

# The Evaluation of Dermatological Disease Profiles of Neurosurgery Inpatients: A Tertiary Clinic Experience

Review began 03/05/2024  
Review ended 03/17/2024  
Published 03/21/2024

© Copyright 2024

Temel et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Berkay Temel<sup>1</sup>, Ozge Orenay<sup>1</sup>, Nermin Karaosmanoglu<sup>1</sup>, Ayhan Tekiner<sup>2</sup>

1. Department of Dermatology, Health Sciences University, Ankara Training and Research Hospital, Ankara, TUR 2. Department of Neurologic Surgery, Health Sciences University, Ankara Training and Research Hospital, Ankara, TUR

**Corresponding author:** Berkay Temel, berkaytemel42@gmail.com

---

## Abstract

**Background:** Both the skin and neuronal systems originate from the ectoderm. In patients hospitalized for neurosurgery, their skin may be affected by genetic and environmental factors.

**Objective:** This study researched disease relationships by evaluating the profile of hospitalized neurosurgery patients who consulted with dermatology in a tertiary clinic (Neurosurgery Clinic, Ankara Training and Research Hospital, Ankara).

**Methods:** This study included hospitalized neurosurgery patients who consulted with dermatology. Age, gender, type of hospitalization, neurosurgical diseases, and dermatology diseases were selected as study variables. The medical health records of the patients were retrospectively scanned and analyzed.

**Results:** A total of 172 consultations were analyzed. The mean age of patients was 44.7 years old ranging from 1 year to 99 years old. The percentage of male patients was 54.7%; 25.5% of the patients were hospitalized for cerebral vascular diseases, 30.2% for spinal diseases, 22.1% for tumors, 12.2% for infections, and 1.2% for other neurosurgical diseases. The most commonly diagnosed dermatological disease in patients was drug eruptions (18.6%), followed by seborrheic dermatitis (16.2%) and contact dermatitis (14.5%).

**Conclusion:** According to this study, the most commonly diagnosed dermatological diseases in neurosurgery inpatients were drug eruption, contact dermatitis, and seborrheic dermatitis. The results of this study may be helpful in terms of neurosurgical training planning and treatment management.

---

**Categories:** Dermatology

**Keywords:** nitrofurazone, contact dermatitis, seborrheic, neurosurgery, dermatology

## Introduction

Dermatology includes a wide range of diseases. While some of them are essentially skin disorders, others are manifestations of systemic diseases. Dermatology consultation is sometimes required in patients who are hospitalized for non-dermatological disorders. Although some patients may have dermatological disorders prior to admission to the hospital, others may develop them during or after hospitalization. These dermatological problems can sometimes interfere with the treatment of conditions that require hospitalization. It is hard to solve this condition in a non-dermatologic department without a dermatology consultation. As a result, dermatological consulting is essential [1].

The embryonic development of the skin and central/peripheral nerve systems comes from the ectoderm. Some diseases may impact both systems at once. Several skin diseases might present with neurological symptoms such as stroke, vascular malformations, malignancies, and epilepsy at the same time [2]. Some dermatological conditions occur due to factors in the environment (such as drug eruptions) and may affect the management of neurological disease [3]. It's critical to identify or suspect dermatological disease in order to reach the best diagnosis and initiate the most effective method of treatment. As a result, dermatology consultations are crucial for clinics that manage neurological diseases like neurosurgery.

To date, there have been limited studies evaluating the profile of neurosurgery patients consulted with dermatology [3-6]. In this study, the aim was to research disease relationships by evaluating the profile of hospitalized neurosurgery patients consulted with dermatology in a tertiary hospital (Neurosurgery Clinic, Ankara Training and Research Hospital, Ankara).

## Materials And Methods

This study included hospitalized neurosurgery patients who consulted with dermatology between August 2013 and August 2023. The study was approved by the Ankara Training and Research Hospital Ethics

### How to cite this article

Temel B, Orenay O, Karaosmanoglu N, et al. (March 21, 2024) The Evaluation of Dermatological Disease Profiles of Neurosurgery Inpatients: A Tertiary Clinic Experience. Cureus 16(3): e56633. DOI 10.7759/cureus.56633

Committee and was in accordance with the Declaration of Helsinki. (E-23-1393).

## Patient selection and inclusion criteria

The design of the study was a retrospective cohort. The medical health records of the patients were scanned. Patients were planned to be included in the study according to the inclusion criteria. The inclusion criteria of the study were that medical records were accessible and complete in terms of study variables. The exclusion criterion of the study was missing information in terms of study variables.

## Study variables

Age, gender, type of hospitalization, neurosurgical diseases, and dermatology diseases were selected as study variables. The age was grouped into three categories. There were under 18-year-olds, 18-65-year olds, and over 65-year-olds. The type of hospitalization was divided into two categories. These were inpatient and intensive care units. The neurosurgical diseases were divided into five categories. These were cerebral vascular diseases, spinal diseases, tumors, infections, and others. The dermatological diseases were divided into four categories. These categories were dermatitis, infection, inflammatory, and others. These categories were created using ICD-10 codes.

## Study plan

The patient's electronic medical records were examined retrospectively by two authors. Study variables were recorded. The analysis was performed using appropriate statistical methods.

## Statistical analysis

Research data was analyzed using IBM SPSS Statistics for Windows, Version 22 (Released 2013; IBM Corp., Armonk, New York, United States). Descriptive data was saved as mean, frequency distribution, and percentile.

# Results

## Main characteristics of the study

The mean age of patients was 44.7 years. The 0-18 age group had 10.5% (n=18) of patients. The 18-65 age group had 63.9% (n=110) of patients. The over-65 age group had 25.6% (n=44) of patients. The ratio of male patients was 54.7% (n=94). Sixty-one percent (n=105) of the patients were consulted from the inpatient units and 39% (n=67) from the intensive care units; 25.5% (n=44) of the patients were hospitalized for cerebral vascular disease, 30.2% (n=52) for spinal disease, 22.1% (n=38) for tumors, 12.2% (n=21) for infections, and 1.2% (n=17) for other neurosurgical diseases. The list of subgroup diseases is shown in Table 1. Other spinal diseases were tethered cord (n=3, 1.7%), spinal stenosis (n=9, 5.2%), and spondylolisthesis (n=3, 1.7%). Other neurosurgical diseases were hydrocephalus (n=15, 8.7%) and dermoid cyst (n=2, 1.1%).

|  | Patients (n=172) |
|--|------------------|
| Age, mean±SD year                                | 44.7 ±13.2       |
| Age groups, n(%)                                 |                  |
| 0-18 years                                       | 18 (10.5)        |
| 18-65 years                                      | 110 (63.9)       |
| >65 years  | 44 (25.6)        |
| Gender, n(%)                                     |                  |
| Male   | 94 (54.7)        |
| Female   | 78 (45.3)        |
| Type of hospitalization n(%)                     |                  |
| Inpatient unit                                   | 105 (61)         |
| Intensive care unit                              | 67 (39)          |
| Neurosurgical diseases, n(%)                     |                  |
| Cerebral vascular diseases, n(%)                 | 44 (25.5)        |
| Intracranial hemorrhagic disorders               | 36 (20.9)        |
| Cerebral infarction or transient ischemic attack | 1 (0.6)          |
| Cerebral aneurysm                                | 7 (4.1)          |
| Spinal diseases, n(%)                            | 52 (30.2)        |
| Herniation                                       | 16 (9.3)         |
| Spinal fracture and trauma                       | 21 (12.2)        |
| Others   | 15 (8.7)         |
| Tumor, n(%)                                      | 38 (22.1)        |
| Infectious disease, n(%)                         | 21 (12.2)        |
| Others, n(%)                                     | 17 (9.8)         |

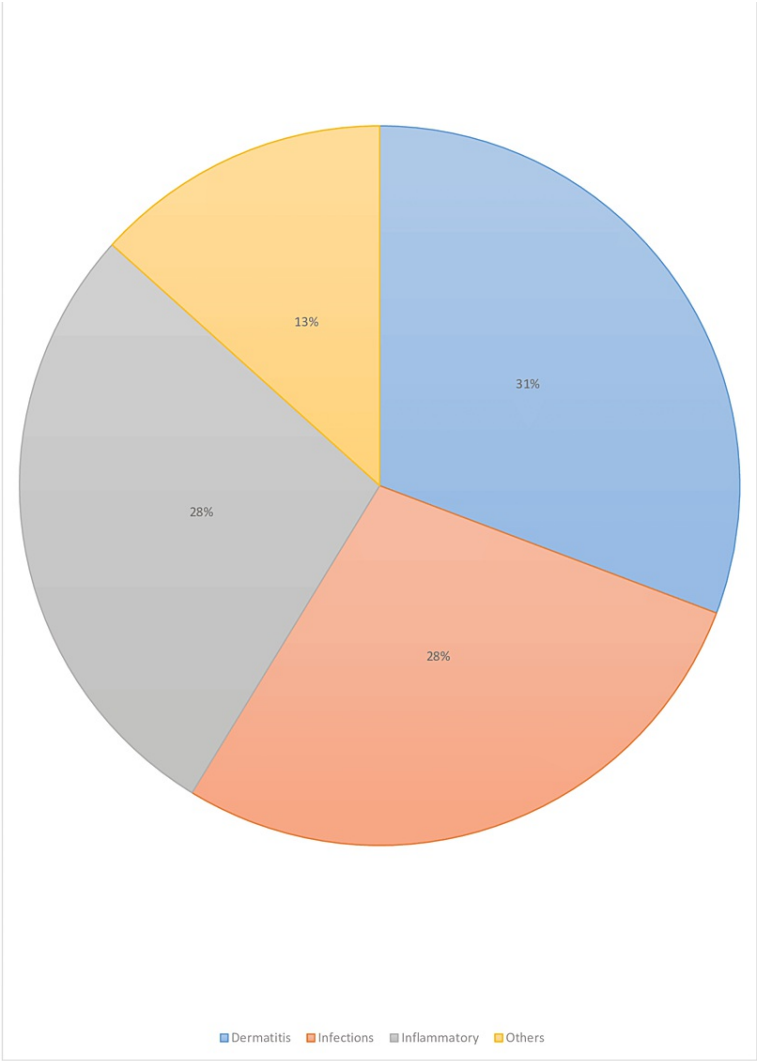
**TABLE 1: The main characteristics of the study**

SD: Standard deviation

The data has been represented as n(%) and mean±SD

Dermatological findings and disease profile of patients

The most seen dermatological finding in 32.6% (n=56) of the patients was macules/patches, followed by papules (n=36, 20.9%) and plaques (n=47, 27.3%). The most commonly diagnosed dermatological disease in patients was drug eruption (n=32, 18.6%), followed by seborrheic dermatitis (SD) (n=28, 16.2%) and contact dermatitis (n=25, 14.5%). Drug eruptions were caused by cefazolin, piperacillin/tazobactam, diclofenac, naproxen, ceftriaxone, and levetiracetam. The most common form of drug eruption was morbilliform (100%). Contact dermatitis was caused by topical nitrofurazone (n=12, 48%), topical diclofenac (n=4, 16%), plaster tape (n=4, 16%), and diapers (n=5, 20%). Twenty percent (n=5) of the contact dermatitis patients had irritant contact dermatitis, while 80% (n=20) had allergic contact dermatitis. The rest of the dermatological findings and disease list are shown in Table 2 and Figure 1.



**FIGURE 1: The distribution of dermatologic diseases**

| Dermatological findings, n(%) |           |
|-------------------------------|-----------|
| Macules/Patches               | 56 (32.6) |
| Papules                       | 36 (20.9) |
| Plaques                       | 47 (27.3) |
| Bullas                        | 5 (2.9)   |
| Vesicle and pustules          | 11 (6.4)  |
| Petechia/purpura              | 5 (2.9)   |
| Ulcer                         | 11 (6.4)  |
| Dermatologic diseases, n(%)   |           |
| Dermatitis                    |           |
| Contact dermatitis            | 25 (14.5) |
| Seborrheic dermatitis         | 28 (16.2) |
| Infections                    |           |
| Cutaneous bacterial diseases  | 9 (5.2)   |
| Cutaneous viral diseases      | 12 (7)    |
| Cutaneous fungal diseases     | 23 (13.4) |
| Scabies                       | 4 (2.3)   |
| Inflammatory                  |           |
| Drug eruption                 | 32 (18.6) |
| Urticaria                     | 2 (1.2)   |
| Papulosquamous diseases       | 3 (1.7)   |
| Bullous diseases              | 1 (0.6)   |
| Alopecia areata               | 1 (0.6)   |
| Folliculitis                  | 9 (5.2)   |
| Others                        |           |
| Hemangioma                    | 1 (0.6)   |
| Genetic skin diseases         | 1 (0.6)   |
| Nevus                         | 4 (2.3)   |
| Cutaneous ulcers              | 17 (9.9)  |

TABLE 2: Dermatologic disease profiles of study participants

The data has been represented as n(%)

The most diagnosed three dermatological diseases in neurosurgery inpatients

Contact dermatitis is the most commonly diagnosed dermatological disease in patients with intracranial hemorrhagic diseases, cerebral aneurysms, tumors, other spinal diseases, and other neurosurgical patients. SD is the most commonly diagnosed dermatological disease in patients with cerebral infarcts. Drug eruption was the most commonly diagnosed dermatological disease diagnosed in patients with herniations, spinal fractures/trauma, and infections. The list of diagnosed three dermatological diseases in patients is shown in Table 3.

| Neurosurgical diseases                           | Dermatological diseases         |
|--|---------------------------------|
| Cerebral vascular diseases                       |                                 |
| Intracranial hemorrhagic disorders               | 1-Contact dermatitis            |
|  | 2- Cutaneous ulcers             |
|  | 3- Seborrheic dermatitis        |
| Cerebral infarction or transient ischemic attack | 1-Seborrheic dermatitis         |
| Cerebral aneurysm                                | 1-Contact dermatitis            |
|  | 2- Seborrheic dermatitis        |
|  | 3- Cutaneous bacterial diseases |
| Spinal diseases                                  |                                 |
| Herniation                                       | 1-Drug eruption                 |
|  | 2-Contact dermatitis            |
|  | 3-Seborrheic dermatitis         |
| Spinal fracture and trauma                       | 1-Drug eruption                 |
|  | 2-Seborrheic dermatitis         |
|  | 3-Contact dermatitis            |
| Others   | 1-Contact dermatitis            |
|  | 2- Cutaneous fungal diseases    |
|  | 3- Seborrheic dermatitis        |
| Tumor  | 1-Contact dermatitis            |
|  | 2- Cutaneous fungal diseases    |
|  | 3- Seborrheic dermatitis        |
| Infectious disease                               | 1-Drug eruption                 |
|  | 2-Seborrheic dermatitis         |
|  | 3-Contact dermatitis            |
| Others   | 1-Contact dermatitis            |
|  | 2- Seborrheic dermatitis        |
|  | 3- Cutaneous bacterial diseases |

TABLE 3: The most seen three dermatological diseases in neurosurgery inpatients

Discussion

Dermatology currently provides primarily outpatient healthcare services. Although cosmetic dermatology has become more popular, clinical dermatology is still essential. Inpatient consultation is an essential part of clinical dermatology. Patients who are hospitalized for non-dermatological diseases can be consulted for dermatological diseases. Recognizing the consultation profile is important for appropriate patient management. There were a considerable number of studies examining dermatological consultations in the literature [3,5,7-11]. However, there was a lack of information and studies about dermatological diseases in neurosurgery inpatients [6]. This study aimed to contribute to the literature in this regard.

In the literature, the relationship between medical departments and dermatological diseases has been analyzed many times based on consultations. In these studies, internal medicine, pediatrics, infectious diseases, and emergency departments were the most frequently requested dermatological consultations. Dermatitis, skin infections, and drug eruption were the most commonly diagnosed dermatological diseases

in these studies [3,5,7-11]. There was limited information about neurosurgery in these studies. A lower percentage of requests from neurosurgery has been documented in some of these studies [7,8,10]. It's interesting to note that neurosurgery was one of the most requested dermatology consultations according to the prior two studies [6,11]. In our study, consultations requested from neurosurgery constituted a small proportion of all consultations.

In a study with a similar purpose to ours, dermatological diseases of neurosurgery inpatients were examined. The mean age was 58.6 years with male dominance (51.8%). These results were consistent with ours. Cerebrovascular diseases were the most common reason for hospitalization, followed by spinal diseases and tumors in the previous study [6]. However, in our study, the most common reason for hospitalization was spinal disease. Additionally, the percentage of tumor patients was lower compared to our study. This may be due to the difference in the number of patients and the difference in physician profiles experienced in tumor surgery between the neurosurgery centers of study.

Eczematous dermatitis (not contact dermatitis or SD) was the most diagnosed dermatologic disease followed by cutaneous fungal infections and drug eruptions in the previous study. In our study, we found the same dermatological disease profile. However, the order was different [6]. We found that the most diagnosed dermatologic diseases were drug eruption, contact dermatitis, and SD.

Drug eruptions, also known as toxidermia, are cutaneous symptoms that occur as a result of systemic drug administration. These reactions range from mild erythematous skin lesions to far more serious reactions like toxic epidermal necrosis [12]. Morbilliform or erythematous maculopapular eruptions account for around 40% of all drug eruptions. Antibiotics (beta-lactams, sulfonamides), nonsteroidal anti-inflammatory medicines (NSAIDs), antiepileptics (carbamazepine, hydantoins), and allopurinol are the most commonly caused agents. The lesions typically form on the trunk or in areas of pressure or trauma first. They spread to the extremities, usually in a symmetrical pattern [13]. In our study, all patients with drug eruption had a morbilliform type. Additionally, the culprit drugs of our study (piperacillin tazobactam, naproxen, and diclofenac) were compatible with the literature. Drug eruptions were found in most patients with neurosurgical infectious diseases, herniation, and spinal fracture/ trauma. In one study, Kim et al. showed the same relationship between infectious diseases and drug eruption in neurosurgical inpatients [11]. This is logical because these patients are more likely to use antibiotics and NSAIDs. In the literature, some drugs induced drug eruption in neurosurgical patients in addition to our causal agents like temozolomide and cephalexin [14,15]. We suggest that neurosurgeons should investigate drug eruption and consult with dermatology in patients who have an erythematous maculopapular rash after taking antibiotics or NSAIDs.

Contact irritants and allergens are chemicals or metal ions that have negative impacts on the skin. Irritant contact dermatitis and allergic contact dermatitis are the two types of contact dermatitis [16,17]. In our study, the causative agents of contact dermatitis were found as topical nitrofurazone, topical diclofenac, plaster tape, and diapers. Nitrofurazone is a topical antibacterial agent having broad-spectrum action. In our country, surgeons, and family physicians choose it for chronic leg ulcers, superficial skin infections, ulcers, burns, and other types of chronic dermatitis. The ointment form of nitrofurazone comprises 0.2% nitrofurazone and the vehicles polyethylene glycol (PEG) 300, PEG 1000, and PEG 4000. Nitrofurazone sensitization is widely reported in the literature [18]. Because of the high incidence of allergic reactions, the use of nitrofurazone has been largely discontinued in Western countries [19]. Some agents induced contact dermatitis in neurosurgical patients in addition to our causal agents like the cervical collar and mastisol (liquid medical adhesive used to secure dressings and tapes) [20,21]. In our study, contact dermatitis was diagnosed mostly in patients with intracranial hemorrhagic disease, cerebral aneurysms, tumors, other spinal diseases, and other neurosurgical patients. The possibility of being bedridden for a long time and having to undergo many surgeries is more likely in these diseases. Based on this data, we suggest neurosurgeons avoid using unnecessary topical antibiotics and NSAIDs in wound care and use allergy-free diapers and faster tapes.

SD is a common inflammatory skin disease characterized by a papulosquamous morphology in sebaceous gland-rich areas, such as the scalp, face, and body folds. Scaling, erythema, and itching are common symptoms of SD [22]. The relationship between neurological/neurosurgical diseases and SD has been examined many times in the literature. Particularly, the relationship between Parkinson's disease and SD was emphasized [23]. Reed et al. reported a significant incidence of SD following spinal cord injury as a result of changed sebum secretion, dermatophytosis, and sweat secretion alterations. In addition, the deposition of sebum and scales on improperly cleaned skin caused by prolonged immobilization was proposed as a probable cause of SD in this study [24]. Kim et al. reported a relationship between intracranial hemorrhage and SD. It has been suggested that the quadriplegic condition seen in ICH patients could be one of the causes [6]. It is clear that more studies are needed to examine the relationship between SD and neurosurgical diseases.

There are some limitations in this study. This study was a retrospective study with a limited number of participants. Additionally, this study was single-center and there was no control group in the study. The strength of our study was that it is one of the few studies on this subject in the literature.

## Conclusions

According to this study, the most commonly diagnosed dermatological diseases in neurosurgery inpatients were drug eruption, contact dermatitis, and SD. The results of this study may be helpful in terms of neurosurgical training planning and treatment management. However, studies with more participants are needed to examine the relationship between dermatological and neurosurgical diseases.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Berkay Temel, Ozge Orenay, Nermin Karaosmanoglu

**Acquisition, analysis, or interpretation of data:** Berkay Temel, Ayhan Tekiner

**Drafting of the manuscript:** Berkay Temel, Ozge Orenay, Nermin Karaosmanoglu

**Critical review of the manuscript for important intellectual content:** Berkay Temel, Ozge Orenay, Ayhan Tekiner

**Supervision:** Berkay Temel, Ozge Orenay, Nermin Karaosmanoglu , Ayhan Tekiner

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. Ankara Training and Research Hospital Ethics Committee issued approval E-23-1393. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

## References

1. Ferreira IG, Almeida CS, Bulcão LA, Ferreira DG, Weber MB, Bonamigo RR: Hospital dermatology: analysis of dermatological consultations in a tertiary teaching hospital. *An Bras Dermatol*. 2023, 98:620-34. [10.1016/j.abd.2022.08.010](https://doi.org/10.1016/j.abd.2022.08.010)
2. Neau JP, Godeneche G, Mathis S, Guillet G: Neurodermatology. *Handb Clin Neurol*. 2014, 121:1561-94. [10.1016/B978-0-7020-4088-7.00104-8](https://doi.org/10.1016/B978-0-7020-4088-7.00104-8)
3. Adisen E, Ünal S, Güler MA: Dermatology consultations. *Turkderm Arch Turk Dermatol Venerol*. 2006, 40:126-9.
4. Connolly DM, Silverstein DI: Dermatology consultations in a tertiary care hospital: a retrospective study of 243 cases. *Dermatol Online J*. 2015, 21:13030.
5. Williams A, Bhatia A, Kanish B, Chaudhary PR, Samuel CJ: Pattern of inpatient dermatology consultations in a tertiary care centre from northern India. *J Clin Diagn Res*. 2016, 10:WC07-10. [10.7860/JCDR/2016/21182.8968](https://doi.org/10.7860/JCDR/2016/21182.8968)
6. Kim KM, Kim HS, Yu J, Kim JT, Cho SH: Analysis of dermatologic diseases in neurosurgical in-patients: a retrospective study of 463 cases. *Ann Dermatol*. 2016, 28:314-20. [10.5021/ad.2016.28.3.314](https://doi.org/10.5021/ad.2016.28.3.314)
7. Peñate Y, Guillermo N, Melwani P, Martel R, Borrego L: Dermatologists in hospital wards: an 8-year study of dermatology consultations. *Dermatology*. 2009, 219:225-31. [10.1159/000232390](https://doi.org/10.1159/000232390)
8. Lyu SM, Byun JY, Choi YW, Choi HY: Clinical features of dermatology-consulted inpatients: focus on the differences between individual departments. *Korean J Dermatol*. 2014, 52:215-21.
9. Tay LK, Lee HY, Thirumoorthy T, Pang SM: Dermatology referrals in an East Asian tertiary hospital: a need for inpatient medical dermatology. *Clin Exp Dermatol*. 2011, 36:129-34. [10.1111/j.1365-2230.2010.03923.x](https://doi.org/10.1111/j.1365-2230.2010.03923.x)
10. Fernandes IC, Velho G, Selores M: Dermatology inpatient consultation in a Portuguese university hospital. *Dermatol Online J*. 2012, 18:16.
11. Kim MJ, Cho SY, Whang KK, Hahm JH: A statistical analysis of dermatologic consultation in nondermatologic inpatients. *Korean J Dermatol*. 2000, 38:1007-15.
12. Getova VI, Georgiev SR, Stoimenova AH, Petkova-Georgieva ES: Bulgarian experience with adverse drug reaction reports from patients and consumers - retrospective data-base study. *Folia Med (Plovdiv)*. 2018, 60:447-53. [10.2478/foimed-2018-0016](https://doi.org/10.2478/foimed-2018-0016)
13. Amsler E, Soria A: Hypersensitivity reactions to beta-lactam antibiotics (Article in French). *Rev Med Interne*. 2017, 38:737-48. [10.1016/j.revmed.2017.06.020](https://doi.org/10.1016/j.revmed.2017.06.020)
14. Mehta H, Gendle CS, Kumaran MS, Vinay K: Temozolomide-induced drug rash with eosinophilia and systemic symptoms syndrome. *Indian J Dermatol Venereol Leprol*. 2023, 89:160. [10.25259/IJDVL\\_754\\_2021](https://doi.org/10.25259/IJDVL_754_2021)
15. Rathinam KK, Sabarathinam S, Nuthalapati P, Mahalingam VT: Phenytoin induced Stevens-Johnson syndrome-toxic epidermal necrolysis overlap exacerbated by cephalixin in a 65-year-old neurosurgical



- patient: a rare case report. *Curr Drug Res Rev.* 2022, 14:80-3. [10.2174/2589977513666210322160009](#)
16. Basketter DA, Huggard J, Kimber I: Fragrance inhalation and adverse health effects: the question of causation. *Regul Toxicol Pharmacol.* 2019, 104:151-156.
  17. Esser PR, Mueller S, Martin SF: Plant allergen-induced contact dermatitis. *Planta Med.* 2019, 85:528-34. [10.1055/a-0873-1494](#)
  18. Bilgili SG, Ozaydin-Yavuz G, Yavuz IH, Bilgili MA, Karadag AS: Cutaneous reactions caused by nitrofurazone. *Postepy Dermatol Alergol.* 2019, 36:398-402. [10.5114/ada.2019.87444](#)
  19. Gehrig KA, Warshaw EM: Allergic contact dermatitis to topical antibiotics: epidemiology, responsible allergens, and management. *J Am Acad Dermatol.* 2008, 58:1-21. [10.1016/j.jaad.2007.07.050](#)
  20. Krishnan P, Aditya G: Allergic contact dermatitis due to cervical collar . *J Neurosci Rural Pract.* 2022, 13:159-60. [10.1055/s-0041-1740454](#)
  21. Bowman RM, Thirunavu V, Lam S: Blistering skin reaction with Mastisol in a patient with spina bifida: illustrative case. *J Neurosurg Case Lessons.* 2021, 1:CASE2011. [10.3171/CASE2011](#)
  22. Schwartz JR, Messenger AG, Tosti A, et al.: A comprehensive pathophysiology of dandruff and seborrheic dermatitis - towards a more precise definition of scalp health. *Acta Derm Venereol.* 2013, 93:131-7. [10.2340/00015555-1382](#)
  23. Arsic Arsenijevic VS, Milobratovic D, Barac AM, Vekic B, Marinkovic J, Kostic VS: A laboratory-based study on patients with Parkinson's disease and seborrheic dermatitis: the presence and density of *Malassezia* yeasts, their different species and enzymes production. *BMC Dermatol.* 2014, 14:5. [10.1186/1471-5945-14-5](#)
  24. Reed WB, Pidgeon J, Becker SW : Patients with spinal cord injury. *Clinical cutaneous studies . Arch Dermatol.* 1961, 83:379-85. [10.1001/archderm.1961.01580090029002](#)