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Research Article

PREVALENCE OF PEMPHIGUS AN AUTOIMMUNE SKIN DISEASE IN PATIENTS ATTENDING URBAN TEACHING HOSPITAL BY DETECTING AUTO ANTIBODIES AGAINST DSG1 AND DSG3

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A B S T R A C T

Objectives: To find out the prevalence of Pemphigus in patients attending the clinical OPD of AIMSR by using Quantitative direct ELISA technique and to demonstrate the antibodies those are formed against desmoglein proteins in the patients of pemphigus. **Material and methods:** A study was conducted for a period of two months on 60 patients who had intra-epidermal blistering skin lesions. Direct ELISA test was done for the identification of Pemphigus vulgaris and Pemphigus foliaceus by detecting the presence of antibodies against Desmoglein proteins. In Pemphigus vulgaris antibodies against DSG 3 or both DSG 1 and DSG 3 are formed, in pemphigus foliaceus antibodies against DSG 1 are formed. **Result:** Out of 3757 people, who have attended OPD of AIMSR, 60 patients with intraepidermal blistering skin lesions were selected and with their consent their blood samples were tested for anti DSG antibodies. The prevalence of pemphigus came out to be 0.43 % (16) and the prevalence of pemphigus vulgaris was 0.35 % (13) and pemphigus foliaceus was 0.08 % (3). Among the 16 patients who have Pemphigus, Pemphigus vulgaris was found to be the commonest subtype accounting to 81.25% (13/16 cases) followed by a less common variant Pemphigus foliaceus accounting to 18.75% (3/16 cases). Antibodies against DSG3 were found in serum samples of 5 patients of Pemphigus vulgaris, against both DSG1 and DSG3 are found in the remaining 8 serum samples of patients of Pemphigus vulgaris and antibodies against DSG1 aloe were found in serum samples of 3 patients of Pemphigus foliaceus. **Conclusion:** The patients whose serum samples were positive for DSG 1 had Pemphigus foliaceus and the patients whose serum samples were positive for DSG 3 or both DSG 1 and DSG 3 had Pemphigus vulgaris. Thus, according to this data, there are 0.43% of the 3,757 patients who have visited the OPD overall who had Pemphigus.

INTRODUCTION

Pemphigus is an autoimmune chronic blistering skin condition that affects the skin's mucous membrane and squamous epithelia. Desmoglein 1 and 3 are keratinocyte surface antigens that have given rise to auto-antibodies[1,2]. Desmoglein proteins (DSG1 and DSG3), which are the main components of desmosomes, one of the adhesion apparatuses in the epidermis, are the target antigens in pemphigus. Patients with pemphigus have anti-Dsg antibodies that circulate in their blood[3]. These antibodies prevent cell-cell adhesion in keratinocytes and mucosal epithelial cells by targeting desmosomes[4]. Patients with pemphigus exhibit desmosome acantholysis, which causes keratinocytes to lose their cohesiveness. Histopathological analysis was used in this. It is a bullous disease that causes denudation of the skin and mucous membranes as well as blister production on both[1]. The prevalence of pemphigus Most often, it affects middle-aged and older people. Children hardly ever experience it. This disease affects women more often than it does males. Pemphigus comes in three immunological subtypes with several clinical variations. In a subtype of Pemphigus vulgaris where only the oral mucosa is affected, antibodies are formed against desmoglein protein 3; in a subtype where both the skin and oral mucosa are affected, antibodies are formed against

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desmoglein proteins 1 and 3; in a subtype of Pemphigus foliaceus where antibodies are formed against desmoglein protein 1; and in a subtype of paraneoplastic pemphigus where many sub This study focuses on the two main kinds of pemphigus, pemphigus vulgaris and pemphigus foliaceus.

Pemphigus vulgaris: The most prevalent form of pemphigus, pemphigus vulgaris, is a potentially fatal autoimmune bullous disease in which autoantibodies (IgG type) are produced against the desmoglein proteins DSG3 and/or DSG1[6]. Lesions develop on the skin and mucosal membranes in this kind of pemphigus. Blister development occurs as a result of loss of keratinocye cell-cell adhesion in the basal and immediate suprabasal layers of the epidermis when auto-antibodies attack the desmoglein protein DSG3, but not in the superficial layer. Flaccid blisters or bullae filled with fluid on a healthy or erythematous base are the basic skin lesions of Pemphigus vulgaris. They are frequently painful but infrequently pruritic. The oral cavity's mucous membrane is predominantly affected. Nearly all patients eventually develop mucosal lesions during the course of their disease, and about 50-60% of patients first present with oral lesions. Patients occasionally just have oral blisters when there is no cutaneous involvement. Oral blisters could be the first sign of pemphigus vulgaris in some people [7]. Its mortality rate is between 5 and 15 percent[8]. Pemphigus vegetans, a localised variation of Pemphigus vulgaris, affects 5% of all cases of pemphigus[9].

Pemphigus foliaceus

Auto-antibodies are produced against the demoglein protein DSG1 in Pemphigus foliaceus, a benign variant of the disease. Intercellular adhesions between the keratinocytes are lost as a result of immunoglobulin IgG auto-antibodies attacking demoglein protein DSG1, which is mostly expressed in the granular layer of the epidermis. This leads to the development of superficial blisters inside the epidermis. Mucous membranes are generally unaffected, although characteristic scaly lesions and crusted erosions develop on the erythematous base of the skin. This type of pemphigus has less clinical symptoms than Pemphigus vulgaris[10]. A form of Pemphigus foliaceus known as Pemphigus erythematous similarly resembles lupus erythematosis[11].

In a study done by Wardhana *et al*. (2013) on 451 hospitalized patients in Bali, Indonesia, they discovered that the frequency there was as high as 7.3%. Out of the total 451 patients, 33 people had pemphigus. The most frequent case type overall was pemphigus vulgaris (PV) (26/33 cases; 78.78%), followed by pemphigus foliaceus (PF) (5/33 cases; 15.1%)[12]. In a research done by Micali G *et al*. in 1998 on 6653 individuals who had visited a clinic in Eastern Sicily, pemphigus was found in 84 patients, or 1.3% of the total population. Pemphigus vulgaris (PV) (75% of cases) and pemphigus foliaceus (17%) were the two most prevalent types[13]. In a study by Uzun S *et al*. (2006) on 10,000 persons in Turkey's Mediterranean region, it was discovered that the prevalence of pemphigus there was 1.46%. The most prevalent clinical subtype, accounting for 83% (123/148), was pemphigus vulgaris, followed by pemphigus foliaceus, accounting for 8.7% (13/148). [14]. In a research by Wasif Ali Khan *et al*. (2009), pemphigus was screened for in 30 cases of non-infectious vesicobullous and vesicopustular skin illnesses out of 600 non-neoplastic skin lesions evaluated in Mumbai. Pemphigus group of disorders were identified in 18 of these 30 cases; Pemphigus vulgaris was discovered in 10 (55.55%) individuals and Pemphigus foliaceus was seen in 8 (44.45%). [15].

On 70 Pemphigus cases, SR Arya *et al*. (1999) performed a clinicopathological research in Mumbai. 43 individuals (61.4%) out of 70 cases had Pemphigus vulgaris. Pemphigus foliaceus was present in 25 individuals (35.7%)[16]. In Eastern India, 41 Pemphigus patients were investigated over the course of a year by Chowdhury J *et al*. (2016). Of them, 32 patients (78%) had Pemphigus vulgaris, 8 patients (19.5%) had Pemphigus foliaceus, and just one patient (0.2%) had IgA Pemphigus[17]. 22 Pemphigus cases in Mysore were the subject of a clinicopathological investigation by Leena, Vijay B, *et al*. in 2010. 648 skin biopsies in total were received for this investigation, of which 22 instances were of the pemphigus group of disorders. The most prevalent type, pemphigus vulgaris, was discovered to account for 81% (18) of cases[18]. In a study on pemphigus in India, Amrinder J. Kanwar *et al*. (2011) conducted a PEBMED search and found 96 papers. In India, the epidemiology of pemphigus has taken on a different trajectory, and the incidence among patients who have seen a dermatologist in the outpatient setting has ranged from 0.09 to 1.8%. Pemphigus vulgaris is the most common kind of pemphigus, accounting for 75–90% of all cases [19]. In a study by Kamal Ahmed, T Narayana Rao, *et al*. (2014), 59 individuals with vesiculobullous disorders—of whom 32 had pemphigus—were examined. Among these 32 individuals, Pemphigus foliaceus affected 6 patients (18.75%) and Pemphigus vulgaris affected 24 patients (75%)[20].

Aims and objectives; The purpose of the present study is to know the prevalence of Pemphigus an autoimmune skin disease in patients attending urban teaching hospital. To investigate the distribution of auto antibodies (mainly IgG) those are formed against desmoglein in patients suffering from Pemphigus disease. To demonstrate tests those are done for the confirmation of Pemphigus disease.

MATERIAL AND METHODS

Study design – Cross sectional study.

Site – Apollo Institute of Medical Sciences and Research (AIMSR), Hyderabad.

Study population – The study population includes patients attending clinical OPD of Apollo Institute of Medical Sciences and Research (AIMSR General Hospital), Hyderabad.

Duration of study – 2 months

Sample size – 60

Materials

1. Microplate wells
2. Calibrators 1, 2 and 3
3. Positive and negative controls
4. Enzyme conjugate
5. Wash buffer
6. Sample buffer
7. Chromogen/Substrate solution
8. Stop solution

Method; Detection of DSG 1 and 3 antibodies in the patients' serum using direct ELISA

Test principle: This approach detects auto-antibodies against desmoglein proteins of type IgG, anti-DSG1 and anti-DSG3, which are specific for pemphigus. The test's fundamental premise is the agglutination of antigen and antibody, which is assessed by an anti-human IgG labelled with an enzyme (enzyme conjugate) that catalyses a colour reaction. For the purpose of finding anti-DSG 1 and anti-DSG 3 antibodies in the blood, this is a semi-quantitative or quantitative analysis. The patient samples, positive and negative controls, and calibrators 1 through 3 are incubated together for quantitative analysis.

Procedure

1. A venous sample is obtained from the patient, using the standard techniques of blood sample collection.
2. From that sample, serum is obtained using centrifugation technique, where the supernatant which is the serum is used for the detection of the DSG 1 and 3 antibodies.
3. The calibrators, positive and negative controls and patient samples are added to individual reagent wells coated with the DSG 1 antigens and incubated. In case of positive samples, specific IgG antibodies will bind to the antigens.
4. The plates are washed and to detect the bound antibodies, a second incubation is carried out using an enzyme conjugate (i.e.) peroxidase labelled anti-human IgG is added and incubated (Conjugate incubation).
5. After washing again, the peroxidase substrate is added and allowed to incubate for an additional period of time (Substrate incubation).

The same procedure is followed for detecting anti DSG 3 antibodies by using reagent wells coated with DSG 3 proteins.

Possible outcomes

If colour is seen, it indicates that the test is positive. If colour is not seen then It indicates that the test is negative. If antibodies against DSG 1 alone are detected in the serum samples of patients, it is *Pemphigus foliaceus.* If antibodies against DSG 3 or both DSG 1 and DSG 3 are detected in the serum samples of patients, it is *Pemphigus vulgaris*.

Calculation of Quantitative results

The standard curve from which the concentration of Anti Dsg-1 antibodies in the patient samples can be taken is obtained by point to point plotting of the OD values measured for the 3 calibration sera against their corresponding units.

Table 1 Standard calibration curve

Date: 2-sept-2016	Cal-1 Anti-Dsg-1	Cal-2 Anti-Dsg-1	Cal-3 Anti-Dsg-1	Positive control Anti-Dsg-1	Negative control Anti-Dsg-1
OD at 450/620 nm	1.276	0.257	0.030	0.962	0.015
RU/ml value	200	20	2	135	<5

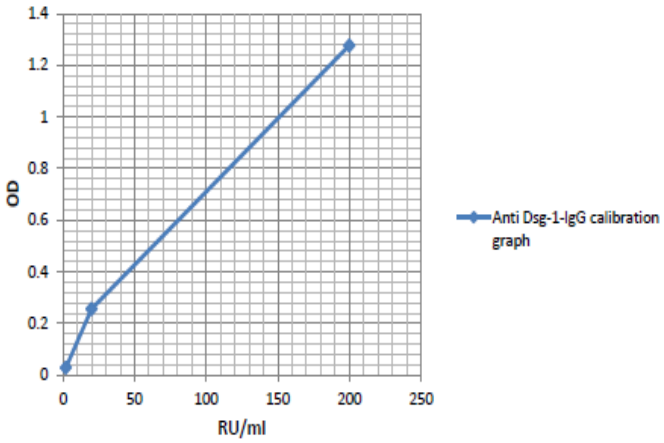

Figure 1 Anti Dsg-1-IgG Calibration graph

The RU/ml is calculated by point to point plotting of the OD value of patient's serum sample. The upper limit of the normal range (cut off) is 20 relative units (RU)/ml. Interpretation of results: <20RU/ml : negative >20RU/ml : positive

OBSERVATIONS AND RESULTS

During the study period, 3,757 patients visited the clinical OPD of AIMSR, and 60 of them had intraepidermal blistering skin lesions that were screened. There are a total of 16 patients that have received a Pemphigus diagnosis (Table 2, Fig 2).

Table 2 Prevalence of *Pemphigus vulgaris and Pemphigus foliaceus* in the study population.

No. of patients	*Pemphigus vulgaris*	*Pemphigus foliaceus*
	13 (81.25%)	3 (18.75%)

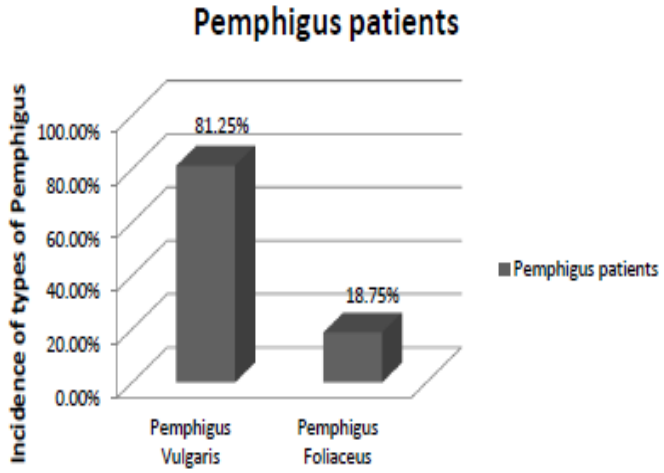

Figure 2 Prevalence of *Pemphigus vulgaris and Pemphigus foliaceus* in the study population

16 of the 60 patients who underwent screening for pemphigus had the condition; this represents 0.43% of the 3757 patients who visited the AIMSR OPD during the study period. Out of these 16, 13 individuals have *Pemphigus vulgaris*, which accounts for 81.25% of cases, and 3 patients have Pemphigus foliaceus, which accounts for 18.75% of cases.

Table 3 Table showing gender distribution of Pemphigus.

GENDER	Pemphigus vulgaris	Pemphigus foliaceus
Male:	4 (30.77%)	1 (33.3%)
Female:	9 (69.23%)	2 (66.7%)

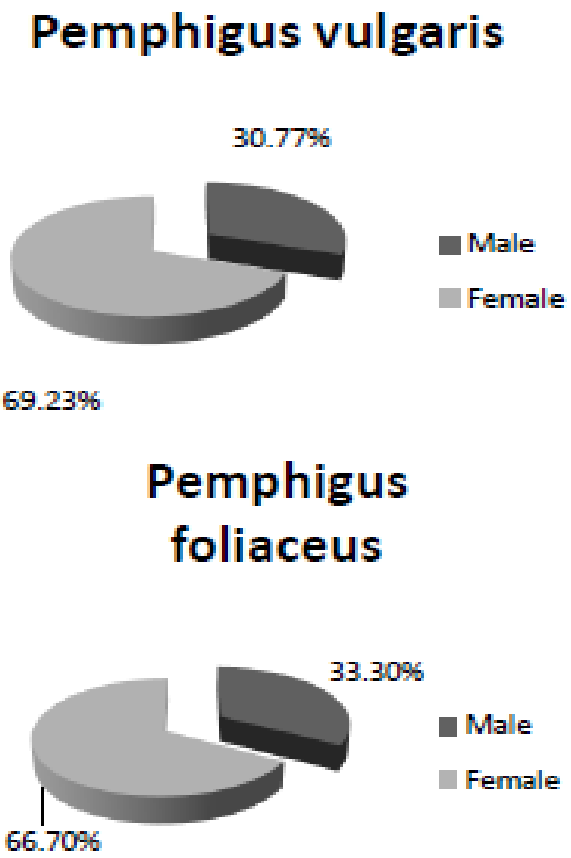

Figure 3 Pie Charts showing gender distribution of *Pemphigus vulgaris and Pemphigus foliaceus.*

Female patients make up the majority of those with *Pemphigus vulgaris* (69.23%) and *Pemphigus foliaceus* patients (66.7%). For *Pemphigus vulgaris*, the male to female ratio is 4:9, while for *Pemphigus foliaceus*, it is reported to be 1:2.

Table 4 Table showing age distribution of pemphigus

Age groups	Pemphigus Vulgaris	Pemphigus Foliaceus
<30	2	0
30-40	4	2
>40-50	5	0
>50	2	1

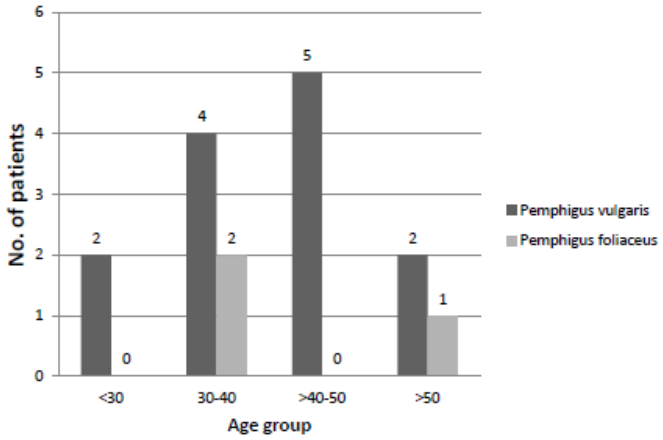

Figure 4 Bar graph showing incidence of pemphigus among different age groups

Pemphigus vulgaris has been more common in patients belonging to the age group 30 to 50 years and Pemphigus foliaceus in patients of age group 30 to 40 years.

Table 5 Prevalence of pemphigus in different areas.

S. No.	Place of Study	Year in which the study was conducted	Study population	Prevalence	Author
1	Eastern Sicily	1998	6,653	1.3%	Micali G *et al*[13]
2	Turkey	2006	10,000	1.46%	Uzun S *et al*[14]
3	Bali-Indonesia	2013	451	7.3%	Wardhana *et al*[12]
4	Hyderabad	2016	3,757	0.43%	Present study

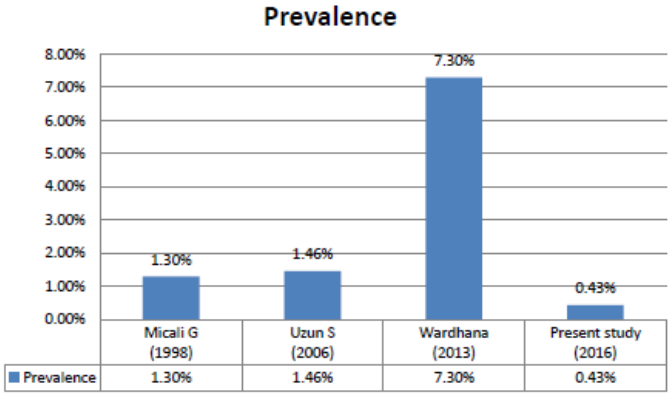

Figure 5 Prevalence of pemphigus in different areas.

The prevalence of Pemphigus in our study is 0.43% which is in correlation with the studies conducted by Micali G et. al., (1.30%) and Uzun S *et al*., (1.46%).

Table 6 Comparison of different studies relation to types of pemphigus.

S.NO.	Place of study	Patients with pemphigus disorder	Pemphigus vulgaris	Pemphigus foliaceus	Author
1	Maharashtra	70	43 (61.4%)	25 (35.7%)	SR Arya *et al*.,[16] (1999)
2	Turkey	148	123 (83%)	13 (8.7%)	Uzun S *et al*.,[14](2006)
3	Maharashtra	18	10 (55.55%)	8 (44.45%)	Wasif Ali Khan *et al*.,[15] (2009)
4	Mysore	22	18 (81%)	0	Leena *et al*.,[18] (2010)
5	Bali-Indonesia	33	26 (78.78%)	5 (15.1%)	Wardhana *et al*.,[12] (2013)
6	Hyderabad	32	24 (75%)	6 (18.75%)	Kamal Ahmed *et al*., [20](2014)
7	Eastern India	41	32 (78%)	8 (19.5%)	Chowdhury J *et al*.,[17] (2016)
8	Hyderabad	16	13 (81.25%)	3 (18.75%)	Present study (2016)

In these studies the samples of only patients suffering from Pemphigus are taken to differentiate between the two types of Pemphigus.

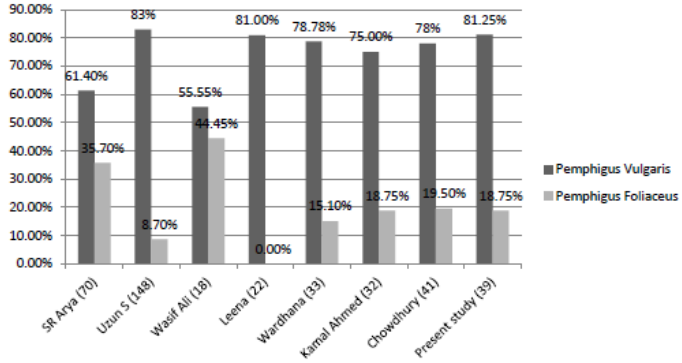

Figure 6 Graphical Representation of different studies.

Thus the result of present study shows *Pemphigus vulgaris* accounting to 81.25% and *Pemphigus foliaceus* accounting to 18.75% which is in close relation to the studies conducted by Uzun S *et al*., in Turkey(PV-83% ; PF-8.70%) , Wardhana *et al*., in Maharashtra (PV- 78.78% ; PF-15.10%) , Kamal Ahmed *et al*., in Hyderabad(PV- 75% ; PF- 18.75%) and Chowdhury *et al*., in Eastern India (PV-78% ; PF-19.50%).

Distribution of auto antibodies that are formed against desmoglein proteins in patients suffering from pemphigus disease

In patients of Pemphigus vulgaris auto antibodies are formed against desmoglein proteins DSG 3 or both DSG 1 and DSG 3, whereas in patients of Pemphigus foliaceus auto antibodies are formed against DSG 1 only. In the present study, distributions of antibodies that are formed against desmoglein proteins are as follows.

Table 7 distribution of antibodies that are formed against desmoglein proteins

	DSG 1	DSG 3	DSG 1 and DSG 3
No of Positive Patients	3	5	8

By the above data we can understand that 13 patients were suffering from *Pemphigus vulgaris* and 3 patients were suffering from *Pemphigus foliaceus.*

DISCUSSION

Once auto antibodies of the IgG type are formed against the Desmoglein proteins DSG1 and DSG3 in serum samples from patients with Pemphigus group disorders including *Pemphigus vulgaris* and *Pemphigus foliaceus*, they can be found using a quantitative direct ELISA test. The anti-human gamma globulin that has been peroxide-labeled is used to identify the anti-DSG1 and anti-DSG3 antibodies. Disease prevalence varies from location to location. The prevalence of Pemphigus, an autoimmune skin disorder, was examined in our study among patients who visited the clinical OPD at the Apollo Institute of Medical Sciences and Research (AIMSR), General Hospital, Hyderabad. Patients with Pemphigus disease develop vesico-bullous lesions that are a defining feature of the condition, but clinical manifestations alone are insufficient to diagnose the condition because patients with other skin conditions such as acute eczema, varicella, and herpes simplex can also present with intra-epidermal blistering skin lesions that are a defining feature of the condition. Therefore, patients with blistering skin lesions of this nature were chosen, and serum samples from these patients were tested by enzyme-linked immunosorbent assay (ELISA) for the presence of auto-antibodies against Desmoglein proteins DSG 1 and DSG 3.

The patients whose serum samples were positive for DSG 1 had *Pemphigus foliaceus* and the patients whose serum samples were positive for DSG 3 or both DSG 1 and DSG 3 had *Pemphigus vulgaris*. In this study, 60 patients with intra-epidermal blistering skin lesions were screened for pemphigus out of 3,757 patients who had visited the OPD of Apollo General Hospital during the study period. *Pemphigus vulgaris* was found to be the most common disorder in 16 of these patients, with 13 having it and three having *pemphigus foliaceus*. Five cases of *pemphigus vulgaris* have antibodies against DSG3, eight cases have antibodies against both DSG1 and DSG3, and three cases of *pemphigus foliaceus* have antibodies against DSG1 only. This allows us to learn the prevalence of pemphigus among all patients who have visited Apollo General Hospital's clinical OPD. The acquired knowledge aids in formulating the most effective management plans for this autoimmune condition. Immunosuppressive therapy has decreased mortality. Particularly, immune-suppressants such cyclophosphamide, azathioprime, and mycophenolate combined with steroids have decreased the disease's death rate. Thus, according to this data, there are 0.43% of the 3,757 patients who have visited the OPD overall who had Pemphigus.

CONCLUSION

The prevalence of pemphigus was determined to be 0.43% in our study, with *pemphigus vulgaris* accounting for 0.35% and *pemphigus foliaceus* for 0.08%. The Pemphigus illnesses (16) showed that Pemphigus vulgaris was the most prevalent subtype, accounting for 81.25 %(13), followed by *Pemphigus foliaceus*, which accounted for 18.75%. (3). Antibodies against DSG1 alone were found in the serum samples of 3 patients, confirming the diagnosis of *Pemphigus foliaceus*. Antibodies against both DSG1 and DSG3 were found in 8 serum samples, accounting for 13 patients with *Pemphigus vulgaris*. Antibodies against DSG3 were found in 5 serum samples.

Acknowledgement

Conflict of Interest

Ethical Declarations

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