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Original Research Article

Topical Medications and Dosage Specificity: Somatotype and Anatomical Body Girths as Correlates and Predictors of Finger Tip Units Metric Length

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Abstract: Finger Tip Unit (FTU) is being considered as a means of quantifying dosages but rough guides are provided in literature and it is without psychometric value. The primary aims of this study were to determine reference values for FTU metric length (FTUML) and compare values of 6 different age groups. 600 participants were purposively recruited. The weight, height and selected anatomic girths were measured using standard procedures. The FTUML was measured from the tip of index finger to the distal palmar crease using an inelastic tape measure. Body Somatotype and BMI were computed. Descriptive and Inferential statistics were used to analyse the data. The mean FTUML for participants between 11 and 20 years, 21 and 30 years and other age groups were 2.5cm, 2.7cm and 2.4cm (SD = 0.3cm each) respectively, There was significant difference between the FTUs of different age groups (F= 15.37, P= 0.001). The FTUML of age group of 21-30 years was significantly higher than that of others (p=0.001). There was significant correlation between FTUML and height, wrist, ankle girths and body Somatotype (r- values= 0.410, 0.234, 0.472 and -0.106 respectively, p<0.01). Age and other independent variables considered were significant predictors of FTUML (F=32.46, P=0.001). The variables contributed 39.9% to the prediction of FTUML. The predictive equation obtained for FTUML was valid (r = 0.63, p = 0.001). It was concluded that the Fingertip Unit Metric Length of the participants ranged between 2.4 and 2.7cm and it differed across different age groups. Age, height, weight, Body Mass Index, girths and somatotype were significant correlates and predictors of Fingertip Units Metric Length.
Keywords: Topical Medications, Cream, Dosage Specificity, Anatomical Girths, Somatotype, Finger Tip Units Metric Length

INTRODUCTION

The administrations of drugs are through different routes and this gives opportunity of choice among users. Transdermal application is of importance to physiotherapists, and choice of administration techniques lies among utilizing massage, iontophoresis and phonophoresis. There is increasing evidence supporting transdermal application against oral drugs especially in pain management for common neuropathic and musculoskeletal conditions [1]. The effect-risk ratio of topical formulations is currently considered as topmost priority [2]. The stratum corneum is an effective and selective barrier to drug permeation, hence, there is need for penetration enhancers and novel drug vehicles that will facilitate local drug delivery by overcoming skin resistance [3-5].

Topical medications are in different forms such as gels, creams, ointments and lotions; and are usually administered epicutaneously through transdermal massage, iontophoresis or phonophoresis [6]. Topical application of NSAIDs had been reported to provide bioavailability and plasma concentrations of between 5% and 15% when compared to those which are delivered through the systemic [2]. Adequate knowledge of drug pharmacokinetic clarifies the relationship between dose, dose frequency, and intensity of pharmacological effects, disease and adverse events [7]. Quantifying appropriate and effective therapeutic dose of relevant medications has been the major bane of providing qualitative care for clients. Aside that bioavailability assessment and determining drug concentration in the skin layers for topical formulations remains a great challenge, it also appears that little focus is placed on adequacy of dosage and specificity for transdermal administration [8]. It has been very difficult to quantify the specific dose for cream or ointment to apply to an area. Appropriate dosage ensures drug effectiveness while overdose attracts risks of side effects [9, 10].

Pharmacology education in physiotherapy training programmes in Nigeria appears non-fulfilling as concerted efforts were not directed to correcting indiscriminate use of dosages for topical medications [11]. The two major concepts used in the quantification of topical medications are the Fingertip unit and Dosing card. The dosing Card is a calibrated tool that ensures accurate dosage but only very few pharmaceutical companies manufactures it for dosage specificity while the fingertip unit is measurable easily. Appreciable efforts had been made to provide quantification for topical cream and gel using Finger Tip Unit (FTU). A FTU is defined as the amount of ointment, cream or other semi-solid dosage form expressed from a tube with a 5mm diameter nozzle, applied from the distal skin-crease to the tip of the index finger of an adult and it is a practical measure for determining dose of topical medications [12,13]. One FTU is enough to treat an area of the skin twice the "handprint" where 2 FTUs are equivalent to 1g [13].

Finger Tip Unit is used in clinical practice to guide the amount of topical drugs that should be applied on the skin in other to minimize side effects and encourage adherence to therapy but rough guides are provided for both children and adults in the literature [14–18]. Aside this, FTU is still a subjective description without metric value or precise measurement. It has been very difficult to quantify the specific dose for cream or ointment [10]. Hence, there is need to provide normative data for different age groups and predictive equation for FTUML. The primary objectives of this study were to determine and compare reference values of Finger Tip Unit (FTU) as a metric length for different age groups; and also determine relationship between age, selected anthropometric variables, girths, body somatotype and FTUML. The study also aimed at deriving a predictive equation for FTU using the listed independent variables.

EXPERIMENTAL SECTION

The participants for this study were 600 apparently healthy individuals within OAU Community and Ife central local government area of Osun state, Nigeria.

Sampling Techniques

The participants were purposively selected and classified into 6 age groups namely: 10 – 20, 21 – 30, 31 – 40, 41 – 50, 51 – 60 and 61 – 70 years.

Inclusion and Exclusion Criteria

The subjects were between the ages of 10 and 70 years and were without skin impairments/lesion in any part of the body. Physically challenged individuals were excluded from the study.

Instruments

The major test instrument was a Tape rule that was calibrated in centimeters. It was measured to the nearest 0.1 centimeter. This was used to measure girth, leg length, Fingertip unit (FTU) and determine body somatotype. Other instruments were weighing scale (Inter ikea systems B.V, 1999) that was calibrated from 0-120kg. It was used to measure the body weight of participants in kilograms to the nearest 1.0kg and Height meter that was calibrated in inches and centimeters. It was also measured to the nearest 0.1 centimeter.

Procedure

The Research and Ethics committee of the Institute of public health, Obafemi Awolowo University, Ile Ife, Osun state, Nigeria granted approval for the study and all the participants consented to participate. The purpose and procedures of the research work was explained to each subject. A standard and validated inelastic tape measure (calibrated in centimeters) was used to measure the Fingertip unit Metric Length (FTUML) and it is the distance between the distal skin-crease and the tip of the index finger of each participant (figure 1).

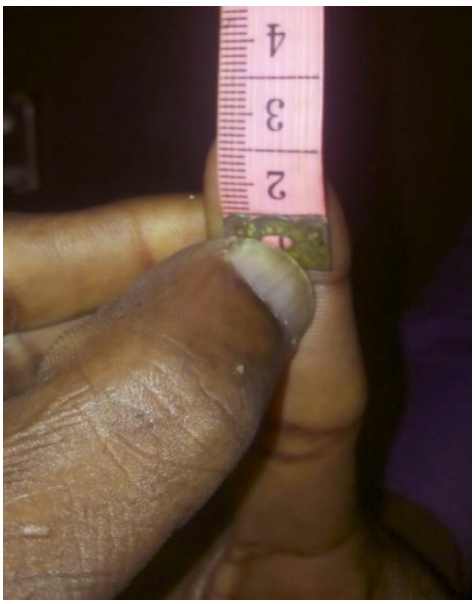

Fig-1: Fingertip unit metric length

In research, the FTU has been used to standardize the amount of cream being applied in clinical research studies. The weight of each participant was measured using a standard bathroom weighing scale. The height was measured using a height meter with the participant standing upright, both arm hanging at the sides while standing against the height meter placed against the wall with participants heels, back and occiput touching the height meter. The arm girth was measured on the right side of the body. The arm was relaxed and hanging by the side. It was measured at the

bulkiest part of the bicep brachii muscle, circumferentially. The forearm girth was also measured at the bulkiest part of the common extensors group of muscles while the wrist girth was measured circumferentially at the level of the radial styloid. The low-back girth was measured circumferentially at the superior tip of both iliac crests. The thigh girth was measured 5cm below the gluteal fold (buttock crease) of each participant while the Knee girth was measured circumferentially at the knee joint and the ankle girth was assessed across the tips of medial and lateral malleoli. Somatotype was obtained for all recruited participants through computation by dividing height in centimeter by value of wrist circumference in centimeter (Grant et al, 1981). The standard measurements were equal for all the participants in each age group.

Data analysis

The data was analysed using descriptive statistics of mean and standard deviation. Also, Pearson's product moment correlation was used to determine relationship between age, height, weight, somatotype, girth and Fingertip unit Metric Length (FTUML). The paired and student t-tests and Analysis of Variance was used to compare FTUML and girths while multiple regression analysis was used to determine the predictive ability of the selected independent variables. The version 23 of Statistical Package for social Sciences (SPSS 23) was used to analyze the data.

RESULTS

The participants comprised of 259 males (43.2%) and 341 females (56.8%). Table 1 shows the gender distribution of each age group. The mean values of age of participants between 11 and 20 years was 18 ±2.2 while that of height, weight and body mass index were 1.6 ±0.1m, 54.0 ±10.9kg and 20.6 ±4.1 respectively. The mean values for other age groups are presented in Table 2. The mean values of selected girths measurement for the age group 11-20 years are arm, 0.25 ±0.03m and fore-arm, 0.23 ±0.02m. Other values for girths at the wrist, low-back, thigh and ankle for other age groups are in Table 3. The mean values for body somatotypes for participants within the age group of 11-20 years were 10.4 ±0.8 while that age group 21-30 was 10.3 ±1.0. Other mean values are presented in Table 4. The result of student t-test showed that there was significant difference between the FTU of male and female participants (t =7.32, p =0.001), (Table 5).

Table 1: Gender distribution of each age group

Age groups (in years)	Male	%	Female	%
11-20	27	27	73	73
21-30	48	48	52	52
31-40	46	46	54	54
41-50	44	44	56	56
51-60	34	34	66	66
61-70	60	60	40	40

Table 2: Mean values of age and selected anthropometric variables of the age groups

Age groups	Mean Values							
	Age (in years) ±SD		Height (m) ±SD		Weight (kg) ±SD		BMI (kg/m^2) ± SD	
11-20	18	2.2	1.6	0.1	54.0	10.9	20.6	4.1
21-30	24	2.5	1.7	0.1	61.6	10.9	22.0	4.3
31-40	35	2.8	1.6	0.1	63.9	13.5	23.7	5.0
41-50	45	2.9	1.7	0.1	70.6	15.0	25.7	5.9
51-60	55	2.8	1.6	0.1	67.6	14.3	25.6	5.0
61-70	64	3.0	1.6	0.1	66.1	11.0	24.7	4.7

Table 3: Mean values of girth measurement for each age group.

Age group (years)	Mean Values (m)											
	Arm ±	SD	Fore-arm ±SD		Wrist ±	SD	Low-back ±SD		Thigh±	SD	Ankle ±	SD
11-20	0.25	0.03	0.23	0.02	0.16	0.01	0.72	0.1	0.45	0.1	0.22	0.02
21-30	0.3	0.3	0.25	0.03	0.17	0.05	0.76	0.1	0.49	0.1	0.24	0.03
31-40	0.28	0.04	0.25	0.02	0.16	0.01	0.8	0.1	0.5	0.1	0.23	0.02
41-50	0.3	0.05	0.26	0.3	0.16	0.01	0.85	0.2	0.5	0.1	0.23	0.02
51-60	0.3	0.04	0.27	0.2	0.16	0.01	0.86	0.1	0.52	0.1	0.22	0.02
61-70	0.28	0.4	0.25	0.3	0.16	0.01	0.82	0.14	0.53	0.1	0.22	0.02

Means values of fingertip unit metric length (FTUML) for each age group

The mean value for FTUML for participants within the age group 11-20 years was 2.5±0.30cm while that of participants of age group 21-30 was 2.7 ±0.3cm. Other values are presented in Table 6. The results of the Analysis of Variance (ANOVA) showed that there was significant difference between the FTUMLs of different age groups (F= 15.37, P= 0.001) (Table 5). The result of the Post Hoc analysis showed that the FTUML of the participants within the age group of 21-30 years was significantly higher than that of other groups (p=0.001), (Table 7).

Table 4: Mean values of Body Somatotypes

Age group (years)	Body somatotypes	± SD
11-20	10.4	0.8
21-30	10.3	1.0
31-40	10.5	0.8
41-50	10.3	0.8
51-60	10.2	0.7
61-70	10.3	0.8

Table 5: Comparison of male and female Fingertip Units Metric Length (FTUML)

Gender	FTUML (cm)	±SD	t	p
Male	2.58	0.3		
Female	2.39	0.3	7.32	0.001

Table 6: Mean value of fingertip unit for each age group

Age groups (years)	FTUML (cm)	SD	F	p
11-20	2.5	0.3		
21-30	2.7	0.3		
31-40	2.4	0.3		
41-50	2.4	0.3		
51-60	2.4	0.3		
61-70	2.4	0.3	15.37	0.001

Table 7: Result of Post Hoc analysis for FTUML

I	j	Mean difference (i-j)	p
1	2	-0.14	0.001
	3	-0.15	0.002
	4	0.13	0.002
	5	0.15	0.001
	6	0.15	0.001
2	3	0.29	0.001
	4	0.27	0.001
	5	0.29	0.001
	6	0.29	0.001
3	4	-0.02	0.710
	5	0.01	0.908
	6	0.003	0.945
4	5	0.02	0.626
	6	0.02	0.659
5	6	0.002	0.963

Comparison of girth measurements for different age groups

The result of ANOVA showed that there was significant difference between bicep-arm girth of different age groups (F=17.72, p=0.001). The results comparing girth measurement of other selected anatomical body parts are presented in Table 8 and Table 9. The results of Post Hoc analysis (LSD) showed that the arm girth of participants within age group 10-20 years was significantly lower than that of other age groups and that of group 4 was significantly greater than that of group 6 (Table 10-16).

Correlation between selected anthropometric variables, girth value and FTUML

The result of the Pearson Product Moment Correlation sowed that there was no significant correlation between Fingertip Unit metric length and weight, arm and forearm girths. However, there was significant correlation between FTUML and height, wrist and ankle girths (r- values= 0.410, 0.234, 0.472 respectively) at $p<0.01$. There was also significant correlation between FTUML and age, BMI and body somatotype (r- values= -0.244, -0.133, -0.106 respectively) at $p<0.01$. Other correlations are presented in Table 17.

Table 8: Comparison of Bicep-arm, Fore-arm, and Wrist girth measurements of different age groups

Girths	Groups	Mean value (m)	±SD	F	p
Bicep arm:	1	0.25	0.03		
	2	0.30	0.31		
	3	0.28	0.04		
	4	0.3	0.05		
	5	0.3	0.04		
	6	0.28	0.04	17.72	0.001
Fore-arm:	1	0.23	0.02		
	2	0.25	0.03		
	3	0.25	0.02		
	4	0.26	0.3		
	5	0.27	0.2		
	6	0.25	0.3	2.24	0.03
Wrist:	1	0.16	0.01		
	2	0.17	0.05		
	3	0.16	0.01		
	4	0.16	0.01		
	5	0.16	0.01		
	6	0.16	0.01	2.64	0.02

Table 9: Comparison of Low-back, Thigh, and Ankle girth measurements of different age groups

Girths	Group	Mean value (m)	±SD	F	p
Low-back:	1	0.72	0.1		
	2	0.76	0.1		
	3	0.8	0.1		
	4	0.85	0.2		
	5	0.86	0.1		
	6	0.82	0.14	19.31	0.001
Thigh :	1	0.45	0.1		
	2	0.49	0.1		
	3	0.5	0.1		
	4	0.5	0.1		
	5	0.52	0.1		
	6	0.53	0.1	12.10	0.001
Knee:	1	0.35	0.03		
	2	0.36	0.03		
	3	0.37	0.04		
	4	0.36	0.04		
	5	0.36	0.36		
	6	0.36	0.37	5.47	0.001
Ankle:	1	0.22	0.02		
	2	0.24	0.03		
	3	0.23	0.02		
	4	0.24	0.02		
	5	0.22	0.02		
	6	0.22	0.02	6.32	0.001

Table 10: Post Hoc analysis for Arm girth measurement

Girth	I	j	Mean difference (i-j)	p
Arm	1	2	-0.025	0.001
		3	-0.031	0.001
		4	-0.048	0.001
		5	-0.040	0.001
		6	-0.034	0.001
	2	3	-0.006	0.26
		4	-0.024	0.001
		5	-0.015	0.006
		6	-0.009	0.09
	3	4	-0.017	0.002
		5	-0.009	0.11
		6	-0.003	0.56
	4	5	0.008	0.15
		6	0.014	0.01
	5	6	0.006	0.29

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

Table 11: Post Hoc analysis for Forearm girth measurement

Girth	I	j	Mean difference (i-j)	p
Fore-Arm	1	2	-0.021	0.085
		3	-0.019	0.116
		4	-0.029	0.015
		5	-0.039	0.001
		6	-0.021	0.087
	2	3	0.002	0.880
		4	-0.009	0.470
		5	-0.019	0.109
		6	0.001	0.993
	3	4	-0.010	0.383
		5	-0.021	0.080
		6	-0.002	0.887
	4	5	-0.011	0.379
		6	0.009	0.464
	5	6	0.019	0.107

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

Table 12: Post Hoc analysis for Wrist girth measurement

Girth	I	j	Mean difference (i-j)	p
Wrist	1	2	-0.011	0.001
		3	-0.001	0.676
		4	-0.007	0.055
		5	-0.004	0.271
		6	-0.005	0.164
	2	3	0.009	0.005
		4	0.005	0.191
		5	0.007	0.034
		6	0.006	0.067
	3	4	-0.005	0.134
		5	-0.002	0.495
		6	-0.003	0.330
	4	5	0.003	0.413
		6	0.002	0.598
	5	6	-0.001	0.771

Table 13: Post Hoc analysis for Low back girth measurement.

Girth	I	j	Mean difference (i-j)	p
Low-back	1	2	-0.045	0.010
		3	-0.087	0.001
		4	-0.132	0.001
		5	-0.143	0.001
		6	-0.107	0.001
	2	3	-0.042	0.017
		4	-0.087	0.001
		5	-0.098	0.001
		6	-0.062	0.001
	3	4	-0.044	0.012
		5	-0.056	0.002
		6	-0.019	0.272
	4	5	-0.011	0.517
		6	0.025	0.154
	5	6	0.036	0.038

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

Result of multiple regression analyses for Finger Tip Unit Metric Length

The result of the linear Regression analysis showed that Age, Weight, height, body somatotypes and selected anatomical body girths are significant predictors of Fingertip Unit Metric Length (FTUML), (F=32.46, P=0.001). The result showed that all the independent variables contributed 39.9% to the prediction of FTUML. The ankle girth was the highest contributor to the prediction of FTUML (22.2%), (Table 18). The predictive equation obtained for FTUML is*:*

FTUML = -0.902 + (Age x - 0.003) + (Height x 3.08) + (Weight x -0.02) + (BMI x 0.04) + (Arm girth x - 0.51) + (Forearm girth x - 0.07) + (Wrist girth x - 2.13) + (Low back girth x 0.08) + (Thigh girth x 0.25) + (Knee girth x - 0.44) + (Ankle girth x4.18) + (Somatotype x - 0.16, [values in meters]

Discussion

The efficacy of drug depends on adequacy of dosage administered. Several studies in pharmacophysiotherapy had used FTU in clinical trials but these are mostly based on estimations. Onigbinde et al estimated 1 FTU of magnesium sulphate gel for a clinical trial using iontophoresis in resolving bicep brachii spasticity in stroke survivours while several others estimated 2 FTUs (1g) of topical glucosamine sulphate, methyl salicilate and non-steroidal inflammatory drugs for on knee joint [20 – 24]. The use of quantitative method will provide accuracy, documentation and specific dosage for topical medications, and also enhance effectiveness and consistency. Reference values are commonly used to contextualise the understanding of measured values [25]. The provision of reference values for maximum isometric muscle force for individual muscle groups had given opportunity to qualify muscle force and evaluate the possible effects of therapy [25 – 27].

The result showed that the Finger Tip Unit Metric Length (FTUML) of the participants for different age groups ranged between 2.4 and 2.7cm. The metric length found for the FTU of those within the age group of 21-30 years was significantly higher than that of other groups. This study is in a verdant area of pharmacophysiotherapy; hence, it is difficult to compare this outcome with previous study. However, our current finding suggests that the use of physiotherapist's FTU to quantify dosage of topical medications might be inappropriate. It is suggestive that the FTUML of patients or clients should be used to quantify the required doses. It also suggested that one FTU (0.5 gram) is equivalent to a range of 2.4 to 2.7cm length of a cream depending on the age group. Precision of doses is paramount; if topical medication is inadequate, it won't be effective and if overdose is massaged, there may be risk of side effects [10]. It is noteworthy that the suggestion that one FTU is used to treat an area of skin on a child equivalent to twice the size of the flat of an adult's hand with the fingers together may be inappropriate, although, this was suggested by National Eczema Society for children between 3 months and 10 years old [28]. However, the current findings found that there was no significant difference between the FTUs of age groups between 31 and 70 years. This also suggested that the same FTU can be used for patients within these groups. Two FTU had been documented to be equivalent to one gram and that it is adequate to treat an area of the skin twice the "handprint". The Rule of Hands states that "4 hand areas = 2FTU =1g" [13]. By our current finding, 2 FTU will range between 4.8cm and 5.2cm FUTML; and the area covered by 2.4 - 2.7cm FTUML will be 312cm^2 in men and 257cm^2 in women depending on age if previous values of areas covered are referred to in literature [13].

Furthermore, the FTUML of male was significantly higher than that of the female. The clinical implication of this study is that the same quantity of drugs or FTU cannot be assumed for both genders. Findings had shown that one FTU weighs 0.49g in men while it weighed 0.43g in women [13]. Also, previous reports had inferred gender-based differences in pharmacodynamics and this can manifest as differences in quantity and efficacy of drugs. It has become increasingly important to separate doses for men and women as responses have been noted to vary as a result of gender difference [29 – 34] .

Table 14: Post Hoc analysis for Thigh girth measurement

Girth	I	j	Mean difference (i-j)	p
Thigh	1	2	-0.042	0.001
		3	-0.041	0.001
		4	-0.056	0.001
		5	-0.073	0.001
		6	-0.079	0.001
	2	3	0.001	0.948
		4	-0.014	0.242
		5	- 0.031	0.008
		6	-0.038	0.001
	3	4	-0.014	0.217
		5	-0.031	0.007
		6	-0.038	0.001
	4	5	-0.017	0.140
		6	- 0.024	0.038
	5	6	-0.007	0.549

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

We observed significant variations in values of selected anatomical girths across different age groups. There were also significant positive correlations between Fingertip Unit metric length; wrist and ankle girths. These implied that girth values differed across different age groups; hence, different anatomical parts require different doses. Furthermore, there was significant negative correlation between Fingertip Unit metric length and body Somatotype. There are different patient's body built (ectomorph [small], mesomorph [medium] and endomorph [large]), hence, the outcome of this study implied that the larger the body built, the lower the FTUML. This also buttressed the inappropriateness of generalizing doses using the FTU of the physiotherapists for all patients. The result of the linear Regression analysis showed that age, weight, height, anatomical girths and body somatotypes are significant predictors of Fingertip Unit Metric Length (FTUML). All the selected independent variables contributed only 39.9% to the prediction of FTUML. However, we considered the co-efficiency of determination (R^2 = 0.40) to be "moderate goodness of fit." for the selected independent variable as the normal ranges between 0 and 1. An R^2 of 1 indicates that the regression line perfectly fits the data. In regression, the R^2 coefficient of determination is a statistical measure of how well the regression line approximates the real data points. The predicted value obtained from the predictive equation obtained from this study was significantly higher than the measured but there was a positive correlation between the two. The moderately high correlation (r = 0.63, p = 0.001) observed in this study showed the validity of the predictive equation. The difference in mean value obtained between the predictive and actual measurement might be attributed to other independent variables that are not considered in this study.

Table 15: Post Hoc analysis for knee girth measurement

i	J	I - j	p
1.00	2.00	-0.010*	.044
	3.00	-0.019*	.000
	4.00	-0.025*	.000
	5.00	-0.013*	.010
	6.00	-0.012*	.022
2.00	3.00	-0.009	.094
	4.00	-0.015*	.004
	5.00	-0.003	.563
	6.00	-0.004	.786
3.00	4.00	-0.006	.229
	5.00	0.006	.273
	6.00	0.007	.161
4.00	5.00	0.012*	.022
	6.00	0.013*	.009
5.00	6.00	0.002	.759

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

Table 16: Post Hoc analysis for Ankle girth measurement

Girth	I	j	Mean difference (i-j)	p
Ankle	1	2	-0.011	0.001
		3	0.002	0.591
		4	0.001	0.933
		5	-0.006	0.097
		6	0.005	0.143
	2	3	0.013	0.001
		4	0.011	0.001
		5	0.016	0.001
		6	0.015	0.001
	3	4	-0.002	0.650
		5	0.004	0.262
		6	0.003	0.353
	4	5	0.005	0.116
		6	0.005	0.167
	5	6	-0.001	0.847

KEY: Group 1- Age 11-20 Group 2- Age 21-30 Group 3- Age 31-40
Group 4- Age 41-50 Group 5-Age 51-60 Group 6- Age 61-70

CONCLUSION

It was concluded that the metric length for Fingertip Unit (FTUML) of participants ranged between 24 and 27cm and it differed across different age groups between 10 and 70 years. Furthermore, there was significant correlation between Fingertip Unit Metric Length, wrist and ankle girth; and body somatotype. The selected independent variables (age, height, weight, Body Mass Index, anatomic body girths and somatotype) were significant predictors of Fingertip Unit metric length (FTUML). The outcome of this study advocates that the fingertip unit metric length of the patients, anthropometric values and body Somatotype should be taken into consideration when determining specific doses for topical medications.

Table 17: Correlation between selected Anthropometric variables, girth values and FTUML

		Weight	BMI	Arm	Height	Fore-arm	Wrist	Low-back	Thigh	Ankle	Knee	Somatotype	FTUML
Age:	r	0.313**	0.325**	0.278**	-0.026	0.015*	0.016	0.336**	0.298**	-0.152**	0.104*	-0.089*	-0.244**
	p	0.001	0.001	0.001	0.520	0.010	0.690	0.001	0.001	0.001	0.010	0.029	0.001
Wt:	r		0.861**	0.803**	0.255**	0.185**	0.311**	0.782**	0.447**	0.379**	0.650**	-0.401**	0.066
	p		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.109`
BMI:	r			0.744**	-0.262**	0.149**	0.192**	0.783**	0.466**	0.217**	0.547**	-0.556**	-0.133**
	p			0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arm:	r				0.053	0.206**	0.264**	0.709**	0.389**	0.290**	0.574**	-0.452**	-0.003**
	p				0.195	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.941
Ht:	r					0.062	0.233**	-0.022**	-0.039	0.338**	0.189**	0.295**	0.410**
	p					0.130	0.001	0.596	0.342	0.001	0.001	0.001	0.001
F/A:	r						0.086*	0.118**	0.132**	0.081*	0.114**	-0.106**	0.004
	p						0.035	0.004	0.001	0.046	0.005	0.009	0.915
Wst:	r							0.214**	0.116**	0.237**	0.226**	-0.671**	0.344**
	p							0.001	0.004	0.001	0.001	0.001	0.001
L/B:	r								0.436**	0.196**	0.565**	-0.423**	-0.054
	p								0.001	0.001	0.001	0.001	0.186
Thigh:	r									0.089*	0.426**	-0.246**	-0.022
	p									0.029	0.001	0.001	0.597
Ankle:	r										0.297**	-0.219**	0.472
	p										0.001	0.001	0.001
Knee:	r											-0.305**	0.079
	p											0.001	0.054
Soma:	r												-0.106**
	p												0.010

**. Correlation is significant at the 0.001 level (2-tailed)*. Correlation is significant at the 0.005 level (2-tailed). Key: Wt: Weight, BMI:Body mass index, Ht: Height, F/A: Fore –arm, Wst: Wrist, L/B: Low-back, Soma: Somatotype, r: correllation , p: singnificance.

Table 18: Percentage contributions of independent selected variables

Independent variables	%	F	p
Age	5.8	37.85	0.001
Height	16.7	120.46	0.001
Weight	0.3	2.58	0.109
BMI	1.6	10.71	0.01
Arm	0.2	0.006	0.940
Fore-arm	0.2	0.011	0.915
Wrist	5.3	34.63	0.001
Low-back	0.1	1.750	0.186
Thigh	0.1	0.279	0.597
Knee	0.5	3.716	0.054
Ankle	22.2	171.35	0.001
Somatotype	1	6.74	0.01

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