12 - ANTHROPOMETRIC AND DERMATOGLYPHIC FEATURES OF INDIVIDUALS WITH DOWN SYNDROME

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INTRODUCTION

Down Syndrome (DS) is regarded as one of the most frequent anomalies in cases of mental disability and is often present in specialized institutions, comprising about 18% out of the total of mental disabilities. It was firstly characterized by John Langdon Down(DOWN JL, 1886) as a chromosomal disorder.

An individual with such a syndrome is usually susceptible to a series of diseases that correspond, in most of the cases, congenital heart disease (40%); hypotonia (100%); otitis media (50 to 70%); vision impairment (15 to 50%); alterations in the cervical spine (1 to 10%); thyroid dysfunction (15%); neurological problems (5 to 10%); obesity and precocious aging leading precociously to the end of life mostly at 70 to 80% (COOLEY WC, GRAHAM JM, 1991; OPITZ JM, GILBERT-BARNESS EF, 1990).

In the 60´s, associations of fingerprints characteristics were verified with determined congenital anomalies, most of them by chromosomal alterations, which became used as a tool in the identification of pathological conditions. It is through dermatoglyphics studies that individuals' genetic predispositions are identified in terms of races, sexes and some of their hereditary characteristics (BEIGUELMAN B, 1982).

Individuals with Down syndrome have fingerprints patterns in the tips of their fingers and in the palms of their hands, the first of which presenting Ulnar loops predominance that can be noticed in seven or more fingers of the hands, in which the high presence of radial loops and other digital patterns is uncommon (BEIGUELMAN B, 1982; BORBOLLA L, GUERRA D, BACALLAO J, 1980; CHAKRABORTY R, 1991; RAJANGAM S. JANAKIRAM S. THOMAS IM, 1995).

When verifying some peculiarities of the individuals with Down Syndrome, a low stature (CRONK, C; CROCKER, A.C; PUESCHEL,S.M. et al., 1988) and an increase of the corporal mass (MARQUES, B.C. NAHAS, M.V., 2003; SILVA D.L, SANTOS J.A.R, MARTINS C.F, 2006) was noticed, with relationship to the anthropometric features. When these individuals are born, they have reductions in their speed growth, coming to 20% between the 3rd and 36th month of life for both sexes; 5% between 3 and 10 years in females and 10% between 3 and 12 years in males. Females with the ages of 10 and 17 years, and males with 12 and 17 years have an accentuated reduction at approximately 27% and 50%, respectively (CRONK, C; CROCKER, A.C; PUESCHEL,S.M. et al., 1988).

Hence, the aim of this study was to verify the anthropometric fingerprints features of individuals with Down Syndrome of the Integrated Center for supporting people with Deficiency - FUNAD in the city of João Pessoa - PB.

METHODOLOGY

The methodological approach adopted in this study followed the descriptive study of traversal features, with a sample consisting of 21 individuals with Down Syndrome, 12 of them females and 09 males, with an age group varying from 06 to 30 years, properly enrolled in the Integrated Center for supporting people with Deficiency - FUNAD in the city of João Pessoa - PB.

This research was accomplished in accordance with the patterns of the Resolution of the *Conselho Nacional de Saúde* - CNS 196/96 of 10/10/1996, and has the approval of CEP/SES-PB - 27/11/2007.

As an inclusion criterion, the people responsible for those with Down syndrome were asked to present medical handbooks confirming the disease.

A tape-measure (Sanny®), a stadiometer (Sanny®) and a scale (Filizola®) were used In order to accomplish the anthropometric measures.

The Body Mass was quantified with the person standing up with his backs to the scale with the feet in the center of the platform. The Stature was observed maintaining him at an orthostatic position (OP) and an inspiratory apnoea was requested at this time to the person together with and observance of the Frankfurt plan (parallel to the soil). In order to verify these measures the person remained barefoot (FERNANDES FILHO J, 2003).

The BMI (kg/m2) was worked out in order to group the participants according to the classes proposed by the World Health Organization (WORLD HEALTH ORGANIZATION, 1997).

Table 1: Classification of the Body Mass Index

BMI	CLASSIFICATION
< 18,5	below the Weight
18,5 – 24,9	below the Weight
25,0 – 29,9	above the Weight
30,0 – 34,9	obesity I
35,0 – 39,9	obesity II
40,0≥	obesity III

Source: World Health Organization (WHO)

Dermatoglyphics, which is the study of the fingerprints, uses as a protocol a collection a method proposed by Cummins and Midlo (1961). It is Worthwhile to point out that the fingerprint nomenclature can only be used when it is deposited on any surface.

The fingerprints are classified in three types, according to the number of deltas (triradius) in each fingerprint.

The **Arch** classification denominated by the letter " **A** " is featured by the non-emergence of deltas in the fingerprint and its lines traversely across the digital surface. The Loop " L " is featured by the emergence of only a delta; its form has a half closed itinerary, in which the lines begin from an extremity of the finger. They curve distally , in relation to the other; however, they

do not get closer to the initial part of the lines; hus,being considered as an open drawing. The Whorl " W " presents two deltas, whose constitution has a closed form, where its central lines are inserted around the nucleus of the fingerprints, as shown in illustration 1.

Arch Loop Whorl

Source**:** FERNANDES FILHO, (1997)

The fingerprints analysis has verified the presence of standardized fundamental indexes, represented by D10 and **SQTL**:

D10 refers to the addition of the drawings of the 10 fingers of the hands, in which the minimum value is " 0 " and the maximum " 20 ". The " 0 " value refers to the presence of the Arch (A), which is the absence of deltas; the Loop (L) presence of a delta (W) and the presence of two or more deltas, and its corresponding scores are " 1 " and " 2 ".

The D10 values are found after the use of the following formula: D10 = Σ L + 2 (Σ W). The addition of the total amount of lines is represented by (SQTL), and it corresponds to the 10 fingers of the hands. The amount of skin crests, in the drawings represents the quantitative characteristic. The descriptive statistics was used for the interpretation of the results with the measures of central tendency.

RESULTS

The values presented in table 2 were found after the evaluation of the anthropometric features. the analysis reveals that in the male group the results of the body mass and stature present a high standard deviation, due to the sample dispersion for containing individuals of 7 and 30 years old. the same was also observed in females, once the values varied from 6 to 29 years old. The BMI results were classified according to the OMS, from which 77,7% of the male group were above the weight and only 33,3% of the females were classified in this pattern.

Table 2: Ages Behavior, Body mass and Height BMI

		age (years)		Body Mass (kg)		Height (cm)		BMI (kg/m^2)	
Gender	N	μ s	Min-Max	μ s	Min-Max	μ s	Min-Max	μ s	Min-Max
Male	**9**	17,6±7,1	7-30	61,5 ±16,5	27,7-80,5	148,6 ±13,6	115 - 158	27,3 ± 4,7	19,3 - 33,1
Female	**12**	15,3±8,5	6-29	38,8 ±16,7	11,5-58	132,7 ±16,8	101-154	20,6 ±5,9	9,7-26

μ = Average; **s** = Standard divert; **Min-Max** = Minimun and maximun Values

The results of table 3 have demonstrated that in both genders the predominance of the type Loop (L) occurred in the fingers of the hands, corresponding to 78,1%. Conversely, the Whorl (W) totaled 17,6% and the Arch (A) 4,3%.

Table 3: Percentile values of the fingerprint

Gender	n	A	L	W
Male	9	2,2%	77,8%	20,0 %
Female	12	5,8%	78,3%	15,8 %

A high SQTL and a high standard deviation were observed in table 4 which revealed the minimum values corresponding to 54 and the maximum of 178 lines. conversely, the SQTLD was larger than the SQTLE.

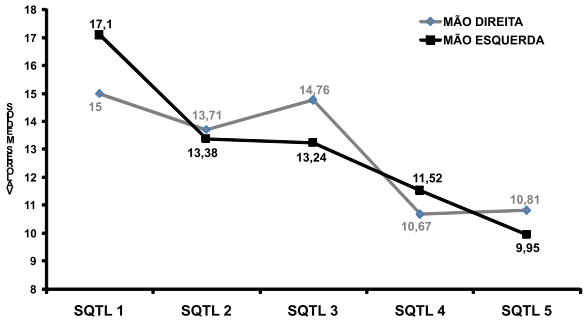
Table 4: Medium behavior and standard deviation of the dermatoglyphic characteristics

Dermatoglyphics	Medium	standard deviation
D 10	11,33	± 2,50
SQTL	130,14	± 35,87
SQTLE	64,95	± 17,21
SQTLD	65,19	± 19,47

SQTLE - Addition of the total amount of left hand finger lines;
SQTLD - Additon of the total amount of the right finger lines.

Figure 1 reveals a decreasing of the number of lines of the thumb nail of both left and right hands, as well as a decreasing of the number of lines from the second to the fifth finger of the left hand. As for the right hand, there is an increase of lines from the second to the third finger with a decreasing from the third to the fifth finger.

Figure 1: Medium behavior of SQTL of both hands of the individuals with DS



SQTL 1 to 5 – Addition of the total amount of lines from the 1st to the 5th finger.

DISCUSSION

In a research accomplished with 104 Portuguese individuals with an age group from 18 to 47 years, all of them with DS, the prevalence of weight and obesity excess was identified by the index of body mass of 68,5% in males and 82,3% in females. The oldest women's group, 30-47 years, revealed a larger obesity prevalence (75%). Only in the youngest men's group, 18-29 years, that an inferior obesity of 50% was identified(SILVA D.L, SANTOS J.A.R, MARTINS C.F, 2006).

Marques, A. C and Nahas M. V (2003) verified the quality of life of 30 individuals with DS, 15 men and 15 women, with more than 40 years. Among the investigated variables, the body mass presented an average of 61,6 kg in men and 64,4 kg in women. The stature was 151,9 cm in men and 143,2 cm in women and the women's BMI 31,3 kg/m2 and the men's BMI 26,8 kg/m2.

Myrelid, A. et al. (2002), analyzed 4.832 data, 354 of them were individuals with DS, 203 males and 151 females. In the study, the medium length of the final stature was 161,5 cm, males and 147,5 cm, females. A medium BMI of 25 kg/m2 was identified in 31% of the men and in 36% of the women at the age of 18 years.

When analyzing these researches (MARQUES, B.C. NAHAS, M.V,2003; SILVA D.L, SANTOS J.A.R, MARTINS C.F., 2006; MYRELID, A. et al. 2002), observed that the incidence of BMI in women was superior to men´s.

These results can be justified due to obesity be more apparent in women experiencing the aging phase (10), diverging with the average of the age found in this research. As for stature, the results corroborate with the values described in the studies mentioned above, which demonstrated that men presented larger values.

When the dermatoglyphic features of the individuals with DS are studied, it is observed that some articles report about the predominance of some dermatoglyphic drawings (RAJANGAM S. JANAKIRAM S. THOMAS IM, 1995; M. HASSANZADEH, NAZARABADI, R. RAOOFIAN, R. et al. 2007; BORBOLLA L, GUERRA D, BACALLAO J, 1980; MASJKEY, D. BHATTACHARYA, S. DHUNGEL, S. 2007; BOROFFICE, R. 1978).

In 1995, Rajagam et al. accomplished a research with 235 individuals wit DS. Those data were correlated and compared with 230 normal subjects, in which significant differences were observed between the control group and DS, once a predominance of the Ulnar loop was identified in the fingers on the hands of the individuals with DS.

In 2007, M. Hassanzadeh et al. accomplished a research with 90 people with DS (n=29), syndrome of Klinefelter (n=22) and normal individuals (control group) (n=39). They identified significant dermatoglyphic characteristics in the individuals with Down syndrome with relationship to the simian line, Ulnar loops, whorl, t' ', t' ' ' and t' and they concluded that the dermatoglyphics can be used as an initial stage of the diagnosis of the Syndrome.

Borbolla L, Guerra D, Bacallao J., accomplished another research in Cuba in 1980. They evaluated the dermatoghyphic characteristics of the tip of the fingers and the palmar complexes in 220 individuals with Down Syndrome and they compared with a group control of 400 normal Cuban individuals. A dominant presence of Ulnar was observed among the results in the second and third fingers of the hands, among other pakmar characteristics. Nevertheless, it was concluded that the results were very similar to those analyzed in other countries, taking into account that the dermatoghyphic patterns of the individualswith DS are not affected by ethnic influences.

A group of researchers (MASJKEY, D. BHATTACHARYA, S. DHUNGEL, S. 2007) evaluated the dermatoglyphic characteristics of 15 individuals with Down syndrome and made correlations and comparisons with a group control of 15 normal people. Among the results of the studied variables, a higher incidence of the Loop was observed in conjunction with a lower incidence of the whorls in individuals with DS, as compared with the components of the group control.

When identifying the dermatoghyphic characteristics of 50 Nigerian individuals with DS, Boroffice, R. A., in 1978, compared them with those of the 100 normal individuals and verified that 94,6% of the digital patterns of those with DS were of the ulnar loop type while in the group control this percentile was 62,5%. No Arch was report in the individuals with DS. A larger incidence of Whorl was also identified in the group control (31,1%) while in the group of DS the feature frequency was 4%.

However, after observing the results demonstrated in the figure 1, it was verified that there was a behavior similar to the study accomplished by Roquetti Fernandes (2004), about the Brazilian football players with cerebral palsy. This likeness was found in the first and fifth fingers of the right hand and then in the first, second and fifth fingers of the left hand.

CONCLUSIONS AND RECOMMENDATIONS

After the analysis of the dermatoghyphic and anthropmetric characteristics of the individuals with DS it became possible to observe some outstanding features of these individuals.

In relation to the anthropometric variables, it was concluded that 77,7% of the male group were above the weight and only 33,3% of the females were classified in this pattern and that the males maintained a stature pattern superior to the women. One should not forget that the growth in the children with DS can be committed in a more accentuated way by the association of other diseases such as serious congenital cardiopathies, gastrointestinal malformations or constant syndromes and endocrine-metabolic diseases (mainly Hypothyroidism and diabetes mellitus) not diagnosed or badly controlled.

Other factors that cannot be disregarded in relation to the overweight prevalence of the male group are the obesity family report, the physical inactivity and the largest offer and ingestion of calories (SHARAV, T.; BOWMAN, T. 1992), which are variables that were not controlled in the present research.

As for the dermatoghyphic characteristics, a prevalence of the drawing type Loop(L) was observed in the fingers of the hands; thus, it could concluded that this simple technique can be a valuable tool to characterize the individuals with DS.

Having observed the results of the present research it could be noticed that they corroborate with the studies described above, strengthening this characteristic in the individual with DS.

However, other studies are recommended to be accomplished larger sample verifying comparisons with a control group, involving the dermatoglyphic variables of the palmar complexes, together with neuromotor tests and body mass, for a better characterization of those individuals.

ABSTRACT

Down Syndrome (SD) the is regarded as the more common of the genetic anomalies and mental deficiencies, which can be identified either at prenatal diagnosis or clinically by the phenotype of the newly born. The precocious diagnosis in DS is crucial, due to several congenital malformations and late complications associated to the Syndrome. Based on this presupposition, the objective of this research was to study the dermatoglyphic and anthropometric features of individuals with Down Syndrome (DS) assisted by the Integrated Center for supporting people with Deficiency - FUNAD in the city of João Pessoa - PB. A sample, consisting of 21 subjects males and female with age group from 6 to 30 years, was evaluated. The fingerprints were collected through the protocol of Cummins and Midlo (1961) and the anthropometric characteristics of the body mass and stature were evaluated. A descriptive methodology of traversal feature was used to analyze the results expressed through the

measures of central tendency and standard deviation, respectively, that identified the following values: age (16,33 ± 7,84) years; body mass (48,55 ± 19,90) kg; stature (139,55 ± 17,19) cm; BMI (23,52 ± 6,28) kg/m2; D10 (11,33 ± 2,50); SQTL (130,14 ± 35,87); SQTLE (64,95 ± 17,21); SQTLD (65,19 ± 19,47). In the qualitative dermatoglyphic features, the following percentages were verified: Arch " A " (4,3%); Loop " L " (78,1%); Whorl " W " (17,6%). Based on the interpretation of those results it was concluded that 77,7% of the male group were above the weight. Only 33,3% of the women were classified in this pattern and that the men maintained a stature pattern superior to the women´s . A prevalence of the drawing of the loop (L) was observed in the dermatoglyphic features in the fingers of the hands. Hence, it could be concluded that this simple technique can be a valuable tool to characterize the individuals with DS.

Key-words: Fingerprints, Anthropometry, Genetics

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CARACTERÍSTICAS DERMATOGLÍFICAS Y ANTROPOMÉTRICAS DE PORTADORES DE SÍNDROME DE DOWN.

RESUMEN

La Síndrome de Down (SD) es considerada como la más común de las enfermedades genéticas,como también de las minusvalías mentales, donde su identificación puede ser diagnosticada desde el prenatal o clínicamente y por el fenotipo del recién nacido. El diagnóstico precoz en (SD) es demasiado importante a causa de innúmeras malformaciones congénitas y complicaciones tardías asociadas a la Síndrome. Tomando como punto de partida lo dicho, el objeto de la presente investigación ha sido estudiar las características dermatoglificas y antropométricas de los portadores de la Síndrome atendidos por el " Centro Integrado de Apoio ao Portador de Deficiencia- FUNAD, en Joao Pessoa,Paraíba, Brasil.

Ha sido evaluado una muestra de 21 personas del sexo masculino y femenino, con edad entre 6 hasta 30 anos. Han sido recolectadas impresiones dactiles, a través del protocolo de Cummins y Midlo (1961) y evaluadas las características

antropométricas de masa corpórea y estatura. Se ha utilizado una metodología descriptiva, de carácter tranversal, para analisar los resultados expresos a través de medida de tendencia central media y desvío patrón respectivamente, que han identificado los siguientes valores: edad (16,33 ± 7,84) años; masa corpórea (48,55 ± 19,90) kg; estatura (139,55 ± 17,19) cm; IMC (23,52 ± 6,28) kg/m^2; D10 (11,33 ± 2,50); SQTL (130,14 ± 35,87); SQTLE (64,95 ± 17,21); SQTLD (65,19 ± 19,47). Sin embargo, en las características dermatoglíficas cualitativas se han verificado los porcentajes siguientes: Arco “A” (4,3%); Hevilla “L” (78,1%); Verticilo “W” (17,6%). A través de la interpretación de esos resultados, se concluye que 77,7% del grupo masculino se ha encontrado por encima del peso, solamente 33,3% de las mujeres han presentado la misma característica y los hombres han presentado estatura superior a las mujeres. En las características dermatoglíficas se ha observado prevalencia del dibujo de la Hevilla(L) en los dedos de la manos, concluyéndose que esta técnica simple puede ser una buena herramienta para caracterizar los portadores de SD.

Palavras Clave: Impresiones Dactiles, Antropometria, Genética

CARACTÉRISTIQUES DERMATOGLYPHIQUES ET ANTHROPOMÉTRIQUES DE PORTEURS DU SYNDROME DE DOWN

RÉSUMÉ

Le Syndrome de Down (SD) est considéré comme étant la plus commune des anomalies génétiques et des déficiences mentales, son identification pouvant être renforcée à partir d'un diagnostic pré-natal ou cliniquement ainsi que par le phénotype du nouveau-né. Le diagnostic précoce dans le cas du SD est crucial, face aux diverses malformations congénitales et complications tardives qui lui sont associées. Partant de ce présupposé, notre objectif, dans la présente recherche, a été d'étudier les caractéristiques dermatoglyphiques et anthropométriques des porteurs du Syndrome de Down (SD) suivis par le Centre Intégré d'Appui au Porteur de Handicap – FUNAD de la ville de João Pessoa – PB. Nous avons évalué un échantillon de 21 sujets, de sexe masculin et féminin, âgés de 6 à 30 ans. La prise des empreintes digitales a été faite selon le protocole de Cummins et Midio (1961) et nous avons évalué les caractéristiques anthropométriques de la mase corporelle et de la stature. Nous avons utilisé une méthodologie descriptive de caractère transversal pour analyser les résultats traduits au moyen des mesures de médiane et d'écart type, respectivement, qui ont donné les valeurs suivantes : âge (16,33 ± 7,84) ans ; masse corporelle (48,55 ± 19,90) kg ; stature (139,55 ± 17,19)cm ; IMC (23,52 ± 6,28) kg/m² ; D10 (11,33 ± 2,50) ; SQTL (130,14 ± 35,87) ; SQTLE (64,95 ± 17,21) ; SQTLD (65,19 ± 19,47). Quant aux caractéristiques dermatoglyphiques qualitatives nous avons trouvé les pourcentages suivants : Arche 'A' (4,3%) ; Boucle 'L' (78,1%) ; Tourbillon 'W' (17,6%). L'interprétation de ces résultats nous a permis de conclure que 77,7% des hommes avaient un poids supérieur à la moyenne contre seulement 33,3% des femmes et que la stature moyenne des hommes était supérieure à celle des femmes. Dans les caractéristiques dermatoglyphiques nous avons observé une prévalence du dessin de type boucle (L) sur les doigts de la main. Nous pouvons conclure que cette technique simple peut être un outil de valeur pour caractériser les porteurs du SD.

Mots-clés : Impressions digitales, Anthropométrie, Génétique.