

PSORIASIS AND THE RELATIONSHIP WITH FOOD: INTEGRATIVE REVIEW

Psoríase e a relação com a alimentação: revisão integrativa

Psoriasis y la relación con los alimentos: revisión integradora

Thaís Verdolin Formiga¹, Marynara Resendes Parreao¹, Bárbara Paixão de Gois², Araújo Dias Pereira*³



Revista
Desafios

Artigo Original
Original Article
Artículo Original

¹ Discente do curso de Nutrição da Universidade Federal do Tocantins (UFT), Palmas-TO, Brasil.

² Nutricionista, Mestranda no programa de Pós-Graduação em Nutrição e Saúde da Universidade Federal de Goiás (PPGNUT-UFG), Goiânia-GO, Brasil.

³ Professora Doutora do curso de Nutrição da Universidade Federal do Tocantins (UFT), Palmas-TO, Brasil. E-mail: araida@mail.uft.edu.br

*Correspondência: Laboratório de Pesquisa Clínica, Curso de Nutrição, Universidade Federal do Tocantins., Av. NS 15, 109 Norte, Palmas, Tocantins, Brasil. CEP:77.010-090. araida@mail.uft.edu.br

Artigo recebido em 23/06/2020 aprovado em 03/05/2021 publicado em 04/06/2021.

ABSTRACT

Psoriasis is a chronic inflammatory disease of the skin and joints, autoimmune, and is associated with several comorbidities. The eating pattern can influence both in the prevention, treatment or its cause. This integrative review sought to understand the relation between food and psoriasis, as well as the influence and interaction of certain nutrients with it. A scientific literature survey was carried out regarding the evidence of studies on the reduction or increase in the severity of psoriasis influenced by food. It can be observed that some foods have a triggering action, such as pepper and gluten, and others collaborate for a clinical improvement, such as fish and olive oil, foods present in a Mediterranean diet. Thus, individualized nutritional care for psoriatic patients is important, so that the best nutritional management strategy can be adopted.

Keywords: Food, Diet, Nutrients, Psoriasis.

RESUMO

A psoríase é uma doença inflamatória crônica da pele e articulações, autoimune, e está associada a diversas comorbidades. O padrão alimentar pode influenciar, tanto na prevenção, tratamento ou causa da doença. Esta revisão integrativa buscou conhecer a relação dos alimentos com a psoríase, bem como, a influência e interação de determinados nutrientes com a doença. Realizou-se um levantamento na literatura científica quanto a evidência de estudos sobre a redução ou aumento da gravidade da psoríase influenciada pela alimentação. Pôde-se observar que alguns alimentos têm ação desencadeadora, como a pimenta e o glúten, e outros colaboram para melhora clínica, como peixe e azeite, alimentos presentes em uma dieta mediterrânea. Dessa forma, é importante o cuidado nutricional individualizado dos pacientes psoriáticos, de modo que a melhor estratégia de manejo nutricional possa ser adotada.

Palavras-chave: Alimento, Dieta, Nutrientes, Psoríase.

RESUMEN

La psoriasis es una enfermedad inflamatoria crónica de la piel y las articulaciones, autoinmune, y se asocia con varias comorbilidades. El patrón de alimentación puede influir tanto en la prevención como en el tratamiento o la causa de la enfermedad. Esta revisión integradora buscó comprender la relación entre la alimentación y la psoriasis, así como la influencia e interacción de ciertos nutrientes con la enfermedad. Se realizó una encuesta en la literatura científica sobre la evidencia de estudios sobre la reducción o aumento de la gravedad de la psoriasis

influenciada por los alimentos. Se observó que algunos alimentos tienen una acción desencadenante, como la pimienta y el gluten, y otros colaboran para la mejora clínica, como el pescado y el aceite de oliva, alimentos presentes en la dieta mediterránea. Por lo tanto, la atención nutricional individualizada para los pacientes psoriásicos es importante, para que se pueda adoptar la mejor estrategia de manejo nutricional.

Palabras clave: Alimentación, Dieta, Nutrientes, Psoriasis.

INTRODUCTION

Psoriasis is a skin disease described since the Christian Era and for many years it was confused with leprosy (HULSE, 1975), until the 19th century, when it was differentiated, by Robert Willian (PATALAY *et al.*, 2008). According to the International Federation of Psoriasis Associations (IFPA) and the Brazilian Association of Psoriasis, Psoriatic Arthritis and Other Chronic Skin (Psoriasis Brazil) (2021), the disease affects approximately 125 million people worldwide.

The incidence varies among demographic regions, being lower in certain countries, such as China (DING *et al.*, 2012), Taiwan (CHANG *et al.*, 2009) and higher in European countries, such as the United Kingdom (GELFAND *et al.*, 2005) and Norway (BRAATHEN *et al.*, 1989). In addition to the USA, which 2% of the population is affected (STERN *et al.*, 2004). According to Psoriasis Brazil, an estimated 5 million people are affected in the country. In general, there is a higher prevalence in adults compared to other age groups (KURD; GELFAND, 2009) and affects both sexes (GELFAND *et al.*, 2004).

The term psoriasis arose from the Greek *psoriasis*, which means itchy rash (FOX, 1915), it is a chronic inflammatory disease of the skin and joints (BOEHNCKE; SCHON, 2015), autoimmune, mediated by the defense cells TCD4 and TCD8 lymphocytes. These markers would cause the over proliferation of proinflammatory cytokines, such as interferon- γ , interleukin 1 (IL-1), interleukin 6 (IL-6) and tumor necrosis factor alpha (TNF- α), causing skin

lesions and consequently, the chronic inflammatory state (RENDON; SCHAKEL, 2019).

This disease is classified according to the appearance and location of its lesions, and is commonly found on the scalp, nails, sacral and palmoplantar region, however, it can be identified anywhere on the body (KIM *et al.*, 2017), classified into psoriasis vulgaris, reverse psoriasis, guttate psoriasis, pustular psoriasis, and erythrodermic psoriasis, which can form erythematous plaques, of different sizes and shapes (RENDON; SCHAKEL, 2019).

The chronic inflammation produced in the skin may be associated with systemic changes in the body and they are susceptible to other inflammatory-based problems and other chronic diseases, for example, insulin resistance, changes in the lipid profile, obesity, cardiovascular diseases, high blood pressure, diabetes type 2 mellitus and dyslipidemia (TAKESHITA *et al.*, 2017).

So, quality of life can be impacted, even when using medication for treatment (KORMAN *et al.*, 2016), however studies indicate that nutritional treatment can ensure a better clinical situation according to the dietary pattern and the practice of physical activities. At the same time, these two factors can play triggering roles for the development of psoriasis. Therefore, food could influence both prevention, cause and treatment, due to the interaction of food nutrients with the disease (BARREA *et al.*, 2016).

Since food interferes in psoriasis in different ways and there are few studies that relate these aspects, this literature review aims to understand the

relationship of some foods with chronic inflammatory skin disease, focusing on the influence and interaction of nutrients with the disease.

MATERIAL AND METHODS

A search was carried out using the descriptors: "psoriasis and diet therapy" and "psoriasis and food". The inclusion criteria were complete articles available electronically, whose results privileged aspects related to the interaction of food and nutrients with psoriasis. Articles published since 2010 were included. The bibliographic survey was carried out on three scientific websites: Latin American Literature in Health Sciences (LILACS), PubMed and Scielo.

Data collection took place in four stages. The first one consisting of an advanced search on scientific websites, in which, a total of 848 studies were obtained: PubMed, 827; LILACS, 14; Scielo 7. In the second stage, filtering by inclusion and exclusion

criteria was carried out. According to the criteria established for the selection and identification process, 449 studies were selected: 440 from PubMed, 4 from LILACS and 5 from Scielo. In the third stage, the abstracts were read, and 439 articles were excluded, as they did not address psoriasis, the effects of food or did not relate to diet therapy and food. In the fourth and last stage, the 10 selected articles were read in full.

RESULTS AND DISCUSSION

After reading the articles in full, two tables were constructed with the synthesis of the data, ordered by types of studies and divided into positive and negative factors. The results were discussed throughout the text. Chart 1 represents the overview of 8 selected publications, highlighting the objectives, methodological aspects and positive results. Table 2 represents the overview of 2 selected publications, highlighting the objectives, methodological aspects and negative results.

Chart 1- Description of the articles that had a positive impact, sorted by type of study.

Title	Author/Year	Type of study/ Sample	Objectives	Results	Limitations
Diet and physical exercise in psoriasis: a randomized controlled trial.	Naldi <i>et al.</i> / 2014	A randomized controlled trial/ 303 patients	Evaluate the impact of dietary intervention linked to physical exercise for weight loss in individuals with psoriasis and overweight or obesity.	It reduced the severity of psoriasis in patients with active disease, treated systemically.	Little data collection on quality of life. Collected data: BMI, waist circumference and biochemical parameters.
Energy-restricted, n-3 Polyunsaturated Fatty Acids-Rich Diet Improves the Clinical Response to	Guida <i>et al.</i> / 2014	A randomized controlled trial/ 44 patients	Evaluate the action of an energy-restricted diet, enriched with n-3 polyunsaturated fatty acids and	In psoriatic obese patients, an energy-restricted diet designed to increase n-3 and reduce n-6 PUFAs, improved the clinical outcomes of the	There were no limitations reported in the study.

Immuno-Modulating Drugs in Obese Patients with Plaque-Type Psoriasis: A Randomized Control Clinical Trial.			low in n-6 polyunsaturated fatty acids, on metabolic markers and clinical results of obese patients with psoriasis.	disease.	
A pilot study assessing the effect of prolonged administration of high daily doses of vitamin D on the clinical course of vitiligo and psoriasis.	Finamor <i>et al.</i> / 2013	Pilot clinical trial/ 9 patients with psoriasis and 16 patients with vitiligo	Evaluate the efficiency and safety of long-term treatment with high doses of vitamin D3 in patients with psoriasis and vitiligo.	The clinical condition of the 9 patients improved during treatment.	Small sample size.
Nutrition and psoriasis: is there any association between the severity of the disease and adherence to the Mediterranean diet?	Barrea <i>et al.</i> / 2015a	Cross-sectional case control study/ 62 patients	Investigate the relationship between adherence to the Mediterranean diet and the severity of psoriasis, and to evaluate patients with psoriasis without previous treatment.	The association between the Mediterranean diet and the severity of psoriasis, provides possible beneficial effects.	Small sample size and study design.
Association Between Mediterranean Anti-inflammatory Dietary Profile and Severity of Psoriasis.	Phan <i>et al.</i> / 2018	Cohort study/ 3557 patients	Assess the association between a score that represents adherence to the Mediterranean diet, and the onset and/or severity of psoriasis.	There was an anti-inflammatory association between a Mediterranean diet and the severity of psoriasis.	Participants were all volunteers, and the use of a psoriasis questionnaire derived from a self-questionnaire.
Dietary Behaviors in Psoriasis: Patient-Reported Outcomes from a U.S. National Survey.	Afifi <i>et al.</i> / 2017	Cohort study/ 1206 patients	Quantify the nutrient intake in psoriatic patients compared to controls, identify popular dietary interventions and the influence on improvement, and understand patients' attitudes and	Patients reported that skin improvement was greater after the reduction of alcohol, gluten, fennel and after adding fish oil, vegetables and vitamin D to the diet.	Potential for response bias, predominance of women, white race, living in urban areas and time lapse between patient data collection and control collection.

			conceptions about the role of diet.		
Coffee Consumption Metabolic Syndrome and Clinical Severity of Psoriasis: Good or Bad Stuff?	Barrea <i>et al.</i> / 2018	Cross-sectional case-control study/ 221 patients	Assess the association between coffee consumption and the clinical severity of psoriasis.	Coffee intake had a beneficial effect on the clinical severity of psoriasis.	Psoriatic patients who consumed decaffeinated coffee were not included.

Chart 2 - Description of studies that presented a negative impact, sorted by type.

Title	Author/Year	Type of study/ Sample	Objectives	Results	Limitations
Association Between Coeliac Disease and Psoriasis: Italian Primary Care Multicentre Study.	Bastiani <i>et al.</i> / 2015	Multicenter clinical trial/ 218 patients	Evaluate the prevalence of celiac disease in patients with psoriasis, and response to a gluten-free diet in individuals with psoriasis and celiac disease in primary care.	High prevalence of celiac disease, so gluten can act as a trigger in psoriasis, and improvement of skin lesions in celiac disease under a gluten-free diet.	Small number of patients with psoriasis and with evidence of associated celiac disease. It was not a blind assessment.
Pilot study on foods to avoid in psoriasis sufferers.	Festugato/ 2011	Case control study/ 43 patients	Highlight some foods that can act as a trigger and/or aggravating factor in psoriasis and enable individual strategies for foods that should be introduced.	Suspension of some foods, such as pepper, contributed to a better treatment result.	Any type of score was used.

Nine of the ten articles selected were from foreign journals and were available in English. Only five in Portuguese. Considering the time constraint, it was possible to verify that this theme is not recent in

the literature, it has been studied since 1952. However, only in the last ten years it has been more discussed and highlighted. It was observed that the greatest interest in this field of research is

concentrated in Italy, in which, six studies came from. The rest were from Brazil and France. About the type of study, six articles are experimental studies and four observational, one cohort and two case-controls.

Regarding patients, the age ranged from 10 to 89 years old. Five clinical studies were performed with averaged 50 years old patients and only two articles were with patients in the elderly. In terms of gender, seven articles found a higher prevalence of psoriasis in men and the other three in women.

The theme psoriasis and food has been a target of interest, in order to outline nutritional strategies to improve the clinical status. Among the articles, five of them reported the relationship between psoriasis and food related to specific diets: three on a restricted energy diet; two on the Mediterranean diet and one on a gluten-free diet. The others related the disease to specific foods and/or nutrients, specially: coffee, two studies; pepper, one study; vitamin D, two studies and polyunsaturated fatty acids, three.

Energy Restricted Diet

The evidences indicate that obesity leads to development of psoriasis, and may also play a role in the worsening of existing psoriasis (JENSEN; SKOV, 2016), using pro inflammatory pathways that are present in white adipose tissue, which in people with obesity, favors an inflammatory low level condition, and this state is determining to the relation between obesity and autoimmune diseases. Obesity is a chronic disease in which excess energy deposits, causes the weight increase (KYLE *et al.*, 2016), and it is more prevalent in developed countries compared to developing ones (APOVIAN, 2016).

A randomized controlled trial study with 44 psoriatic patients and with a BMI > 30 kg/m², provided evidence that a diet with energy restriction

has a positive impact on patients with obesity and psoriasis, in which along with the weight loss, there was a 50% reduction of PASI, and the significant improvement reported in the Quality of Life in Dermatology Index (GUIDA *et al.*, 2014).

Also, a randomized controlled test with 303 patients with obesity and psoriasis, pointed that the intervention with the restricted diet combined with physical exercise led to reduced sensitivity of the disease (NALDI *et al.*, 2014). Kong *et al.* (2019) demonstrated that it's important to considerate the patient's body weight, however, the focus on the loss of weight is because of the reducing of the adipokines secretion and inflammation induced by them in the obesity condition.

With respect to the secretion of adipokines, the highest level of factor tumor- α necrosis (TNF- α) is able to reduce adiponectin (SEREFLICAN *et al.*, 2016), which plays regulatory role in skin inflammation, which contributes to the development of psoriasis in obesity (SHIBATA *et al.*, 2015).

The use of TNF- α inhibitors in psoriatic patients has shown an increase in adiponectin, however, some studies indicate that the administration of anti-tumor alpha in the treatment of this disease may be correlated with weight gain (VOLOSHYNA *et al.*, 2016).

A clinical non-randomized study with 45 patients, associated an energy restricted diet with the treatment with anti-TNF- α in patients with psoriasis, in order to avoid weight gain, and to get better response therapy with inhibitors of TNF- α (CAMPANATI *et al.*, 2017), since weight gain increases the secretion of adipokines and thus raises the level of necrosis factor α tumor, which in turn favors the development of psoriasis (SHIBATA *et al.*, 2015).

Finally, the energy restricted diet prevents weight gain and consequently the increase of

inflammation in obesity, playing an important role in clinical status of patients with obesity and psoriasis.

Mediterranean Diet

The Mediterranean diet, in addition to be a healthy dietary standard (SERRA-MAJEM; ORTIZ-ANDRELLUCCHI, 2018), is considered a model of sustainable lifestyle (DERNINI *et al.*, 2017) associated with reducing the risk of inflammation over a long period (AKBARALY *et al.*, 2015). Thus, it reduces the risk of cardiovascular diseases (MARTÍNEZ-GONZÁLEZ *et al.*, 2015), metabolic (DI DANIELE *et al.*, 2017) and several chronic inflammatory diseases due to the large number of antioxidants and anti-inflammatories present in food (BILLINGSLEY; CARBONE, 2018). It is rich in fruits, vegetables, cereals, fish and extra virgin olive oil, with reduced consumption of dairy products, meat and eggs (VITIELLO *et al.*, 2016).

A cross-sectional observational study with 62 individuals, found that the adherence to the Mediterranean diet and the higher consumption of extra virgin olive oil, that is, a source of monounsaturated fatty acid, is associated with a decrease in the severity of psoriasis (BARREA *et al.*, 2015a). A similar type of study, conducted with 41 patients, based on the 7-day dietary records, found that the lower intake of monounsaturated fatty acid is linked to the progression of psoriasis (BARREA *et al.*, 2015b) and higher PASI score (JAAKKOLA *et al.*, 2018).

Another cohort study, carried out with 3557 psoriatic patients, found an association between adherence to the Mediterranean diet and the onset and/or severity of psoriasis (PHAN *et al.*, 2018), in which they used MEDI-LITE, a score for scoring adherence to the Mediterranean diet (SOFI *et al.*, 2017). The study found that patients with low levels

of adherence to diet exhibited severe psoriasis (PHAN *et al.*, 2018).

Therefore, in different studies and score types, PASI and MEDI-LITE, a positive relationship between an anti-inflammatory diet and the clinical status of psoriasis is perceived. In which, this evidence may support the hypothesis that the Mediterranean diet may delay the severity of psoriasis.

Gluten-free Diet

The celiac disease, an autoimmune disease that afflicts the small intestine primarily, improves when gluten is excluded from diet (CAIO *et al.*, 2019), that is, a wheat-free diet (kamut, spelled and others), oats, barley and rye, ingredients that are found in bread, beer, pasta, cereals, wafer distributed in the Catholic Church, among other processed foods (MELINI; MELINI, 2019).

Some studies propose a link between psoriasis and sensitivity to gluten (NAGUI, *et al.*, 2011; WU *et al.*, 2012; AKBULUT, *et al.*, 2013; KOLCHAK, *et al.*, 2017). In a prospective multicenter study, in which 218 patients were evaluated, a significant improvement in PASI was found in patients who adhered to a gluten-free diet (BASTIANI *et al.*, 2015).

However, a recent observational study found no association between gluten intake and psoriasis, but the type of study is limited, as it did not assess the impact of gluten intake on the severity of the disease (DRUCKER, *et al.*, 2020). Given the above, for psoriatic patients with positive celiac antibodies, a diet excluding gluten may offer benefits in improving the clinical condition.

Coffee

Coffee is considered one of the most consumed beverages in the world (HIGASHI, 2019),

it includes in its chemical composition, mainly, caffeine, caffeic acid, chlorogenic and diterpenes (cafestol and kahweol) (MOREIRA *et al.*, 2017). It also includes other components that when biochemically active can have a huge impact on the etiology of diseases, such as cancer and inflammatory diseases (BULDAK *et al.*, 2018).

The beneficial effects of caffeic acid (CA) have already been explored and found, for example, in cardiovascular conditions (VOSKOBOINIK *et al.*, 2019), especially its performance as an antioxidant. However, it is important to note that this role occurs when it is used in a certain dose, up to 200 ml per day (ZAMPELAS *et al.*, 2004), if it exceeds this limit, it can act as a pro-oxidant (KHAN *et al.*, 2016).

A Brazilian case-control study, carried out with 43 psoriatic patients, found that there was an improvement in the lesions when suspending the coffee from the diet, however the study did not use any score (FESTUGATO, 2011). There is still insufficient evidence to link coffee intake to the clinical status of psoriasis, so the relevance of the anti-inflammatory effect of this food on the disease is still unclear (SHARIF *et al.*, 2017).

However, a cross-sectional observational case-control study with 221 psoriatic patients who drank 3 cups of coffee a day, demonstrated that they had low clinical severity with a lower PASI score (BARREA *et al.*, 2018). Thus, it is possible to realize that coffee possibly does not act in the aggravation of the disease.

In addition, the routine intake of coffee can increase adiponectin, which is an adipokine with anti-inflammatory effect. A recent *in vitro* study showed the ability of coffee to play an anti-inflammatory and immunosuppressive role (GOKCEN; ŞANLIER, 2019), this immunosuppressive activity is due to caffeine that acts by preventing the release of pro-inflammatory cytokines (FESTUGATO, 2011).

Pepper

Pepper is a capsaicinoid, that is, a set of several molecules with capsaicin, a substance that causes the aroma and spicy taste (SPILLER *et al.*, 2008). Some studies report beneficial functions of capsaicin, such as anti-inflammatory, antioxidant and anti-itch (ANANDAKUMAR *et al.*, 2008; BASITH *et al.*, 2016,). It also works to improve cardiac, liver function and insulin sensitivity (PANCHAL *et al.*, 2018).

However, capsaicin, can induce interleukin 8 (IL-8) in the intestinal epithelium, acting as a trigger for inflammation, as in psoriasis (FESTUGATO, 2011). In a study carried out with 43 psoriatic patients, it was found that 44.19% of them consumed pepper. After discontinuing consumption, 88.37% of the patients observed an improvement in the lesions (FESTUGATO, 2011). There are still few studies that relate pepper to the clinical condition of the disease, though.

Vitamin D

Vitamin D is an active mode of the steroid hormone originating from cholesterol, it can also be known as calcitrol or 1.25 - hydroxy vitamin D (FINAMOR *et al.*, 2013). This vitamin is mainly synthesized in the skin by exposure to the sun and does not have much availability in food (BIZZARO *et al.*, 2017). About 10% of the human genome has positions occupied by vitamin D receptors, even so the deficiency of this vitamin is very recurrent, and has been associated with several diseases, such as autoimmune ones (AZRIELANT; SHOENFELD, 2017).

A pilot clinical trial, carried out in Brazil, in which 9 patients with psoriasis participated, found a significant improvement in the disease, after six months of vitamin D3 supplementation (FINAMOR *et al.*, 2013). Vitamin D plays an important role in

immune homeostasis (ORGAZ-MOLINA *et al.*, 2012) and is related to the significant decrease in the PASI score.

Even though it is available in foods such as salmon, sardines and egg yolks, in some cases supplementation is necessary (CHANG; LEE, 2019), with a daily recommendation of 200 to 600 IU according to the RDA (BIZZARO *et al.*, 2017).

Polyunsaturated Fatty Acids (PUFAs)

Fatty acids are considered fundamental substances for the structural design components of cells, organs and tissues, as well as for the formation of biologically active structures (SOKOLA-WYSOCZANSKA *et al.*, 2018). The definition of PUFAs is made by the position of the double or triple bond closest to the end of the fatty acid methyl group, the best known are PUFA Omega 3 and PUFA Omega 6, both of which cannot be synthesized by mammals, so they must be consumed in the diet (MARION-LETELLIER *et al.*, 2015).

PUFA n-3 is called linolenic acid (ALA), which through denaturation or elongation is converted into eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), and PUFA n-6 is known as linoleic acid (LA) and gives rise to arachidonic acid (AA) and gamma-linolenic acid (GLA). AA is a precursor of prostaglandins, as which are an important element in inflammatory processes, in contrast, experimental evidence arising that the nutritional intervention with PUFA n-3, antagonize the metabolism of eicosanoids derived from n-6, generating anti-inflammatory prostaglandins (MARION-LETELLIER *et al.*, 2015).

This anti-inflammatory effect of omega 3 is an essential component in wound recovery and tissue regeneration. Some enzymes involved in the synthesis of prostaglandins have demonstrated implications for psoriasis (GUIDA *et al.*, 2014).

Dietary intervention, which alters the amount of omega 3 and 6 in the diet, has been shown to be effective in the clinical improvement of this disease (FESTUGATO, 2011, AFIFI *et al.* 2017).

The Western diet is low in PUFA n-3, which are found in foods such as fish, seafood, nuts, flaxseed and among other foods (GAMMONE *et al.*, 2018). Afifi *et al.* (2017), when evaluating dietary interventions, reported that one of the most common and that generated improvement in skin lesions, was the consumption of fish oil, possibly omega 3.

Research has increased and shown benefits of a diet rich in n-3 fatty acids for the skin (HUANG *et al.*, 2018), a randomized clinical trial study conducted with 44 patients affected by plaque psoriasis, found improvement in disease severity, due to reduced PASI (GUIDA *et al.*, 2014). Therefore, it is possible to verify a positive relationship between the clinical status of psoriasis and polyunsaturated fatty acids.

CONCLUSION

It is noticed that when it comes to discussing the issues related to psoriasis, many studies address nutrition trying to understand its impact on reducing or increasing the severity of the disease. It is already clear that some foods can have a negative influence, such as pepper and gluten, which are considered triggers. In the other hand, some can help controlling the disease, such as those that are part of the Mediterranean diet, which contains fish, olive oil, fruits, and vegetables. Another commonly explored factor is the positive impact of calorie-restricted diets in patients with obesity. There is a disease improvement as a result of an improved inflammatory profile due to weight reduction.

With regard to coffee, it possibly does not act in worsening the disease, but despite its known antioxidant effect, more research is needed to

elucidate its influence on the clinical improvement of psoriasis.

Some nutrients do play a role in clinical improvement, such as vitamin D, which is available in few foods, and the omega-3 fatty acid, which is highly available in fish. Although there are no dietary recommendations established by the psoriasis guidelines, the relationship between food, nutrients and psoriasis is clear. Therefore, individualized nutritional counseling for patients with psoriasis is of utmost importance, as appropriate nutritional guidance is able to promote improvement in clinical status.

Authors have declared that there is no potential conflict of interest regarding this article.

REFERENCES

AFIFI, L.; DANESH, M.J.; LEE, K.M.; BEROUKHIM, K.; FARAHNIK, B.; *et al.* Dietary Behaviors in Psoriasis: Patient-Reported Outcomes from a U.S. National Survey. ***Dermatology and therapy***, 2017, v.7, n.2, p. 227–242. [Doi:10.1007/s13555-017-0183-4](https://doi.org/10.1007/s13555-017-0183-4)

AKBARALY, T.N.; SHIPLEY, M.J.; FERRIE, J.E.; VIRTANEN, M.; LOWE, G.; *et al.* Long-term adherence to healthy dietary guidelines and chronic inflammation in the prospective Whitehall II study. ***The American Journal of Medicine***. 2015, v.128, n.2, p.152–160.e4. [Doi:10.1016/j.amjmed.2014.10.002](https://doi.org/10.1016/j.amjmed.2014.10.002).

AKBULUT, S.; GUR, G.; TOPAL, F.; SENEL, E.; TOPAL, F.; *et al.* Saritas Ü. Celiac Disease-Associated Antibodies in Psoriasis. ***Annals of Dermatology***, 2013, v.25, p.298. [Doi: 10.5021 / ad.2013.25.3.298](https://doi.org/10.5021/ad.2013.25.3.298).

ANANDAKUMAR, P.; KAMARAJ, S.; JAGAN, S.; RAMAKRISHNAN, G.; VINODJKUMAR, R.; DEVAKI, T. Capsaicin modulates pulmonary antioxidant defense system during benzo(a)pyrene-induced lung cancer in swiss albino mice. ***Phytotherapy Research***, 2008 v.22, p.529–533. [Doi:10.1002/ptr.2393](https://doi.org/10.1002/ptr.2393)

AZRIELANT, S.; SHOENFELD, Y. Vitamin D and the Immune System. ***The Israel Medical Associations Journal***, 2017, v.19, n.8, p.510-511. Disponível em: https://pubmed.ncbi.nlm.nih.gov/28825771/?from_term=vitamin+D&from_filter=simsearch2.ffrft&from_filter=ds1.y_5&from_page=4&from_pos=9

BARREA, L.; BALATO, N.; DI SOMMA, C.; MACCHIA, P.E.; NAPOLITANO, M.; *et al.* Nutrition and psoriasis: is there any association between the severity of the disease and adherence to the Mediterranean diet?. ***Journal of translational medicine***, 2015a, v.13, n.18. [Doi:10.1186/s12967-014-0372-1](https://doi.org/10.1186/s12967-014-0372-1)

BARREA, L.; MACCHIA, P.E.; TARANTINO, G.; DI SOMMA, C.; PANE, E.; *et al.* Nutrition: a key environmental dietary factor in clinical severity and cardio-metabolic risk in psoriatic male patients evaluated by 7-day food-frequency questionnaire. ***Journal of Translational Medicine***. 2015b, v.13, p.303. [Doi:10.1186/s12967-015-0658-y](https://doi.org/10.1186/s12967-015-0658-y)

BARREA, L.; MUSCOGIURI, G.; DI SOMMA, C.; ANNUZIATA, G.; MEGNA, M.; *et al.* Coffee consumption, metabolic syndrome and clinical severity of psoriasis: good or bad stuff?. ***Archives Toxicology***. 2018, v.92, n.5. p.1831–1845. [Doi:10.1007/s00204-018-2193-0](https://doi.org/10.1007/s00204-018-2193-0)

BARREA, L.; NAPPI, F.; DI SOMMA, C.; SAVANELLI, M.M.; FALCO, A.; *et al.* Environmental Risk Factors in Psoriasis: The Point of View of the Nutritionist. ***International Journal of Environmental Research and Public Health***, 2016, v.13, n.5, p.743. [Doi:10.3390/ijerph13070743](https://doi.org/10.3390/ijerph13070743)

BASITH, S.; CUI, M.; HONG, S.; CHOI, S. Harnessing the Therapeutic Potential of Capsaicin and Its Analogues in Pain and Other Diseases. ***Molecules***. 2016, v.21, n.8, p.966. [Doi:10.3390/molecules21080966](https://doi.org/10.3390/molecules21080966)

BASTIANI, R.; GABRIELLI, M.; LORA, L.; NAPOLI, L.; TOSETTI, C.; *et al.* Association between coeliac disease and psoriasis: Italian primary care multicentre study. ***Dermatology***. 2015, v.230, n.2, p.156–160. [Doi:10.1159/000369615](https://doi.org/10.1159/000369615)

- BILLINGSLEY, H.E.; CARBONE, S. The antioxidant potential of the Mediterranean diet in patients at high cardiovascular risk: an in-depth review of the PREDIMED. **Nutrition & Diabetes**. 2018, v.8, n.1, p.13. Doi:10.1038/s41387-018-0025-1
- BIZZARO, G.; ANTICO, A.; FORTUNATO, A.; BIZZARO, N. Vitamin D and Autoimmune Diseases: Is Vitamin D Receptor (VDR) Polymorphism the Culprit?. **The Israel Medical Association Journal**. 2017, v.19, n.7, p.438–443. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/28786260/>
- BOEHNCKE, W.H.; SCHON, M.P. Psoríase. **The Lancet**, 2015, v.386, p.983-994. Doi: 10.1016 / s0140-6736 (14) 61909-7
- BRAATHEN, L.R.; BOTTEN, G.; BJERKEDAL, T. Prevalence of psoriasis in Norway. **Acta Dermato-Venereologica Supplementum**, 1989, v.142, n.5-8. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/2763787/>.
- BULDAK, R.J.; HEJMO, T.; OSOWSKI, M.; BULDAK, L.; KUKLA, M.; *et al.* The Impact of Coffee and Its Selected Bioactive Compounds on the Development and Progression of Colorectal Cancer In Vivo and In Vitro. **Molecules**, 2018, v.23, n.12, p.3309. Doi:10.3390/molecules23123309.
- CAIO, G.; VOLTA, U.; SAPONE, A.; LEFFLER, D.A.; GIORGIO, R.D.; *et al.* Celiac disease: a comprehensive current review. **BMC Medicine**, 2019, v.17, n.1, p.142. Doi:10.1186/s12916-019-1380-z.
- CAMPANATI, A.; MOLINELLI, E.; GANZETTI, G.; GIULIODORI, I.; MINETTI, M.; *et al.* The effect of low-carbohydrates calorie-restricted diet on visceral adipose tissue and metabolic status in psoriasis patients receiving TNF-alpha inhibitors: results of an open label controlled, prospective, clinical study. **Journal of Dermatological Treatment**. 2017, v.28, n.3, p.206–212. Doi:10.1080/09546634.2016.1214666.
- CHANG, S.W.; LEE, H.C. Vitamin D and health - The missing vitamin in humans. **Pediatrics and Neonatology**. 2019, v.60, n.3, p.237-244. Doi:10.1016/j.pedneo.2019.04.007
- CHANG, Y.T.; CHEN, T.J.; LIU, P.C.; CHEN, Y.C.; CHEN, Y.J.; *et al.* Epidemiological study of psoriasis in the national health insurance database in Taiwan. **Acta Dermato-Venereologica**, 2009, v.89, p.262-6. Doi: 10.2340 / 00015555-0642.
- DERNINI, S.; BERRY, E.M.; SERRA-MAJEM, L.; LA VECHIA, C.; CAPONE, C.; *et al.* Med Diet 4.0: the Mediterranean diet with four sustainable benefits. **Public Health Nutrition**. 2017, v.20, n.7, p.1322–1330. Doi:10.1017/S1368980016003177
- DI DANIELE, N.; NOE, A.; VIDIRI, M.F.; MORICONI, E.; MARRONE, G.; *et al.* Impact of Mediterranean diet on metabolic syndrome, cancer and longevity. **Oncotarget**, 2017, v.8, n.5, p.8947-8979. Doi:10.18632/oncotarget.13553
- DING, X.; WANG, T.; SHEN, Y.; WANG, X.; ZHOU, C.; *et al.* Prevalence of psoriasis in China: a population-based study in six cities. **European Journal of Dermatology**, 2012, v.22, p.663-7. Doi: 10.1684 / ejd.2012.1802
- DRUCKER, A.M.; QURESHI, A.A.; THOMPSON, J.M.; LI, T.; CHO, E. Gluten intake and risk of psoriasis, psoriatic arthritis, and atopic dermatitis among United States women. **Journal of the American Academy Dermatology**, 2020, v.82, n.3, p.661-665. Doi: 10.1016/j.jaad.2019.08.007.
- FESTUGATO, M. Estudo piloto sobre alimentos que devem ser evitados nos portadores de psoríase. **Anais Brasileiros de Dermatologia**. Rio de Janeiro, v.86, n.6, p.1103-1108, 2011. [Doi:10.1590/S0365-05962011000600006](https://doi.org/10.1590/S0365-05962011000600006) .
- FINAMOR, D.C.; SINIGAGLIA-COIMBRA, R.; NEVES, L.C.; GUTIERREZ, M.; SILVA, J.J.; *et al.* A pilot study assessing the effect of prolonged administration of high daily doses of vitamin D on the clinical course of vitiligo and psoriasis. **Dermato-endocrinology**, 2013, v.5, n.1, p.222–234. [Doi.org/104161/derm.24808](https://doi.org/104161/derm.24808)
- FOX, H. DERMATOLOGY OF THE ANCIENTS. **Journal of the American Medical Association**, 1915, p.469. Doi:10.1001/jama.1915.02580060001001.

- GAMMONE, M.A.; RICCIONI, G.; PARRINELLO, G.; D'ORAZIO, N. Omega-3 Polyunsaturated Fatty Acids: Benefits and Endpoints in Sport. **Nutrients**. 2018, v.11, n.1, p.46. Doi:10.3390/nu11010046
- GELFAND, J.M.; FELDMAN, S.R.; STERN, R.S.; THOMAS, J.; ROLSTAD, T.; MARGOLIS, D.J. Determinants of quality of life in patients with psoriasis: a study of the United States population. **Journal of the American Academy of Dermatology**, 2004, v.51, n.5, p.704–708. Doi: 10.1016 / j.jaad.2004.04.014
- GELFAND, J.M.; WEINSTEIN, R.; PORTER, S.B.; NEIMANN, A.L.; BERLIN, J. A.; MARGOLIS, D.J. Prevalence and Treatment of Psoriasis in the United Kingdom. **Archives of Dermatology**, 2005, v.141, n.12. Doi:10.1001/archderm.141.12.1537
- GOKCEN, B.B.; ŞANLIER, N. Coffee consumption and disease correlations. **Critical Reviews in Food Science and Nutrition**. 2019, v.59, n.2, p.336–348. Doi:10.1080/10408398.2017.1369391
- GUIDA, B.; NAPOLEONE, A.; TRIO, R.; NASTASI, A.; BALATO, N.; *et al.* Energy-restricted, n-3 polyunsaturated fatty acids-rich diet improves the clinical response to immuno-modulating drugs in obese patients with plaque-type psoriasis: a randomized control clinical trial. **Clinical Nutrition**. 2014, v.33, n.3, p.399–405. Doi: 10.1016/j.clnu.2013.09.010
- HIGASHI, Y. Coffee and Endothelial Function: A Coffee Paradox?. **Nutrients**, 2019, v.11, n.9, p.2104. Doi:10.3390/nu11092104
- HUANG, T.H.; WANG, P.W.; YANG, S.C.; CHOU, W.L.; FANG, J.Y. Cosmetic and Therapeutic Applications of Fish Oil's Fatty Acids on the Skin. **Marine Drugs**. 2018, v.16, n.8, p.256. Doi:10.3390/md16080256
- HULSE, EV. The nature of biblical “leprosy” and the use of alternative medical terms in modern translations of the Bible. **Palestine Exploration Quartely**, 1975, v.107, p.87-105. Doi: 10.1017 / s0025727300022250.
- IFPA. INTERNATIONAL FEDERATION OF PSORIASIS ASSOCIATIONS. Acesso em 28 de Outubro, 2020. <https://ifpa-pso.com/>
- JAAKKOLA, M.K.; MCGLINCHEY, A.J.; KLÉN, R.; ELO, L.L. PASI: A novel pathway method to identify delicate group effects. **PLoS One**. 2018, v.13, n.7, p.e0199991. Doi:10.1371/journal.pone.0199991
- JENSEN, P.; SKOV, L. Psoriasis and Obesity. **Dermatology**. 2016, v.232, n.6, p.633–639. Doi:10.1159/000455840
- KHAN, F.A.; MAALIK, A.; MURTAZA, G. Inhibitory mechanism against oxidative stress of caffeic acid. **Journal of Food Drug Analysis**. 2016, v.24, n.4, p.695–702. Doi:10.1016/j.jfda.2016.05.003
- KIM, W.B.; JEROME, D.; YEUNG, J. Diagnosis and management of psoriasis. **Canadian Family Physician Medecin**, 2017, v.63, n.4, p.278-285.
- KOLCHAK, N.A.; TETARNIKOVA, M.K.; THEODOROPOULOU, M.S.; MICHALOPOULOU, A.P.; THEODOROPOULOS, D.S. Prevalence of antigliadin IgA antibodies in psoriasis vulgaris and response of seropositive patients to a gluten-free diet. **Journal of Multidisciplinary Healthcare**, 2017, v.11, p.13-19. Doi: 10.2147/JMDH.S122256.
- KONG, Y.; ZHANG, S.; WU, R.; SU, X.; PENG, D.; *et al.* New insights into different adipokines in linking the pathophysiology of obesity and psoriasis. **Lipids in Health and Disease**. 2019, v.18, n.1, p.171. Doi:10.1186/s12944-019-1115-3
- KORMAN, N.J.; ZHAO, Y.; PIKE, J.; ROBERTS, J. Relationship between psoriasis severity, clinical symptoms, quality of life and work productivity among patients in the USA. **Clinical and Experimental Dermatology**, 2016, v.41, n.5, p.514-521. Doi:10.1111/ced.12841
- KURD, S.K.; GELFAND, J.M. The prevalence of previously diagnosed and undiagnosed psoriasis in adults in the USA: Results of the NHANES 2003-2004. **Journal of the American Academy of Dermatology**, 2009, v.60, n.2, p.218-224. Doi: 10.1016 / j.jaad.2008.09.022

- KYLE, T.K.; DHURANDHAR, E.J.; ALLISON, D.B. Regarding Obesity as a Disease: Evolving Policies and Their Implications. **Endocrinology and Metabolism Clinics of North America**. 2016, v.45, n.3, p.511–520. Doi:10.1016/j.ecl.2016.04.004
- MARION-LETELLIER, R.; SAVOYE, G.; GHOSH, S. Polyunsaturated fatty acids and inflammation. **International Union of Biochemistry and Molecular Biology Life**. 2015, v.67, n.9, p.659–667. Doi:10.1002/iub.1428
- MARTÍNEZ-GONZÁLEZ, M.A.; SALAS-SALVADÓ, J.; ESTRUCH, R.; CORELLA, D.; FITÓ, M.; *et al.* Benefits of the Mediterranean Diet: Insights From the PREDIMED Study. **Progress in Cardiovascular Diseases**. 2015, v.58, n.1, p.50–60. Doi:10.1016/j.pcad.2015.04.003
- MELINI, V.; MELINI, F. Gluten-Free Diet: Gaps and Needs for a Healthier Diet. **Nutrients**, 2019, v.11, n.1, p.170. Doi:10.3390/nu11010170
- MOREIRA, A.S.P.; NUNES, F.M.; SIMÕES, C.; MACIEL, E.; COIMBRA, A.M.; *et al.* Data on coffee composition and mass spectrometry analysis of mixtures of coffee related carbohydrates, phenolic compounds and peptides. **Data in Brief**. 2017, v.13, p.145–161. Doi:10.1016/j.dib.2017.05.027
- NAGUI, N.; EL NABARAWY, E.; MAHGOUB, D.; MASHALY, H.; SAAD, N.; *et al.* Estimation of (IgA) anti-gliadina, anti-endomísió e transglutaminase de tecido no soro de pacientes com psoríase . **Clinical and Experimental Dermatology**, 2011, v.36, p.302–304. Doi: 10.1111 / j.1365-2230.2010.03980.x.
- NALDI, L.; CONTI, A.; CAZZANIGA, S.; PATRIZI, A.; PAZZAGLIA, M.; *et al.* Diet and physical exercise in psoriasis: a randomized controlled trial. **British Journal of Dermatology**. 2014, v.170, n.3, p.634-642. Doi:10.1111/bjd.12735
- ORGAZ-MOLINA, J.; BUENDÍA-EISMAN, A.; ARRABAL-POLO, M.A.; RUIZ, J.C.; ARIAS-SANTIAGO, S. Deficiency of serum concentration of 25-hydroxyvitamin D in psoriatic patients: a case-control study. *Journal of the American Academy Dermatology*, 2012, v.67, n.5, p.931-8. Doi: 10.1016/j.jaad.2012.01.040.
- PANCHAL, S.K.; BLISS, E.; BRONW, L. Capsaicin in Metabolic Syndrome. **Nutrients**. 2018, v.10, n.5, p.630. Doi:10.3390/nu10050630
- PATALAY, R.; LESLIE, K.S.; LEVELL, N.J. Robert Willan and the age of enlightenment. **International Journal of Dermatology**, 2008, v.47, p.297-300. Doi: 10.1111 / j.1365-4632.2008.03355.x
- PHAN, C.; TOUVIER, M.; KESSE-GUYOT, E.; ADJIBADE, M.; HERCBERG, S.; *et al.* Association Between Mediterranean Anti-inflammatory Dietary Profile and Severity of Psoriasis: Results From the NutriNet-Santé Cohort. **JAMA dermatology**. 2018, v.154, n.9, p.1017–1024. [Doi:10.1001/jamadermatol.2018.2127](https://doi.org/10.1001/jamadermatol.2018.2127).
- PSORIASIS BRASIL. Associação Brasileira de Psoríase, Artrite Psoriásica e de Outras Doenças Crônicas de Pele. Acesso em Fevereiro, 2021. <https://psoriedadebrasil.org.br/>
- RENDON, A.; SCHAKEL, K. Psoriasis Pathogenesis and Treatment. **International Journal of Molecular Sciences**, v.20, n.6, p.1475, 2019. Doi:10.3390/ijms20061475
- SEREFILICAN, B.; GOKSUGUR, N.; BUGDAYCI, G.; POLAT, M.; HAYDAR, P.A. Serum Visfatin, Adiponectin, and Tumor Necrosis Factor Alpha (TNF- α) Levels in Patients with Psoriasis and their Correlation with Disease Severity. **Acta Dermatovenerol Croat**. 2016, v.24, n.1, p.13–19. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/27149125/>
- SERRA-MAJEM, L.; ORTIZ-ANDRELLUCCHI, A. The Mediterranean diet as an example of food and nutrition sustainability: a multidisciplinary approach. **Nutricion Hospitalaria**, 2018, v.35, p.96-101. Doi:10.20960/nh.2133.
- SHARIF, K.; WATAD, A.; BRAGAZZI, N.L.; ADAWI, M.; AMITAL, H.; *et al.* Coffee and autoimmunity: More than a mere hot beverage!. **Autoimmunity Reviews**. 2017, v.16, n.7, p.712–721. Doi:10.1016/j.autrev.2017.05.007

SHIBATA, S.; TADA, Y.; HAU, C.S.; MITSUI, A.; KAMATA, M.; *et al.* Adiponectin regulates psoriasisform skin inflammation by suppressing IL-17 production from $\gamma\delta$ -T cells. **Nature Communications**. 2015, v.6, p.7687. Doi:10.1038/ncomms8687

SOFI, F.; DINU, M.; PAGLIAI, G.; MARCUCCI, R.; CASINI, A. Validation of a literature-based adherence score to Mediterranean diet: the MEDI-LITE score. **International Journal of Food Sciences and Nutrition**. 2017, v. 68, n. 6, p. 757-762. Doi: 10.1080/09637486.2017.1287884

SOKOLA-WYSOCZANSKA, E.; WYSOCZANSKI, T.; WAGNER, J.; CZYZ, K.; BODKOWSKI, R.; *et al.* Polyunsaturated Fatty Acids and Their Potential Therapeutic Role in Cardiovascular System Disorders-A Review. **Nutrients**. 2018, v.10, n.10, p.1561. Doi:10.3390/nu10101561

SPILLER, F.; ALVES, M.K.; VIEIRA, S.M.; CARVALHO, T.A.; LEITE, C.E.; *et al.* Anti-inflammatory effects of red pepper (*Capsicum baccatum*) on carrageenan- and antigen-induced inflammation. **Journal of Pharmacy and Pharmacology**, 2008, v.60, p.473-478. Doi:10.1211/jpp.60.4.0010

STERN, R.S.; NIJSTEN, T.; FELDMAN, S.R.; MARGOLIS, D.J.; ROLSTAD, T. Psoriasis Is Common, Carries a Substantial Burden Even When Not Extensive, and Is Associated with Widespread Treatment Dissatisfaction. **Journal of Investigative Dermatology Symposium Proceedings**, 2004, v.9, n.2, p.136-139. Doi:10.1046/j.1087-0024.2003.09102.x

TAKESHITA, J.; GREWAL, S.; LANGAN, S.M.; MEHTA, N.N.; OGDIE, A.; *et al.* Psoriasis and comorbid diseases: Epidemiology. **Journal of the American Academy of Dermatology**. 2017, v.76, n.3, p.377-390. Doi: 10.1016/j.jaad.2016.07.064.

VITIELLO, V.; GERMANI, A.; CAPUZZO, D.E.; DONINI, L.M.; DEL BALZO, V. The New Modern Mediterranean Diet Italian Pyramid. **Annali di Igiene: medicina preventiva e di comunita**. 2016, v.28, n.3, p.179-186. Doi:10.7416/ai.2016.2096

VOLOSHYNA, I.; MOUNESSA, J.; CARSONS, S.E.; & REISS, A.B. Effect of inhibition of interleukin-12/23 by ustekinumab on the expression of leptin and leptin receptor in human THP-1 macrophages. **Clinical and experimental dermatology**, 2016, v.41, n.3, p.308-311. [Doi.org/10.1111/ced.12699](https://doi.org/10.1111/ced.12699)

VOSKOBOINIK, A.; KOH, Y.; KISTLER, P.M. Cardiovascular effects of caffeinated beverages. **Trends in Cardiovascular Medicine**. 2019, v.29, n.6, p.345-350. Doi: 10.1016/j.tcm.2018.09.019.

ZAMPELAS, A.; PANAGIOTAKOS, D. B.; PITSAVOS, C.; CHRYSOHOOU, C.; STEFANADIS, C. Associações entre o consumo de café e marcadores inflamatórios em pessoas saudáveis: o estudo ATTICA. **The American Journal of Clinical Nutrition**, 2004, v. 80, n. 4, p. 862-867. Doi: 10.1093 / ajcn / 80.4.862.

WU, J.J.; NGUYEN, T.U.; POON, K.Y.T.; HERRINTON, L.J.; LISA, J. The association of psoriasis with autoimmune diseases. **Journal of the American Academy of Dermatology**, 2012, v.67, n.5, p.924-930. Doi:10.1016/j.jaad.2012.04.039