RESEARCH ARTICLE

Dermatoglyphical impressions are different between children and adolescents with normal weight, overweight and obesity: a cross-sectional study [version 1; peer review: 2 approved, 1 approved with reservations, 1 not approved]

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Abstract

Background: Obesity is a health condition that causes a great impact on public health. The aim of this study was to determine the association between dermatoglyphic characteristics and excessive weight in children and adolescents aged 10 to 19 years in the center-west region of Santa Catarina, Brazil.
Methods: The sample comprised of 2,172 children and adolescents aged 10 to 19 years old of both sexes and from public and private teaching networks.
Results: The results suggested a predictive marker of obesity, with a greater number of lines in left hand finger two (Mesql2) and a higher frequency of the whorl pattern in participants of a healthy weight, while the overweight group had a higher frequency of the radial loop pattern and the obese group had a higher frequency of the ulnar loop pattern.
Conclusion: It was concluded that there may be different dermatoglyphic characteristics depending on the nutritional status of children and adolescents.

Keywords

Dermatoglyphic, Obesity, Child, Adolescent

Open Peer Review

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Competing interests: Nodari Junior was involved in the development of the dermatoglyphic and is one of the founders of the company that sells the reader, so benefits financially from the sale of the reader.

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Introduction

Obesity is a matter of constant concern for global health and is considered to be the second most common cause of preventable death (WHO, 2014). This condition has a multifactorial origin involving genetic and environmental factors (Martínez García *et al.*, 2017) and is considered one of the major problems for public health around the world. By 2014, more than 1.9 million adults were overweight. Of these, 600 million were obese. From 1980 to 2013, the number of obese and overweight people increased by 27.5% among adults and 47.1% among children, which generated even more concern (Ng *et al.*, 2014).

The predictive value of dermatoglyphic features (DGFs) in relation to a variety of diseases has been investigated for more than five decades, from the seminal work of Cummins and Midlo in 1961 (Bhat *et al.*, 2012; Sharma & Sharma, 2012; Shetty *et al.*, 2016). Dermatoglyphics is the scientific study of epidermal crescent patterns and several researchers from different fields, such as biology, anthropology, genetics, and medicine, are engaged in unraveling several unknown aspects of this field (Raniwala *et al.*, 2017). In addition, dermatoglyphics has been used as a noninvasive diagnostic tool to detect or predict different medical conditions that have a fetal origin (Wijerathne *et al.*, 2016).

The reason for the association between DGFs and health is the influence of epigenetics, which affects both (Yohannes, 2015). The formation of the former begins in the first trimester of pregnancy, during the 6th week, is completed after the 24th week of gestation and is formed according to the development and maturation of the central nervous system (Babler, 1991; King *et al.*, 2009).

Although DGFs have no causal relationship with health (Mittal *et al.*, 2012), they may be used as a marker of health problems when there are associations that are consistent with the diseases of interest, this condition being essential for effective screening (Gupta & Karjodkar, 2013). In the case of obesity, this is a multifactorial (polygenic and environmental) condition where epigenetic factors of obesity can influence DGF patterns; therefore, these can be used as markers of obesity throughout life (Bhardwaj *et al.*, 2015).

Our aims were to determine the association between DGF characteristics and obesity in children and adolescents aged 10 to 19 years in the center-west region of the state of Santa Catarina, in the south of Brazil and investigate whether a dermatoglyphic marker can of obesity exists.

Methods

Study design

A cross-sectional study of children and adolescents aged 10 to 19 years, female and male, from public and private schools in the municipality of Joaçaba, Santa Catarina, Brazil. This study was submitted to the Ethics in Research (CEP) with Human Beings from Unoesc/Hust and was approved under protocol number 449.924.

Study participants

The data belong to the laboratory evaluation database and exercise physiology measurements of the University of West Santa Catarina (Unoesc) of Joaçaba. This data storage bank has data from 3,074 individuals investigated in the school census in the years 2013 – 2014, performed by the Institute of Educational Studies and Research "Anísio Teixeira" with the purpose of monitoring the development of these children and adolescents. The inclusion criteria for this study were students aged between 10 and 19 years enrolled in a public or private network in primary or secondary education in the municipality of Joaçaba, Santa Catarina, who participated in school censuses conducted in the years 2013 – 2014. All individuals with incomplete data for variables such as weight and height, with anomalous fingerprints due to, for example, sweat or excessive dirt on the fingers, were excluded from the sample. The final sample consisted of 2,172 students, of which 1,166 were female and 1,006 were male.

According to the National Institute of Educational Studies and Research Anísio Teixeira (INEP, 2013), of the students enrolled in primary and secondary education in 2013 in the municipality of Joaçaba, 3,193 students were enrolled in public schools and 1,733 in private schools. In 2014, 2,842 students were enrolled in the public school system and 1,839 in the private system. Based on the number of students enrolled in their respective years, the database represents 64% of the total number of students.

Collection of demographic characteristics

Although the students were familiar with the tests performed, the protocols of each were detailed verbally by the evaluators in order to reduce the margin of error, with the exception of the dermatoglyphic test, which is only part of this study but is easy to perform.

The body mass index (BMI) tables of the Ministry of Health of Brazil (Ministry of Health, 2011) were used to classify BMI, dividing their percentages by age and sex, thus denominating them: low weight ($< 5^{th}$ percentile), healthy weight ($\geq 5^{th}$ percentile and $< 85^{th}$ percentile), overweight ($\geq 85^{th}$ percentile and $< 97^{th}$ percentile) and obese ($\geq 97^{th}$ percentile), according to the World Health Organization (WHO, 2014).

The anthropometric evaluation of children and adolescents consisted of three phases and was carried out in the following way: first, weight was measured by a single measurement in a calibrated digital scale, with a maximum capacity of 150 kilos (kg). The scale was supported on a flat, firm and smooth surface. The participant was positioned in the center of the scale, wearing the least possible clothing, barefoot, erect, feet together, arms extended along the body and looking at the horizon (Ministry of Health, 2011). Once their balance was stable, weight was recorded in kg.

After weight was recorded, stature was measured using a vertical mobile stem stadiometer, with a scale in centimeters (cm)

and an accuracy of one millimeter (mm). The patients were positioned with their backs to the instrument, barefoot, feet together, in an upright position, looking forward, with their arms extended along the body. The mobile part of the stadiometer was placed on the top of the head at the highest point and the height reading was performed (Ministry of Health, 2011).

The BMI was calculated using the following formula that relates weight (kg) to height (meters): BMI = Weight / Height (WHO, 1995).

Fingerprint collection and analysis

The collection of the fingerprints occurred after the collection of the other information within the schools and was collected by the researchers. The protocol proposed by Cummins and Midlo in 1961 was chosen to analyze DGF characteristics. For the capture, processing and analysis of fingerprints, a computerized process for dermatoglyphic reading was used. The Dermatoglyphic Reader consists of an optical scanner that collects and interprets the image and constructs, in binary code, a dermatoglyphic drawing, which is processed by the reader's specific software for the treatment and reconstruction of real and binarized images in black and white, as validated by Nodari Júnior *et al*. in 2008.

After all the images have been collected, the reader user selects them one by one and defines specific points (nucleus and deltas), tracing the Galton Line, and the software, through specific algorithms, marks the intersections of the line with the digital lines. In this way, the reader provides the number of lines on each finger, as well as the type of fingerprint pattern. The software carries out this qualitative pattern identification and quantitative determination of lines, generating a Microsoft Excel worksheet containing the processed data (Nodari-junior *et al*., 2008).

This fingerprint analysis could also have been carried out using non-proprietary methods, such as the traditional method proposed by Cummins and Midlo using ink and paper.

Statistical analysis

Statistical analyzes were performed using the STATA version 12.0. Analysis of variance (ANOVA) for DGF tested the null hypothesis that there was no difference in the number of finger lines between the weight groups. The differences were considered statistically significant at $p < 0.05$. The chi-square test was used to test whether there was a difference between weight groups in the following variables: arch, radial loop, ulnar loop and whorl fingerprint patterns (Figure 1). The differences were considered statistically significant at $p < 0.05$.

Results

The final sample for this study consisted of 2,172 students, of which 1,166 were female and 1,006 were male (Alberti, 2019). Students were aged between 10 and 19 years and enrolled in a public or private primary or secondary education in the municipality of Joaçaba, Santa Catarina-Brazil.

As for the quantitative fingerprint variables (the number of lines of each finger, the total number of lines on the fingers of the right hand, the total number of lines on the fingers of the left hand and the total number of lines on the fingers of both hands), it was observed that, on average, individuals who were of a healthy weight had a greater number of lines in relation to overweight and obese individuals in MET2 (left-hand finger two). (Table 1).

The results obtained may suggest the presence of predictive markers for BMI in the researched population. For left-hand finger two (MET2), participants of a healthy weight presented with

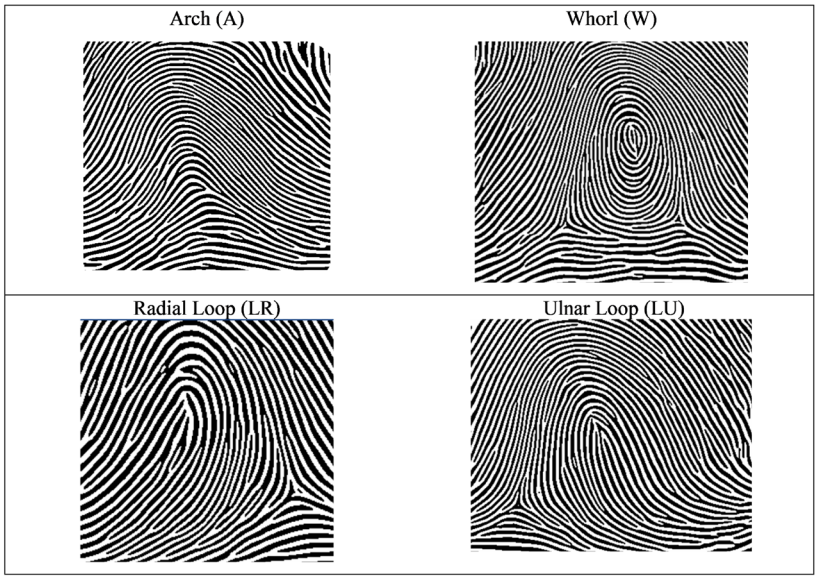

Figure 1. Examples of dermatoglyphic drawings. Nodari Junior and Fin authorized the reproduction of this image (taken from Nodari-Júnior & Fin, 2016), both are authors of this article.

Table 1. Number of finger lines by weight.

Number of lines on fingers	All (n=2162): mean (SD)	Weight status			
		Healthy weight (n=1862): mean (SD)	OW (n=204): mean (SD)	Obese (n=96): mean (SD)	p-value*
Mesql1	12.86 (5.47)	12.87 (5.47)	12.68 (5.23)	13.10 (5.88)	0.8089
Mesql2	8.68 (5.64)	8.83(5.63)	7.63(5.25)	7.98(6.34)	*0.0068
Mesql3	9.86(5.67)	9.92(5.70)	9.48(5.17)	9.48(6.20)	0.4520
Mesql4	12.37(5.61)	12.39(5.56)	12.32(5.64)	12.12(6.45)	0.8968
Mesql5	10.87(5.03)	10.87(5.02)	10.75(5.06)	11.25(5.30)	0.7150
Sqtle	54.64(21.63)	54.88(21.43)	52.85(21.72)	53.94(25.22)	0.4217
Mdsql1	14.71(5.45)	14.61(5.40)	15.41(5.54)	15.08(6.25)	0.1109
Mdsql2	9.13(5.70)	9.22(5.74)	8.47(5.27)	8.81(5.92)	0.1737
Mdsql3	10.19(5.03)	10.20(5.02)	10.39(4.85)	9.63(5.61)	0.4619
Mdsql4	12.54(5.44)	12.64(5.42)	12(5.32)	11.77(6.05)	0.1018
Mdsql5	10.97(5.08)	10.95(5.06)	11.10(5.08)	11.13(5.65)	0.8861
Sqtld	57.55(20.59)	57.63(20.35)	57.37(21.01)	56.42(24.23)	0.8468
Sqtl	112.19(41.04)	112.51(40.57)	110.23(41.75)	110.35(48.30)	0.6795

Note: *oneway ANOVA.

OW, overweight; Mdsql, number of lines on right hand fingers; Mesql, number of lines on left hand fingers; Sqtle: sum of the number of lines on the left hand; Sqtld, sum of the number of lines on the right hand; Sqtl, sum of the number of lines on both hands.

a higher frequency the whorl pattern, while overweight and obese participants had a higher frequency of the ulnar loop pattern; for left-hand finger three (MET3), participants of a healthy weight presented a higher frequency of the radial loop pattern, while overweight and obese participants had a higher frequency of the ulnar loop pattern; for left-hand finger four (MET4), participants of a healthy weight presented a higher frequency of the whorl pattern, while the overweight group presented a higher frequency of the radial loop and the ulnar loop pattern; for left-hand finger five (MET5), participants of a healthy weight presented a higher frequency of the arch pattern, while the overweight group presented a higher frequency of the radial loop pattern and the obese group had a higher frequency of the ulnar loop pattern; for finger one of the right hand (MDT1), participants of a healthy weight presented a higher frequency of the arch pattern, the overweight group had a higher frequency of the radial loop pattern, and the obese group had a higher frequency of the ulnar loop pattern; for right-hand finger three (MDT3), participants of a healthy weight had a higher frequency of the whorl pattern, while overweight and obese groups had a higher frequency of the ulnar loop pattern; for right-hand finger four (MDT4), participants of a healthy weight had the highest frequency of the whorl pattern, while the overweight group presented a higher frequency of the radial loop pattern and the obese group presented a higher frequency of the figure ulnar loop; for right-hand finger five (MDT5), participants of a healthy weight presented a high frequency of the whorl pattern, while the overweight group presented a high frequency of the radial loop pattern and the obese group presented a high frequency of the ulnar loop pattern. (Table 2).

Discussion

This study suggests that a higher number of the total number of lines in Mesql2 may be a predictive marker of obesity and that a higher frequency of the whorl pattern may be found in people of a healthy weight, a higher frequency of the radial loop pattern may be found in overweight people and a higher frequency of the ulnar loop pattern may be found in obese people.

An increase in weight in children and adolescents can occur rapidly, causing, for example, low levels of cardiorespiratory and musculoskeletal aptitude and impairing the quality of life of these individuals (García-Hermoso *et al.*, 2018). Several studies have begun to recognize epigenetic factors in obesity and, despite a relatively high heritability of non-syndromic common obesity (40–70%), the search for genetic variants that contribute to susceptibility has been a challenging task. Genome-wide association studies have dramatically changed the pace of detection of common variants involved in genetic susceptibility. By the year 2011, more than 40 genetic variants were associated with obesity. However, since these variants do not fully explain the heritability of obesity, other forms of variation, such as epigenetic markers, should be considered (Herrera *et al.*, 2011).

Every organism is unique and has epigenetic traits that are inherited and generated in the womb. Studies have been conducted

Table 2. Finger line patterns by weight status.

Hand / Finger	Type of dermatoglyphic figures	Weight status			p-value*
		Healthy weight (%)	OW (%)	Obese (%)	
Left hand, finger 1 MET1	Arch	86.58	9.74	3.67	0.205
	Radial Loop	80.00	20.00	0.00	
	Ulnar Loop	81.81	12.73	5.45	
	Whorl	86.08	8.35	5.57	
Left hand, finger 2 MET2	Arch	86.31	9.28	4.41	*0.046
	Radial Loop	87.19	8.37	4.43	
	Ulnar Loop	79.63	12.04	8.33	
	Whorl	87.32	9.44	3.24	
Left hand, finger 3 MET3	Arch	87.06	8.80	4.14	*0.008
	Radial Loop	94.29	2.86	2.86	
	Ulnar Loop	78.57	13.27	8.16	
	Whorl	84.57	11.43	4.00	
Left hand, finger 4 MET4	Arch	85.65	9.57	4.78	*0.002
	Radial Loop	81.25	18.75	0.00	
	Ulnar Loop	73.17	17.07	9.76	
	Whorl	88.41	8.06	3.53	
Left hand, finger 5 MET5	Arch	86.56	9.21	4.23	*0.000
	Radial Loop	50.00	50.00	0.00	
	Ulnar Loop	72.41	13.79	13.79	
	Whorl	88.12	7.92	3.96	
Right hand, finger 1 MDT1	Arch	87.37	8.30	4.33	*0.005
	Radial Loop	66.67	33.33	0.00	
	Ulnar Loop	74.19	16.13	9.68	
	Whorl	85.62	10.09	4.29	
Right hand, finger 2 MDT2	Arch	85.71	9.52	4.76	0.391
	Radial Loop	89.53	7.56	2.91	
	Ulnar Loop	83.04	10.71	6.25	
	Whorl	85.96	9.83	4.21	
Right hand, finger 3 MDT3	Arch	86.21	9.51	4.28	*0.032
	Radial Loop	83.33	11.11	5.56	
	Ulnar Loop	77.59	12.07	10.34	
	Whorl	89.02	7.93	3.05	
Right hand, finger 4 MDT4	Arch	85.37	9.59	5.04	*0.000
	Radial Loop	78.95	21.05	0.00	
	Ulnar Loop	76.00	8.00	16.00	
	Whorl	88.15	8.77	3.08	
Right hand, finger 5 MDT5	Arch	86.37	9.27	4.37	*0.002
	Radial Loop	69.23	30.77	0.00	
	Ulnar Loop	76.00	16.00	8.00	
	Whorl	88.46	6.73	4.81	

Note: *chi-square test. OW, overweight; MET, left hand; MDT, right hand.

that are aimed at highlighting the influence of the gestation period and fetal environment for the development of diseases and conditions over a lifetime, such as obesity (Martínez García *et al.*, 2017).The fetal development phase begins at the 9th week of gestation and goes through to the baby's birth, the human gestation lasting on average 38 weeks (Dipietro, 2008). There are studies that reinforce that epigenetic influences have a strong association with the development of obesity (Ornellas *et al.*, 2017).

Dermatoglyphics has its fundamental basis in this premise, being an epigenetic marker related to the period of fetal development (Yohannes, 2015). In addition to the fact that the fingerprints are intrinsically related to the central nervous system and can therefore reflect motor capacities inherited genetically and epigenetically for conditions that may have a marker expressed during this period of fetal development, fingerprint evaluation is a simple and practical method (King *et al.*, 2009).

In one sample of 370 obese children, in a study to identify dermatoglyphic patterns in obese individuals and to discover the association between standard dermatoglyphics and obesity, a high frequency of the arch pattern was observed in the right thumb (Bhardwaj *et al.*, 2015).

In another study, the authors (Oladipo *et al.*, 2010) sought to determine the dermatoglyphic characteristics of obese Nigerian patients by comparing a group of 50 obese individuals (25 men and 25 women) with a group of 50 normal weight subjects (25 men and 25 women). The arch pattern was observed in the first digits of the right hand in 54.5% of obese men and 42.33% of obese women, whereas individuals with normal weight presented the figure more frequently.

In the city of São Paulo, Brazil, a survey (Pasetti *et al.*, 2012) with 30 obese Brazilian women with a mean age of 46.1 ± 07.87 years, all with a BMI equal to or greater than 30, observed that participants presented a high frequency of the arch pattern, low frequencies of the ulnar loop pattern and a high frequency of the whorl pattern. These results corroborate the findings of several other authors (Bhardwaj *et al.*, 2015; Oladipo *et al.*, 2010) who also presented a predominance of the arch pattern in the obese group.

The present study utilized a sample of 2,172 individuals and the computerized method developed by Nodari Júnior, Heberle, Ferreira-Emygdio and Irany-Knackfuss in 2008, providing greater precision in the dermatoglyphic analysis. This method allows optimization of the analysis and greater reliability in the counting and marking of lines and designs. It allowed differentiation of the ulnar loop and radial loop patterns, which other studies in dermatoglyphics and obesity have not done.

The results showed the presence of different dermatoglyphic characteristics for different nutritional statuses of children and adolescents, indicating a higher number of the total number of lines in Mesql2 and a higher frequency of the whorl pattern may be found in people of a healthy weight, a higher frequency of the radial loop pattern may be found in overweight people and a higher frequency of the ulnar loop pattern may be found in obese people.

This data may contribute to this field of research and allow better and more adequate referrals possible for people that have a predictive marker of fetal origin of obesity.

As a limitation, because it was a cross-sectional study, it was not possible to associate the results with important factors, such as prenatal and family history, and it is recommended in future studies that a cohort-type follow-up should be performed to verify a possible association between these factors and the level of physical activity, along with fingerprints.

Data availability

Underlying data

Open Science Framework: Data file new 5_Dermatoglyphical impressions are different between children and adolescents with normal weight, overweight and obesity https://doi.org/10.17605/OSF.IO/AFN62 (Alberti, 2019)

This project contains the following underlying data:

- Data file new 5_Dermatoglyphical impressions are different between children and adolescents with normal weight, overweight and obesity.xlsx (demographic information, the number of finger lines and fingerprint pattern types for each participant)

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Open Peer Review

Current Peer Review Status: ✗ ✓ ? ✓

Version 1

Reviewer Report 01 July 2020

https://doi.org/10.5256/f1000research.21350.r62596

✓ **Jannu Chiranjeevi**
Vaagdevi College of Physiotherapy, Warangal, Telangana, India

Firstly I congratulate the authors for doing great work on the title "Dermatoglyphical impressions are different between children and adolescents with normal weight, overweight and obesity: a cross-sectional survey."

Introduction:

- The introduction was very clear and the authors have clearly described obesity and dermatoglyphic features in relation to a variety of diseases. The aim of the study was well determined about obesity in children and adolescents aged 10 to 19 years in the centre west region of Santa Catarina.

Methods:

- Under this section, the study design and study participants were well documented. But I feel that the census was made only between 2013 - 2014. It could be more productive if they have done in at least 5 years census. The collection of demographic characteristics and fingerprint collection and analysis within the schools was done properly by the authors.

- Statistical analysis using ANOVA was well apt to the study and the results were well documented under the results section. The table and figures are giving proper information about the study.

Discussion:

- The whole study was well summarised under this section. The limitations of the study were well documented.

Overall it's a very good study which is most beneficial.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Physical therapy, Physiotherapy, Neurosciences, Rehabilitation, ergonomics, stroke, cerebral palsy, spinal cord injuries, diabetes, diabetic neuropathy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 24 June 2020

https://doi.org/10.5256/f1000research.21350.r64349

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Ali Azhar Dawasaz
Department of Diagnostic Sciences and Oral Biology, College of Dentistry, King Khalid University, Abha, Saudi Arabia

The authors have tried to address the relationship between dermatoglyphics and nutritional status (normal, overweight, and obese) in participants aged 10 to 19 years from the center-west region of Santa Catarina, Brazil using BMI. This is a cross-sectional study on a large sample population and addresses an important health parameter like obesity that is not only local but a global phenomenon. Dermatoglyphics is a relatively easier screening tool that is gaining importance in identifying health-related risks. This article is an important addition to the current literature.

Some concerns however remain and need some additional information from the authors.

1. I would like to ask authors to discuss the importance of the use of BMI when there are other more reliable tools to screen individuals' health statuses. BMI is considered a macro tool and can be used to calculate a baseline value for an ethnically identified population. However, BMI carries

inherent flaws when incorporated in a correlation study where a mixed population is under investigation.

2. Introduction section, line 6 says: By 2014, more than 1.9 million adults were overweight. Of these, 600 million were obese. Please correct the discrepancy in figures and provide a valid reference.

3. Page 4, under BMI calculation, the formula needs to be corrected.
BMI=Weight in kg/ (Height in mtr)^2

4. Please provide name and company details of the commercially available dermatoglyphic reader used in this study.

5. The weight of participants was noted on a digital scale nonetheless, considering variations caused due to intake of food or water prior to measurement would give varying results and could impact the reliability of data observed. It is requested that the authors kindly add an additional statement regarding the above concern whether taken into consideration or not.

6. In general, the objectives and study design are acceptable; however, the conclusions drawn from the study allowing prediction of obesity using DGF remains unclear. Authors are requested to carry out additional statistical tests (Regression/correlation) in order to have a compelling reason to conclude the same.

References

1. Dinescu D, Horn EE, Duncan G, Turkheimer E: Socioeconomic modifiers of genetic and environmental influences on body mass index in adult twins.*Health Psychol*. 2016; **35** (2): 157-66 PubMed Abstract | Publisher Full Text
2. Zhang HG, Chen YF, Ding M, Jin L, et al.: Dermatoglyphics from all Chinese ethnic groups reveal geographic patterning.*PLoS One*. 2010; **5** (1): e8783 PubMed Abstract | Publisher Full Text
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Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Dermatoglyphics, Radiation hazards, dentistry,

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 29 April 2020

https://doi.org/10.5256/f1000research.21350.r62253

Prathap Lavanya
Department of Anatomy, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India
Prathap Suganthirababu
Neurological Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India

The author has attempted to associate the genetic and epigenetic influence of obesity and overweight which is represented in dermatoglyphic patterns. The author's interest in predicting the epigenetic influence of obesity through a non-invasive, cost – effective way of analysis is highly appreciable. The author used dermatoglyphic scanner instead of traditional method for data collection improves the accuracy. The methodology is clear and reproducible. He used appropriate statistical tools and the results conclude significant difference between the obese, overweight and healthy population.
Few corrections to be made –

1. Introduction section – last paragraph –last sentence - kindly check the sentence formation.

2. Under Methodology - Collection of demographic details - avoid using 'patient' can alternate it with 'participants'.

3. Under Results section – Paragraph 1- The description is repeated, can avoid repetition.

4. Under results section – Paragraph – 2 - the codes used for digits are varying. Can use any one form of representation either Mesql2 or MET2.

5. Under the results section in the description, the digits are represented as MET / But in the reference table, it is represented as Mesql. Kindly fix with one form of representation and use the same in both description and data table.

The article is recommended for publication after the above said corrections.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Dermatoglyphics, breast cancer, epigenetics, Human anatomy,

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 27 August 2019

https://doi.org/10.5256/f1000research.21350.r51076

Tarimobo Otobo
[1] Department of Diagnostic Imaging, The Hospital for Sick Children, University of Toronto, Toronto, ON, Canada
[2] Institute of Medical Sciences, University of Toronto, Toronto, ON, Canada

The authors attempted to study and report the finger dermatoglyphic characteristics of normal, overweight and obese children. The choice of cross-sectional study design for the purpose of reporting the palmer dermatoglyphics characteristics in the sample population is commendable as it provided the baseline distribution of arch, whorl ulna, and radial loops in the study population. The analysis of the distribution and comparison of the finger dermatoglyphic characteristics between the normal, overweight and obese subjects was exceptional.

I am not sure if some of the conclusions were intended, e.g. suggesting that a particular fingerprint pattern is predictive of an outcome (in this case either of obese, overweight and normal weight) was overreaching. More so, since the study design and statistical analysis, did not provide sufficient evidence for such a conclusion.

The correct reference of the manual ink pad dermatoglyphic collect method is by Antonok *et al.*[1]

It was challenging to comprehend most of the paragraphs, because of challenging lexical semantics. A detail grammatical edit is recommended.

In general, the objective and study design of the article good; however, a major revision is required before final publication release.

References

1. To the method of receiving of human palmer prints. *Voprosy anthropol.*1975; **50**: 217-221

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
No

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Development and Validation of Outcome measurement tools, Physical anthropometry, and big data computational analytics.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.