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Clinical Profile and Predictors of Posterior Reversible Encephalopathy Syndrome at Tertiary Care Hospital, Peshawar

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ABSTRACT

Posterior Reversible Encephalopathy Syndrome is an acute neurological condition characterized by reversible subcortical vasogenic edema, often presenting with seizures, headache, visual disturbances, and altered mental status. **Objectives:** To evaluate the clinical profile, risk factors, radiological findings, and outcomes of Posterior Reversible Encephalopathy Syndrome patients at a tertiary care hospital in Peshawar. **Methods:** This prospective cohort study was conducted at Northwest General Hospital and Research Center, Peshawar, from January 2023 to March 2025. Ninety patients diagnosed with Posterior Reversible Encephalopathy Syndrome through clinical presentation and Magnetic Resonance Imaging confirmation were enrolled using non-probability consecutive sampling. Data on demographics, risk factors, symptoms, imaging, outcomes, and length of hospital stay were collected and analyzed. Descriptive analysis of the study was performed through SPSS version 25.0. **Results:** Among 90 patients, 61 (67.8%) were females, 29 (32.2%) were males. The mean age was 35.92 ± 3.16 years. Seizures (70%), headache (56.7%), and altered mental status (54.4%) were the most common symptoms. Hypertension (53.3%) and postpartum eclampsia (50.8% of females) were the leading risk factors. Magnetic Resonance Imaging showed parieto-occipital/cerebellar involvement in 74.4% and bilateral lesions in 96.7%. Most patients (92.2%) recovered and were discharged, while 7.8% passed away. **Conclusions:** Posterior Reversible Encephalopathy Syndrome is more prevalent in young females with underlying hypertension or postpartum complications. Early recognition and management can result in favorable outcomes. This study highlights the importance of timely diagnosis to prevent irreversible damage.

INTRODUCTION

Posterior reversible encephalopathy syndrome (PRES) is a clinical and radiological condition characterized by bilateral reversible vasogenic edema of the subcortical white matter, mostly in the parieto-occipital region. This causes a range of acute or subacute neurological symptoms, including headache, mental status changes, seizures, and visual impairment. PRES is typically suspected in patients with severe hypertension, renal failure, autoimmune diseases, eclampsia, or immunosuppressive medicines. Frequent neurological evaluations and neuroimaging using computed tomography or magnetic resonance imaging are required to diagnose and assess the illness [1, 2]. This syndrome mostly affects young and middle-aged people, predominantly females, and may present a variety of clinical symptoms, like visual disturbances, headaches, seizures, and impaired consciousness. Magnetic Resonance Imaging reveals oedema, typically affecting the posterior subcortical areas. Triggering factors include hypertension, pre-eclampsia/eclampsia, renal failure, cytotoxic agents, and autoimmune conditions [3]. PRES is a reversible but often underdiagnosed neurological

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condition associated with a range of triggers such as hypertension, renal failure, autoimmune disorders, and eclampsia. This study aims to evaluate the clinical characteristics, risk factors, and radiological patterns of PRES, and to identify factors associated with in-hospital mortality and clinical outcomes among patients admitted to our center. While PRES has been well-documented globally, most of the available literature from Pakistan, particularly from Peshawar, consists of case reports, with very limited research-based studies. There is a lack of comprehensive local data regarding its clinical presentation, risk factors, and outcomes in our population.

Posterior Reversible Encephalopathy Syndrome (PRES) is an increasingly recognized neurological condition associated with hypertension, renal dysfunction, and pregnancy-related complications. Despite its clinical importance, the condition remains underdiagnosed due to its variable presentation and limited awareness among clinicians. Most available evidence is derived from international studies, while local data from Pakistan, particularly from Peshawar remain scarce and are mainly limited to case reports. This lack of comprehensive regional evidence highlights the need for systematic research to better understand the clinical profile, risk factors, and outcomes of PRES in the local population. This study aims to evaluate the clinical profile, risk factors, radiological findings, and outcomes of Posterior Reversible Encephalopathy Syndrome patients at a tertiary care hospital in Peshawar.

METHODS

This prospective cohort study was carried out in the Neurology Department of Northwest General Hospital and Research Center, Peshawar, from February 2025 to April 2025. Ethical approval (Ref# IRB&EC/2024-GH/0245) was obtained from the Institutional Review Board and Ethical Committee of Alliance Health Care Private Limited, and written informed consent was taken from all participants. Patients presenting to the emergency or neurology departments with acute neurological symptoms suggestive of posterior reversible encephalopathy syndrome (PRES), such as seizures, headache, visual disturbances, or altered mental status, were clinically assessed and underwent magnetic resonance imaging (MRI). Using a non-probability consecutive sampling technique, only those with bilateral, symmetrical vasogenic edema predominantly involving the posterior brain regions on MRI were included. The sample size (n=90) was calculated at a 95% confidence level, 5% margin of error, and an expected frequency of systemic hypertension of 6.2% [4]. Inclusion criteria were age >18 years, either gender, and both clinical and radiological confirmation of PRES. Patients with inconclusive or normal MRI findings, alternative neurological diagnoses, pre-existing major neurological disease, or those who declined participation were excluded. PRES was defined as bilateral, symmetrical hyperintense signals on T2-weighted and fluid-attenuated inversion recovery (FLAIR) sequences predominantly in the parieto-occipital lobes, without significant diffusion restriction on diffusion-weighted imaging (DWI) and infarction, confirmed by a consultant radiologist. Electroencephalography (EEG) was performed in patients with seizures or unexplained altered mental status, fundoscopy was conducted in patients with visual complaints, and obstetric history was obtained in pregnant or postpartum women to assess for pre-eclampsia/eclampsia. Data were collected prospectively using a structured proforma, including demographic details, clinical presentation, blood pressure readings, medical and obstetric history, medication use, laboratory investigations (CBC, renal and liver function tests, electrolytes, autoimmune profile, and urine protein where relevant), fundoscopy and EEG findings, radiological results, treatment strategies, and short-term clinical outcomes. Management included blood pressure control, antiepileptic therapy, and intensive care admission in cases of severe neurological compromise, hemodynamic instability, or refractory seizures. Patients were followed during their hospital stay to assess disease progression and treatment response. Data were analyzed using SPSS version 25.0; numerical variables were expressed as mean ± SD or median (IQR) after normality testing, and categorical variables as frequencies and percentages. The independent t-test or Mann-Whitney U test was used for continuous variables, and Fisher's exact test for categorical variables to compare outcomes based on discharge status.

RESULTS

The study included 90 patients diagnosed with PRES, predominantly females 61 (67.8%). The mean age of patients was 35.92 ± 3.16 years. Clinically, seizures were the most common presentation, 63 (70%), and hypertension was the most prevalent risk factor, present in 48 (53.3%) patients. Renal involvement was observed in 27 (30%) patients and 9 (10%) diagnosed with chronic kidney disease. Imaging findings predominantly showed parieto-occipital and cerebellar involvement in 67 (74.4%) patients, Table 1.

Table 1: Demographics, Clinical Profile, Risk Factors, Imaging, and Outcomes PRES patients

Variables	Frequency (%) /Mean ± S.D
Demographics	
Males (n, %)	29 (32.2%)
Females (n, %)	61 (67.8%)

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Age (mean ± SD) years	35.92 ± 3.16 years
Clinical Profile	
Seizures (n, %)	63 (70%)
Headache (n, %)	51 (56.7%)
Visual Impairments (n, %)	28 (31.11%)
Altered Mental Status (n, %)	49 (54.4%)
Vomiting (n, %)	17 (18.9%)
Fever (n, %)	15 (16.7%)
Quadriperesis and Hemiperesis (n, %)	11 (12.2%)
Risk Factors	
Hypertension (n, %)	48 (53.3%)
Postpartum/Eclampsia (n, %)	31/61 (50.8%) (Females)
Renal Diseases (n, %)	27 (30%)
Chronic Kidney Disease (n, %)	9 (10%)
Imaging Profile	
Parieto-occipital and Cerebellar Involvement (n, %)	67 (74.4%)
Subcortical Lesions (n, %)	64 (71.1%)
Bilateral Involvement (n, %)	87 (96.7%)

There was no statistically significant difference in age or gender distribution between discharged and died patients (p>0.050). However, hospital stay was significantly shorter in patients who died compared to those discharged (median 6 vs. 9 days, p=0.045). The p-value was calculated by using the t-test, the Mann-Whitney U test, and Fisher's Exact test, Table 2.

Table 2: Comparison of demographic and clinical variables between patients discharged and those who died during hospitalization for PRES

Variable	Discharged (n=83)	Died (n=7)	p-Value
Age (years) Mean ± SD	33.6 ± 2.9	36.0 ± 11.2	0.590
Hospital Stay Median (IQR)	9 days (IQR = 5)	6 days (IQR = 3)	0.045
Female (n, %)	56/61 (91.8%)	5/61 (8.2%)	0.999
Male (n, %)	27/29 (93.1%)	2/29 (6.9%)	

Axial FLAIR MRI scan of the brain, demonstrating a large, hyperintense lesion in the left temporal lobe. The lesion shows surrounding vasogenic edema and is causing mass effect with effacement of the temporal sulci, Figure 1.

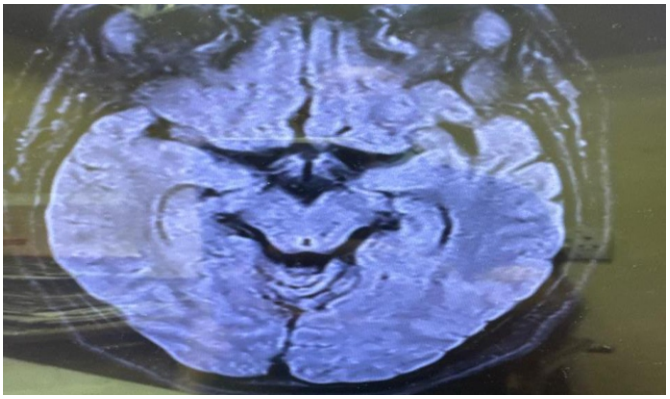

Figure 1: Axial FLAIR MRI scan of the brain, demonstrating a large, hyperintense lesion in the left temporal lobe

T2-weighted axial MRI scan of the brain at the level of the lateral ventricles. The image shows a well-defined, hyperintense lesion within the right posterior frontal lobe, Figure 2.

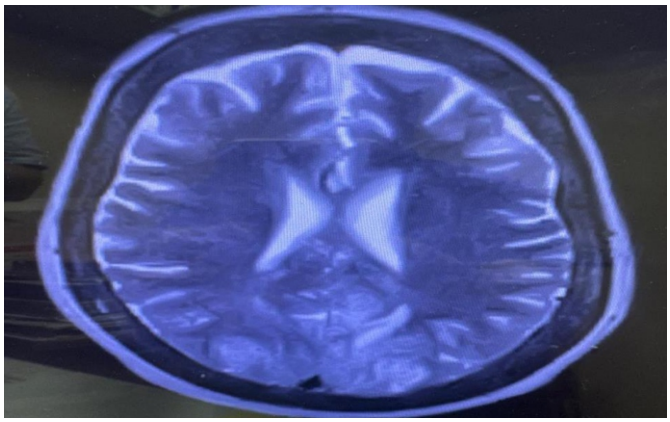

Figure 2: T2-weighted axial MRI scan of the brain at the level of the lateral ventricles

Axial FLAIR MRI scan of the brain, at the level of the parietal lobes. A small, discrete focus of hyperintensity is seen in the subcortical white matter of the left parietal lobe, Figure 3.

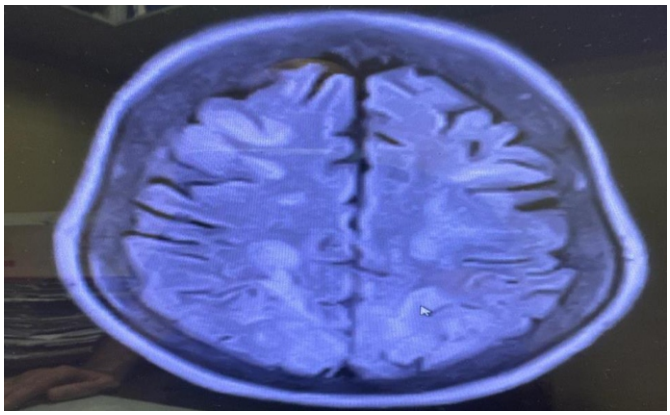

Figure 3: Axial FLAIR MRI scan of the brain, at the level of the parietal lobes

DISCUSSION

This study evaluated the clinical profile, risk factors, radiological patterns, and outcomes of patients diagnosed with PRES in a tertiary care hospital in Peshawar. The most frequent presenting symptoms—seizures, headaches, visual disturbances, and altered mental status—were consistent with previous reports by William *et al.* [5] and Ghanem *et al.* [6], where seizures were observed in up to 79.01% of cases. These features reflect the underlying pathophysiological hallmark of PRES: vasogenic edema, predominantly affecting the parieto-occipital lobes [5, 7]. The similarity of our findings to reports from other populations underscores the consistent presentation of PRES across regions. Hypertension was the most common associated condition, frequently occurring in combination

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with preeclampsia and eclampsia in pregnant or postpartum women [8]. A systematic review also highlighted its significant association with PRES in systemic lupus erythematosus (SLE) patients, stressing the importance of strict blood pressure control [9]. Renal failure, with or without immunosuppressive therapy, is another important contributor [10]. Autoimmune diseases such as SLE, particularly when treated with cyclophosphamide, pose an elevated risk due to both disease-related vascular inflammation and treatment-related endothelial injury [11, 9]. In addition, cytotoxic and immunosuppressive drugs especially cyclosporine and tacrolimus—are well-recognized precipitants, particularly in transplant and oncology patients [12]. As in previous studies, we observed a higher prevalence of PRES in females, largely due to pregnancy-related cases, consistent with Seitz *et al.* [13] and Ranasingha and Bandara [14]. William *et al.* [5] similarly reported eclampsia as the most frequent risk factor in a Pakistani cohort. These findings highlight the need for heightened clinical vigilance in pregnant and postpartum women, where the condition may progress rapidly if not promptly addressed. The link between PRES and pregnancy is further supported by Hossain *et al.* [15], who demonstrated a significant association with gestational age. Barai and Aher [4] reported that, in 97 PRES cases, the male-to-female ratio was 1:18, with headache, seizures, altered sensorium, and visual disturbances being the most common symptoms. Antepartum eclampsia, postpartum eclampsia, and preeclampsia were the main risk factors, followed by systemic hypertension and renal disease. Radiologically, the occipital lobe was most frequently involved, with subcortical hypodensities seen in all patients. Although most patients recovered well, the authors emphasized that PRES is not always reversible and can lead to morbidity or mortality [1]. In current cohort, the proportion of male patients (32.2%) was higher than reported in most literature, which generally shows female predominance. This pattern is consistent with a study in hemodialysis patients, where 72% of PRES cases were male, suggesting that renal failure may increase risk in this group [16]. Hypertension, renal impairment, and immunosuppressive drug use were notable risk factors in our series, corroborating findings from Hinduja, [17] and William *et al.* [5]. Our overall prognosis was favorable, with 92.2% of patients discharged, comparable to the reversibility rates reported by Hinduja, [17]. Nevertheless, severe cases, particularly those with comorbidities such as myelodysplastic syndromes or cerebral hemorrhage, have worse outcomes, as shown by Takigawa *et al.* [18] and Lim *et al.* [19]. Persistent neurological deficits, including visual and motor impairments, may also occur, potentially affecting long-term quality of life [20]. The in-hospital mortality rate in our study (7.8%) was between the ranges reported in literature, 11.2% [21] and 2.17% [22]. All deceased patients presented with severe neurological compromise and significant comorbidities, such as chronic kidney disease, postpartum eclampsia with multiorgan dysfunction, or poorly controlled hypertension. Shorter hospital stays in these patients compared to survivors likely reflected rapid deterioration despite standard care. Late presentation and advanced disease stage at admission appear to have been major contributors to mortality in our setting. Our median hospital stay was shorter than reported by Goyal and Jeswani, [23] and de Farias Bressan *et al.* [24], which may reflect differences in disease severity, timeliness of intervention, and healthcare resource availability. The reversibility of PRES with timely management, especially blood pressure control and treatment of underlying causes, remains a key finding, consistent with the literature [17]. Early recognition is critical to preventing permanent neurological damage, as also stressed by Khanum *et al.* [25].

This study has limitations, including its single-center design, small sample size, short follow-up, and lack of treatment monitoring, which may limit generalizability. Additionally, the study focused primarily on short-term in-hospital outcomes and lacked long-term follow-up to assess neurological recovery or recurrence of PRES Future multicenter studies with larger cohorts and long-term follow-up are needed to confirm these findings and refine prognostic assessments in PRES.

CONCLUSIONS

Our study findings highlight that PRES predominantly affects young to middle-aged females and commonly presents with seizures, headaches, altered mental status, and visual disturbances. The most frequent risk factors identified were hypertension, postpartum eclampsia, and renal dysfunction. MRI typically revealed bilateral parieto-occipital lobe and cerebellum involvement. Most patients had favorable outcomes with early diagnosis and treatment. Recognizing these clinical and radiological predictors can facilitate timely diagnosis and management, thereby reducing morbidity and mortality associated with PRES.

Authors' Contribution

Conceptualization: ANN
Methodology: ANN
Formal analysis: HK, ANN
Writing and Drafting: AH, H, ANN, NAK
Review and Editing: AH, H, ANN, NAK, HK

All authors approved the final manuscript and take responsibility for the integrity of the work

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Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Ando Y, Ono Y, Sano A, Fujita N, Ono S. Posterior Reversible Encephalopathy Syndrome: A Review of the Literature. Internal Medicine. 2022 Jan; 61(2): 135-41. doi: 10.2169/internalmedicine.7520-21.

[2] Parasher A and Jhamb R. Posterior Reversible Encephalopathy Syndrome (PRES): Presentation, Diagnosis and Treatment. Postgraduate Medical Journal. 2020 Oct; 96(1140): 623-8. doi: 10.1136/postgradmedj-2020-137706.

[3] Triplett JD, Kutlubaev MA, Kermode AG, Hardy T. Posterior Reversible Encephalopathy Syndrome (PRES): Diagnosis and Management. Practical Neurology. 2022 Jun; 22(3): 183-9.

[4] Barai S and Aher A. To Study the Clinic radiological Profile and Outcome of Posterior Reversible Encephalopathy Syndrome (PRES). The Journal of the Association of Physicians of India. 2022 Apr; 70(4): 11-2.

[5] William M, Anjum S, Habib M, Paudel N, Anjum AS. Posterior Reversible Encephalopathy Syndrome: A Study of Risk Factors, Presenting Complaints, and Magnetic Resonance Imaging Findings from a Tertiary Care Hospital in Pakistan. International Journal of Research in Medical Sciences. 2024 Oct; 12(10): 3628. doi: 10.18203/2320-6012.ijrms20242919.

[6] Ghanem R, Glaisner S, Bobin A, Ronchetti AM, Cereja S, Joly B, *et al.* Posterior Reversible Encephalopathy Syndrome (PRES) and Myeloma. Leukemia Research Reports. 2024 Jan; 21: 100407. doi: 10.1016/j.lrr.2023.100407.

[7] Makkawi S, Khojah O, Baeshen SK, Ahmed ME. Clinical and Radiological Features of Unilateral Posterior Reversible Encephalopathy Syndrome (PRES): A Case Report. Cureus. 2024 Apr; 16(4). doi: 10.7759/cureus.58774.

[8] Marcoccia E, Piccioni MG, Schiavi MC, Colagiovanni V, Zannini I, Musella A, *et al.* Postpartum Posterior Reversible Encephalopathy Syndrome (PRES): Three Case Reports and Literature Review. Case Reports in Obstetrics and Gynecology. 2019; 2019(1): 9527632. doi: 10.1155/2019/9527632.

[9] Bhangu JK, Javed K, Manshahia PK, Nahar S, Kanda S, Chatha U, *et al.* The Association of Hypertension with Posterior Reversible Encephalopathy Syndrome in Systemic Lupus Erythematosus Patients: A Systematic Review. Cureus. 2023 Dec; 15(12). doi: 10.7759/cureus.50620.

[10] Chowdhary M, Kabbani AA, Tobey D, Hope TD. Posterior Reversible Encephalopathy Syndrome in a Woman with Focal Segmental Glomerulosclerosis. Neuropsychiatric Disease and Treatment. 2015 Apr; 11: 1111-4. doi: 10.2147/NDT.S84010.

[11] Buttar C, Lakhdar S, Castillo FC, Abrudescu A. Cyclophosphamide Induced Posterior Reversible Encephalopathy Syndrome (PRES) in a Patient with Lupus Nephritis. Clinical Medicine Reviews and Case Reports. 2021; 8: 354. doi: 10.23937/2378-3656/1410354.

[12] Nakai T, Honda N, Soga E, Fukui S, Kitada A, Yokogawa N, *et al.* A Retrospective Analysis of the Safety of Tacrolimus Use and Its Optimal Cut-off Concentration during Pregnancy in Women with Systemic Lupus Erythematosus: Study from Two Japanese Tertiary Referral Centers. Arthritis Research & Therapy. 2024 Jan; 26(1): 15. doi: 10.1186/s13075-023-03256-8.

[13] Seitz A, Zhang C, Qadourah H, Parauda S, Kaiser J, Liao V, *et al.* Epidemiology of Posterior Reversible Encephalopathy Syndrome (PRES) in the United States: A National Inpatient Sample Study. Stroke. 2024 Feb; 55(Suppl 1): WP155. doi: 10.1161/str.55.suppl_1.WP155.

[14] Ranasingha K, Bandara K. Posterior Reversible Encephalopathy Syndrome (PRES) in a Postpartum Woman with Late-onset Preeclampsia. Sri Lanka Journal of Obstetrics and Gynaecology. 2023 Dec; 45(4). doi: 10.4038/sljog.v45i4.8098.

[15] Hossain N, Khan N, Panhwar N, Noureen S. Clinical Spectrum of Posterior Reversible Encephalopathy Syndrome (PRES) in Patients with Eclampsia. Pakistan Journal of Medical Sciences. 2015 Sep; 31(5): 1121. doi: 10.12669/pjms.315.7707.

[16] Chandragiri S, Surendra M, Raju S, Sridhar N, Ramesh B, Raju N. Clinical Profile and Outcome of Posterior Reversible Encephalopathy Syndrome in Hemodialysis Patients. Indian Journal of Nephrology. 2018 Jul; 28(4): 283-6. doi: 10.4103/ijn.IJN_237_17.

[17] Hinduja A. Posterior Reversible Encephalopathy Syndrome: Clinical Features and Outcome. Frontiers in Neurology. 2020 Feb; 11: 71. doi: 10.3389/fneur.2020.00071.

[18] Takigawa K, Shima T, Kubara C, Akamine S, Utsumi S, Yoshino T, *et al.* Fatal Posterior Reversible Encephalopathy Syndrome after Blood Transfusion in a Patient with Myelodysplastic Syndromes. Transfusion. 2024 Sep; 64(9): 1791-7. doi: 10.1111/trf.17968.

[19] Lim JH, Kim SH, Mo C, Kim HW, Lee SY. Clinical Features and Outcomes of Posterior Reversible

DOI: https://doi.org/10.54393/pjhs.v6i7.3240

Encephalopathy Syndrome after Heart Transplantation: A Case Series. Clinical Transplantation and Research. 2024 Jun; 38(2): 154-62. doi: 10.4285/ctr.24.0009.

[20] Fischer M, Schmutzhard E. Posterior Reversible Encephalopathy Syndrome. Journal of Neurology. 2017 Aug; 264(8): 1608-16. doi: 10.1007/s00415-016-8377-8.

[21] Siebert E, Bohner G, Liebig T, Endres M, Liman TG. Factors Associated with Fatal Outcome in Posterior Reversible Encephalopathy Syndrome: A Retrospective Analysis of the Berlin PRES Study. Journal of Neurology. 2017 Feb; 264(2): 237-42. doi: 10.1007/s00415-016-8328-4.

[22] Cui HW, Lei RY, Zhang BA. Clinical Features and Risk Factors of Mortality in Patients with Posterior Reversible Encephalopathy Syndrome. Behavioural Neurology. 2022; 2022(1): 9401661. doi: 10.1155/2022/9401661.

[23] Goyal G, Jeswani J. Study of Clinicoradiological Profile in Posterior Reversible Encephalopathy Syndrome: An Experience from North India. Indian Journal of Critical Care Medicine. 2022; 26(4): 501. doi: 10.5005/jp-journals-10071-24172.

[24] de Farias Bressan ML, Merlos F, Merlos PG, Faria JP, Roman AK. Posterior Reversible Encephalopathy Syndrome in a Dialysis Patient - A Case Report. LUMEN ET VIRTUS. 2024 Aug; 15(39): 2732-8. doi: 10.56238/levv15n39-087.

[25] Khanum E, Rahman NT, Islam A, Rahman T, Mahmud N, Begum S. Posterior Reversible Encephalopathy Syndrome in a 20-year-old Female Admitted into the Intensive Care Unit. Journal of Enam Medical College. 2021; 11(3): 190-4. doi: 10.3329/jemc.v11i3.66886.