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REVIEW ARTICLE

The role of nutrition in patients with pemphigus receiving prolonged corticosteroid therapy

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Pemphigus is a rare autoimmune blistering disorder that affects the skin and mucous membranes, characterised by acantholysis due to IgG-mediated autoantibody interference with desmoglein-mediated keratinocyte adhesion. Despite advances in immunosuppressive therapy, managing pemphigus remains a challenge. Both disease pathology and treatments, especially corticosteroids, contribute to nutritional deterioration. Extensive skin lesions cause high protein loss, and mucosal involvement leads to dysphagia, which leads to reduced dietary intake. At the same time, long-term steroid use will intensify the malnutrition condition due to the adverse effects of the medication, such as insulin resistance, obesity, dyslipidaemia, and calcium/vitamin D depletion. This review highlights the critical yet often overlooked role of nutritional management in pemphigus clinical care. Routine nutritional screening using Nutritional Risk Screening (NRS-2002), recognised as a more reliable tool than body mass index (BMI), should be implemented along with a thorough evaluation of both macronutrient and micronutrient intake to enhance wound healing and mitigate steroid-related adverse effects. Specific recommendations include complex carbohydrates, omega-3 fatty acids, and oral nutrition supplementation. Moreover, avoiding dietary triggers such as thiol-, phenol-, and tannin-rich foods is advised to reduce flare risk in genetically susceptible individuals.

Keywords: pemphigus, prolonged corticosteroid therapy, critical role of nutrition

Introduction

Pemphigus is a group of rare autoimmune skin diseases that can be life-threatening. Pemphigus is characterised by the formation of blisters due to an autoimmune reaction involving mucocutaneous tissues. The combination of genetic susceptibility factors and IgG-mediated autoantibodies that bind the epidermal keratinocyte adhesion complex, specifically desmosomes, triggers the loss of intercellular adhesion known as acantholysis, underlying pemphigus pathogenesis.[1,2]

The incidence of pemphigus varies depending on the geographic location and the majority ethnic group in the region. The highest incidence is found in Israel among the Jewish ethnic group, at 16.1 cases per 1 million people.[3] Pemphigus exacerbation is one of the emergency conditions in dermatology fields that involves the oral mucosa and oesophagus, causing dysphagia and contributing directly to malnutrition depending on the severity of the disease.

Extensive skin peeling causes high protein loss, multiorgan dysfunction, and potentially sepsis.[4] Currently, the mainstay treatment consists of steroids and immunosuppressive agents, which in the long term will cause a decline in nutritional status, prolong the healing phase, and increase mortality.[5] Meta-analysis data demonstrated that glucocorticoid consumption within the first 3 months at a dose equivalent to more than or equal to 5 milligrams of prednisone will decrease calcium absorption and increase the risk of various other metabolic disorders. Thus, it can be concluded that both pemphigus itself and its management will cause a decline in nutritional status, both acutely and chronically.[6]

Based on this, nutritional therapy support is very crucial in the management of pemphigus, considering that the main treatment is steroid agents, which have long-term adverse effects in the form of metabolic and nutritional disorders. Optimal nutritional management includes macronutrients, micronutrients, and additional supplementation, which will accelerate the healing process, especially in flare-up periods, and minimise the adverse effects of steroids, which will improve the patient's quality of life.[5,6]

However, to date, literature discussing optimal nutritional management and recommendations for pemphigus patients remains limited. Therefore, this literature review will discuss the role of nutrition as an adjuvant treatment for pemphigus, which is expected to reduce morbidity and mortality in pemphigus patients.

Method

This literature review was conducted following a structured approach to identify, select, and synthesise relevant studies addressing the role of nutrition in patients with pemphigus undergoing prolonged corticosteroid therapy. The search strategy encompassed electronic databases including PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar, covering publications from August 2014 to August 2024. Keywords and Medical Subject Headings (MeSH) used in various combinations included: 'pemphigus', 'pemphigus vulgaris', 'autoimmune blistering diseases', 'corticosteroid therapy', 'long-term glucocorticoid use', 'nutrition', 'malnutrition', 'dietary recommendations', 'macronutrients', 'micronutrients', and 'nutritional supplementation'. Boolean operators ('AND' and 'OR') were applied to refine the search.

Inclusion criteria comprised original research articles, systematic reviews, meta-analyses, clinical guidelines, and case reports that discussed nutritional aspects, dietary recommendations, or metabolic effects in pemphigus patients receiving prolonged corticosteroid therapy. Studies in English and Indonesian were considered. Exclusion criteria included conference abstracts without full text, non-peer-reviewed literature, animal studies, and articles unrelated to nutritional management in pemphigus or corticosteroid-induced metabolic effects.

Titles and abstracts of retrieved records were screened for relevance, followed by a full-text review to confirm eligibility. Reference lists of included studies were manually searched to identify additional relevant publications. Data from selected sources were extracted and organised thematically, focusing on the epidemiology of malnutrition in pemphigus, the impact of long-term corticosteroid therapy on nutritional status, recommended macro- and micronutrient intake, and dietary modifications to prevent disease exacerbations. The synthesis process emphasised integrating clinical and biochemical evidence to generate comprehensive recommendations. Given the narrative nature of this review, no formal risk-of-bias assessment or meta-analysis was performed. However, preference was given to high-quality evidence from systematic reviews, clinical practice guidelines, and peer-reviewed original studies.

Pemphigus

Pemphigus refers to a group of chronic vesicobullous autoimmune diseases that cause intradermal blistering on the skin and mucous membranes. Pemphigus is characterised by the presence of circulating autoantibodies in the form of Immunoglobulin G (IgG) that bind to the surface of keratinocytes.[7,8] To date, epidemiological studies related to the prevalence and incidence of pemphigus globally remain limited. Previous epidemiological studies have shown that the incidence of pemphigus varies significantly depending on geographical conditions and the predominant ethnic groups in the region. The incidence of pemphigus in Asia ranges from 1.6 to 16.1 per million people, with pemphigus vulgaris being the most common subtype, accounting for 55% of autoimmune blistering disease cases in RSUP Ngoerah, Denpasar, Bali.[10] The incidence of pemphigus in Europe ranges from 0.5 to 8 cases per 1 million people. In Northern Europe, such as Iceland and Finland, the incidence is higher, at 6.8 cases per 1 million people.[3,9]

In the case of pemphigus vulgaris, autoantibodies will bind to desmoglein 1 and 3, calcium-dependent adhesion molecules that are located in the upper and lower epidermis with a molecular weight of 130 kD.[11] Numerous studies have demonstrated that genetic factors play an important role in the pathogenesis of pemphigus. The genetic factors identified are human leucocyte antigen (HLA) class II, specifically HLA DRB1*0402 and HLA DQB1*0503.[12] Polyclonal autoantibodies can also be found in pemphigus patients, where, during the acute phase, IgG4 subclass dominates, as this immunoglobulin is responsible for producing autoantibodies against desmoglein 3, and during the remission phase, IgG1 dominates. The titre of these autoantibodies correlates with the severity of pemphigus. The role of CD4+ T cells, particularly Th2 cells, is to regulate autoantibody production, and autoreactive T cells secrete interleukin 4, 10, and IFN-γ while producing autoantibodies against desmoglein 3. This process begins with the presentation of desmoglein antigen by antigen-presenting cells (APCs) to CD4 + and CD8+ T cells.[13]

The manifestation of pemphigus vulgaris can be classified into mucosal-dominant, mucocutaneous, or cutaneous-only types (which is the rarest case).[14] Generally, lesions begin in the oral mucosa and will affect the skin within a certain time; the range of time until the skin is involved differs in every individual. Involvement of the oral mucosa presents as the formation of blisters that easily rupture, leaving erosions and crusts accompanied by pain, particularly in the buccal region (inner cheek area), and may lead to weight loss and malnutrition. Lesions may also appear in other locations on mucous membranes besides the oropharyngeal mucosa, such as the lining of the larynx, oesophagus, conjunctiva, nose, genitalia, and anus. Lesions on the body most commonly occur on the skin of the head, upper body, and intertriginous areas.[12] Skin lesions present in loose blisters characterised by positive Nicolsky signs I and II.[15]

Pemphigus can be diagnosed based on physical examination and simple laboratory examination, such as Tzank smear, which is stained using Giemsa solution, which will show an image of acantholytic cells under microscopic examination.[15] Tzank smear is very helpful in resource-limited settings. However, biopsy or immunohistochemistry remains the gold standard examination.[16] Histopathology examination will reveal intraepidermal acantholysis, gaps in the suprabasal layer, and the presence of basal keratinocytes attached to the basement membrane zone (BMZ) but not attached to the keratinocytes next to them, giving a characteristic appearance known as a 'row of tombstones'.[14,17]

The management of pemphigus involves a multidisciplinary approach with primary focus on accelerating healing of the skin and mucosal lesions to prevent secondary infection, reducing the duration of hospital stay, improving functional status, and reducing the side effects that commonly occur due to long-term corticosteroid use.[17] Currently, the mainstay treatment during disease flare-up periods is corticosteroids.[18] Based on guidelines published by the British Journal of Dermatology in 2017, the initial dose of corticosteroids is 1 milligram of prednisolone per kilogram of bodyweight within the first 2–3 weeks, combined with a steroid-sparing agent.[19]

According to the European Dermatology Forum (EDF) guidelines, azathioprine is the first-line adjuvant therapy for pemphigus vulgaris. This drug works by limiting DNA and RNA synthesis and inhibiting purine metabolism. The dosage of azathioprine used is 2–3 mg/kg/day. Another adjuvant is mycophenolate mofetil (MMF), which is rapidly absorbed and converted into the active metabolite mycophenolic acid (MPA). This metabolite selectively inhibits inosine monophosphate dehydrogenase and inhibits purine synthesis in T cells and B cells, thereby inhibiting the proliferation of T cells and B cells. In pemphigus vulgaris, the recommended initial dose of MMF is 2–3 grams/day, divided into two doses. However, the efficacy of azathioprine is said to be superior to that of mycophenolate mofetil.[18]

Intravenous immunoglobulin (IVIg) may be used as a treatment for refractory pemphigus vulgaris. The IVIg dose used is 400 mg/kg/day for 5 days, and IVIg has minimal side effects and does not increase the risk of secondary infection, making it a suitable option for the management of pemphigus in children and adults. Biological agents such as rituximab are also indicated for refractory pemphigus. Rituximab is a monoclonal antibody targeting the CD20 antigen in B cells. The rituximab dose is an intravenous injection of 1 000 mg every 2 weeks. Other adjuvant therapies, such as methotrexate and cyclophosphamide, are

rarely used due to their weak level of evidence and strength of recommendation.[19] Other treatments include wound care using sterile gauze, 0.9% NaCl solution, and paraffin-based tulle to accelerate re-epithelialization by making the area around the lesion moist.[4]

Several complications may arise in patients with pemphigus. One of the most common complications is dysphagia and malnutrition. The presence of erosive lesions and crusts on the oral mucosa, pharynx, larynx, and the lining of the oesophagus can cause dysphagia, leading to a decline of nutritional status in pemphigus patients.[5] Furthermore, severe pemphigus with extensive lesion areas can cause hypercatabolism due to extensive epidermal shedding, resulting in increased resting energy expenditure. Extensive inflammation causes serum albumin to shift into the interstitial space due to increased vascular permeability, where albumin is required for cell proliferation in the context of skin renewal, as well as to enhance immune function. Both acute and chronic conditions experienced by pemphigus patients will lead to hypoalbuminemia and increase patient mortality.[20]

The prognosis for this disease has improved significantly since the discovery and administration of corticosteroids as the main treatment, as shown by the data of survival rates for pemphigus vulgaris, which reached 86.9% within one year.[21] Pemphigus patients who are at high risk of malnutrition will experience an increase in mortality rates. Mortality and morbidity in pemphigus patients with malnutrition can be reduced through integrating nutritional management in our practice by doing routine nutritional status screening and giving the patient adequate nutrition, including the use of oral nutrition supplements (ONS). A study by the European Society for Clinical Nutrition and Metabolism found that mortality rates in adult patients with malnutrition who received ONS were lower (14.7%) compared with those who did not receive ONS (35%).[22]

Nutritional status in patients with pemphigus

To date, only a few studies have evaluated epidemiological data on malnutrition in pemphigus patients. In the study by Cunha et al., pemphigus patients on long-term corticosteroid therapy demonstrated similar anthropometric measures compared with healthy controls, but had significantly higher serum triglyceride levels, suggesting possible metabolic alterations related to prolonged steroid exposure rather than differences in fat mass per se. The study also found that the height-creatinine index (%) of pemphigus patients was lower than that of healthy controls (64.8% vs. 90.1%), indicating that pemphigus patients on long-term corticosteroid therapy experience a decrease in muscle mass, as reflected in the amount of urinary creatinine excretion.[23]

Other studies have also found that pemphigus patients generally experience malnutrition due to increased resting energy expenditure (REE) during exacerbations. If the assessment of the body surface area (BSA) affected is more than 30% the PDAI score is > 25, or if at least two mucous membranes are affected, the condition is classified as severe. Additionally, the response to widespread and extensive inflammation increases metabolic requirements due to increased resting energy expenditure (REE) and can increase energy requirements by up to 250%, a condition referred to as hypercatabolism.[24] Mucocutaneous involvement leads to impaired food intake, which may cause immune system dysregulation, an indirect cause, elevate the risk of infection, and prolong wound healing in pemphigus patients.[25]

Based on studies, pemphigus patients may also experience vitamin D deficiency and hypocalcaemia. Steroid administration in pemphigus patients also affects calcium and vitamin D levels. Long-term corticosteroid use reduces intestinal calcium absorption by antagonising vitamin D activity, increases renal calcium excretion, and promotes bone resorption, which together can lead to hypocalcaemia. Low vitamin D levels in patients with pemphigus vulgaris may additionally be caused by a decrease in the skin's ability to produce vitamin D, as occurs in patients with burns.[26]

Evaluation of nutritional status in pemphigus patients receiving corticosteroid therapy should be conducted periodically. The Nutritional Risk Screening 2002 (NRS-2002) is a practical and more reliable tool suitable for both outpatient and inpatient settings, demonstrating higher sensitivity (88%) and specificity (92%) than body mass index (BMI) due to its inclusion of nutritional parameters and disease severity.[27,28] This tool can also be an indicator for dermatologists to know when to collaborate with a clinical nutritionist in daily practice. Specifically for pemphigus, disease severity within the NRS-2002 is classified based on body surface area (BSA) involvement: score 1 for BSA < 8%, score 2 for 9–28%, and score 3 for > 29%.[29] An NRS-2002 score of $\geq$ 3 indicates malnutrition, signalling dermatologists to collaborate closely with clinical nutritionists.[30]

Adverse effects of glucocorticoid use on nutritional status

Glucocorticoids (GCs) are hormones secreted physiologically by the adrenal cortex and act as anti-inflammatory and immunosuppressive agents. However, long-term use of glucocorticoids has some adverse effects on multiple organs and metabolic issues. In general, the side effects of long-term corticosteroid administration on nutritional status include hyperglycaemia, hyperlipidaemia, obesity, hypernatremia, and hypocalcemia.[6]

Studies report that the risk of developing type II diabetes mellitus and obesity in individuals who consume long-term corticosteroids increases two to four times that of non-diabetic subjects due to the effects of steroids on insulin biosynthesis and resistance to cells and tissues. Cushing's syndrome and moon face are phenomena also experienced as a result of long-term corticosteroid consumption due to the occurrence of fat distribution and lipolysis.[31,32] In addition to causing obesity as a side effect due to increased fat tissue deposition, long-term use of corticosteroids is also known to cause abnormal changes in lipid profiles or dyslipidaemia. This condition is characterised by increased levels of total cholesterol, triglycerides, low-density lipoprotein (LDL), and decreased levels of high-density lipoprotein (HDL). The exact cause of this condition is still unclear, but it is suspected to be due to corticosteroids affecting lipid metabolism, through increased lipolysis, increased lipoprotein lipase (LPL), increased adipokine activity, increased insulin resistance, and inhibition of free fatty acid oxidation by beta-oxidase.[33]

Furthermore, long-term corticosteroid use can increase blood pressure due to hypernatremia. This condition is caused by stimulation of mineralocorticoid receptors by exogenous glucocorticoids, which then leads to Na + retention in the kidneys, volume expansion, and ultimately increased blood pressure. Long-term corticosteroid therapy can also increase calcium resorption in bones and increase calcium excretion in the kidneys, leading to hypocalcaemia and increasing the risk of secondary osteoporosis and non-traumatic osteonecrosis. Glucocorticoids increase the risk of fractures in both men and

women, regardless of bone mineral density (BMD) and prior fracture history.[31]

Recommended nutrition for pemphigus patients undergoing long-term corticosteroid therapy

The recommended nutritional intake for pemphigus patients can be classified according to the type of nutrients, namely macronutrients and micronutrients, particularly organic compounds such as vitamins. Macronutrients that are important for pemphigus patients consist of carbohydrates, proteins, and fats. However, as yet, there has been limited research discussing the specific nutritional needs of pemphigus patients. Previous studies have recommended certain nutritional components for patients with clinical signs of malnutrition due to long-term corticosteroid therapy, which includes pemphigus patients. The calorie intake in cases of malnutrition varies, with studies reporting a total daily intake between 800 and 1 400 kilocalories (kcal), which is substantially below estimated requirements. In cases of increased energy demands, such as during hypermetabolic states, total daily energy needs may be increased to 25–30 kcal/kg of bodyweight.[5,24]

Adequate carbohydrate intake is necessary for fibroblast production and movement, as well as leukocyte activity. Carbohydrates can also stimulate the secretion of hormones and growth factors, including insulin, which play a role in anabolic processes during the proliferative phase. To date, research on carbohydrate intake recommendations for pemphigus patients remains limited. However, for patients undergoing long-term corticosteroid therapy, a carbohydrate intake of approximately 45–60% of total energy is recommended, with the exact proportion individualised according to metabolic status. In patients with glucocorticoid-induced insulin resistance or impaired glucose tolerance, lower proportions within this range and an emphasis on low glycaemic index, high-fibre carbohydrate sources are advisable. The type of carbohydrate should also be considered, with complex carbohydrates preferred over simple carbohydrates to avoid spikes in the glycaemic index, particularly in patients receiving long-term steroid therapy, such as pemphigus patients. Some examples of foods classified as complex carbohydrates are high-fibre foods composed of longer glucose chains (oligosaccharides or polysaccharides). Examples of foods with complex carbohydrate structures include high-fibre foods such as vegetables, fruits, beans, legumes, whole grains, and brown rice.[34,35]

The protein requirements of patients with extensive lesions such as pemphigus are known to increase by up to 50% due to significant protein loss. In severe cases with extensive mucocutaneous involvement, a high-protein diet, up to 2–3 grams/kgBW/day, may be considered, typically administered via nasogastric feeding when oral intake is compromised.[24] This aggressive approach should be individualised based on renal function and metabolic status and is supported by narrative clinical reviews. For patients with a history of long-term corticosteroid use without chronic kidney disease (CKD), a daily protein intake of 1.2–1.5 g/kgBW/day is recommended. Meanwhile, for patients with a history of long-term corticosteroid use and a history of CKD, a protein intake of 0.6 g/kgBW/day is recommended.[36] Additional protein intake can be obtained from egg white extract or additional albumin supplementation. Based on a study reported by Detarun et al., egg white extract consumed for 8 weeks resulted in a significant increase in serum albumin levels in patients with chronic diseases.[37] Administration of albumin formula for 45 days at a dose determined by bodyweight, as determined by a clinical nutritionist, also resulted in a significant increase in serum albumin.[38]

Fats also play a structural role in the cell membrane layer during tissue growth in the wound-healing process. Similar to carbohydrates, fat selection also needs to be considered in PV patients receiving steroids due to the risk of dyslipidaemia and lipid metabolism changes.[39] Replacing saturated fats with unsaturated fats such as monounsaturated fatty acids (MUFA) may be considered in patients undergoing long-term steroid therapy to reduce the side effects of dyslipidaemia. Polyunsaturated fatty acids (PUFAs) from both dietary sources and supplementation, such as omega-3 and certain omega-6 fatty acids, may have immune-modulating effects. The anti-inflammatory benefits are most clearly established for omega-3 PUFAs, whose metabolites, such as resolvins (RvD1 and RvD2), inhibit immune activation and increase Treg cell levels. While some omega-6 fatty acids, like linoleic acid, can have beneficial roles, excessive intake, especially with a high omega-6:omega-3 ratio, may favour pro-inflammatory eicosanoid production. Thus, a balanced intake of these fatty acids is recommended. However, research on the specific dosage of omega-3 fatty acid supplementation in patients with pemphigus vulgaris has not yet been conducted.[7] Some food sources containing omega-3 and omega-6 as sources of PUFA include fish, seaweed, and nuts as sources of omega-3, while sources of omega-6 include eggs, vegetable oil, fresh seafood, and red meat.[40] The recommended dietary intake (RDI) for omega-3 is approximately 0.5% of total daily energy intake, while the RDI for omega-6 is approximately 2% of total daily energy intake. Women require 5 grams of omega-6 and 1 gram of omega-3 per day, while men require 6.4 grams of omega-6 and 1.6 grams of omega-3 per day.[41]

Hypernatremia, which can occur as a side effect of long-term steroid treatment, warrants limiting daily sodium intake to < 1 500 mg/day, as recommended in glucocorticoid nutrition guidelines and consistent with the American Heart Association's target for high-risk adults.[6,42] To date, there have been no studies evaluating sodium administration in pemphigus patients; however, pemphigus patients are at high risk of developing hypernatremia due to long-term corticosteroid use. According to the American College of Rheumatology, adult patients taking prednisone at a dose of 2.5 mg or more per day for three months or longer should optimise their vitamin D intake with supplementation of 600–800 IU and calcium intake of 1 000–1 200 mg per day to prevent glucocorticoid-induced osteoporosis.[43]

Vitamin D is one of the vitamins that often decreases in patients taking long-term corticosteroids, including pemphigus patients. Although there are no guidelines for vitamin D administration in pemphigus patients, the Endocrine Society guidelines recommend vitamin D supplementation of 1 500–2 000 IU per day to consistently increase vitamin D levels above 30 ng/ml in patients at risk of vitamin D deficiency. Vitamin D supplementation in adult patients with vitamin D insufficiency or deficiency is recommended at a dose of 6 000 IU/day for 3 months, with a maximum daily dose of 10 000 IU. It is further recommended to monitor vitamin D levels every 1–1.5 months during supplementation to prevent toxicity from excessive doses.[44]

In addition to vitamin D, calcium intake of approximately 950–1 000 mg/day is also recommended for healthy adults, while US

guidelines indicate that this should be increased to 1 200 mg/day for adults aged > 70 years.[6] Vitamin C is an important cofactor in collagen biosynthesis and can protect the endothelium by increasing collagen synthesis and aiding the wound healing process during the proliferative and remodelling phases. To date, no studies have investigated the effects of vitamin C supplementation in pemphigus patients. However, previous studies suggest that vitamin C supplementation at doses of 500 mg to 2 grams per day may be considered to aid wound healing.[45]

High doses of corticosteroids can deplete vitamin A stores in the liver. Vitamin A can counterbalance the anti-inflammatory effects of corticosteroids on wound healing; therefore, systemic vitamin A supplementation may be considered in patients with acute or chronic wounds receiving immunosuppressive therapy to accelerate wound healing.[46]

The Dietary Reference Intake (DRI) for vitamin A is 700 mg or 2 310 IU per day for women and 900 mg or 3 333 IU per day for men. Specific guidelines and recommendations for vitamin A administration to PV patients have not been found. Zinder et al. recommend oral vitamin A supplementation at 15 000–20 000 IU/day for 14–21 days in patients receiving chronic corticosteroid therapy to enhance wound healing, with the caveat that such high doses approach toxicity thresholds and should be administered only short term, under close monitoring of liver function.[47]

In pemphigus patients who are in remission, certain foods containing specific compounds should be avoided to prevent exacerbation. Foods containing thiols, phenols, tannins, and thiocyanates are not recommended for pemphigus patients because, in some patients with genetic susceptibility, these compounds can trigger disease exacerbation. Foods high in thiols include garlic, peanuts, and mangoes; phenol-rich foods include black tea, coffee, and certain berries. Tannin-rich foods include grapes, pomegranates, and some nuts, and thiocyanate-containing foods include cruciferous vegetables such as cabbage, broccoli, and Brussels sprouts.[48]

Clinical implications and future research directions

Integration of systematic nutritional assessment into standard care protocols for pemphigus patients represents a critical yet often overlooked component of comprehensive management. A multidisciplinary approach involving dermatologists, nutritionists, internal medicine specialists, and other specialists is essential to address the complex interplay between disease activity, treatment side effects, and nutritional status. Implementation of regular screening using validated tools such as NRS-2002 at the time of diagnosis, during flare-up conditions, and follow-up visits could facilitate early identification of at-risk patients. Moreover, the development of pemphigus-specific nutritional guidelines could standardise care and potentially reduce treatment-related morbidity and mortality while improving healing rates and quality of life outcomes.

Despite these promising implications, several knowledge gaps persist, highlighting important directions for future research. Prospective cohort studies are needed to evaluate the long-term impact of optimised nutritional interventions on disease outcomes, steroid-sparing effects, and relapse rates in pemphigus patients. Such studies should incorporate measurement of relevant biomarkers that might serve as predictors of nutritional deterioration or treatment response. Additionally, randomised controlled trials comparing different nutritional supplementation protocols could help establish evidence-based recommendations for specific macro- and micronutrient requirements in this population. Future research should also explore the potential synergistic effects between nutritional optimisation and emerging biological therapies, which may enhance treatment efficacy while minimising adverse effects. Finally, the development and validation of a pemphigus-specific nutritional assessment tool that accounts for the unique challenges of vesiculobullous autoimmune diseases would significantly advance clinical practice in this field. These research endeavours would contribute substantially to bridging the current evidence gap and improving comprehensive care for pemphigus patients.

Conclusion

Optimal nutritional status is crucial for supporting skin healing processes, reducing the risk of secondary infections, and minimising the long-term side effects of steroids, which are the first-line treatment for pemphigus. Routine nutritional screening using the NRS-2002 tool, collaborating with a clinical nutritionist when needed, and the provision of additional supplementation when necessary should be an integral part of the holistic management of this condition. Additionally, clinicians should provide comprehensive education to patients regarding the importance of a balanced diet and the avoidance of foods that may trigger exacerbations of pemphigus.

Author contributions

All authors contributed equally to this study.

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