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EVALUATING CO-MORBIDITIES IN BULLOUS PEMPHIGOID: CLINICAL PROFILES, TREATMENT OUTCOMES, AND DISEASE SEVERITY

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ABSTRACT

Background: Bullous pemphigoid (BP) is a chronic autoimmune blistering disorder that predominantly affects the elderly and is often associated with multiple co-morbidities. This study aimed to evaluate the proportion of co-morbidities in patients with BP and compare them with controls, along with assessing the impact of these conditions on disease severity and treatment outcomes.

Materials and Methods: This retrospective cross-sectional study included 124 BP patients and 124 age- and gender-matched controls. Detailed demographic, clinical, and laboratory data were collected. The presence of co-morbidities, including hypertension, diabetes mellitus, ischemic heart disease, stroke, and others, was recorded. BP patients were further categorized into those with and without co-morbidities to assess differences in disease severity, treatment response, and clinical outcomes. Statistical analysis was performed using appropriate tests, with $p<0.05$ considered significant.

Results: BP patients had significantly higher rates of hypertension (46.0% vs. 32.3%; p=0.034), diabetes mellitus (35.5% vs. 22.6%; p=0.041), and peripheral neuropathy (16.1% vs. 6.5%; p=0.031) compared to controls. Hemoglobin levels were significantly lower in BP patients (10.9 ± 1.7 g/dL vs. 12.3 ± 1.4 g/dL; $p<0.001$), while inflammatory markers such as total leukocyte count, ESR, CRP, and serum creatinine were significantly elevated ($p<0.05$ for all). BP patients with co-morbidities were significantly older (69.3 ± 10.1 years vs. 62.5 ± 10.3 years; p=0.004), had longer disease duration (10.4 ± 3.8 months vs. 8.3 ± 3.2 months; p=0.013), and exhibited more severe disease (p=0.019). Treatment response was less favorable in BP patients with co-morbidities, with a lower complete response rate (47.9% vs. 66.7%; p=0.048).

Conclusion: BP patients demonstrated a higher burden of co-morbidities, which significantly impacted disease severity and treatment outcomes. Screening for and managing co-morbidities should be an integral part of BP management to improve prognosis and therapeutic success.

Keywords: Bullous pemphigoid, co-morbidities, hypertension, diabetes mellitus, peripheral neuropathy, disease severity, treatment outcomes.

INTRODUCTION

Bullous pemphigoid (BP) is the most common autoimmune blistering disorder, predominantly affecting older adults, with an estimated incidence ranging from 2.5 to 42.8 cases per million per year in Western populations, while data from India remain limited.[1] BP is characterized by autoantibodies directed against BP180 and BP230, key components of hemidesmosomes that maintain dermal-epidermal adhesion. This autoimmune response leads to subepidermal blister formation, pruritic eruptions, and significant morbidity.[2]

Emerging evidence suggests that BP is associated with a higher prevalence of systemic co-morbidities, particularly neurological and cardiovascular conditions.[3] Studies have reported that patients with BP have a significantly increased risk of neurodegenerative disorders, including Alzheimer's

disease, Parkinson's disease, and multiple sclerosis, with odds ratios ranging from 1.5 to 4.5 in various cohorts.[4,5] This association is hypothesized to result from shared immunological mechanisms, including cross-reactivity between neuronal and epidermal antigens.[6] Additionally, metabolic conditions such as diabetes mellitus and dyslipidemia are reported in BP patients at higher rates than the general population, with diabetes prevalence reported to be as high as 27% in some studies.[7,8]

Cardiovascular diseases, including ischemic heart disease, stroke, and atrial fibrillation, have also been frequently observed in BP patients. One large-scale study found that BP patients had a 1.8-fold increased risk of major cardiovascular events compared to controls.[9] Furthermore, BP patients often present with multiple risk factors such as hypertension (seen in up to 60% of cases) and obesity, further compounding their overall morbidity.[10]

In India, the burden of BP-related co-morbidities remains underexplored, despite the increasing prevalence of chronic diseases and aging populations. Given the substantial morbidity linked to BP and its associated conditions, understanding the co-morbid profile in Indian patients is essential to improve clinical outcomes.[9,10] This study aimed to determine the proportion of co-morbidities in patients with and without BP, contributing to evidence-based management strategies and multidisciplinary care approaches.

MATERIALS AND METHODS

Study Design and Setting: This retrospective cross-sectional study was conducted at the Department of Dermatology, in a tertiary care center of North India, for a period of 1 year between November 2023 to October 2024. Ethical clearance for the study was obtained from the Institutional Ethics Committee (IEC). Written informed consent was obtained from all participants before enrollment, ensuring adherence to ethical guidelines.

Study Population: The study population included patients aged 18 years or older diagnosed with bullous pemphigoid (BP) in last 10 years (January 2012 to December 2022) based on clinical presentation, histopathological findings (subepidermal blister with eosinophilic infiltrates), and direct immunofluorescence (DIF) demonstrating linear IgG and/or C3 deposits along the basement membrane zone. Patients with atypical presentations underwent serological confirmation using BP180 and BP230 enzyme-linked immunosorbent assay (ELISA). The control group comprised age- and sex-matched individuals without BP, recruited from outpatient clinics for non-dermatological concerns. Individuals with incomplete medical records, those diagnosed with other autoimmune blistering disorders, or those unwilling to participate were excluded from the study.

Study Sample Size: The sample size was calculated based on an Indian study that reported a 45% prevalence of hypertension among BP patients and a 22% prevalence in the control group [11]. Using a significance level (α) of 0.05 and 80% power, the minimum required sample size was 112 participants in each group. To account for potential data loss or exclusions, 10% additional participants were recruited, resulting in a final sample size of 124 BP patients and 124 controls.

Data Collection: Detailed demographic data including age, sex, and residence, along with clinical parameters such as BP duration, site of lesions, and treatment history, were collected. Co-morbidities were identified based on clinical evaluation, documented diagnoses in medical records, and prescribed medications. Hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, or use of antihypertensive medication. Diabetes mellitus was diagnosed based on fasting plasma glucose ≥126 mg/dL, HbA1c ≥6.5%, or use of antidiabetic medication. Ischemic heart disease was identified through documented history of myocardial infarction, angina, or coronary artery bypass grafting. Stroke was defined as a confirmed cerebrovascular accident via clinical and radiological evidence. Chronic kidney disease (CKD) was defined as estimated glomerular filtration rate (eGFR) <60 mL/min/1.73m² for more than three months. Neurodegenerative disorders included documented diagnoses of Alzheimer's disease, Parkinson's disease, or multiple sclerosis. Autoimmune diseases included confirmed diagnoses of conditions such as rheumatoid arthritis, systemic lupus erythematosus, or psoriasis.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as mean ± standard deviation (SD) for continuous variables and frequencies with percentages for categorical variables. Differences between BP patients and controls were assessed using the chi-square test for categorical variables and the independent t-test for continuous variables. A p-value <0.05 was considered statistically significant.

Ethical Considerations: Patient confidentiality was maintained throughout the study, and data were anonymized before analysis. All procedures adhered to the ethical standards of the Declaration of Helsinki and local regulatory guidelines.

RESULTS

BP patients had a mean age of 67.3 ± 10.4 years, comparable to controls (65.7 ± 9.6 years; p = 0.271). Gender distribution was similar between groups (47.6% males in BP patients vs. 49.2% in controls; p = 0.315). BMI, residence, educational status, smoking, and alcohol use showed no significant differences. However, a significantly higher proportion of BP patients had a family history of autoimmune diseases compared to controls (15.3% vs. 5.6%; p = 0.015) [Table 1].

Table 1: Demographic and Lifestyle Characteristics of BP Patients and Controls.

Variable	BP Patients (n=124)	Controls (n=124)	p-value
	Frequency (%) or Mean ± SD		
Age (years)	67.3 ± 10.4	65.7 ± 9.6	0.271
Gender			
Male	59 (47.6%)	61 (49.2%)	0.315
Female	65 (52.4%)	63 (50.8%)	
BMI (kg/m²)	24.4 ± 3.7	24.0 ± 3.5	0.318
Residence			
Urban	71 (57.3%)	69 (55.6%)	0.412
Rural	53 (42.7%)	55 (44.4%)	
Educational Status			
Illiterate	27 (21.8%)	25 (20.2%)	0.287
Primary	39 (31.5%)	37 (29.8%)	
Secondary/Higher	58 (46.8%)	62 (50.0%)	
Smoking Status	33 (26.6%)	29 (23.4%)	0.392
Alcohol Use	27 (21.8%)	31 (25.0%)	0.549
Family History of Autoimmune Diseases	19 (15.3%)	7 (5.6%)	0.015

The mean duration of BP was 9.2 ± 3.5 months. The majority of cases occurred during summer (42.7%), followed by monsoon (33.1%) and winter (24.2%). Common lesions included vesicles/bullae (75.0%) and erythematous plaques (52.4%), while pruritus was reported in 73.4% of patients. Blister distribution was predominantly generalized (63.7%), and 46.0% of patients had moderate disease severity. Systemic corticosteroids were the most common treatment (66.9%), with prednisolone being the preferred agent (57.3%). Combination therapy was used in 33.1% of cases. Adverse drug reactions and infections occurred in 16.9% and 13.7% of patients, respectively. Complete treatment response was achieved in 55.6% of cases, with a mean remission time of 12.4 ± 4.2 weeks. Hospital admissions occurred in 26.6% of patients, ICU admissions in 8.9%, and mortality was 5.6%. The relapse rate was 18.5%. The mean DLQI score was 12.8 ± 5.4, with significant impact on symptoms, feelings (15.3%), and daily activities (16.9%) [Table 2].

Table 2: Clinical Characteristics, Treatment Patterns, and Outcomes in BP Patients.

Variables	Frequency (%) or Mean ± SD
Duration of BP (months)	9.2 ± 3.5
Season	
Summer	53 (42.7%)
Monsoon	41 (33.1%)
Winter	30 (24.2%)
Type of Lesion	
Erythematous Plaques	65 (52.4%)
Vesicles/Bullae	93 (75.0%)
Erosions/Ulcers	47 (37.9%)
Crusts/Scales	39 (31.5%)
Pruritus	91 (73.4%)
Blister Distribution	
Localized	45 (36.3%)
Generalized	79 (63.7%)
Mucosal Involvement	43 (34.7%)
Severity	
Mild	39 (31.5%)
Moderate	57 (46.0%)
Severe	29 (23.4%)
Systemic Corticosteroids	83 (66.9%)
Prednisolone	71 (57.3%)
Dexamethasone pulse therapy	12 (9.7%)
Immunosuppressants	29 (23.4%)
Azathioprine	15 (12.1%)
Methotrexate	8 (6.5%)
Mycophenolate mofetil	6 (4.8%)
Topical Corticosteroids	45 (36.3%)
Clobetasol propionate	29 (23.4%)
Betamethasone valerate	16 (12.9%)
Combination Therapy	41 (33.1%)
Prednisolone + Azathioprine	21 (16.9%)
Prednisolone + Methotrexate	10 (8.1%)
Dexamethasone pulse + Cyclophosphamide	10 (8.1%)
Treatment Response	
Complete	69 (55.6%)
Partial	41 (33.1%)
No Response	14 (11.3%)

Time to Remission (weeks)	12.4 ± 4.2
Adverse Drug Reactions (ADR)	21 (16.9%)
Infection During Treatment	17 (13.7%)
Hospital Admission Required	33 (26.6%)
ICU Admission	11 (8.9%)
Mortality	7 (5.6%)
Relapse Rate	23 (18.5%)
Total DLQI Score (Mean ± SD)	12.8 ± 5.4
DLQI	
Symptoms and Feelings	19 (15.3%)
Daily Activities	21 (16.9%)
Leisure	20 (16.1%)
Work and School	15 (12.1%)
Personal Relationships	13 (10.5%)
Treatment-Related Effects	27 (21.8%)

BP patients had significantly higher rates of hypertension (46.0% vs. 32.3%; p=0.034), diabetes mellitus (35.5% vs. 22.6%; p=0.041), and peripheral neuropathy (16.1% vs. 6.5%; p=0.031) compared to controls. Hemoglobin levels were significantly lower in BP patients (10.9 ± 1.7 g/dL vs. 12.3 ± 1.4 g/dL; p<0.001), while total leukocyte count, ESR, CRP, and serum creatinine were significantly elevated (p<0.05 for all). Albumin levels were significantly lower in BP patients (3.1 ± 0.6 g/dL vs. 4.0 ± 0.5 g/dL; p<0.001). Antihypertensive use, particularly Amlodipine (16.1% vs. 9.7%; p=0.005), and antidiabetic medication use, notably Metformin (17.7% vs. 11.3%; p=0.045), were significantly higher in BP patients. No significant differences were noted in lipid-lowering agents, bisphosphonates, or thyroid medications [Table 3].

Table 3: Comparison of Co-morbidities, Laboratory Parameters, and Medication Use in BP Patients and Controls

Variable	BP Patients (n=124)	Controls (n=124)	p-value
	Frequency (%) or Mean ± SD		
Co-morbidity			
Hypertension	57 (46.0%)	40 (32.3%)	0.034
Diabetes Mellitus	44 (35.5%)	28 (22.6%)	0.041
Ischemic Heart Disease	21 (16.9%)	13 (10.5%)	0.162
Stroke	11 (8.9%)	7 (5.6%)	0.324
Chronic Kidney Disease	27 (21.8%)	18 (14.5%)	0.158
Neurodegenerative Disorders	12 (9.7%)	6 (4.8%)	0.213
Autoimmune Diseases	15 (12.1%)	10 (8.1%)	0.354
Dyslipidemia	38 (30.6%)	26 (21.0%)	0.112
Osteoporosis/Osteopenia	24 (19.4%)	14 (11.3%)	0.089
Thyroid Disorders	22 (17.7%)	13 (10.5%)	0.135
Peripheral Neuropathy	20 (16.1%)	8 (6.5%)	0.031
Infectious Complications	28 (22.6%)	19 (15.3%)	0.164
Nutritional Deficiencies	33 (26.6%)	22 (17.7%)	0.102
Laboratory Parameter			
Hemoglobin (g/dL)	10.9 ± 1.7	12.3 ± 1.4	<0.001
Total Leukocyte Count (x10³/µL)	8.2 ± 2.5	7.1 ± 2.1	0.017
Erythrocyte Sedimentation Rate (ESR) (mm/hr)	43 ± 16	29 ± 11	<0.001
C-reactive protein (CRP) (mg/L)	18.1 ± 7.2	11.9 ± 4.4	<0.001
Serum Creatinine (mg/dL)	1.4 ± 0.5	1.1 ± 0.4	0.029
Albumin (g/dL)	3.1 ± 0.6	4.0 ± 0.5	<0.001
Medication Type			
Antihypertensives	54 (43.5%)	30 (24.2%)	
Amlodipine	20 (16.1%)	12 (9.7%)	0.005
Telmisartan	18 (14.5%)	9 (7.3%)	
Cilnidipine	10 (8.1%)	5 (4.0%)	
Metoprolol	6 (4.8%)	4 (3.2%)	
Antidiabetic Medications	41 (33.1%)	27 (21.8%)	
Metformin	22 (17.7%)	14 (11.3%)	0.045
Glimepiride	10 (8.1%)	6 (4.8%)	
Dapagliflozin	5 (4.0%)	4 (3.2%)	
Insulin	4 (3.2%)	3 (2.4%)	
Lipid-lowering Agents	30 (24.2%)	19 (15.3%)	
Atorvastatin	18 (14.5%)	12 (9.7%)	0.109
Rosuvastatin	9 (7.3%)	5 (4.0%)	
Fenofibrate	3 (2.4%)	2 (1.6%)	
Bisphosphonates/Calcium Supplements	23 (18.5%)	13 (10.5%)	
Alendronate	10 (8.1%)	6 (4.8%)	0.097
Risedronate	5 (4.0%)	3 (2.4%)	
Calcium with Vitamin D3	8 (6.5%)	4 (3.2%)	
Thyroid Medications (Levothyroxine)	18 (14.5%)	12 (9.7%)	0.256

Patients with BP and co-morbidities were significantly older (69.3 ± 10.1 years) than those without co-morbidities (62.5 ± 10.3 years; p = 0.004). Disease duration was longer in patients with co-morbidities (10.4 ± 3.8 months) compared to those without (8.3 ± 3.2 months; p = 0.013). BP severity was greater in patients with co-morbidities, with higher proportions exhibiting moderate (42.5%) and severe (31.5%) disease compared to those without co-morbidities (p = 0.019). Treatment response was less favorable in patients with co-morbidities, with lower rates of complete response (47.9% vs. 66.7%; p = 0.048). Gender distribution showed no significant difference [Table 4].

Table 4: Clinical Profile and Treatment Response in BP Patients with and without Co-morbidities.

Variable	BP with Co-morbidities (n=73)	BP without Co-morbidities (n=51)	p-value
	Frequency (%) or Mean ± SD		
Age (years)	69.3 ± 10.1	62.5 ± 10.3	0.004
Gender			
Male	39 (53.4%)	27 (52.9%)	0.853
Female	34 (46.6%)	24 (47.1%)	
Disease Duration (months)	10.4 ± 3.8	8.3 ± 3.2	0.013
Severity of BP			
Mild	19 (26.0%)	21 (41.2%)	0.019
Moderate	31 (42.5%)	20 (39.2%)	
Severe	23 (31.5%)	10 (19.6%)	
Treatment Response			
Complete	35 (47.9%)	34 (66.7%)	0.048
Partial	29 (39.7%)	13 (25.5%)	
No Response	9 (12.3%)	4 (7.8%)	

DISCUSSION

The presence of multiple co-morbidities in patients with bullous pemphigoid (BP) highlights the complexity of managing this condition. In our study, BP patients demonstrated a significantly higher prevalence of hypertension (46.0% vs. 32.3%; p=0.034), diabetes mellitus (35.5% vs. 22.6%; p=0.041), and peripheral neuropathy (16.1% vs. 6.5%; p=0.031) compared to controls. These findings align with previous studies that have reported increased cardiovascular risk and metabolic disorders in BP patients.[12,13] For instance, a study by Bonnesen et al., similarly observed elevated rates of hypertension and diabetes in BP patients, reinforcing the hypothesis that systemic inflammation and immune dysregulation in BP may contribute to metabolic disturbances.[14] The higher prevalence of peripheral neuropathy may be linked to immune-mediated mechanisms targeting neural tissues, as seen in other autoimmune disorders.[15]

Our study also identified significantly lower hemoglobin levels in BP patients (10.9 ± 1.7 g/dL vs. 12.3 ± 1.4 g/dL; p<0.001) alongside elevated inflammatory markers such as total leukocyte count, ESR, CRP, and serum creatinine (p<0.05 for all). This aligns with findings from Ren et al., who reported that BP patients frequently exhibit anemia and systemic inflammation, likely driven by chronic disease processes and nutritional deficiencies.[16,17] Additionally, hypoalbuminemia was significantly more common in BP patients (3.1 ± 0.6 g/dL vs. 4.0 ± 0.5 g/dL; p<0.001), consistent with reports by Martin et al., where hypoalbuminemia was identified as an independent predictor of poor prognosis in BP patients.[18] The presence of hypoalbuminemia may reflect increased vascular permeability, chronic inflammation, and reduced nutritional intake in this population.[19]

Medication use patterns further revealed that BP patients were more frequently prescribed antihypertensive agents, particularly Amlodipine (16.1% vs. 9.7%; p=0.005), and antidiabetic medications such as Metformin (17.7% vs. 11.3%; p=0.045). This may reflect the higher burden of hypertension and diabetes in BP patients, supporting earlier findings by Titou et al., who reported increased medication requirements for cardiovascular and metabolic conditions in BP populations.[20]

The subgroup analysis comparing BP patients with and without co-morbidities further underscored the impact of these conditions on disease severity and outcomes. Patients with co-morbidities were significantly older (69.3 ± 10.1 years vs. 62.5 ± 10.3 years; p=0.004) and had longer disease duration (10.4 ± 3.8 months vs. 8.3 ± 3.2 months; p=0.013), potentially reflecting a more prolonged inflammatory state and cumulative health burden.[21] BP severity was notably greater in those with co-morbidities, with higher rates of moderate (42.5%) and severe (31.5%) disease compared to their counterparts (p=0.019). Similar patterns have been observed in studies by Liu et al. and Joen et al., suggesting that co-morbidities may exacerbate immune dysregulation, impair healing, and increase the risk of severe skin manifestations.[22,23]

Treatment outcomes were also influenced by the presence of co-morbidities. Patients with co-morbidities had lower rates of complete response (47.9% vs. 66.7%; p=0.048), which may indicate impaired immune recovery, reduced treatment adherence, or complications arising from concurrent medical conditions.[24] Similar trends have been noted in prior research by Kibsgaard et al., which

emphasized the association between multiple co-morbidities and poorer treatment outcomes in BP patients.[25] Moreover, BP patients with co-morbidities may require polypharmacy, potentially increasing the risk of adverse drug reactions and interactions.[26]

Limitations: This study has certain limitations. The cross-sectional design limits the establishment of causal relationships between Bullous Pemphigoid and co-morbidities. Data collection was confined to a single tertiary care center, which may affect generalizability. Additionally, reliance on medical records for co-morbidity assessment carries a risk of incomplete documentation. Future multicenter studies with larger sample sizes and longitudinal designs are recommended to validate these findings and explore potential causative mechanisms.

CONCLUSION

Overall, our findings align with the growing body of evidence suggesting that BP patients experience a substantial burden of co-morbidities, which significantly influence disease severity, treatment response, and overall outcomes. Clinicians managing BP should adopt a multidisciplinary approach that addresses both cutaneous and systemic manifestations while actively screening for common co-morbidities to improve long-term prognosis. Further research involving larger cohorts is warranted to better understand the interplay between BP and systemic diseases, particularly in the Indian population where healthcare accessibility and management strategies may differ.

REFERENCES

1. Miyamoto D, Santi CG, Aoki V, Maruta CW. Bullous pemphigoid. An Bras Dermatol. 2019;94(2):133-146.
2. Didona D, Schmidt MF,Maglie R, Solimani F. Pemphigus and pemphigoids: Clinical presentation, diagnosis and therapy. JDDG: Journal der Deutschen Dermatologischen Gesellschaft. 2023;21:1188–1209.
3. Egami S, Yamagami J, Amagai M. Autoimmune bullous skin diseases, pemphigus and pemphigoid. J Allergy Clin Immunol. 2020;145(4):1031-1047.
4. Bech R, Kibsgaard L, Vestergaard C. Comorbidities and Treatment Strategies in Bullous Pemphigoid: An Appraisal of the Existing Litterature. Front Med (Lausanne). 2018;5:238.
5. Yu Phuan CZ, Yew YW, Tey HL. Bullous pemphigoid and antecedent neurological diseases: An association with dementia. Indian J Dermatol Venereol Leprol. 2017;83:457-461.
6. Gambichler T, Segert H, Höxtermann S, Schmitz L, Altmeyer P, Teegen B. Neurological disorders in patients with bullous pemphigoid: Clinical and experimental investigations. J Eur Acad Dermatol Venereol. 2015;29:1758-1762.
7. Huttelmaier J, Benoit S, Goebeler M. Comorbidity in bullous pemphigoid: up-date and clinical implications. Front Immunol. 2023;14:1196999.
8. Chouchane K, Di Zenzo G, Pitocco D, Calabrese L, De Simone C. Bullous pemphigoid in diabetic patients treated by gliptins: the other side of the coin. J Transl Med. 2021;19(1):520.
9. Kalińska-Bienias A, Kowalczyk E, Jagielski P, Bienias P, Kowalewski C, Woźniak K. The association between neurological diseases, malignancies and cardiovascular comorbidities among patients with bullous pemphigoid: case-control study in a specialized polish center. Adv Clin Exp Med. 2019;28:637–642.
10. Kwa MC, Silverberg JI. Association between inflammatory skin disease and cardiovascular and cerebrovascular Co-morbidities in US adults: analysis of nationwide inpatient sample data. Am J Clin Dermatol. 2017;18:813–823.
11. De D, Kaushik A, Handa S, et al. Bullous pemphigoid in India: Review of cases registered in an autoimmune bullous disease clinic. Indian J Dermatol Venereol Leprol. 2023;89:553–557.
12. Welc N, Ważniewicz S, Głuszak P, et al. Clinical Characteristics, Comorbidities, and Treatment in Patients with Pemphigus-A Single-Center Retrospective Study. Antibodies (Basel). 2024;13(4):103.
13. Zhang B, Chen X, Liu Y, Chen F, Yang N, Li L. Relationship between bullous pemphigoid and metabolic syndrome: a 12-year case-control study conducted in China. Ther Adv Chronic Dis. 2022;13:20406223221130707.
14. Bonnesen K, Poulsen CFB, Schmidt SAJ, Sørensen HT, Schmidt M. Autoimmune blistering disorders and cardiovascular risks: A population-based cohort study. J Am Acad Dermatol. 2024;91:82–90.
15. Shastri A, Al Aiyan A, Kishore U, Farrugia ME. Immune-Mediated Neuropathies: Pathophysiology and Management. Int J Mol Sci. 2023;24(8):7288.
16. Siranart N, Chumpangern Y, Phutinart S, et al. Chronic disease associated with bullous pemphigoid risk: A systematic review and meta-analysis. JAAD Int. 2024;17:141-152.
17. Lee S, Rastogi S, Hsu DY, Nardone B, Silverberg JI. Association of bullous pemphigoid and comorbid health conditions: a case-control study. Arch Dermatol Res. 2021;313(5):327-332.
18. Martin E, Mauer I, Malzahn U, Heuschmann PU, Goebeler M, Benoit S. Comorbid diseases among bullous pemphigoid patients in Germany: new insights from a case-control study. J Dtsch Dermatol Ges. 2022;20(6):798-805.
19. Soeters PB, Wolfe RR, Shenkin A. Hypoalbuminemia: Pathogenesis and Clinical Significance. JPEN J Parenter Enteral Nutr. 2019;43(2):181-193.
20. Titou H, Kerrouch H, Frikh R, Hjira N. The association between bullous pemphigoid and comorbidities: a case-control study in Moroccan patients. Acta Dermatovenerol Alp Pannonica Adriat. 2022;31:7–11.
21. Kılıç Sayar S, Sun GP, Küçükoğlu R. Comorbidities of bullous pemphigoid: A single-center retrospective case-control study from Turkey. Dermatol Ther. 2021;34(5):e15031.
22. Liu Y, Wang Y, Zhang J, et al. Risk factors predisposing relapse of bullous pemphigoid at initial diagnosis: A retrospective cohort study of 205 patients. Int Immunopharmacol. 2023;125:111082.
23. Jeon HW, Yun SJ, Lee SC, Won YH, Lee JB. Mortality and Comorbidity Profiles of Patients with Bullous Pemphigoid in Korea. Ann Dermatol. 2018;30(1):13-19.
24. Shen WC, Chiang HY, Chen PS, Lin YT, Kuo CC, Wu PY. Risk of all-cause mortality, cardiovascular disease mortality, and cancer mortality in patients with bullous pemphigoid. JAMA Dermatol. 2022;158:167–175.
25. Kibsgaard L, Bay B, Deleuran M, Vestergaard C. A retrospective consecutive case-series study on the effect of systemic treatment, length of admission time, and co-morbidities in 98 bullous pemphigoid patients admitted to a tertiary centre. Acta Derm Venereol. 2015;95(3):307-11.
26. Karakioulaki M, Eyerich K, Patsatsi A. Advancements in Bullous Pemphigoid Treatment: A Comprehensive Pipeline Update. Am J Clin Dermatol. 2024;25(2):195-212.