

Potential Dermatological Conditions Resulting from a Prolonged Stay at Home during the COVID-19 Pandemic: A Review

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ABSTRACT A new coronavirus emerged in 2019 in Wuhan, China named Severe Acute Respiratory Syndrome type 2 coronavirus (SARS-CoV-2). Later, this virus spread worldwide, causing a disease called coronavirus disease (COVID-19). To control the outbreak, many countries announced mandatory quarantine; thus, people changed their lifestyles and started engaging in most activities from home. This review explains how some dermatological pathologies may be precipitated by prolonged stays at home, considering that quarantine was a widely used public health measure during 2020. Most of these dermatoses had to be seen, diagnosed, and treated through tele-dermatology, a remote health care system that took force during the COVID-19 pandemic because of its ease and efficiency in connecting health care professionals and their patients; therefore, reducing the risk of contagion and costs associated to medical care. This review of the principal dermatologic conditions during confinement could allow for a better preparation of health professionals.

KEY WORDS: COVID-19, skin diseases, dermatitis, acneiform eruptions, scalp dermatoses

Quarantine as a public health measure

On December 12, 2019, a new virus of the *Coronaviridae* family was identified in Wuhan, China, later called Severe Acute Respiratory Syndrome type 2 coronavirus (SARS-CoV-2). This virus had not been previously found in humans and is presumed to have originated from mutations of two different viruses, a bat coronavirus and a pangolin coronavirus. Such recombination of genes had been observed in corona-

viruses, because that is how the Middle East Respiratory Syndrome coronavirus (MERS-CoV) appeared (1). In humans, infection with SARS-CoV-2 can be asymptomatic or can trigger the coronavirus disease (COVID-19). It may cause symptoms similar to those of the common cold, such as fever, cough, myalgia, fatigue, headache, hemoptysis, and diarrhea (2), which can progress to dyspnea, severe respiratory distress

syndrome, acute cardiac injury, and even death. In any clinical form, infected persons can transmit the virus (1).

Given the alarming disease transmission levels, the severity of the infection, and the absence of specific drugs, on March 11, 2020 the World Health Organization (WHO) declared COVID-19 a pandemic (3). The WHO then proposed the use of personal hygiene measures, social and physical distancing, and home isolation (1). In response, more than 50 countries implemented quarantine as a public health measure to contain the virus' spread, including the United Kingdom, Italy, Spain, France, Germany, Austria, South Africa, India, New Zealand, and the United States (4,5).

Quarantine is defined as restricting people's movement for a period of time to prevent or limit the risk of spreading contagious diseases (6). It involves restricting healthy or symptom-free people to their home or a facility since they may be in the incubation period of the disease. This measure has been implemented throughout the history of medicine to prevent the spread of communicable diseases, such as the bubonic plague in the Middle Ages, smallpox in the 20th century (7), SARS-CoV in 2003 (8,9), and Ebola in 2014 (5).

While quarantine effectively controls outbreaks, epidemics, and pandemics, it also has undesirable effects on people's health (10). Although there are no exact statistics on the increase of dermatoses worldwide since the beginning of the COVID-19 pandemic, several centers have described their own experiences, such as the Nevsehir State Hospital and Usak Training and Research Hospital in Turkey (11) and the Fondazione IRCCS Policlinico San Matteo in Italy (12). Additionally, some others have studied internet search trends to get a general idea of the changes and interest in dermatological consultation before and during the COVID-19 pandemic (13,14). In order

to compile the literature published so far and consider the pathogenic mechanisms of dermatological diseases, we reviewed some of the main dermatological diseases that may be triggered by prolonged stay at home. During the pandemic, many studies reported dermatological manifestations in patients infected by SARS-CoV-2 (15); however, this review aims to describe pathologies occurring during the COVID-19 pandemic in the general population. Below, we explain four major mechanisms by which we believe dermatoses are exacerbated or appear in prolonged stay-at-home periods. This information is summarized in Table 1.

Dietary effects

Isolation periods at home changes people's lifestyles, including the way we eat. The type of food consumed in confinement was a noticeable change. Collective panic and insecurity lead to an excessive purchase of ultra-processed foods (as they are non-perishable foodstuffs) that end up being harmful to the body because of a high content of salt, sugar, and trans fats (16) and its lack of nutrients and antioxidants (17). In a questionnaire survey by Adams *et al.* involving 584 families, one-third of the families reported an increase in the number of high-calorie snacks and desserts in their homes; nearly half reported a rise in non-perishable processed foods during the COVID-19 pandemic (18).

The amount of food ingested also changed. Multiple studies report weight gain due to changes in eating behaviors, such as eating food just because it is available and not because of hunger, boredom eating or eating in response to the smell of food, and eating snacks after main meals (19). Eating also became a coping mechanism for fear, anxiety, and stress caused by the situation (20). Stress stimulates the hypothalamic-pituitary-adrenal (HPA) axis by

Table 1. Summary of the main dermatological pathologies that may appear or become exacerbated by prolonged stay at home

Potential pathologies with exacerbation during prolonged stay at home	Pathophysiological mechanism			
	Dietary effects	Vitamin D efficiency	Psychological effects	Direct harmful effects on the skin
Atopic dermatitis		X		X
Acne	X		X	
Rosacea	X		X	
Psoriasis	X	X	X	
Seborrheic dermatitis			X	
Acute telogen effluvium			X	
Alopecia areata		X	X	
Burns				X
Irritant contact dermatitis				X
Photodamage by screens				X
Scabies				X

increasing cortisol secretion by the adrenal gland. Cortisol stimulates the sensation of hunger, insulin secretion, and visceral fat deposition (21), contributing to the abovementioned weight gain (22).

Weight gain, specifically obesity, is associated with systemic inflammation through the release of adipokines by macrophages and T-cells, including adiponectin, resistin, visfatin, C-reactive protein (CRP), and chemerin. These changes in quality, frequency, and volume of food generally facilitate the inflammation in diseases such as atopic dermatitis (AD), acne, rosacea, and psoriasis(23,24).

Vitamin D deficiency

Vitamin D is a fat-soluble vitamin with multiple functions in the skin, ranging from keratinocyte proliferation, differentiation, and apoptosis to barrier maintenance and immunoregulatory processes (25).

The major source of vitamin D in humans is the cutaneous synthesis in the presence of sunlight. The lockdown reduced people's exposure to sunlight, similar to or even lower than the level of exposure in winter season (26,27). This insufficient sunlight exposure has diminished vitamin D (25-hydroxycholecalciferol) absorption and its positive effects on health.

Solar ultraviolet B radiation (UVB) (290-310 nm) (28), is necessary for the reaction in which provitamin D3 (7-dehydrocholesterol), which is found at the skin level, is converted to previtamin D3 (cholecalciferol). At the hepatic level, it is converted to calcidiol (25-hydroxycholecalciferol) by hepatic 25-hydroxylase. Later, at the renal level through renal 1-alpha-hydroxylase, calcidiol is converted to calcitriol (1,25-dihydroxycholecalciferol) which is considered the active metabolite of vitamin D (29).

Because of its immunomodulatory and anti-inflammatory effects, vitamin D has been associated with the reduction of disease severity in dermatoses (30) such as AD, acne, psoriasis, and alopecia areata (AA).

Psychological effects

The COVID-19 pandemic as a whole caused psychosocial issues because of a large number of factors that came together during 2020. The loss of daily activities, modified lifestyle, social distancing, prohibition of travel, reduced social and physical contact, postponement and cancellation of events, boredom, global socioeconomic crisis, loss of income, increase in unemployment, fear of infection, uncertain disease behavior, and the increasing number of deaths (31,32) are some of the many factors that have had

an impact. Therefore, a raise in psychiatric manifestations such as addiction disorders, acute stress, insomnia, and post-traumatic stress disorder (7,22,32), but especially anxiety and depression have been reported (33).

The skin is prone to changes depending on the psychosocial state of the individual, since it shares the same embryological origin as the nervous system. It is known that the skin produces neurotransmitters, neuropeptides, and hormones according to neurological stimuli (34). Additionally, psychological stress causes an upregulation of the HPA gland axis, which stimulates the local and systemic production of stress hormones. In addition, pro-inflammatory mediators (nuclear factor- κ B, interleukin (IL) -1, IL-6 and tumor necrosis factor (TNF-alpha)) and sensory neuropeptides (nerve growth factor, corticotropin-releasing factor receptor, substance P, and calcitonin gene-related peptide) are released and stimulate mast cell degranulation and inflammation rupture of the skin barrier. The dysfunction of the cutaneous barrier prevents its normal function of limiting the invasion by immunogens and irritants. Likewise, this decrease of the epidermal lipids and the structural proteins of the skin increases transepidermal water loss (35).

This neuroendocrine modulation explains why psychological disorders can exacerbate or trigger chronic conditions of both the skin, such as AD (36), acne, rosacea, psoriasis, and seborrheic dermatitis, and of the scalp, such as acute telogen effluvium and AA. The relationship between the various dermatological pathologies and psychiatric disorders is a vicious circle. As the burden of emotional stress increases, these diseases and psychiatric and emotional disorders are triggered again. It is estimated that between 30-40% of skin diseases are accompanied by mental pathologies (37).

Direct harmful effects on the skin

The skin is the initial barrier to the external environment, so it is prone to physical, chemical, mechanical, and thermal injuries, among others. Hygiene measures were intensified during the COVID-19 pandemic, with recommendations to that effect from the Center for Disease Control and Prevention (CDC) and the WHO (38,39). Viruses, such as SARS-CoV-2, act as nanoparticles that can remain active for many hours on surfaces and then be picked up by touch. Using water alone is not sufficient to remove the virus from the skin. These recommendations consist of increasing the frequency of handwashing and using sanitizing substances if adequate hand washing is not possible. Substances commonly contain chlorhexidine,



chloroxylenol, triclosan, alcohol, quaternary ammonium compounds, iodine or iodophors, and chloroxylenol (40). These measures seek to dissolve the virus lipid membrane and alter its supramolecular interactions to ensure its inactivation. However, this can alter the barrier function of the skin at the same time (41).

A healthy skin barrier is composed of keratin and lipids of the stratum corneum. Substances such as soaps, alkaline detergents, hot water, very cold water, and rough paper towels, as well as conditions such as low humidity, frequent use of gloves, and constant friction also cause acute loss of lipids from the skin surface (42).

As the stratum corneum lipid barrier is depleted and the proteins are denatured, loss of transepidermal water occurs, allowing epidermal penetration of irritants and allergens. This can trigger an inflammatory response, exacerbating AD and irritative contact dermatitis (36,42) in skin prone to these conditions.

Likewise, direct contact with thermal agents such as fire or boiling liquids caused injury, especially in infants, where the incidence of burns seems to have increased during the COVID-19 quarantine through home accidents. The National Health Interview Survey (NHIS) added home injury questions and searched for the frequency of home injuries and ingestions in the United States since the start of the COVID-19 pandemic. In total, 26% of households reported having experienced an injury, of which 5% were burns from hot objects and 4% were scald burns (43).

Skin also is exposed to physical agents such as radiation on a daily basis. The widespread use of light-emitting diodes (LEDs) and the rapidly increasing use of smartphones, tablets, laptops, and desktop computers have led to a significant rise in the exposure to short-wavelength visible light. Recent studies show that even short exposures can increase the generation of reactive oxygen species. This oxidative stress is linked with aging signs of the skin (44).

Finally, infections are another way of direct injury to the skin or mucous membranes. Infections or colonization by organisms that live in the home environment increased during the pandemic period. The capacity of microorganisms to invade and injure structures depends on their number of and pathogenicity factors. Acari in general, such as *Sarcoptes scabiei*, played an important role during the COVID-19 quarantine (45) due to its infestation of the skin that causes scabies.

The mechanisms described above frequently trigger the following skin conditions:

Atopic dermatitis: This is a chronic inflammatory skin disease that affects up to 20% of the population in childhood and 10% in adulthood (36). It has no clear cause but is a combination of inflammation and allergic components in genetically predisposed subjects (46). Patients have a dysfunctional skin barrier that predisposes to trans-epidermal water loss, facilitating their sensitivity to allergen penetration (47). They present acute flare-ups of lesions with erythema, edema, excoriations, and exudate that are very pruritic (Figure 1). These lesions have an age-related distribution pattern. On infants they are widely distributed and often located on the face (cheeks) and trunk, with the diaper area spared. In childhood, it becomes more localized and appears on flexor surfaces. Among adolescents and adults, it typically affects the hands, eyelids, neck, and flexures (48).

Exacerbation or worsening of AD lesions during quarantine has increased due to contact with soaps, disinfectants, and household cleaning detergents, triggering lesions predominantly on the hands and even up to the arm fold (49).

It has also been said that having vitamin D deficiency is a risk factor for AD, and although the



Figure 1. Atopic dermatitis. Female teenager with generalized xerosis and poorly defined erythematous plaques in the forearm fold with scratching stigmata and some excoriations. Photograph taken by patient during dermatology consultation.



Figure 2. Acne. Young female patient with several papules, pustules, and erythematous plaques on the forehead, chin, and cheeks, as well as closed comedo on the forehead and cheeks. Some ice pick scars on the cheeks. Photograph taken by patient during quarantine and sent for teleconsultation with dermatology specialist.

evidence on the association is still contradictory, it is worth mentioning given the low exposure to sunlight during quarantine. The majority of the literature suggests a negative correlation between the severity of AD and vitamin D levels; it was found that moderate and severe AD groups had lower vitamin D levels compared with the mild AD group. It has been suggested that vitamin D ameliorates AD lesions by normalizing the altered innate immune response, inhibiting the allergic response and restoring defects in the epidermal barrier (25).

Acne vulgaris: This is a chronic inflammatory disease of the pilosebaceous unit of the skin that results in lesions such as comedones, papules, pustules, nodules, pseudocysts, and scarring in severe cases (Figure 2). There are four major mechanisms that contribute to acne lesions: overproduction of sebum, abnormal shedding of follicular epithelial cells, *Cutibacterium acnes* follicular colonization, and inflammation reactions (50).

The prevalence of acne is high during adolescence due to hormonal changes; however, it also appears in response to exogenous factors such as an unhealthy diet (51,52) and psychological background factors. Three major types of foods have been found to promote the appearance of acne lesions: hyperglycemic carbohydrates, dairy products, and saturated fats (53). These are associated with hyperglycemia,



Figure 3. Rosacea. Adult female with excoriated erythematous papules, some pustules with an erythematous base involving the cheeks, dorsum of the nose, and chin. Yellowish-bloody crusts on the chin. Photograph taken by patient during quarantine and sent for teleconsultation with dermatology specialist.

hyperinsulinemia, and increased insulin-like growth factor-1 (IGF-1), which also stimulates lipogenesis of the sebaceous glands (54). A study involving adolescents from Spain, Brazil, Italy, Colombia, and Chile showed an increase in the intake of sweets and fried foods during the COVID-19-related confinement (55). In this way, acne incidence may increase because of the rise in consumption of an unbalanced diet during the quarantine.

Acne is also precipitated by psychological stress (34). Patients often complain of breakouts following the experience of frustrating or stressful events, such as exam periods or exhausting jobs. Emotional stress increases glucocorticoids and adrenal androgens, both hormones that induce sebaceous hyperplasia and worsen acne (56). Stress also induces the release of neuroactive substances within the epidermis and can activate inflammatory processes in the skin (57,58). Substance P is a neuropeptide released from peripheral nerves in response to stress and pain. *In vitro* studies have revealed that Substance P increases the size of the sebaceous glands and the number of sebum vacuoles in sebaceous cells, suggesting that this peptide may stimulate lipogenesis of the sebaceous glands (59). Psychosocial factors secondary to the COVID-19 quarantine may explain how exacerbations of acne from a neurological point of view.

Rosacea: This is an inflammatory chronic disorder triggered by vasomotor alterations and dysfunction of the skin's sebaceous glands, mainly affecting the face and ocular region (60). This is characterized by erythema, pustules, and telangiectasia, primarily on the midface (Figure 3) (61). The pathogenesis of rosacea has not been entirely elucidated, but





Figure 4. Psoriasis. Male adult with well-defined irregular erythematous-violaceous plaques with thick desquamation on the palms and dorsum of both hands. Notice the melanonychia on the first and third fingers. Photograph taken by patient during dermatology consultation.

neuroimmunological dysfunction has been reported in patients with rosacea (62). The expression of matrix metalloproteinases is increased in patients with this disease, leading to inflammatory tissue damage and degradation of the extracellular matrix. Psychological factors such as stress, anxiety, and personality disorders are related to the exacerbation or appearance of rosacea, probably because they share common inflammatory pathways (63). This relationship requires further study since most of the literature examines the opposite relationship, i.e. rosacea as a trigger for depressive and anxious symptoms. On the other hand, the role of nutrition has been extensively studied in rosacea; heat-related, alcohol-related, capsaicin-related, and cinnamaldehyde-related are some of the food molecules that trigger rosacea, which is due to the stimulation of the Transient Receptor Potential (TRP) cation channels, which initiate pro-inflammatory cascades (64). Alcohol consumption might be the key point to some cases of rosacea exacerbation during quarantine. Studies conducted in Germany (65), the United States(66), and the UK(67) found an increase in the consumption of the above during the COVID-19 quarantine. Further studies about this association are needed.

Psoriasis: This is a chronic inflammatory systemic disease characterized by the abnormal differentiation and excessive proliferation of epidermal keratinocytes in response to the activation of the immune system by T lymphocytes (68). This leads to sharply demarcated erythematous plaques with a whitish scale, especially on the elbows, knees, and scalp (Figure 4) (69). An online survey conducted in China between February 25 and March 6, 2020, reported a moderate to high exacerbation of psoriasis on 43.7% of participants, positively associated with income loss, stress, anxiety, and depression during the

COVID-19 pandemic (70). Another study (37) identified six molecules that are increased in psoriasis and anxiety disorders as compared to normal stages: growth hormone (GH1), leptin (LEP), brain-derived neurotrophic factor (BDNF), chemokine ligand 2 (CCL2), tumor necrosis factor (TNF), and corticotropin-releasing hormone (CRH). The six factors are signaling peptides that modulate various cellular and physiological processes such as catabolism, immune response, and behavioral reactions. Of all the peptides found in this study, CRH is the most important, as it is released in states of anxiety, fear, or stress. Patients with psoriasis have an increased expression of CRH and CRH-receptors in the affected skin (71). Another mechanism that could have exacerbated psoriasis during lockdown was vitamin D absorption insufficiency. This molecule reduces T-cell proliferation, induces regulatory T-cell differentiation, and controls inflammation in psoriasis(30).

Several case-control studies have shown significantly lower levels of serum vitamin D in patients with psoriasis compared with controls and reported an inverse correlation between vitamin D levels and the severity of the disease (25). The studies were supported by the use of objective tools such as the Psoriasis Area and Severity Index (PASI) (72).

It has been suggested that certain foods or nutrients exacerbate psoriasis, such as saturated fatty, simple sugars, red meat, or alcohol, through the activation of the inflammasome cascade, generation of reactive oxygen species (ROS), production of inflammatory markers, gut dysbiosis, and suppression of regulatory T-cells. Other foods or nutrients ameliorate psoriasis, such as vitamin D, vitamin B12, short-chain fatty acids (SCFAs), dietary fibers, genistein, selenium, or probiotics, due to their suppression of inflammatory signaling (73). The impact of nutrition



Figure 5. Seborrheic dermatitis. Young man with well-defined irregular erythematous plaques with yellowish-white oily scaling located in the nasolabial folds, cheeks, and skin of the upper lip. Photograph taken by patient during quarantine and sent for teleconsultation with dermatology specialist.

on psoriasis is so important that a weight reduction may improve patients' lesions (23). This should be taken into account due to the already mentioned significant weight gain in people during COVID-19 quarantine (19,74).

Seborrheic dermatitis (SD): This is a chronic shedding of the skin rich in sebaceous glands, characterized by the appearance of erythema and oily desquamation (75) usually on the scalp, face, retro auricular region, body folds, and trunk (Figure 5). Infrequently, its presentation is generalized (76). It is characterized by periods of remission and exacerbation in response to multiple emotional and environmental factors (75). SD is often preceded by a stressful event, which suggests a poor prognosis. Emotional stress, fatigue, and depression have been shown to trigger the reactivation of the disease in almost all patients (77), so an increase in cases of SD due to emotional factors during the COVID-19 quarantine is expected to happen.

Acute telogen effluvium: This is a form of non-scarring alopecia that involves diffuse loss of hair due to early initiation of the telogen phase (78). This entity usually appears three months after physiologic stress that could involve hormonal changes, medications, febrile states, nutritional disturbances, and metabolic or emotional stress. Stress induces an abrupt change from the anagen hair cycle to the telogen phase in numerous hair follicles. For some, the confinement and the pandemic situation were sufficient to gener-



Figure 6. Alopecia areata. Middle-aged woman with rounded, well-defined alopecic area of approximately 4 centimeters in the coronal region. Some exclamation point hairs are observed within the affected area. Photograph taken by patient during quarantine and sent for teleconsultation with dermatology specialist.

ate this physiological stress. Turkmen *et al.* examined the frequency of hair and scalp pathologies during the COVID-19 quarantine. They found that the most frequent condition was acute telogen effluvium, with an incidence of 27.9%, followed by AA (2.8%) in patients who answered a web questionnaire (79). Acute telogen effluvium is a self-limited condition, and once the stressor is resolved or removed, acute telogen effluvium usually remits in about 95% of the cases (80).

Alopecia areata (AA): This is another type of non-scarring hair loss that commonly occurs as well-circumscribed patches on the scalp (Figure 6). It can progress to include the entire scalp (total alopecia) or even affect body hair (alopecia universalis). It is a complex disease that lacks signs of significant inflammation or scarring (81), in which there is a sudden transition from the anagen to the catagen phase or from the anagen phase to the telogen phase (82). Its etiology is not entirely understood, but it is believed that an autoimmune reaction occurs in genetically predisposed individuals in which autoreactive cytotoxic T-cells and IFN-gamma-secreting natural killer cells target the hair follicle, leading to acute hair loss (30) after being exposed to certain factors such as stress, infections, toxins, and even certain food items.



Figure 7. Burn. Second and third degree burn on the left hand of a middle-aged man who suffered a domestic accident after placing his hand on a stove. Tense blisters can be observed involving the middle and distal phalanx of the third finger, along with erosions on the hypothenar palmar region and the last two fingers. Photograph taken on emergency room consultation.

Up to 78% of the patients with AA have psychiatric diagnoses, such as depression, generalized anxiety disorder, and adaptive paranoid disorders. However, it can occur in people without any psychiatric history but because of a specific stressful events such as loss of a loved one, bad news, sexual abuse, etc. (83). For some, the pandemic itself acted as the emotional stressor that triggers AA. Data from the Hospital for Research and Training at Uşak, Turkey, found that the prevalence of AA in May 2020 was 1.48%, whereas before the COVID-19 pandemic it was only 0.97% (84).

Vitamin D might also play a role in AA, namely its immune modulation. This molecule plays a regulator effect on T-cells, including CD8+ T-cells, CD4+ T-cells, and Th17, contributing to attenuate or prevent the autoimmune cascade responsible for AA (85). Many studies have associated lower Vitamin D levels with AA occurrence, so the notably reduced sunlight exposure during quarantine could impact this disease. This again leads to a vicious cycle where severe stages of AA might discourage patients from public appearance and therefore from sun exposure, developing less Vitamin D absorption(86).

Burns: Burns are defined as the trauma of the skin, mucous membranes, and underlying tissues generally produced by the action of physical, chemical, and biological agents that cause coagulative necrosis of the epidermis and deeper tissues (87). Prolonged stay at home has been associated with an increase in domestic accidents (88), resulting in burns from household appliances such as stoves, ovens, and hair or clothing irons, but mainly from liquids at high temperatures such as boiling water or oil. Depending on the causal agent, the depth and classification of the burns may vary, and first-, second-, or third-degree



Figure 8. Irritative contact dermatitis. Well-defined erythematous plaque with eroded and scaly areas on the dorsal area of the left hand. Middle-aged woman presented with the above after several days of dish washer use. Photograph taken by patient during quarantine and sent for teleconsultation with dermatology specialist.

burns may be observed (Figure 7) (89,90). During the COVID-19 quarantine, a burn unit in England reported 75% and 25% of their patients were from incidents that occurred at home and work, respectively; while in this same unit in 2019, only 59% of the burns had happened at home, 13%, at work, and 28% at other places(91). Another retrospective study in Hong Kong found that scald injury was the second (34.3% n=12/35) most frequent home accident in the pediatric population between January to May 2020 (COVID-19 social isolation period) (92).

Another practice that took force during the pandemic was steam inhalation. This is traditionally used as a home remedy for common colds and upper respiratory tract infections, but became the cause for scalds stemming to the hot steam and burns from the accidental spillage of boiling water, especially in children (93).

Irritative contact dermatitis: This is an acute inflammation of the skin caused by contact with weak irritants that activate the innate immune system, causing an acute skin reaction (94). The lesions are limited to the skin area that comes in contact with the irritants. Papules or erythematous plaques can be seen in these cases (Figure 8), and if contact persists, vesicles or blisters, lichenification, erosions, and scars can appear. Patients experience itching, stinging, burning, or even pain. Repeated use of

household cleaning products is the leading cause of this condition during quarantine (47). Reactions to paints, solvents, plants, or wood are other substances also reported to be in use during home confinement.

Photodamage by screens: While exposure to solar light was reduced during the quarantine, exposure to high energy visible (HEV) light, commonly referred to as 'blue light' (400-490 nm) from electronic devices such as cell phones, tablets, computers, and televisions has increased. Whether it is for entertainment, communication, or work from home, direct and prolonged exposure to blue light is an increasing phenomenon. It is estimated that approximately four out of five people (81%) in the global workforce are affected by the closure of their workplaces, resorting to the digital transformation of their jobs (95). A questionnaire survey in France involving 1777 participants compared behaviors before and during the quarantine and reported an increase from 10% to 29% in screen exposure for more than 4 hours at night (96).

Prolonged exposure to HEV light can increase the amount of DNA damage, cell and tissue death, and injury, causing eye damage, skin barrier damage, hyperpigmentation, and photoaging (97). Various studies have demonstrated the formation of reactive oxygen species (ROS) *in vivo* and *in vitro* (98) upon irradiation with HEV light, saying its biological effects are comparable to the ones produced by ultraviolet A radiation (UVA) (320-400 nm).

HEV light and UVA induce photo-oxidation of melanogenic precursors leading to immediate pigment darkening (IPD) and persistent pigment darkening (PPD). IPD is characterized by a greyish darkening observed immediately after irradiation and fading shortly afterward, whereas a brownish-black pigmentation can develop over several weeks in PPD without the involvement of melanogenesis processes (99). Staying indoors gives a false sense of security against harmful ultraviolet radiation, so less care is taken in closed environments, such as the use of photoprotective substances.

Scabies: Scabies is a contagious skin infestation caused by *Sarcoptes scabiei* and transmitted by direct skin-to-skin contact (100). It has an incubation period of 2-3 weeks on average, and severe clinical manifestation occurs after 4-6 weeks of the first infestation. Scabies presents typical lesions such as cuniculi, papules, and nodules in specific anatomical sites such as interdigital spaces, volar surfaces of the wrists, armpits, buttocks, and external genitalia (100). *Sarcoptes* can live for up to three days outside the body at normal room temperature and tend to develop outbreaks in enclosed spaces such as hospitals,

nursing homes, and prisons. But outbreaks of this disease were seen in households during the COVID-19 pandemic, probably because of the increase in the number of people in the same place and the contact with their belongings (45). This is similar pattern as the one observed with regard to this infection during winter (101).

An experience from a hospital in Spain mentioned that patients had extended symptomatic periods before consultation, which was due to the fear of leaving home, with them ultimately becoming desperate because of pruritus as well as the frequent reinfections among cohabitants (102).

Scabies is almost the only documented infection with increased cases during the COVID-19 pandemic. More research needs to be done on other infections such as sexually transmitted diseases (STDs).

CONCLUSION

In general, many dermatological pathologies may appear or be exacerbated during a prolonged stay in enclosed places. Given that authorities have ordered the cancellation of multiple activities in most countries under quarantine, allowing only essential services to remain open, such as hospitals, pharmacies, grocery stores, and ATM machines (103), dermatology consultations were carried out remotely through teleconsultation (11,36) to avoid complications and accumulation of patients over the months.

The health emergency caused by COVID-19 represents a challenge for dermatologists since it required rethinking years of medical practice to achieve a good doctor-patient relationship, determine diagnostic approaches, and ensure adherence to and satisfaction with treatments.

Given the diversity in the dermatological pathologies discussed in this review, we consider it important to adopt a multidisciplinary approach that includes the expertise of dermatologists, psychiatrists (37), psychologists, and nutritionists to ensure improved patient management. Additionally, we suggest retrospective studies implemented to look for associations during quarantine confinement and dermatoses, including the ones mentioned in this review such as atopic dermatitis, rosacea, psoriasis, seborrheic dermatitis, and irritant contact dermatitis.

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