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Research Article

Relationship between Digit Ratio (2D:4D) and Hirsutism Among Various Ethnic Groups in Adamawa State, Nigeria

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Abstract

Background of Study: 2D:4D is the ratio between the length of the second (index finger) and fourth digit (ring finger) which varies due to exposure to androgen. Hirsutism refers to excessive growth of terminal hair in women, in skin areas sensitive to androgens.

Aim: This study was carried out to evaluate sexual difference in digit ratio (2D:4D) of subjects from different ethnic groups and the extent to which it relates to hirsutism in females.

Material and Methods: A total of 465 subjects (174 males and 291 females) participated in this study aged 15 and above. The lengths of the index (2D) and ring (4D) digit were measured from the basal crease to the tip of the finger using vernier caliper and 2D:4D were calculated for each subject. The degree of hirsutism was determined using the Ferriman Gallwey Score which quantifies the presence of terminal hair over nine (9) body parts. The data was analyzed using statistical package for social sciences (SPSS) version 22.

Results: The results from this present study showed that the male subjects had higher index (2D) and ring (4D) finger length compared to females and it was statistically significant ($P < 0.05$). It was also revealed that the male subjects had lower digit ratio (2D:4D) compared to the female subjects. Hirsute were found to have lower digit ratio (2D:4D) compared to non-hirsute, although the difference was not statistically significant ($P > 0.05$). Furthermore, no association was found between 2D:4D and ethnicity, hirsutism and ethnicity as well as age and hirsutism.

Conclusion: Digit ratio (2D:4D) is sexually dimorphic, males have shorter digit ratio while female females have longer digit ratio. Hirsute have lower digit ratio (2D:4D) compared to non-hirsute. Good knowledge of the digit ratio (2D:4D) could be used for sex identification by forensic experts and anthropologists.

Keywords: Index Finger; Ring Finger; Digit Ratio; Hirsutism; Hirsute; Non-hirsute

Introduction

2D:4D is the ratio between the length of the second (index finger) and fourth digit (ring finger) which varies due to exposure to androgen. 2D:4D digit ratio has been proposed as sexually dimorphic phenotypic trait [1,2]. Various studies have shown that the index digit (2D) is shorter in males than the ring digit (4D) [3,4]. It was also reported that the digit ratio of males is lower than the digit ratio of females [5-7].

Hirsutism is the excessive growth of terminal hair in women, in skin areas sensitive to androgens. It is a sign of increased circulating levels of androgen activity on the hair follicles, either as a result of increased circulating levels of androgens or sensitivity of the hair follicles to normal circulating level of androgen [8-10]. Chhabra., *et al*. found that there is positive correlation between severity of hirsutism and testosterone levels, while Ukanu., *et al*. found that females with hirsutism have lower digit ratio compared to non-hirsute due to their high testosterone level [11,12].

Previous studies on digit ratio were mostly done using subjects from single or just few ethnic groups and only few studies have been done to evaluate the possible relationship between digit ratio and hirsutism. Therefore, this study aimed at evaluating sexual dimorphism in digit ratio (2D:4D) among different ethnic groups in Adamawa State of Nigeria and the extent to which it relates with hirsutism in females.

Material and Method

Sample size

The study was conducted among 465 (174 males and 291 females) participants from different ethnic groups in Adamawa State of Nigeria who are 15 years and above. Subjects with digit abnormalities were excluded from the study. The ethnic groups whose members were used for the study are: Higgi, Hausa, Fulani, Fali, Kilba, Chamba, Nzanyi, Bachama, Marghi, Yungur, Burah, Lunguda, Mbula, Bali, Kanakuru, Nyandang, Hona, Gude, Ga'adu, Mboi, Bille, Verre, Lala, and Nwagba. Ethical approval was obtained from ethic and research committee of College of Nursing and Midwifery, Yola. (CONMY/OFF/229/VOL.1/23).

Method of measurement

A vernier caliper was used to measure the lengths of the index(2D) and ring fingers from the basal crease to the tip of the finger. All the measurements were taken twice and the mean recorded for accuracy while the digits were fully extended. The degree of hirsutism in female subjects was determined using modified Ferriman-Gallwey scoring method which quantifies the presence of terminal hair over nine (9) body parts [13]. A score of ≥8 was considered indicative of hirsutism.

Statistical analysis

Data were analyzed using statistical package for social sciences (SPSS) version 22. Independent sample t-test was used to determine the mean difference of the digit ratios (2D:4D) of males and females. One way ANOVA (analysis of variance) was used to determine the association between digit ratio and ethnicity, while chi-square was used to determine the association between hirsutism and ethnicity as well as hirsutism and age. The P-value set at ≤ 0.05 was considered to be statistically significant.

Results

The result in table 1 shows that the male subjects have longer ring finger length (4D) and shorter index finger length (2D) compared to the females; the mean value of the index finger (2D) and ring finger (4D) in males were found to be higher compared to that of females and the difference was statistically significant ($P < 0.05$). The result also shows that the mean value of the digit ratio (L2D:4D) was lower in males than females in the left hand and the difference was also found to be statistically significant ($P < 0.05$). However, there was no statistical difference found between the mean value of the right digit ratio (R2D:4D) of males and females ($P < 0.05$).

Gender		N	Mean	Std. Deviation	t-value	DF	Sig.
L2D	Male	174	5.4	1.01	9.59	341	.00
	Female	291	4.54	0.93			
L4D	Male	174	5.94	1.03	11.71	331	.00
	Female	291	4.82	0.92			
L2D:4D	Male	174	2.71	0.58	-1.76	366	.051
	Female	291	2.92	1.85			
R2D:4D	Male	174	2.61	0.58	0.14	413	0.89
	Female	291	2.70	0.69			

Table 1: Relationship between digit ratio and gender from different ethnic groups.

L2D: Index Finger Length, L4D: Ring Finger Length, L2D: 4D - Left Digit Ratio, R2D: 4D - Right Digit Ratio.

The mean value of the digit ratio (2D:4D) of hirsute was lower compared to the mean value of non-hirsute in both left and right hand (Table 2). However, the mean difference was found not to be statistically significant.

	Hirsutism	N	Mean	Std. Deviation	t	df	Sig.
L2D	Hirsute	131	4.61	0.92	1.21	290	0.23
	Non hirsute	161	4.48	0.95			
L4D	Hirsute	131	4.82	0.92	-.086	290	0.93
	Non hirsute	161	4.83	0.92			
L2D:4D	Hirsute	131	2.83	0.51	-.848	177	0.40
	Non hirsute	161	2.77	2.44			
R2D:4D	Hirsute	131	2.74	0.78	0.84	240	0.40
	Non hirsute	161	2.67	0.60			

Table 2: Relationship between digit ratio and hirsutism.

L2D: Index Finger Length, L4D: Ring Finger Length, L2D:4D - Left Digit Ratio, R2D:4D - Right Digit Ratio.

The result in table 3 shows that there was no association between digit ratio (2D:4D) and ethnicity, digit ratios (2D:4D) of the right and left hand of subjects from different ethnic groups showed no statistical difference (P > 0.05).

		Sum of Squares	Df	Mean Square	F	Sig.
R2D:4D	Between Groups	7.28	19	0.38	0.91	0.57
	Within Groups	186.95	445	0.42		
L2D:4D	Between Groups	36.71	19	1.93	0.84	0.66
	Within Groups	1020.83	445	2.29		

Table 3: Relationship between digit ratio and ethnicity.

R2D:4D - Right Digit Ratio, L2:4D - Left Digit Ratio

The result in figure 1 shows that non-hirsute within the age range of 15 to 20 years, 21 to 26 years and 27 to 32 years are higher in number compared to the hirsute; while non-hirsute were not found within the age range of 33 years and above in this present study. However, the mean difference was not statistically significant (P > 0.05). The Fulani groups were found in this study to have the highest number of hirsute followed by the Higgi and Bachama ethnic groups, while the Mbula ethnic group have the least number of hirsute and no hirsute were found among the Kanakura and Hona ethnic groups (Figure 2). However, the difference observed among the ethnic groups was not statistically significant (P < 0.05).

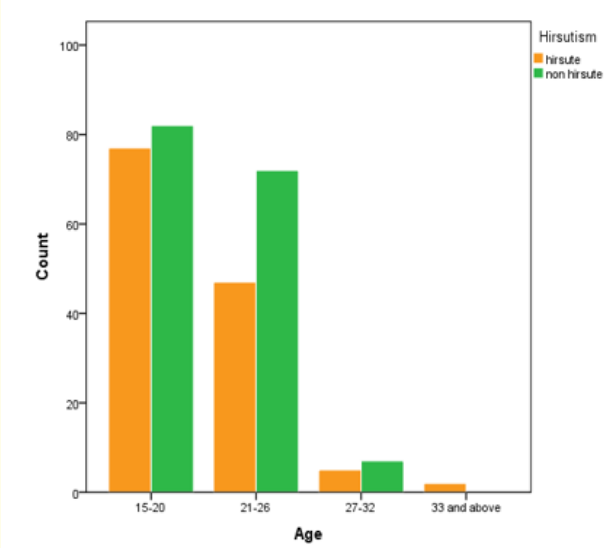

Figure 1: Association Hirsutism and age.

Discussion

In this study, we found that males have longer ring finger(4D) length and shorter index finger(2D) length compared to the females and it was statistically significant. It agrees with the work

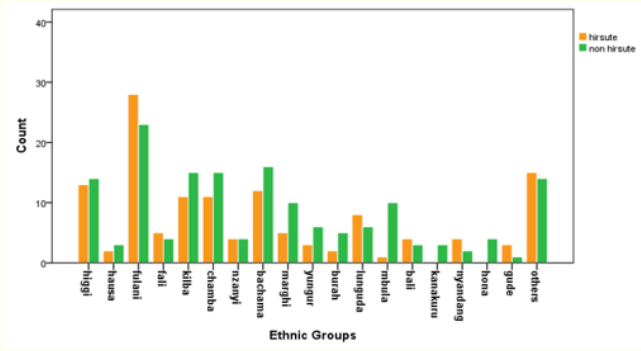

Figure 2: Association between hirsutism and ethnicity.

of Ebeye on the anthropometric study of 2D:4D digit ratios among Urhobo people of Southern part of Nigeria, where she found that males have longer ring digit and shorter index digit compared to females [5]. This study also agrees with other studies that reported longer ring digit length and shorter index length in males when compared with that of the females [6,14,15].

It was also found in this study that males digit ratio (2D:4D) is lower compared to females and this agrees with previous studies on the association between digit ratio and gender [5,16,17].

Our study also shows that hirsute have lower digit ratio (2D:4D) compared to non-hirsute, although the difference was not statistically significant. This little difference observed in hirsute could be as a result of high testosterone level – giving them male-like digit ratio, while the non-hirsute had high oestrogen level – giving them female-like digit ratio. The study agrees with previous finding by Ukanu., *et al*. which revealed that hirsute have lower digit ratio compared to non-hirsute [12]. However, the result from this present study disagrees with a study conducted among females Igala population, which reported that the difference between hirsute and non-hirsute digit ratio (2D:4D) was statistically significant [12].

We also found in this study that the association between digit ratio and ethnicity was not statistically significant. Manning., *et al*. reported significant ethnic difference in 2D:4D in a study conducted among Caucasian, Oriental and Black children and this is in disagreement with the present study [18]. It has also been reported in different studies that digit ratios vary from one part of Nigeria to another. Studies conducted among the Igala population and Urhobo population of Southern Nigeria revealed that male have lower digit ratio (2D:4D) compared to females [5,12]. However, most of the previous findings on digit ratio focus on single or few ethnic groups in Nigeria, but the present study evaluate over twenty ethnic groups in Adamawa state.

There was also no significant statistical difference found in the association between hirsutism and ethnicity. However, this present study is in disagreement with Afifi., *et al*. who reported a correlation between hirsutism and ethnicity in their research conducted among American patients with polycystic ovarian syndrome [19]. Our study also revealed that there was no association between hirsutism and age.

Conclusion

In conclusion, Digit ratio (2D:4D) have been found in this study to be sexually dimorphic, males have shorter digit ratio while female females have longer digit ratio. Hirsute have lower digit ratio (2D:4D) compared to non-hirsute. Good knowledge of the digit ratio (2D:4D) could be used for sex identification by forensic experts and anthropologists.

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