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## RESEARCH ARTICLE

### CAPILLARY DISEASES IN PATIENTS WHO HAD COVID-19

**Giovanna Balan Cavalcante, Júlia Lascala Cardoso, Valentina Vetorasso Cabrera Mano, Maria Julia Castellucci Camossatto, Maria Fernanda Maluf Novaes Franco and Adriana Novaes Rodrigues**

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#### Abstract

**Introduction:** The clinical conditions caused by Covid-19 are not fully understood because it is a new pandemic and new pathology.

**Objective:** This study examined the effects of the disease in relation to trichology.

**Methods:** The study was conducted through an online questionnaire, with questions about before and after disease.

**Results:** The two alterations found were alopecia areata and telogen effluvium.

**Conclusion:** The alopecia detected in this study, telogen effluvium and alopecia areata, are related to several other systemic diseases, however SARS - CoV - 2 acts as a trigger in different autoimmune pathways and creates a link between the pathologies described here, generating the need for further investigations.

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#### Introduction:-

The Covid-19 is an infectious disease caused by coronavirus, SARS-CoV-2, and its main symptoms are fever, tiredness and dry cough. Initially described as rapidly evolving pneumonia for Acute Respiratory Discomfort Syndrome (ARDS), on December 31st, 2019, China notified the WHO about the high number and accelerated dispersion of these conditions in the population. In March 2020, the virus spread to all continents, reaching several countries and a large number of people, leading the World Health Organization (WHO) to declare a pandemic situation on March 11th, 2020. <sup>(1,2)</sup> At that time, Brazil registered the involvement of just over 8,000 Brazilians, mainly affecting a population over the age of 60 years and with comorbidities, such as cardiovasculares diseases and diabetes. <sup>(2)</sup> In continuous dispersion, on April 20th, 2020, Brazil recognized the community transmission of the disease. <sup>(3)</sup> The data of March 20th, 2021, about the total number of registered cases worldwide, corresponded to 121,882,440, with 69,033,271 recovered and 2,692,806 deaths and in Brazil these numbers were: 11,871,390 cases, 10,435,864 recovered and 290,314 deaths. <sup>(4)</sup>

The first Covid-19 patients reported general symptoms, but many patients progressed to more severe cases and even death. Regarding dermatological symptoms, diffuse or localized alopecia, telogen effluvium, hives and rashes are described in patients with Covid-19 contamination, even after the viral fall. <sup>(5)</sup> SARS - CoV - 2 can act as a trigger in different autoimmune pathways, creating an inflammatory environment that allows unspecific activation of the immune system or by a cross-reaction between its antigens and the host's antigens. <sup>(6)</sup> In view of that, the present study aims to analyze the hair loss, existing and continuous, as a dermatological manifestation associated with patients during and after Covid-19 infection.

**Corresponding Author:- Giovanna Balan Cavalcante**

## Materials and Methods:-

This is a cross-sectional and observational study, carried out through an online questionnaire, formulated especially for this study.

### Participants and questionnaire

Over 50 questionnaires with 22 positive responses were sent to female patients. The female audience's choice was defined, based on Edmonds (2002), who observed that women are more associated with vanity and bodycare, especially with hair and nails, which facilitates the observation of hair loss. <sup>(7)</sup>

The questionnaire reported the social demographic characteristics of all participants who answered the questionnaire, such as age, gender and occupation, it also made questions about before and after pandemic capillary changes, and about seborrheic dermatitis of the scalp. It presents the main clinical and demographic data of confirmed Covid-19 patients, according to these verities of the disease. Comorbidities such as arterial hypertension and diabetes were recorded, as they are risk factors for the underlying pathology investigated.

The analysis showed a margin of error of 0.05, a confidence level of 98% and a response distribution of 0.50. The value of  $P < 0.05$  was accepted as statistically significant. All data analyzes were performed using IBM SPSS Statistics (Statistical Package for Social Sciences) for Windows 26.0 software.

## Results:-

The patient's average age was 41.09 years old. Regarding the clinical severity of Covid-19, 91% had no need for hospitalization, and 80% of them used some type of medication during the clinical phase of Covid-19. As for the type of alopecia, 36% had alopecia areata and 72% had diffuse alopecia. Regarding the family history of capillary pathologies, 91% did not have this condition and 18% reported having some previously undergone treatment for hair loss.

Regarding comorbidities, 19% have diabetes and 19% have systemic arterial hypertension. Obesity and overweight were verified in 35% of the participants.



**Picture 1:-** Patient with diffuse alopecia, after Covid-19.

Geographically, 91% of the studied population is located in the central part of Brazil, an economically significant region. (Picture 2)



**Picture 2:-** Geographic location of the studied population.

The dermatoscopy showed the presence of black dots, yellow dots and vellus hair, allowing the diagnosis of alopecia areata (AA).

### **Discussion:-**

We endorse age, hypertension, obesity, diabetes and heart disease as risk and worsening factors for disease outcomes<sup>(8)</sup>, which corroborates the findings of Müller, et al<sup>(9)</sup> genetic factors may influence the geographical distribution of Covid-19<sup>(10)</sup>, which may explain the concentration of cases in the south eastern region of Brazil.

Regarding alopecias, they can be clinically classified as diffuse or localized. When referring to those located, they depend on the area in which they are located, as well as whether they are cicatricial or not; congenital/ hereditary or acquired.<sup>(11)</sup>

Several factors can be associated with capillary damage and among the acute stress, which can lead to telogen effluvium and alopecia areata (AA). Considering the significant impact of the Covid-19 pandemic on mental health and the psychological stress of the population;<sup>(12)</sup> the detection of these two pathologies in this research as well as our results are supported by the current literature.

Alopecia areata is a multifactorial disease that affects 1 to 3% of dermatological patients due to both genetic and autoimmune influences, and it is still significantly influenced by psychic traumas.<sup>(13)</sup> Although the exact pathophysiology remains unclear, it is related to an autoimmune reaction against hair follicles. The interaction between HLA-DR, CTLA4 and ULBP3 and emotional/physical stress and reactions to viral pathologies have been shown to play a key role in the etiology and progression of AA.<sup>(14)</sup>

As the etiologic agent of Covid-19 is of viral origin, autoimmune pathogenesis occurs through the presence of pathogens that increase the release of co-stimulating signals, allowing dendritic cell to stop present antigens more effectively, pathogens and auto-antigens. If this occurs in genetically predisposed individuals, the activation of autoreactive T lymphocytes can develop and progress.<sup>(15)</sup>

Androgenetic alopecia is physiologically based on the thinning and atrophy of hair follicles and sebaceous glands. During the process, local fibrotic structures around and below the hair follicles probably develop due to the adipocyte-myofibroblast transition involving the dermal adipocytes.<sup>(16)</sup>

When associated with Covid-19, several pathways by which androgens are involved are detected. The androgen-regulated TMPRSS2 protease is a necessary co-receptor cell for SARS-CoV-2 infection. The viral spike protein is initiated by this enzyme.<sup>(15)</sup>

Another link is the immunological modulation conducted by androgens, as androgens are immunosuppressants.<sup>(17)</sup>

The permissive adrenal phenotype of the HSD3B1 gene encodes 3 $\beta$ -hydroxysteroid dehydrogenase - 1, which is involved in the transformation of dehydroepiandrosterone into active and more powerful androgens.<sup>(18)</sup> The limitation of this study lies in the fact that the participants were not fully examined by a dermatologist.

### Conclusions:-

In addition to reinforce the association between alopecia and the presence of Covid-19 in this research, the authors suggest a larger controlled study. The alopecia detected in this study, telogen effluvium and alopecia areata, are related to several other systemic diseases, however SARS - CoV - 2 acts as a trigger in different autoimmune pathways, creating a link between the pathologies described here and generating the need for further investigations to contribute to the clinical-investigation understanding of the consequences of Covid-19 on human trichology.

### Conflict of interest:

The authors have declared there are no conflicting interests.

### Protection of people and animals:

The authors declare that the procedures followed were in accordance with the requested criteria by the heads of the Clinical Investigation Commission and Ethics and in accordance with the Helsinki Declaration of World Medical Association updated in 2013.

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