EVALUATION OF SERUM IMMUNOGLOBULINS AND BODY MASS INDEX IN YOUNG ADULT FEMALES WITH STRIAE DISTENSAE IN IMO STATE UNIVERSITY, OWERRI.

ABSTRACT

Aims: The prevalence and severity of striae distensae vary among populations, although it poses no health risk but has a significant psychological effect. This research carried out at Imo State University was to determine the serum levels of some immunoglobulins (IgG, IgE, and IgM), any correlation between serum IgM with IgG and IgE, and body mass index in young adult females with striae distensae. The study also aims to determine and compare the demographic features of young adult female students with striae distensae and control in Imo State University.

Materials and methods: Using random sampling technique, sixty (60) young adult females with striae distensae (test samples) were selected and age-matched with sixty (60) young adult females without striae distensae, who served as a control group. Ten milliliters (10ml) of venous blood was collected from each participant, it was dispensed into plain containers and was allowed to clot, and then centrifuged to obtain serum, which was stored at $-20℃$ before use. While the immunoglobulins were determined using the Elisa technique, data obtained were subjected to statistical analysis using SPSS 21, and the $P < 0.05$ level of significance was adopted.

Results: The results reveal significant lower levels of IgG (29.33 ± 5.10), IgE (1378.01 ± 263.52), and IgM (762.52 ± 188.09) in test samples as compared to control with IgG (33.40 ± 4.32), IgE (1640.95 ± 209.37), and IgM(895.24 ± 196.45).There was non-significant correlation of IgM with IgG (r = -0.217, p = 0.096) and IgE (r = -0.217, p = 0.095) while there was a significant correlation of IgG with IgE (r = 0.524, p < .000) in young adult females with striae distensae. There was no significant difference in the BMI in all the striae distensae subjects compared with the control (0.234).

Conclusion: This study concludes that low plasma levels of immunoglobulins were associated with striae distensae in young adult females. The results observed striae distensae to be sparingly a consequence of being overweight and is liable to cause severe psychological distress on its subjects.

Keywords: striae distensae, venous, immunoglobulins, serum, correlation.

1. INTRODUCTION

Striae distensae (SD), also known as the stretch mark is a common skin condition, which is not yet associated with any significant medical problem but can cause significant distress to its sufferers. Striae distensae represent linear dermal scars that are accompanied by epidermal atrophy, as a natural result of the skin stretching, which may diminish over time, but will not disappear completely. They are indented, reddened streaks that usually appear on the skin from rapid weight gain or weight change [1].

The classic anatomical sites affected include the abdomen and breast for pregnancy-related striae, the outer thighs or lumbosacral regions for adolescent boys, and the buttocks, thighs, upper arms, and breast for adolescent girls [2, 3]. Striae progress through three different stages of maturation: the acute stage is characterized by red and slightly raised striae rubrae, the subacute stage is characterized by the purpuric stage, and the chronic stage is characterized by hypopigmented and atrophic striae albae [4].

Histologic studies of mature striae reveal stretched collagen fibers aligned parallel to the skin surface, followed by the subsequent loss of collagen and increased flattening of rete ridges [3].

Immunoglobulins (Igs) are glycoprotein molecules called antibodies (Abs), that are produced in response to foreign substances entering the living body-antigens or immunogens (viruses, bacteria, or toxins, etc.), binding them and forming antigen-antibody complexes resulting in antigen (Ag) elimination and protection of the body of the host. Igs are produced by the lymphocytes and are found in infractions of blood called gamma globulin [5]. Igs are synthesized with a molecular arrangement that fits the shape of molecules on the antigens or immunogens, to allow effective binding of the Abs. Igs binding to Ags help to inactivate, weaken or enhance phagocytosis of Ags [6]. They act as a critical part of the immune response by specifically recognizing and binding to particular antigens, and aiding in their destruction [7]. The antibody immune response is highly complex and exceedingly specific. The various immunoglobulins classes and subclasses (isotypes) differ in their biological features, structure, target specificity, and distribution. Hence, the assessment of the immunoglobulin isotype can provide useful insight into complex humoral immune responses [8].

Body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults and for classifying (categorizing) them into groups. The common interpretation is that it represents an index of an individual's fatness and is calculated by a person's weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. BMI is an inexpensive and easy screening method for weight category — underweight, healthy weight, overweight, and obesity that may lead to health problems but it is not diagnostic of the body fatness or health of an individual.

BMI does not measure body fat directly, but BMI is moderately correlated with more direct measures of body fat. The physical examination of BMI and site of striae shows there is no significant relationship between BMI and the occurrence of striae [9]. This result in line with Parhusip et al. (2014) showed no significant relationship between obesity and the striae disease in young adults. However, studies conducted by Ahsan et al. found linked between weight gain with the occurrence of striae [10]. Furthermore, BMI appears to be as strongly correlated with various metabolic and disease outcomes as are these more direct measures of body fatness.

This study aims to evaluate the serum levels of some immunoglobulins (IgG, IgE, and IgM), the correlation between serum IgM with IgG and IgE, and to determine and compare the body mass index of young adult females with striae distensae and control.

2. BIOCHEMICAL FINDINGS IN STRIAE DISTENSAE

Serum elastin levels are increased in women with SG and the newly synthesized elastin may not be functional as it is thin and disorganized. Therefore, increased elastin production may not prevent the formation of striae. Striae development during pregnancy is influenced by many variables such as genetic structure, skin type, age, BMI, weight gain, and gender, serum elastin level is not suitable for clinical purposes to predict the occurrence of SG [11]. Ibrahim *et al.*, studied qualitatively the changes in the dermal collagen of two forms of striae distensae (SD) namely striae rubrae (SR) and striae albae (SA) when compared to normal skin (NS) using confocal Raman spectroscopy [12]. The methodology includes an in vivo human skin study for the comparison of confocal Raman spectra of dermis region of SR, SA, and NS by supervised multivariate analysis using partial least squares discriminant analysis (PLS-DA) to determine qualitatively the changes in dermal collagen.

Ud-Din, McGeorge, and Bayat, further analyzed these groups for the extent of hydration of dermal collagen by studying the changes in the water content bound to it [13]. PLS-DA score plot showed good separation of the confocal Raman spectra of dermis region into SR, SA, and NS data groups. Further analysis using the loading plot and S-plot indicated the participation of various components of dermal collagen in the separation of these groups. Bound water content analysis showed that the extent of hydration of collagen is more in SD when compared to NS. Based on the results obtained, this study confirms the active involvement of dermal collagen in the formation of SD [13]. It also emphasizes the need to study quantitatively the role of these various biochemical changes in the dermal collagen responsible for the variance between SR, SA, and NS.

3. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

3.1 Criteria for selection

By random sampling, 120 young adult female students of Imo State University between the ages of 18 and 28 years were selected. They consist of 60 females with STRIAE DISTENSAE and 60 females without STRIAE DISTENSAE (control). All the participants gave their informed consent to this study after the procedure was explained to them. The fixed dates for blood sample collection were acceptable to each participant.

3.2 Study design and sample collection

The period of subject enrollment, classification, sample collection, and laboratory determination of serum immunoglobulins (IgG, IgE, IgM), and body mass index (BMI) lasted from July 2021 to September 2021.

Ten (10) milliliters of venous blood were collected from each participant. It was dispensed into a plain container to obtain serum. The samples were refrigerated at −20℃ and analyzed within 1 week.

3.3 Laboratory procedures

Reagents were commercially purchased and the manufacturer's operational instruction was followed.

Determination of Serum Human Immunoglobulin IgE, IgG, and IgM (Per and Bo, 1998) using ELISA Kit as Modified by Melsin Medical Co., Limited.

Principle

The stop solution changes the color from blue to yellow and the intensity of the color is measured at 450 nm using a spectrophotometer. To measure the concentration of IgE, IgG, and IgM in the sample, the ELISA kit includes a set of calibration standards. The calibration standards are assayed at the same time as the samples and allowed to produce a standard curve of Optical Density (O.D) versus IgE, IgG, and IgM concentrations. The concentration of IgE, IgG, and IgM in the samples is then determined by comparing the O.D of the samples to the standard curve.

4 RESULTS

Table 1: Mean ± SD values of Serum IgG, IgE, and IgM in young adult females with striae distensae and controls.

Variables (Mean ± SD)	StraieDistensae (n = 60)	Control (n = 60)	t-value	p-value
IgG(g/L)	29.33 ± 5.10	33.40 ± 4.32	-4.848	0.000
Lower 95% C.I	28.01	32.28		
Upper 95% C.I	30.65	34.51		
IgE(g/L)	1378.01 ± 263.52	1640.95 ± 209.37	-6.446	0.000
Lower 95% C.I	1309.94	1586.87		
Upper 95% C.I	1446.09	1695.04		
IgM(g/L)	762.52 ± 188.09	895.24 ± 196.45	-4.650	0.000
Lower 95% C.I	713.93	844.49		
Upper 95% C.I	811.11	945.99		

Table 2: Pearson correlation of Serum IgM, IgG, and IgE with each other in young adult females with striae distensae.

	IgG	IgM	IgE
IgG			
r-value	1	-0.217	0.524
p-value		0.096	0.000
n	60	60	60
IgM			
r-value	-0.217	1	-0.217
p-value	0.096		0.095
n	60	60	60
IgE			
r-value	0.524	-0.217	1
p-value	0.000	0.095	
n	60	60	60

Table 3: Mean ± SD values of Body mass index in young adult females with striae distensae in the study population.

Variables (Mean ± SD)	Striae Distensae (n = 60)	Control (n = 60)	t-value	p-value
All ages (18-28)	29.69 ± 7.60	28.17 ± 5.90	1.20	0.234
Lower 95% C.I	27.73	24.30		
Upper 95% C.I	31.65	35.25		
18-19 (years)	31.66 ± 9.31	29.77 ± 7.13	0.441	0.671
Lower 95% C.I	24.51	24.30		
Upper 95% C.I	38.82	35.25		
20-21 (years)	28.55 ± 8.82	29.10 ± 5.04	-0.235	0.820
Lower 95% C.I	22.15	25.50		
Upper 95% C.I	34.95	32.70		
22-23 (years)	28.02 ± 8.20	30.36 ± 6.20	-0.613	0.553
Lower 95% C.I	22.51	26.42		
Upper 95% C.I	33.53	34.30		
24-25 (years)	27.75 ± 7.02	25.06 ± 4.83	1.190	0.251
Lower 95% C.I	24.14	22.58		
Upper 95% C.I	31.35	27.54		
26-28 (years)	32.73 ± 6.20	29.52 ± 6.72	1.170	0.263
Lower 95% C.I	29.15	25.64		
Upper 95% C.I	36.31	33.39		

Table 4: Demographic features of young adult females with striae distensae

TEST								
		CONSIDERED AS DISORDER (%)		PSYCHOLOGICAL DISTRESS (%)		MEDICAL TREATMENT (%)		
AGE DISTRIBUTION	FREQUENCY (%)	YES	NO	YES	NO	YES	NO	MEAN BMI (KG/M^2)
18-19	15.0	15.0	0	11.7	3.3	8.3	6.7	30.25
20-21	13.3	8.3	5	10	3.3	8.3	5	27.46
22-23	18.3	15	3.3	16.7	1.7	6.7	11.7	26.73
24-25	30.0	20	10	11.7	18.3	3.3	26.7	27.01
26-28	23.3	3.3	20	6.7	16.7	1.7	21.6	32.43

The result showed that there were significantly lower serum levels of IgG (29.33 ± 5.10), IgE (1378.01 ± 263.52), and IgM (762.52 ± 188.09) in young adult females with striae distensae compared with serum levels of IgG (33.40 ± 4.32), IgE (1640.95 ± 209.37), and IgM (895.24 ± 196.45) in controls. All parameters has p = 0.000 in each case (Table 1). Also there was non-significant correlation of IgM with IgG (r = -0.217, p = 0.096) and IgE (r = -0.217, p = 0.095) while there was a significant correlation of IgG with IgE (r = 0.524, p < .000) in young adult females with SD (Table 2).

There was no significant difference in the BMI in all the SD subjects compared with the control (0.234). Also, there was no significance in BMI in the SD subjects when compared according to their age distribution with corresponding control $(p > 0.05)$.

The results from Table 4 show that 61.7% of test samples consider striae distensae as a medical disorder while 38.3% do not. Also, 56.8% admitted that SD has caused some level of psychological distress while 43.2% feel otherwise. Therefore, 71.7% have not bothered to take any medical treatment for it while 28.3% have taken treatments (Appendix 3). The table also reveals that 61.7% of the test are overweight and 38.3% are obese (Appendix 1).

5 DISCUSSION

Although striae distensae does not cause serious health problems, the present study shows that serum levels of IgE, IgG, and IgM in young adult females with striae distensae were significantly lower compared with the controls in each case. Low levels of antibodies in the immune system, expose the body to a greater chance of developing repeated infections. The immune system may make low levels of antibodies in response to certain diseases, such as can [14].

Low levels of IgE can occur in a rare inherited disease that affects muscle coordination while IgE antibody levels are often high in people with allergies [15]. IgE binds with extremely high affinity to the FcεRI (a major receptor that mediates allergic inflammatory signaling in mast cells and basophils) which is expressed on mast cells, basophils, Langerhans cells, and eosinophils [15]. Skin inflammation in atopic dermatitis (AD) is characterized histologically by intense infiltration of lymphocytes, monocytes, and eosinophils [16]. This

indicates that young adult females with IgE deficiency may be highly predisposed to striae distensae, especially as it affects muscle coordination [14].

IgG deficiencies can occur at any age and are more likely to predispose victims to infections. High levels of IgG may mean a long-term (chronic) infection, such as HIV while low levels of IgG occur in macroglobulinemia [17]. Levels of IgG get higher in multiple myeloma, long-term hepatitis, and multiple sclerosis (MS). In multiple myeloma, tumor cells make only one type of IgG antibody (monoclonal); the other conditions cause an increase in many types of IgG antibodies (polyclonal) [17]. The high levels of IgM antibodies stop the growth of cells that make IgG. Other conditions that can cause low levels of IgG include some types of leukemia and a type of kidney damage (nephrotic syndrome) [18]. However, in rare cases, genetics may play a role. People with IgG deficiency also often find that pneumonia and the flu vaccines don't protect them from getting these infections [17].

Low levels of IgM occur in multiple myeloma, some types of leukemia, and some inherited types of immune diseases while high levels of IgM can mean macroglobulinemia, early viral hepatitis, mononucleosis, rheumatoid arthritis, kidney damage (nephrotic syndrome), or a parasite infection is present [14]. Therefore, because IgM antibodies are the type that forms when an infection occurs for the first time, high levels of IgM can mean a new infection is present. High levels of IgM in a newborn mean that the baby has an infection that started in the uterus before delivery [18].

Furthermore, the study reveals that the majority of the SD subjects and control are either overweight or obese, while a few of control is healthy, which supports that the occurrence of striae correlates closely with obesity and is highly prevalent in obese adults and children [19]. This may imply that striae distensae is a consequence of obesity though Novak reported that the development of SD in adolescents is not related to obesity. SD is reported to rather coincide with the markers of adolescence such as breast development, pubic hair growth, and menarche [20].

More so, a greater percentage of SD subjects consider striae distensae as a medical disorder and it has caused some level of psychological distress to them. Some SD subjects feel distressed about the way it makes their skin appear [21], which makes them participate in physical activities, leaving them feeling self-conscious about how they appear [22]. Therefore, few of the SD subjects have made medical attempts to end the cosmetic nuisance.

6 CONCLUSION

SD is associated with low plasma levels of immunoglobulins and is observed to not be largely a consequence of being overweight.

CONSENT

All authors declare that written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the Department Medical Laboratory Science, Imo State University, Owerri, Nigeria, Research Ethics Committee with reference number MLS/IMSU/REC/2021/05 and written informed consent was obtained from all study participants prior to their enrollment and sample collection of blood following the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly used products in our area of research and country. There is 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 the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

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