Digital Dermatoglyphic Patterns of Uturu People of Abia State

ABSTRACT

Background: Dermatoglphics is an essential tool in population studies, identification of persons and diagnosis of diseases of genetic origin. The aim of the study was to determine the characteristics of finger dermatoglyphic patterns peculiar to Uturu indigenes of Abia State.
Materials and Methods: The study was conducted among the Uturu Indigenes of isikwuato Local Government Area of Abia State Nigeria. A total of two hundred (200) volunteers comprising 100 Males (M) and 100 Females (F) participated in the study. The finger prints of the thumb (I), index finger (II), middle finger (III), ring finger (IV) and little finger (V) were obtained from the right and left hands using using digital scanners and computers. Data were obtained for finger dermal patterns, finger ridge count (FRC) and total finger rigde count (TFRC) Analysis of data was done using Microsoft Excel Data Analysis Toolpack (2016 Edition) and Chi Square test at p>0.05 was used to determine sexual dirmorphism and bilateralism.
Results: The patterns observed among sampled Uturu indigenes were Arch (AR), Central pocket loop (CP.L), Double loop (DL), Spiral whorl (SP.W), Ulnar whorl (UL). Uturu people have more ulnar loops in both hands, followed by whorls and arches, while radial loop was the least observed pattern. The test for bilateralism showed no significant diference in the distribution of dermal patterns in the right and left fingers. In the index finger, significant difference (P>0.05) was observed in the paterrn distribution in the right and left hand between males and females. Utturu ideigenes have more finger ridge count in the right thumb.
Conclusion: The findings of the study will be relevant to biomedical anthropologists, Forensic Scientists and population studies experts.

Keywords: Dermatoglyphic patterns, Dermal patterns, Friction ridges, Finger

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1. INTRODUCTION

The term dermatoglyphics refers to the study of naturally occurring ridges on the surface of the hand and feet of primates and other animals. [1,2,3,4,5] It is also a collective name used to describe all patterns of the ridged skin of the palm and soles; though these patterns show great diversity and combination in individuals, they can be categorized into a number of different types; parallel ridges and furrows form arches, loops and whorls (ALW system) on the finger tips. [6,7,8]

Dermal ridge differentiation takes place in the third and fourth week of fetal life, and by the end of the fourth month, the ridges and their arrangements are in their complete and permanent form. From this time onward until death there is no morphological change either in the detailed structure of the ridges or in the patterns formed by them. It is also a polygenic trait and is not duplicated among species even among monozygotic twins. [1,2,9]

The fact that each individual's ridge configuration is unique has been greatly utilized as a means of personal identification (especially by law enforcement agencies), Physical anthropologist has utilized it population studies as well as in the determination of ancestry. [1,10]

The dermatoglyphics patterns have been reported for Algerian populations [11], Mediterranean populations. [12] There are also several reports on dermatoglyphic pattern in Nigerian populations [10,13,14,15,16]. However, there is paucity of information about the dermal ridge pattern of Uturu indigenes of Abia in East Nigeria, Therefore the objective of this study is to determine the characteristic dermatoglyphic pattern peculiar to Uturu indigenes of Abia State.

MATERIALS AND METHODS

2.1 Study Design

This was a descriptive cross-sectional study.

2.2 Study Population

The study was conducted among the Uturu Indigenes, in Isikwuato L.GA. of Abia State Nigeria. Uturu is a town located within latitudes 05.33°N and 06.03°N, in the northern part of Abia State, Nigeria. It has a population of over 40,000 individuals. Archaeologists have also discovered

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evidence of the habitation of early, middle, and late Stone Age Homo erectus, hence this town is also known as the early man's abode. Several educational institutions are located in Uturu, which includes Abia State University, Marist Brothers' Juniorate, Uturu, Gregory University, and several post-secondary schools.[17]

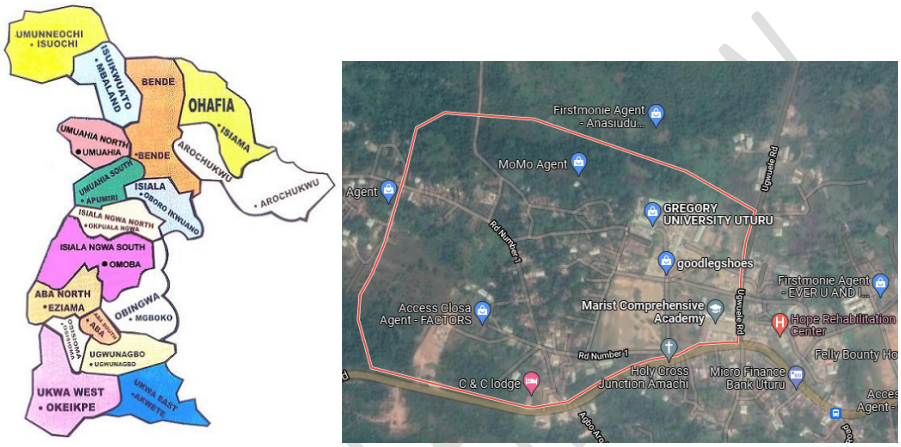

Figure 1: Map of Uturu

2.3 Sample and Sampling Technique

The sample size for this study was obtained using Taro Yamane[18], $n = \frac{N}{1 + N(e)^2}$

n = minimum sample size from the population under study

N = is the study population

e = level of precision or error margin, usually 0.05

$$n = \frac{40000}{1 + 40000(e)^2} = 396$$

Hence a minimum sample size of 396 individuals were involved in the study.

2.4 Sampling Technique

A simple random sampling technique was used in selecting Uturu indigenes for the study.

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2.5 Nature/source of Data

The study involved primary data. Finger prints were obtained directly from the volunteers.

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2.6 Method of Data Collection/Procedure for obtaining prints

Palmer prints were obtained using the Hp digital scanner and autocad computer software as described by Oghenemavwe and Osaat. [4]

1.7 Selection criteria

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The study included;

1. Subjects with complete ten (10) digits, who never had accident or surgery involving the palmar surface of the digit.
2. Subjects with clear prints.
3. Those whose parents and grandparents are indigenes of Uturu.

2.9 Ethical Considerations

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Ethical approval for this study was sought from the Research Ethics Committee of Gregory University Uturu.

Participation in the study was voluntary and the study was carried out in accordance with the ethical standards. Permission was obtained from the subjects before taking their finger prints.

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2.8 Data Analysis

Data was analysed using Microsoft Excel Data Analysis Toolpack (2016 Edition). Results were presented in descriptive statistics showing the mean, standard error of mean, standard deviation, variance and range (maximum and minimum values). Percentage distribution of dermal patterns was presented in frequency distribution tables, while test of significance was carried out using Chi-square test. Sexual dimorphism in finger ridge count and total finger ridge count was determined using independent sample t-test. Confidence level was set at 95% and a p-value less than 0.05 was considered statistically significant.

2. RESULTS AND DISCUSSION

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The percentage distribution of dermal patterns in all subjects was presented in Table 1, while those of male as well as female subjects were presented in Tables 3 and 4 respectively.

The descriptive statistics for finger ridge count and total finger ridge count was presented in Table 2. Chi square test to determine the differences in the distribution of dermal patterns between males and females was presented in Table 5 (Right hand) and 6 (Left hand). And also, in Table 7 (Male) and 8 (Female) to determine bilateralism in the distribution of dermatoglyphic patterns in left and right fingers.
Descriptive statistics for finger ridge count and total finger ridge count in male and female subjects was presented in Table 9, while sexual dimorphism in finger ridge count and total finger ridge count was presented in Table 10.

In Table 1, more ulnar loops were observed in both fingers (right and left) followed by whorls and arches, while radial loop was the least observed pattern in both hands. Jaja *et al* [13] and Udoaka[15] in two separate studies on the Ijaw people of Southern Nigeria, also reported ulnar loop to be the most prevalent finger ridge pattern and radial loop being the least. Ujaddughe[19] made similar observations in Esan ethnic group of Edo state, Nigeria and the Igbo and Okrika people of Southern Nigeria respectively. This pattern is also same for Europeans. [20] However, Igbigbi and Msamati[21] observed the contrary, arches were the most dominant pattern in Malawians.

Finger ridge count and total finger ridge count was presented in Table 2 and 9. On the average, there are more finger ridges on the thumb (Right (R) = 8.27; Left (L) = 7.93), while the index finger has the least count [Right (R) = 6.56; Left (L) = 6.94]. For the right hand, both subjects have the highest mean finger ridge count on the thumb [Male (8.08), Female (8.47)]. The lowest was observed on the index finger in both subjects [Male (6.41), Female (6.71)]. For the left, Males had the highest ridge count on the ring finger (8.06), with the lowest on the little finger (6.44). Females had the highest finger ridge count (TFRC) of 8.64, with lowest (6.90) on the index finger. Females had more total finger ridge count (74.05) compared to male subjects (72.35). Ekanem[14] made similar observations in the Annang people of Akwa Ibom State of Nigeria, with males having higher TFRC compared to females. Igbigbi and Msamati[21], reported in a Malawian population, that males had a significantly higher TFRC compared to females.

Distribution of dermal patterns according to sex was presented in Table 3 and 4. A larger percentage of ulnar loop (UL) was observed on both hands for male and female subjects, with

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the little finger (V) having more UL [Male (R = 81; L = 78), female = (R = 89; L = 89)] compared to other digits. The least observed pattern was radial loop (RL) which was only observed on the left index finger (3 times) in female subjects. Udoaka[15] also observed a higher frequency of ulnar loops on all fingers in both sex, while George and Yassa[22], did not observe same in all fingers. The ring finger instead has higher frequency of whorls.

In Table 5 and 6, differences in the distribution of dermal patterns between male and female subjects was determined using Chi-square. Significant difference was only observed on the index finger (X^2 = 10.08; P = 0.04, X^2 = 9.26; P = 0.01) of the right and left digits respectively. Other authors (Igbigbi and Msamati[21]; Ekanem[14]) observed sexual dimorphism in finger ridge patterns of Malawaians, Tanzanians and Annang people of Akwa Ibom State Nigeria respectively.

Bilateralism test for distribution of patterns was carried out in Table 7 and 8. Significant difference was not observed in the dermatoglyphic pattern of the right and left digits in male and female subjects. Jindal *et al* [23] made similar observations among Indian children.

Sexual dimorphism in finger ridge count was presented in Table 10. Significant difference was only observed on the left thumb (P = 0.03). Others authors such as Jantz [24]; in three of the six Negro samples he studied as well as in the Parsis of India males observed significant difference in finger ridge count between sex.

3. CONCLUSION

The study examined the dermatoglyphic patterns of Uturu people of Abia State, Nigeria. Dermatoglyphic patterns as observed in the present study was similar to those of other Nigerian studies. There was more ulnar loop, followed by whorl, arch, central pocket loop, double loop, radial loop in the study population. Sexual differences were not observed in the patterns studied, except for the index finger of both hands.

The present study had the lowest amount to radial loop pattern as compared to previous studies. There was also a prevalence of double loop and central pocket loop as compared to previous studies. The ulnar loop was the highest in qualitative variables as seen in previous studies.

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This study will be relevant in anthropology, medicine, especially in forensic investigations involving the people of Uturu.

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TABLES

Table 1: The percentage distribution of dermal pattern in the fingers of all Subjects

Pattern	I(%)	II(%)	III(%)	IV(%)	V(%)
			RIGHT		
AR	19(9.5)	22(11)	8(4)	6(3)	5(2.5)
CP.L	6(3)	2(1)	3(1.5)	17(8.5)	6(3)
DL	15(7.5)	4(2)	2(1)	2(1)	1(0.5)
SP.W	50(25)	52(26)	37(18.5)	49(24.5)	18(9)
UL	110(55	120(60)	150(75)	126(63)	170(85)
			LEFT		
AR	25(12.5)	25(12.5)	18((9)	7(3.5)	7(3.5)
CP.L	2(1)	6(3)	7(3.5)	14(7)	7(3.5)
DL	14(7)	1(0.5)	3(1.5)	1(0.5)	0(0)
SP.W	43(21.5)	46(23)	40(20)	50(25)	19(9.5)
UL	116(58)	119(59.5)	132(66)	128(64)	167(83.5)
RL	0 (0)	3(1.5)	0(0)	0(0)	0(0)

I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 2: Descriptive statistics for finger ridge count and total finger ridge count for all subjects

Finger	N	Mean	SEM	SD	VAR	MinV	MaxV
				RIGHT			
I	200	8.27	0.33	4.69	21.97	0.00	20.00
II	200	6.56	0.25	3.60	12.94	0.00	15.00
III	200	6.98	0.23	3.30	10.89	0.00	17.00
IV	200	7.69	0.26	3.69	13.63	0.00	21.00
V	200	7.34	0.25	3.56	12.66	0.00	19.00
				LEFT			
I	200	7.93	0.33	4.59	21.07	0.00	18.00

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II	200	6.94	0.28	4.02	16.18	0.00	18.00
III	200	7.35	0.30	4.18	17.48	0.00	17.00
IV	200	7.84	0.29	4.16	17.30	0.00	23.00
V	200	6.72	0.21	2.97	8.81	0.00	17.00
TFRC	200	73.20	1.84	26.09	680.69	19.00	139.00

I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger, N = Sample size, SEM = Standard error of mean, SD = Standard deviation, VAR = Variance, MinV = Minimum value, MaxV = Maximum value

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Table 3: Distribution of dermal patterns in the fingers of male subjects

	I	**II**	**III**	**IV**	**V**
			RIGHT		
AR	12	14	6	4	3
CP.L	2	2	3	11	4
DL	6	4	1	1	0
SP.W	25	28	20	28	12
UL	55	52	70	56	81
			LEFT		
AR	18	15	10	5	6
CP.L	0	4	4	5	4
DL	5	0	2	1	0
SP.W	22	28	20	29	12
UL	55	53	70	60	78

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 4: The distribution of dermal Pattern in the fingers of female subjects

Pattern	I	II	III	IV	V
		RIGHT			
AR	7	8	2	2	2
CP.L	4	0	0	6	2
DL	9	0	1	1	1
SP.W	25	24	17	21	6
UL	55	68	80	70	89
		LEFT			
AR	7	10	8	2	1
CP.L	2	2	3	9	3
DL	9	1	1	0	0
SP.W	21	18	20	21	7
UL	61	66	68	68	89
RL	0	3	0	0	0

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, RL = Radial loop, I = Thumb, II= lindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 5: Chi Square Test to determine differences in the distribution of dermal patterns between males and females [Right hand]

Finger	Pattern	Male	Female	X^2	*P* value	Inference
	AR	12	7			
	CP.L	2	4			
I	DL	6	9	2.58	0.63	Not significant
	SP.W	25	25			
	UL	55	55			
	AR	14	8			
	CP.L	2	0			
II	DL	4	0	10.08	0.04	Significant
	SP.W	28	24			
	UL	52	68			
	AR	6	2			
	CP.L	3	0			
III	DL	1	1	5.91	0.21	Not significant
	SP.W	20	17			
	UL	70	80			
	AR	4	2			
	CP.L	11	6			
IV	DL	1	1	4.62	0.33	Not significant
	SP.W	28	21			
	UL	56	70			
	AR	3	2			
	CP.L	4	2			
V	DL	0	1	4.24	0.37	Not significant
	SP.W	12	6			
	UL	81	89			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, RL = Radial loop, I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 6: Chi Square Test to determine differences in the distribution of dermal patterns between males and females [Left hand]

Pattern	Male	Female	X^2	*P* value	Inference
AR	18	7	8.32	0.14	Not significant
CP.L	0	2			
DL	5	9			
SP.W	22	21			
UL	55	61			
RL	0	0			
AR	15	10	9.26	0.10	Significant
CP.L	4	2			
DL	0	1			
SP.W	28	18			
UL	53	66			
RL	0	3			
AR	10	8	0.82	0.98	Not significant
CP.L	4	3			
DL	2	1			
SP.W	20	20			
UL	70	68			
RL	0	0			
AR	5	2	5.21	0.31	Not significant
CP.L	5	9			
DL	1	0			
SP.W	29	21			
UL	60	68			
RL	0	0			
AR	6	1	5.75	0.33	Not significant
CP.L	4	3			
DL	0	0			
SP.W	12	7			
UL	78	89			
RL	0	0			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, RL = Radial loop, I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 7: Bilateralism test for distribution of patterns in the left and right fingers [Males subjects]

Finger	Pattern	Right	Left	X^2	*P*-value	Inference
	AR	12	18			
	CP.L	2	0			
I	DL	6	5	3.42	0.52	Not significant
	SP.W	25	22			
	UL	55	55			
	AR	14	15			
	CP.L	2	4			
II	DL	4	0	4.71	0.32	Not significant
	SP.W	28	28			
	UL	52	53			
	AR	6	10			
	CP.L	3	4			
III	DL	1	2	1.48	0.83	Not significant
	SP.W	20	20			
	UL	70	70			
	AR	4	5			
	CP.L	11	5			
IV	DL	1	1	2.52	0.69	Not significant
	SP.W	28	29			
	UL	56	60			
	AR	3	6			
	CP.L	4	4			
V	DL	0	0	1.06	0.9	Not significant
	SP.W	12	12			
	UL	81	78			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, RL = Radial loop, I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 8: Bilateralism test for distribution of patterns in left and right fingers [Female subjects]

Finger	Pattern	Right	Left	X^2	*P*-value	Inference
	AR	7	7			
	CP.L	4	2			
II	DL	9	9	1.32	0.86	Not significant
	SP.W	25	21			
	UL	55	61			
	AR	8	10			
	CP.L	0	2			
II	DL	0	1	7.12	0.21	Not significant
	SP.W	24	18			
	UL	68	66			
	RL	0	3			
	AR	2	8			
	CP.L	0	3			
III	DL	1	1	7.82	0.21	Not significant
	SP.W	17	20			
	UL	80	68			
	AR	2	2			
	CP.L	6	9			
IV	DL	1	0	1.63	0.80	Not significant
	SP.W	21	21			
	UL	70	68			
	AR	2	1			
	CP.L	2	3			
V	DL	1	0	1.61	0.88	Not significant
	SP.W	6	7			
	UL	89	89			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar whorl, RL = Radial loop, I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger

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Table 9: Descriptive Statistics for Finger ridge count and total finger ridge count in male and female subjects

Finger	Sex	Mean	SEM	SD	VAR	MinV	MaxV
			RIGHT				
I	M	8.08	0.48	4.78	22.80	0.00	19.00
	F	8.47	0.47	4.61	21.26	0.00	20.00
II	M	6.41	0.38	3.75	14.08	0.00	15.00
	F	6.71	0.34	3.45	11.88	0.00	14.00
III	M	6.93	0.33	3.31	10.97	0.00	17.00
	F	7.02	0.33	3.30	10.91	0.00	17.00
IV	M	7.71	0.38	3.84	14.75	0.00	21.00
	F	7.66	0.36	3.56	12.65	0.00	17.00
V	M	7.76	0.39	3.92	15.38	0.00	19.00
	F	6.91	0.31	3.11	9.70	0.00	15.00
			LEFT				
I	M	7.24	0.47	4.73	22.39	0.00	16.00
	F	8.64	0.44	4.36	18.97	0.00	18.00
II	M	6.90	0.41	4.09	16.76	0.00	17.00
	F	6.98	0.40	4.36	18.97	0.00	18.00
III	M	7.11	0.42	4.20	17.67	0.00	17.00
	F	7.58	0.42	4.17	17.36	0.00	15.00
IV	M	8.06	0.44	4.44	19.67	0.00	23.00
	F	7.62	0.39	3.87	15.01	0.00	20.00
V	M	6.44	0.32	3.17	10.07	0.00	17.00
	F	7.00	0.27	2.73	7.47	0.00	14.00
TFRC	M	72.35	2.73	27.35	747.95	0.00	139.00
	F	74.05	2.49	24.88	618.86	0.00	135.00

I = Thumb, II= Iindex finger, III = Middle finger, IV = ring finger, V = Little finger, N = Sample size, SEM = Standard error of mean, SD = Standard deviation, VAR = Variance, MinV = Minimum value, MaxV = Maximum value, M = Male, F = Female

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Table 10: Independent T test to determine sexual dimorphism in finger ridge count and total finger ridge count

Finger	Sex	Mean±SD	*P* value	Inference
		RIGHT		
I	M	8.08 ±4.78	0.56	Not significant
	F	8.47±4.61		
II	M	6.41±3.75	0.55	Not significant
	F	6.71±3.45		
III	M	6.93±3.31	0.85	Not significant
	F	7.02±3.30		
IV	M	7.71±3.84	0.92	Not significant
	F	7.66±3.56		
V	M	7.76±3.92	0.09	Not significant
	F	6.91±3.11		
		LEFT		
I	M	7.24±4.73	0.03	Significant
	F	8.64±4.36		
II	M	6.90±4.09	0.89	Not significant
	F	6.98±4.36		
III	M	7.11±4.20	0.43	Not significant
	F	7.58±4.17		
IV	M	8.06±4.44	0.46	Not significant
	F	7.62±3.87		
V	M	6.44±3.17	0.25	Not significant
	F	7.00±2.73		
TFRC	M	72.35±27.35	0.71	Not significant
	F	74.05±24.86		

I = Thumb, II= index finger, III = Middle finger, IV = ring finger, V = Little finger, SD = Standard deviation, M = Male, F = Female

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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