 2009; Gondivkar et al. 2009; Kenneth et al. 2018), ethnic differentiation among others (Jeergal et al. 2016; Oladipo et al. 2018; Alabi et al. 2019).

Although lip prints are unique to individuals and does not change from the sixth week of intrauterine life till death (Alabi et al. 2019), they show few or no similarity between

parents and children and even siblings (Saad et al. 2005; Ghalant et al. 2013). However, some factors have been found to correlate with lip print pattern like individual temperament (Abidullah et al. 2015) and finger prints (Negi, 2016; Kumaran et al. 2017). However, the effect of environmental factors on lip print patterns is not yet fully understood.

Pre and perinatal exposure to certain environmental factors can influence the developmental outcomes in an individual (Waldie et al. 2000; Singh 2005). What has not been fully verified is if the climatic season of conception and birth of an individual plays a significant role in the types of lip print pattern they bear. Only a few literatures are available especially in Nigeria in this regard (Adamu et al. 2013; Alabi et al. 2019). The aim of this study is to determine the relationship between season of birth and the prevalence of lip print pattern in a Nigerian population

MATERIAL AND METHOD

Study Population

The study was conducted in ten different local governments in Niger state for a period of three weeks. Niger state is located in north central, Nigeria. According to 2006 national population census, Niger state population had been projected to be 3,954,772 by 2016, with the Nupe tribe numbering up to 1,759,874 and Gbagyi. 1,198,318 (National Population Commission, 2006).

Sample Size

Sample size was determined using Fishers formulae (Fisher, 1935). $SS = \frac{Z^2 xpxq}{d^2}$

For the Nupe tribe,
Z = 1.96
P = 0.445 (proportion of Nupe)

$$P = \frac{\text{Nupe ethnic group}}{\text{Population of Niger State}} = \frac{1,759,874}{3,954,772} = 0.445$$

q = 1-p = 1 – 0.445 = 0.555

d = 0.05 (tolerance level of 0.05)
Therefore,

$$\text{Sample size (SS)} = \frac{1.96^2 \times 0.445 \times 0.555}{0.5^6} = 380$$

Adding 10% attrition rate of the sample size determined = 0.1×380 = 38
Total sample size = 380+38 = 418

For Gbagyi tribe,
Z = 1.96
P = 0.303 (proportion of the ethnic group)

$$P = \frac{\text{Gbegyi ethnic group}}{\text{Population of Niger State}} = \frac{1,198,318}{3,954,772} = 0.303$$

q = 1-p = 1 – 0.303 = 0.697
d = 0.05 (tolerance level of 0.05)

Therefore,

$$\text{Sample size (SS)} = \frac{1.96^2 \times 0.303 \times 0.697}{0.05^6} = 324$$

Adding 10% attrition rate of the sample size determined = 0.1×324 = 32.4
Total sample size= 324+32 = 356
Therefore, total working sample for the two ethnic groups is= 356+418=774.

Inclusion Criteria:

All subjects had to be indigenes of Nupe or Gbagyi tribe from both parents up to the second generation. All subjects had to be between the ages of 18 and 64years. All subjects were confirmed to be healthy and free from any deformity, congenital anomaly of the lips, and inflammation of the lips or history of any craniofacial surgery.

Ethical Approval

Ethical clearance was sort and obtained from the Department of Anatomy Ethical Review Committee of the University of Ilorin, Ilorin. The ethical approval number was *15/46KA034/09/2018*

Sampling Technique:

Informed consent was obtained from study cohorts who met the inclusion criteria, after which a structured questionnaire was administered by trained research assistants. Literate subjects were asked to fill the required information while subjects who could not write were assisted.

The following procedures were then followed to obtain their lip prints;

- The subjects were made to stand in an anatomical position while their lips were cleaned. Females with lip stick used facial wipes.
- Lip gloss was applied once in a single motion
- Glass slide was placed on the lip and print removed in a single motion for print collection.
- Carbon fine powder was sprinkled on the lip print to preserve the print.
- Cello tape was used to attach the well-developed lip-print to the space provided for it on the questionnaire. (Suzuki and Tsuchihashi, 1971).

Figure 1. Process of picking lip prints from subjects on glass slide

Determination of Season of birth:

Month of birth was used to divide the subjects into dry and wet season of birth. The season of birth was defined as wet season from April to October and dry season from November to March.

Data Analysis:

Analysis commenced by dividing both upper and lower lips into compartments as follows, Upper Right Quadrant (URQ), Upper Middle Quadrant (UMQ), Upper Left Quadrant (ULQ), Lower Right Quadrant (LRQ), Lower Middle Quadrant (LMQ), Lower Left Quadrant (LLQ) (Suzuki and Tsuchihashi, 1971).

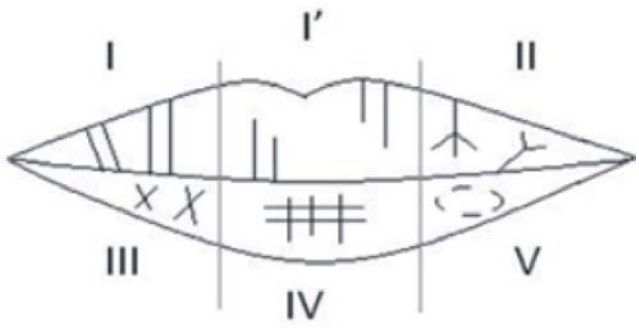

Figure 2. Types of grooves (Suzuki and Tsuchihashi, 1971)

The prints were then identified into types as proposed by Hassan and Fahmy (1977). They classified lip prints into six and differentiated the branched type (type II) into proximal (a) and distal (b). Hassan and Fahmy classification of lip grooves is as follows;

Type I	Complete vertical
Type I'	Incomplete vertical
Type IIa	Branched proximal
Type IIb	Branched distal
Type III	Intersected
Type IV	Reticular pattern
Type V	Unknown

Statistical analysis:

The data were analysed using SPSS version 23.0. Descriptive statistics were used to categorize demographic frequency and distribution patterns. Lip print types were expressed as frequency and proportion for each lip quadrant. Correlations between male and female lip print pattern and their season of birth was done using Chi-square test. The confidence level was set as 95% while statistical

significance was set at $p<0.05$. Pearson correlation and Chi-square statistical methods were used.

RESULT

In Table 1, Type III was seen predominantly in the upper right quadrant of 312(40.8%) of the total population understudy in both wet and dry season while Type I' was the least expressed 25(3.2%). There was no significant distributional difference in the print pattern of the population born in dry and the ones born in wet seasons (Male; χ^2=8.406, p=0.21, Female; χ^2= 10.667, p=0.099, Total;χ^2= 6.987; p=0.322).

Table 1: Chi-square test of association in lip print distribution at the upper right quadrant between males and females stratified by season

Season	Sex	URQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	32	12	14	7	53	60	14	8.406	0.21	NS
		16.7%	6.3%	7.3%	3.6%	27.6%	31.3%	7.3%			
	Wet	40	4	10	6	59	64	7			
		21.1%	2.1%	5.3%	3.2%	31.1%	33.7%	3.7%			
	Total	**72**	**16**	**24**	**13**	**112**	**124**	**21**			
		18.8%	**4.2%**	**6.3%**	**3.4%**	**29.3%**	**32.5%**	**5.5%**			
Female	**Dry**	7	1	13	2	105	56	12	10.667	0.099	NS
		3.6%	0.5%	6.6%	1.0%	53.6%	28.6%	6.1%			
	Wet	13	8	6	1	95	53	10			
		7.0%	4.3%	3.2%	0.5%	51.1%	28.5%	5.4%			
	Total	**20**	**9**	**19**	**3**	**200**	**109**	**22**			
		5.2%	**2.4%**	**5.0%**	**0.8%**	**52.4%**	**28.5%**	**5.8%**			
Total	**Dry**	39	13	27	9	158	116	26	6.987	0.322	NS
		10.1%	3.4%	7.0%	2.3%	40.7%	29.9%	6.7%			
	Wet	53	12	16	7	154	117	17			
		14.1%	3.2%	4.3%	1.9%	41.0%	31.1%	4.5%			
	Total	**92**	**25**	**43**	**16**	**312**	**233**	**43**			
		12.0%	**3.3%**	**5.6%**	**2.1%**	**40.8%**	**30.5%**	**5.6%**			

In Table 2, Type III was seen predominantly in the upper middle quadrant of 299(39.1%) of the total population understudy in both wet and dry season while Type IIb was the least expressed 12(1.6%). There were no significant distributional differences in the print pattern of the population born in dry and the ones born in wet seasons (Male; χ^2= 5.72, p=0.455, Female; χ^2= 10.935, p=0.09, Total; χ^2= 4.341; p=0.63).

Table 2: Chi-square test of association in lip print distribution at the upper middle quadrant between males and females stratified by season

Season	Sex	UMQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	32	10	9	2	51	75	13	5.72	0.455	NS
		16.7%	5.2%	4.7%	1.0%	26.6%	39.1%	6.8%			
	Wet	32	5	10	7	57	70	9			
		16.8%	2.6%	5.3%	3.7%	30.0%	36.8%	4.7%			
	Total	**64**	**15**	**19**	**9**	**108**	**145**	**22**			
		16.8%	**3.9%**	**5.0%**	**2.4%**	**28.3%**	**38.0%**	**5.8%**			
Female	**Dry**	6	1	9	2	102	64	12	10.935	0.09	NS
		3.1%	0.5%	4.6%	1.0%	52.0%	32.7%	6.1%			
	Wet	13	8	6	1	89	62	7			
		7.0%	4.3%	3.2%	0.5%	47.8%	33.3%	3.8%			
	Total	**19**	**9**	**15**	**3**	**191**	**126**	**19**			
		5.0%	**2.4%**	**3.9%**	**0.8%**	**50.0%**	**33.0%**	**5.0%**			
Total	**Dry**	38	11	18	4	153	139	25	4.341	0.63	NS
		9.8%	2.8%	4.6%	1.0%	39.4%	35.8%	6.4%			
	Wet	45	13	16	8	146	132	16			
		12.0%	3.5%	4.3%	2.1%	38.8%	35.1%	4.3%			
	Total	**83**	**24**	**34**	**12**	**299**	**271**	**41**			
		10.9%	**3.1%**	**4.5%**	**1.6%**	**39.1%**	**35.5%**	**5.4%**			

In Table 3, Type III was seen predominantly in the upper left quadrant of 313(41%) of the total population understudy in both wet and dry season while Type IIb was the least expressed 16(2.1%). There were no significant distributional differences in the print pattern of the population born in dry and the ones born in wet seasons (Male; χ^2= 7.792, p=0.254, Female; χ^2= 11.304, p=0.079, Total;χ^2= 4.921; p=0.554)

Table 3: Chi-square test of association in lip print distribution at the upper left quadrant between males and females stratified by season

Season	Sex	ULQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	31	13	15	5	51	64	13	7.792	0.254	NS
		16.1%	6.8%	7.8%	2.6%	26.6%	33.3%	6.8%			
	Wet	32	4	10	8	57	70	9			
		16.8%	2.1%	5.3%	4.2%	30.0%	36.8%	4.7%			
	Total	**63**	**17**	**25**	**13**	**108**	**134**	**22**			
		16.5%	**4.5%**	**6.5%**	**3.4%**	**28.3%**	**35.1%**	**5.8%**			
Female	**Dry**	5	1	10	2	110	56	12	11.304	0.079	NS
		2.6%	0.5%	5.1%	1.0%	56.1%	28.6%	6.1%			
	Wet	12	8	6	1	95	56	8			
		6.5%	4.3%	3.2%	0.5%	51.1%	30.1%	4.3%			
	Total	**17**	**9**	**16**	**3**	**205**	**112**	**20**			
		4.5%	**2.4%**	**4.2%**	**0.8%**	**53.7%**	**29.3%**	**5.2%**			
Total	**Dry**	36	14	25	7	161	120	25	4.921	0.554	NS
		9.3%	3.6%	6.4%	1.8%	41.5%	30.9%	6.4%			
	Wet	44	12	16	9	152	126	17			
		11.7%	3.2%	4.3%	2.4%	40.4%	33.5%	4.5%			
	Total	**80**	**26**	**41**	**16**	**313**	**246**	**42**			
		10.5%	**3.4%**	**5.4%**	**2.1%**	**41.0%**	**32.2%**	**5.5%**			

In Table 4, Type III was seen predominantly in the lower right quadrant of 372(48.7%) of the total population studied in both wet and dry season while Type I' was the least expressed 10(1.3%). There were no significant distributional differences in the print pattern of the population born in dry and the ones born in wet seasons (Male; χ^2= 4.591, p=0.597, Female; **χ^2= 3.564, p=0.735, Total;χ^2=** 4.574; p=0.599)

Table 4: Chi-square test of association in lip print distribution at the lower right quadrant between males and females stratified by season

Season	Sex	LRQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	22	4	14	14	74	53	11	4.591	0.597	NS
		11.5%	2.1%	7.3%	7.3%	38.5%	27.6%	5.7%			
	Wet	30	1	10	11	69	59	10			
		15.8%	0.5%	5.3%	5.8%	36.3%	31.1%	5.3%			
	Total	**52**	**5**	**24**	**25**	**143**	**112**	**21**			
		13.6%	**1.3%**	**6.3%**	**6.5%**	**37.4%**	**29.3%**	**5.5%**			
Female	**Dry**	4	2	10	2	114	54	10	3.564	0.735	NS
		2.0%	1.0%	5.1%	1.0%	58.2%	27.6%	5.1%			
	Wet	4	3	5	3	115	51	5			
		2.2%	1.6%	2.7%	1.6%	61.8%	27.4%	2.7%			
	Total	**8**	**5**	**15**	**5**	**229**	**105**	**15**			
		2.1%	**1.3%**	**3.9%**	**1.3%**	**59.9%**	**27.5%**	**3.9%**			
Total	**Dry**	26	6	24	16	188	107	21	4.574	0.599	NS
		6.7%	1.5%	6.2%	4.1%	48.5%	27.6%	5.4%			
	Wet	34	4	15	14	184	110	15			
		9.0%	1.1%	4.0%	3.7%	48.9%	29.3%	4.0%			
	Total	**60**	**10**	**39**	**30**	**372**	**217**	**36**			
		7.9%	**1.3%**	**5.1%**	**3.9%**	**48.7%**	**28.4%**	**4.7%**			

In Table 5, Type III was expressed predominantly in the lower middle quadrant of 322(42.1%) of the total population born both during wet and dry season while Type I' was the least expressed 9(1.2%). There were no significant distributional differences in the print pattern of the population born during dry and the ones born during wet seasons (Male; χ^2= 7.627, p=0.267, Female; χ^2= **5.910, p=0.433, Total;** χ^2= 6.054; p=0.417)

Table 5: Chi-square test of association in lip print distribution at the lower middle quadrant between males and females stratified by season

Season	Sex	LMQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	30	3	6	9	61	73	10	7.627	0.267	NS
		15.6%	1.6%	3.1%	4.7%	31.8%	38.0%	5.2%			
	Wet	31	1	6	1	62	78	11			
		16.3%	0.5%	3.2%	0.5%	32.6%	41.1%	5.8%			
	Total	**61**	**4**	**12**	**10**	**123**	**151**	**21**			
		16.0%	**1.0%**	**3.1%**	**2.6%**	**32.2%**	**39.5%**	**5.5%**			
Female	**Dry**	5	2	6	3	103	67	10	5.910	0.4333	NS
		2.6%	1.0%	3.1%	1.5%	52.6%	34.2%	5.1%			
	Wet	9	3	1	3	96	68	6			
		4.8%	1.6%	0.5%	1.6%	51.6%	36.6%	3.2%			
	Total	**14**	**5**	**7**	**6**	**199**	**135**	**16**			
		3.7%	**1.3%**	**1.8%**	**1.6%**	**52.1%**	**35.3%**	**4.2%**			
Total	**Dry**	35	5	12	12	164	140	20	6.054	0.417	NS
		9.0%	1.3%	3.1%	3.1%	42.3%	36.1%	5.2%			
	Wet	40	4	7	4	158	146	17			
		10.6%	1.1%	1.9%	1.1%	42.0%	38.8%	4.5%			
	Total	**75**	**9**	**19**	**16**	**322**	**286**	**37**			
		9.8%	**1.2%**	**2.5%**	**2.1%**	**42.1%**	**37.4%**	**4.8%**			

Table 6: Chi-square test of association in lip print distribution at the lower left quadrant between males and females stratified by season

Season	Sex	LLQ							Chi-square analysis		
		TYPE I	TYPE I'	TYPE IIa	TYPE IIb	TYPE III	TYPE IV	TYPE V	χ^2-value	P-value	Inf
Male	**Dry**	24	4	9	13	75	55	12	4.456	0.615	NS
		12.5%	2.1%	4.7%	6.8%	39.1%	28.6%	6.3%			
C	**Wet**	25	1	8	8	70	67	11			
		13.2%	0.5%	4.2%	4.2%	36.8%	35.3%	5.8%			
	Total	**49**	**5**	**17**	**21**	**145**	**122**	**23**			
		12.8%	**1.3%**	**4.5%**	**5.5%**	**38.0%**	**31.9%**	**6.0%**			
Female	**Dry**	2	2	7	2	120	53	10	4.602	0.596	NS
		1.0%	1.0%	3.6%	1.0%	61.2%	27.0%	5.1%			
	Wet	4	2	2	4	113	54	7			
		2.2%	1.1%	1.1%	2.2%	60.8%	29.0%	3.8%			
	Total	**6**	**4**	**9**	**6**	**233**	**107**	**17**			
		1.6%	**1.0%**	**2.4%**	**1.6%**	**61.0%**	**28.0%**	**4.5%**			
Total	**Dry**	26	6	16	15	195	108	22	4.213	0.648	NS
		6.7%	1.5%	4.1%	3.9%	50.3%	27.8%	5.7%			
	Wet	29	3	10	12	183	121	18			
		7.7%	0.8%	2.7%	3.2%	48.7%	32.2%	4.8%			
	Total	**55**	**9**	**26**	**27**	**378**	**229**	**40**			
		7.2%	**1.2%**	**3.4%**	**3.5%**	**49.5%**	**30.0%**	**5.2%**			

DISCUSSION

The effectiveness of cheiloscopy in personal identification seems to be gaining much approval with reports from several population establishing sexual dimorphism and ethnic differentiation (Sharma et al. 2014; Moshfeghi et al. 2016). In Nigeria, there is still a gap in the availability of data from the various ethnic groups in the country.

In this study, the analysis of qualitative cheiloscopy using the Hassan and Famhy characterisation revealed consistency in the prevalence of intersected (type III) and reticular (type IV) pattern in all the upper and lower lip quadrant of both sex, while there was scarcity of incomplete vertical (Type I') and branched distal (Type IIb) patterns. These findings are contrary to the report of (Alabi et al. 2019) and (Oladipo et al. 2018) among who reported predominant patterns of type I and II among people leaving in Ilorin and Igbo's tribe respectively. Types III and IV lips pattern observed among Nupe and Gbagyi tribe has against type II pattern predominant with Igbo tribe has reported by Oladipo et al. (2018) might be of genetic factors. For example, Vats et al. (2011) observed a lasting resemblance of lip print pattern between parents and their descendants in a genetic study. It has also been noted that children with cleft lip and cleft palate inherit their lip prints (Weal et al. 2005). The sexual dimorphic property found in lip prints has also been linked to genetic effects that differ across sexes, most notably in sex chromosomes (Adamu et al. 2012).

However, because lip prints are formed during intrauterine life at about 6weeks of gestation (Oladipo et al. 2018), the patterns that eventually stays with an individual can be genetically altered if exposed to mutants or certain environmental factors (Singh, 2005). This study evaluated the possible effect of the season of birth as an environmental factor on lip print patterns.

The qualitative analysis of association between cheiloscopy and season of birth carried out on each lip compartment according to Suzuki and Tsuchilashi (1971) lip partitioning did not show significant distributional

correlation in any of the upper or lower lip quadrants. A test of association in the *URQ* showed χ^2value of 6.987 and p = 0.322 in the total population. In the females' *UMQ*, there was a slightly high difference in the pattern distribution of those born during wet and dry season (χ^2= 10.935) but not significant (p=0.09). Similar pattern was seen in the females *ULQ* as well with χ^2=11.304 & p=0.07. These are the highest odds in our result. Throughout the lower quadrants there was no significant difference in the distribution of prints in the population born in both season. The lowest p value was seen in the *LMQ* of males (P=0.267). Our results agreed with This is in agreement with Mahaswari, (2005) and Shilpa et al. (2010) who observed no change in lip prints during the course of years' observation.

Although, Weber and his colleagues had proven that height of an individual has a significant correlation to their month of birth (Weber et al. 1998), and Waldie et al. (2000) reported the effect of prenatal and postnatal exposure to sunlight as slightly impactful on human growth, there has not been any prior evidence from literature that season of birth have a significant influence on the predominance of any type of lip print pattern. The two major Nigerian studies in this regard "Sharma et al. (2014) and Adamu et al. (2013)" reported no tangible association. The findings from this study have further corroborated these claims.

CONCLUSION

It has been further established from this study that different tribes have different types of lip print pattern as a result of variation in genetic composition. Furthermore, this study also established that season of birth either wet (during raining season) or dry (during hot temperature) has no significant influence on the lip print distribution among the study population unlike the previous studies which established that season of birth to having a significant correlation with an individual height. Thus, genetic variables have a greater impact on lip prints than environmental factors.

ACKNOWLEDGEMENT

Special thanks to the Department of Anatomy for their backing, and ethical approval of the study. Our appreciation goes to the Nupe and Gbagyi community chiefs who gave us approval to work within their communities and also we acknowledge the study cohorts who volunteered to be part of the study.

Competing Interest: There was no conflict of interest declared by any party and the research was fully funded by the researchers.

REFERENCES

Abidullah M, Kumar MN, Bhorgonde KD, Reddy DS. (2015). Cheiloscopy and dactyloscopy: Do they dictate personality patterns?. Journal of Forensic Dental Sciences. 7: 114.

Adamu LH, Taura MG, Hamman WO, Ojo SA, Dahiru AU, Sadeeq AA, Ibrahim AD. (2012). Association of lip prints and sex among Nigerians. Nigerian Journal of Basic and Clinical Science. 9: 79-83.

Adamu LH, Taura MG, Sadeeq AA, Asuku AY, Datti S, Abdu IT. (2013). The influence of season of birth on the pattern of lip prints in Nigeria. Bayero Journal of Pure and Applied Sciences. 6: 6-9.

Alabi AS, Amedu NO, Olowo ST, Kareem SB, Lewu SF. (2019). Morphologic distribution of lip prints among genders, season of birth and different dialects of a Nigerian population. Journal of Environmental Toxicology and Public Health. 4: 36-41.

Bindal U, Jethani SL, Mehrotra N, Rohatgi RK, Arora M, Sinha P. (2009). Lip prints as a method of identification in human being. Journal of the Anatomical Society of India. 58: 152-5.

Eboh DE. (2012). A Study of Morphological Patterns of Lip Prints among The Yorubas in Okitipupa, South-western Nigeria. African Journal of Tropical Medicine and Biomedical Research. 4: 1-4.

Fisher RA. (1935). The logic of inductive inference (with discussion). Journal of Royal Statistical Society. 98: 39-82.

Ghalaut P, Bhagwath S, Saxena S. (2013). An Assessment Of Inheritance Pattern Of Lip Prints In North Indian Population. Indian Journal of Dental Sciences. 5: 34-41.

Gondivkar SM, Indurkar A, Degwekar S, Bhowate R. (2009). Cheiloscopy for sex determination. Journal of Forensic Dental Sciences. 1: 56.

Hassan FZ, Fahmy SM. (1977). The pattern of lip prints in upper Egyptians. Assiut Medical J. 1: 477-486.

Jeergal PA, Pandit S, Desai D, Surekha R, Jeergal VA. (2016). Morphological patterns of lip prints in Mangaloreans based on Suzuki and Tsuchihashi classification. Journal of Oral and Maxillofacial Pathology. 20: 320-327.

Kapoor N, Badiye A. (2017). A study of distribution, sex differences and stability of lip print patterns in an Indian population. Saudi journal of biological sciences. 24: 1149-54.

Kenneth EU, Emelda OC, Obaje SG, Chinedu UG. (2018). Sexual dimorphism in the patterns of lip prints among students of Alex Ekwueme Federal University Ndufu-Alike Ikwo, Nigeria. European Journal of Biomedical. 5: 379-384.

Kumaran SM, Bastia BK, Kumar L, Patel SH. (2017). Correlation between fingerprint and lip print pattern in Gujarati population. Medico-Legal Update. 17: 217-221.

Mahaswari TNU. (2005). Lip prints.PG dissertation. Department of oral medicine and Radiology, Saveetha Dental College and hospitals, Chennai

Moshfeghi M, Beglou A, Mortazavi H, Bahrololumi N. (2016). Morphological patterns of lip prints in an Iranian population. Journal of Clinical and Experimental Dentistry. 8(5): e550.

Naik R, Mujib BA, Telagi N, Hallur J. (2017). Comparative analysis of lip with thumbprints: An identification tool in personal authentication. Journal of Oral and Maxillofacial Pathology: JOMFP. 21: 171.

National Population Commission, Nigeria (2006). Population Distribution by Sex, State 2006. (Cited 2020 July 1) Available online at: https://nigerianstat.gov.ng/download/474

Negi A, Negi A. (2016). The connecting link! Lip prints and fingerprints. Journal of Forensic Dental Sciences. 8: 177.

Oladipo GS, Alabi AS, Paul CW, Amadi PN, Paul JN, Robert FO, Amasiatu VC. and Gospel S. (2018). Cheiloscopy among the Igbo students in Madonna University Elele, Rivers State, Nigria. Saudi Journal of Biomedical Research, 3: 129-13.

Saad WM, Kamel AH, Hassan FZ, Elotiefy MA. (2005). Genetic studies on the inheritance of lip prints in cleft lip and palate. Egypt J Plast Reconstr Surg. 29: 9-12.

Sharma NA, Eldomiaty MA, Gutiérrez-Redomero E, George AO, Garud RS, Sánchez-Andrés A. (2014). Diversity of human lip prints: a collaborative study of ethnically distinct world populations. Annals of Human Biology. 41: 568-578.

Sharma P, Saxena S, Rathod V. (2009). Cheiloscopy: The study of lip prints in sex identification. Journal of Forensic Dental sciences. 1: 24.

Shilpa P, Ish P, Madhu SA, Gayathri R, Sowmya GV. (2010). A study of lip prints in relation to gender, family and blood group. International Journal of Oral and Maxillofacial Pathology. 1: 4-7.

Singh H, Chhikara P, Singroha R. (2011). Lip prints as evidence. Journal of Punjab Academy of Forensic Medicine & Toxicology. 11: 23-25.

Singh I, (2005). Development of the face. In: Text book of human embryology. Jaypee Brothers: pp:231-236.

Suzuki K, Tsuchiahashi Y. (1971). A new attempt of personal identification by means of lip print. Canadian Society of Forensic Science Journal. 4: 154-158.

Synder LM. (1950). Textbook of Homicide investigation. Identification of dead bodies. pp:65.

Tsuchihashi Y. (1974). Studies on personal identification by means of lip prints. Forensic Science. 3: 233-248.

Vahanwala S, Nayak CD, Pagare SS. (2005). Study of lip prints as aid for sex determination. Medico-legal Update. 5: 93-98.

Vats Y, Dhall JK, Kapoor AK. (2011). Heritability of Lip Print Pattern among Northern Indian populations. Journal of Forensic Research. 2: 137.

Waldie KE, Poulton R, Kirk IJ, Silva PA. (2000). The effects of pre-and post-natal sunlight exposure on human growth: evidence from the Southern Hemisphere. Early Human Development. 60: 35-42.

Weal M, Saad MS, Assem HK, Hassan FZ, El-otiefy MA. (2005). Genetic Studies on the Inheritance of Lip Prints in-Cleft Lip and Palate. Egyptian Journal of Plastic Reconstractrive Surgery. 29: 9-12.

Weber GW, Prossinger H, Seidler H. (1998). Height depends on month of birth. Nature. 391: 754-755.