International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Gupta M et al. Int J Reprod Contracept Obstet Gynecol. 2020 Oct;9(10):4236-4244
www.ijrcog.org

pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20204320

Original Research Article

A study of neurological disorders in pregnancy and puerperium

Megha Gupta[1]*, Yashodhara Pradeep[1], Renu Singh[1], P. K. Shrivastava[2]

[1]Department of Obstetrics and Gynaecology, [2]Department of Radiodiagnosis King George Medical University, Lucknow, Uttar Pradesh, India

Received: 10 August 2020
Revised: 10 September 2020
Accepted: 11 September 2020

***Correspondence:**
Dr. Megha Gupta,
E-mail: megha.guptaobg@gmail.com

ABSTRACT

Background: Neurological diseases contribute to 20% of maternal deaths. The objective of this study was to find the prevalence of primary and secondary neurological disorders in pregnant and postpartum patients, to study their clinical features, feto-maternal outcome and diagnosis using radiological imaging.
Methods: This is a prospective cross-sectional study done over a period of 1 year. Pregnant and postpartum women with neurological disorders except eclampsia were enrolled. A total of 100 cases were analysed out of which 92 underwent radiological imaging to confirm diagnosis. Primary outcome in the form of prevalence of neurological disorders and secondary outcome in the form of maternal and foetal outcome was assessed.
Results: The prevalence of neurological disorders in pregnancy is 1150/100000 deliveries. 75 cases were classified as primary neurological disorders (prevalence of 862/100000) which included epilepsy, cerebrovascular accidents, CNS infections, neoplasm, neuropathies and miscellaneous. 25 cases were secondary neurological disorders (prevalence of 287/100000) which included hepatic and septic encephalopathy. Among primary disorders the prevalence of cerebrovascular accidents was found to be highest (33.3%) followed by epilepsy (32%) while that among secondary neurological disorder was of Hepatic encephalopathy (92%). Majority (68%) had recovery while 15%of women had residual deficit. There were 17 (17%) cases of maternal mortality.
Conclusions: Neurological disorders were significantly associated with poor feto- maternal outcome. Radiological imaging in the form of MRI is an excellent diagnostic tool for confirming diagnosis of neurological disorders.

Keywords: Cerebrovascular accident, Epilepsy, Neurological disorder

INTRODUCTION

A variety of neurological disorders may be encountered during pregnancy and puerperium. Management of pregnancy with neurological disease is highly challenging. Neurological diseases contribute to approximately 20% of maternal deaths.[1] Neurological disorders in pregnancy can be primary or secondary. The primary neurological disorders studied in relation to pregnancy include Epilepsy, Cerebrovascular accidents, CNS infections, neoplastic diseases, neuropathies, demyelinating disorders etc.[2] Secondary neurological disorders include metabolic encephalopathies secondary to hypoxia, ischaemia, hypoglycaemia, hepatic failure or azotemia.

Neurological disorders commonly manifest as headache, seizures, motor deficits, altered sensorium, visual deficits, aphasia, and cranial nerve palsies. According to WHO, headache emerged to be a very common neurological complaint during pregnancy.[3] Epilepsy is the most common neurological disease that will be encountered by an obstetrician (1in 200) followed by cerebrovascular accidents. Cerebrovascular accidents are further classified

into stroke - ischaemic and hemorrhagic, subarachnoid haemorrhage and cortical venous thrombosis (CVT).

The overall incidence of ischemic stroke during pregnancy is low (3.5-5 per 100,000 pregnancies in the developed world). Women 3–4 weeks' postpartum may develop an aseptic thrombosis of cerebral veins and sinuses.[4,5] Mortality related to CVT is estimated at 9% and is primarily due to intra cerebral haemorrhage.[6] Patients may present with neuropathies as bell's palsy, Guillain Barre syndrome, meralgia paraesthetica and demyelinating disorders as multiple sclerosis.

Bell's palsy, or idiopathic palsy of the seventh cranial nerve, is seven times more prevalent than expected during the third trimester of pregnancy.[7]

The advent of CT, MRI and MR venography has proved to be a boon for early diagnosis of pregnancy related neurological complications. There is minimal risk to the foetus. Early diagnosis of pregnancy with neurological complications will result in deciding appropriate treatment of neurological disease and termination of pregnancy at appropriate gestational age with better maternal and foetal outcome.

This study was conducted with the aim to determine the prevalence of total neurological disorders complicating pregnancy and puerperium and that of primary and secondary neurological disorders. Analysis of maternal and fetal outcome and co -relation with radiological imaging was done.

METHODS

This was a hospital based prospective cross- sectional study done in the Department of Obstetrics and Gynaecology and Department of Neurology at King George Medical University, Lucknow for a duration of 1 yr. This was a pilot study that included all the cases presenting with neurological disorders in pregnancy and puerperium (107) during the study period.

Inclusion criterion

Pregnant and postpartum women with; Signs and symptoms suggestive of neurological disease.

Primary neurological disorders that includes epilepsy, CNS infections, cerebrovascular. Disorders (cerebral venous thrombosis, Ischaemic stroke & haemorrhage), CNS neoplasm, etc. Secondary neurological disorders like metabolic encephalopathies.

Exclusion criterion

Women not compliant for follow up. Women unwilling to participate. Women diagnosed with eclampsia. Women in whom MRI is contraindicated as those with claustrophobia, prosthetic cardiac valves, etc.

For all subjects written and informed consent was taken. A special proforma was filled for all patients which included history, general examination, neurological examination and obstetric examination. Expert opinion by neurologist was taken for all patients. Routine blood investigations (hemogram, LFT, KFT, electrolytes.) relevant radiological imaging CT/MRI brain, MRA/MRV brain, MRI spinal cord and other specific investigations as NCV/EEG/EMG according to merits of individual conditions were done.

Patients were then classified as those with primary and secondary neurological disorders and outcome was assessed as primary and secondary outcome. The primary outcomes analysed included prevalence of total neurological disorders, primary and secondary neurological disorders in pregnancy and puerperium. The secondary outcomes were assessed as pertaining to the foetus as abortion, preterm or term delivery, livebirth or stillbirth and maternal outcome in the form of complete recovery, residual deficit or mortality.

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. The values were represented in Number (%) and Mean±SD. Statistical formula used was chi square test and level of significance was determined.

RESULTS

A total 107 patients presented with neurological complaints of which 100 patients were analysed as 7 patients could not be followed. Majority of the cases were unbooked (84), of age group 25-30 years (61%), multiparous (58%) and belonged to lower socioeconomic status (63%).75 (75%) were classified as with primary neurological disorders whereas remaining 25 (25%) had secondary neurological disorders. The total no of deliveries in the hospital during study period was 8691. The prevalence of neurological disorders primary and secondary per 1 lakh deliveries with percentage is shown in Table 1.

Table 1: Distribution of patients according to type of neurological disorder.

Type of Neurological disorder	No. of cases	Percentage	Prevalence/ 100,000
Primary Neurological disorder	75	75	862
Secondary Neurological disorder	25	25	287
Total	100	100	1150

The most common clinical presentation in patients was seizure with associated symptoms as altered

consciousness or motor deficit (49%) followed by altered consciousness (32%) and headache (30%) (Table 2).

Table 2: Distribution of patients according to clinical presentation.

Clinical Features	No. of cases	Percentage
Seizures alone or h/o seizure	22	22
Altered Consciousness	32	32
Seizure and altered consciousness	09	09
Seizure with altered consciousness with motor deficit	18	18
Motor weakness with altered consciousness	10	10
Headache	30	30
Motor Weakness	20	20
Visual Symptoms	20	20
Aphasia	08	08
Facial Nerve Palsy	12	12

Table 3: Distribution of patients according to type of primary (75) and secondary neurological disorder (n=25).

Type of Primary/secondary Neurological disorder	No. of cases	Percentage	Prevalence / 100,000
Epilepsy	24	32.0	276
Vascular	25	33.3	287
CNS Infection	11	14.7	126
Space Occupying Lesion	09	12.0	103
Neuropathy	02	2.7	23
Miscellaneous	04	5.3	34
Total	75	100	862
Hepatic encephalopathy	23	92.0	264
Septic encephalopathy	2	8.0	23
Total	25	100	287

Table 4: Case Distribution according to imaging modality.

Investigation	Total Number	Primary Neurological disorder (n=75)		Secondary Neurological disorder (n=25)	
		No.	%	No.	%
MRI & MRA & MRV	80	66	88.0	14	56.0
CT	12	07	9.3	05	20.0
Not Done	8	02	2.7	06	24.0

Table 5: Diagnosis and co-relation of neurological disease with neuro -imaging.

Clinical feature	MRI and MRA and MRV n=66	Result	N	CT N=7	Result	n
Seizure alone or h/o seizure	22	Inflammatory granuloma	11	-	-	-
		NAD	08			
		glioma	01			
		Diffuse cell atrophy	01			
		Epidermoid tumour	01			
Altered consciousness	09	Tubercular meningitis	04	-	-	-
		Encephalopathy	02			
		Diffuse cell atrophy	01			
		Calcified granuloma	01			
		Colloid cyst	01			
Seizure with altered consciosness	07	Tubercular meningitis	02			
		Glioma	02			
		Encephalopathy	01			
		Central pontine myelinolysis	01			
		Inflammatory granuloma	01			
Seizure with altered consciousness with motor weakness	18	Ischaemic stroke	10	5	Hemorrhagic stroke	05
		Cortical venous thrombosis	03			
		Tubercular meningitis	02			
		Glioma	02			
		Paravertebral neoplasm	01			

Continued.

Clinical feature	MRI and MRA and MRV n=66	Result	N	CT N=7	Result	n
Motor weakness with altered consciousness	10	Hemorrhagic stroke	03	2	Neurocysticerc-osis	02
		Cortical venous thrombosis	02			
		GBS	02			
		Ischaemic stroke	01			
		Subarachnoid hemorrhage	01			
		Neurocysticercosis	01			

Among different primary neurological disorders, vascular disorders were most common (33.3%) followed by Epilepsy (32%) while hepatic encephalopathy was the most common secondary neurological disorder (Table 3).

Role of radiological imaging

MRI with MRA with MRV was done in 66 (88%) cases of primary neurological disorders while CT scan was done in 7 cases (9.3%).

The diagnosis of epilepsy (22), ischemic stroke (11), hemorrhagic stroke (8), subarachnoid haemorrhage (1), TBM (6), encephalopathy (3), CNS neoplasm (9) and miscellaneous was thereby made (Table 4 and 5).

The diagnosis of secondary neurological disorder was confirmed by exclusion of focal pathology in 14 (56%) cases with MRI and 6 (20%) cases by CT scan and on the basis of biochemical investigations as serum bilirubin levels and liver function tests.

Diagnosis of 6 cases of tubercular meningitis was confirmed by CSF analysis and 2 case of GBS by nerve conduction velocity.

The presentation of both primary and secondary neurological disorders was found to be more common in pregnancy than puerperium (86% vs 14%). 87.5% cases of epilepsy, 85% cases of stroke, 90.9% cases of CNS infections and 100% cases of CNS neoplasm presented antenatally.

Cortical Venous Thrombosis was the only primary neurological disorder where significantly higher no. of subjects presented in the postpartum period (80% vs 20% $p < 0.001$). Among secondary neurological disorders, all cases of septic encephalopathy and 73.9 % cases of HE presented in antenatal period.

Maternal outcome

The total no. of maternal deaths during study period were 328. So neurological disorders contributed to 5.4% of maternal deaths. Total no. of live births during this period were 7767. Therefore, maternal mortality ratio due to neurological disorders was 218 per 100000 live births (Table 6).

Table 6: Case distribution on the basis of maternal outcome (n=100).

Maternal Outcome	No. of cases	Percentage
Recovery	68	68
Residual Deficit	15	15
Mortality	17	17
MMR in pregnancy with neurological disease	100	218/100000 0 live births

The rate of recovery was highest in cases of epilepsy (100%) and lowest in cerebrovascular accidents (77.7%). It was 43.5% in cases of hepatic encephalopathy. Statistically, a significant difference in recovery rate within primary neurological disorders ($p<0.001$) and between primary and secondary neurological disorders was observed ($p=0.010$) (Figure 1).

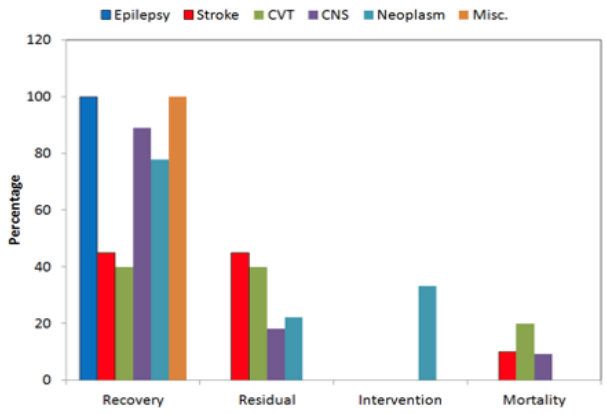

Figure 1: Case distribution according to maternal outcome among primary neurological disorders.

Morbidity in terms of residual deficit was highest in patients with stroke (45%) and Cortical Venous Thrombosis (40%). No residual deficit was seen in cases with epilepsy and HE. Statistically, a significant difference in morbidity within primary neurological disorder ($p=0.005$) and between primary and secondary neurological disorders was observed ($p=0.015$) (Figure 1).

Mortality rate was highest in cases of CVT (20%) amongst primary neurological disorders. No maternal

deaths were seen in cases of Epilepsy and CNS neoplasm. Maternal deaths were 56.7% in cases with HE. Overall mortality rate in primary disorders was 5.56%. In secondary disorders, mortality rate was 52%. Mortality rate in secondary disorders was significantly higher as compared to that in primary disorder group (p<0.001) (Figure 1).

Fetal outcome

Still birth rate was 22.22% in primary neurological and 62.5% in secondary neurological disorders. A significant difference in the stillbirth rate was observed between primary and secondary neurological disorders (p<0.001) (Table 7). Low birth weight rate was 58.33% in primary neurological and 87.5% in secondary neurological disorders. Preterm births in patients with HE was 81.8 %. Preterm rate was 41.67% in primary and 79.17% in secondary neurological disorders. A significant difference in preterm birth rate was observed between primary and secondary neurological disorders (p=0.001) (Table 8).

Table 7: Case distribution on the basis of foetal outcome (n=96).

Fetal Outcome	No. of cases	Percentage
Live	65	67.7
Stillbirth	31	32.3

Table 8: Case distribution on the basis of period of gestation (n=96).

Fetal outcome	No. of cases	Percentage
Preterm	49	51.0
Term	47	49.0

Table 9: The comparable chart of earlier studies and the present study.

Condition	To et al[8] (n=161 (%)	Janaki et al[9] (n=97) (%)	Agarwal et al[10] (n=87) (%)	Srinivasan[11] et al (n=68) (%)	Gupta et al[2] (n=76) (%)	Present study (n=100) (%)
Epilepsy	102 (63.3)	30 (30.9)	5 (5.7)	17 (23.5)	22 (28.9)	24(24)
CVA	7 (4.3)	48 (49.5)	72 (82.7)	41(60.3)	9 (11.9)	25(25)
CNS infections	-	4 (4.1)	5 (5.7)	3 (4.4)	12 (15.8)	11(11)
CNS tumours	12(7.5)	7 (7.2)	1(1.1)	16 (23.5)	1(1.3)	9(9)
Eclampsia	19 (11.8)	Not included	Not included	Not included	Not included	Not included
Demyelinating diseases	4 (2.5)	1 (1.03)	1 (1.1)	3 (4.4)	1(1.3)	0
Peripheral Neuropathies	12 (7.5)	1(1.03)	2 (2.3)	1(1.5)	1(1.3)	2(2)
Metabolic encephalopathies	Not included	Not included	Not included	Not included	28(36.8)	25(25)
Cord affections	-	-	-	5 (7.4)	1(1.3)	-
Incidence (Primary Neurological disorders)	326 /100000 deliveries	Not studied	Not studied	Not studied	353/100000 deliveries	862/100000 deliveries

DISCUSSION

The prevalence of primary neurological disorders in the present study is more than the studies by Gupta et al and To et al that is 862 vs 353 and 326 respectively.[2,8] This may be because the study is carried out in a tertiary care hospital which caters to a population of more than 20 crore and has nearby states as Bihar and is also a referral centre for Emergency obstetric care. Most of the studies carried out so far have been done in Department of Neurology as by Janaki et al, Agarwal et al and Srinivasan et al which included only primary neurological disorders.[9-11] except two studies by To et al. (1994) and S Gupta et al (2004-2005) which were done in department of Obstetrics and Gynaecology. The studies carried out so far do not give an account of secondary neurological disorders except for the study by Gupta et al.[2]

This study had headache as the third commonest symptom which is similar to study by WHO.[3] In this study CNS tumours were found to be 12% while cerebrovascular accidents were 33.3%. This is higher than the study by Gupta et al (1% and 9%) but is comparable to studies by Janaki et al (7% and 48%); Agarwal et al (1% and 72%) and Srinivasan et al (16 % and 41%).[9-11] Among the cerebrovascular accidents the incidence of hemorrhagic stroke in the present study is 80.5 per 100000 deliveries and that of ischaemic stroke is 126. This is higher in comparison to the study by Liang, Chang in which the incidence of hemorrhagic and

ischaemic stroke was 4.3 and 4.6 per 100000 deliveries respectively.[12]

MRI was diagnostic investigation in all cases of primary neurological disorders while diagnosis of secondary neurological disorders was made by exclusion of any focal pathology by radiological imaging. This is consistent with the study done by Dr. Subhashree Chandrasekara etal who used MRI in antenatal period and CT/ MRI in postnatal period.[13] Cortical venous thrombosis presented in puerperium in 80% cases in this study which is consistent with the study by Jeng JS, Tang SC in which 73% cases of CVT occurred in the puerperium.[14]

In the present study 68% subjects had complete recovery, residual deficit was associated with 15% subjects and maternal mortality rate was 17%. This is consistent with the study by Berg CJ et al (20% vs 17%).[1] Subjects with cerebrovascular accidents had the worst prognosis with residual deficit in 44% of the cases. In the study by Agarwal et al and Dias MS Sekhar et al mortality rate in cases of CVT was 28% which is comparable to our study (20%).[10] In a study Liang et al maternal mortality rate due to cerebrovascular accidents was 17.8% which is comparable to our study (17.6 vs 17.8%).[12] In the present study, the mortality rate in subjects with HE was 56.7% which is lower than the study by S Gupta et al (56.7% vs 64.3%).[2]

CONCLUSION

This study throws light on the fact that neurological disorders contribute significantly to maternal morbidity and mortality. Routine antenatal care for all pregnant patients for early diagnosis and timely referral to tertiary care hospitals is needed for optimal outcome. The symptom of headache should be taken with caution and it requires elaborate history, examination and investigation to make early diagnosis of primary neurological disorder to decrease maternal and perinatal morbidity and mortality. MRI with MRA with MRV proved to be the most beneficial diagnostic tool in this study and should be recommended for early diagnosis of the disorder and thus decide its management. The diagnosis of diseases such as epilepsy, cerebrovascular accident, tubercular meningitis, encephalopathy, glioma, neurocysticercosis, central pontine myelinolysis etc can be confirmed using this modality. This study gives an insight to the prevalence and presenting symptoms of neurological disorders followed by their diagnosis and outcome for mother and baby.

ACKNOWLEDGMENTS

Authors would like to thank all the patients and the department of obstetrics and gynaecology of King George Medical University for their continuous support and co-operation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Berg CJ, Chang J, WM, Whitehead SJ. Pregnancy-related mortality in the united states, 1991-1997. Obstet Gynecol. 2003;101(2):289-96.
2. Gupta S, A Rohtagi, SK Sharma, Gurtoo A. A study of neurological disorders during pregnancy and puerperium. Ann Indian Acad Neurol. 2006;9(3);152 -7.
3. World Health Organization. Headache disorders. http://www.who.int/mediacentre/factsheets/fs277/en/ Accessed on 01 April 2013.
4. Fox MW, Harms RW, Davis DH. Selected neurologic complications of pregnancy. Mayo Clin Proc 1990;65(12):1595–618.
5. Kriplani A, Relan S, Misra NK, Mehta VS, Takkar D. Ruptured intracranial aneurysm complicating pregnancy. Int J Gynaecol Obstet 1995;48(2):201-6.
6. Cantu C, Barinagarrementeria F. Cerebral venous thrombosis associated with pregnancy and Puerperium. Review of 67 cases. Stroke 1993;24(12):1880–4.
7. Hilsinger RL Jr, Adour KK, Doty HE. Idiopathic facial paralysis, pregnancy, and the menstrual cycle. Ann Otol Rhinol Laryngol 1975;84(4 Pt 1):433-42.
8. To WK, Cheung RT. Neurological disorders in pregnancy. Hongkong Med J 1997;3(4):400-8.
9. Janaki S, Thomas L. Neurological complications in pregnancy and puerperium. J Assosc Phys India 1963;11:128-37.
10. Agarwal K. Neurological disorders in pregnancy and puerperium. J Assoc Phys India 1968;19:705-13.
11. Srinivasan K, Ramamurthi B. Neurological disorders in pregnancy and puerperium. J Assoc Phys India 1971;19(10):705-13.
12. Amias AG. Cerebral vascular disease in pregnancy, I: haemorrhage. J Obstet Gynaecol Br Commonw. 1970;77:100-12 39Me Eur J Neurol 2006;13(11):1256-60.
13. Chandrasekara S, Anand JP, Nanjundan M, Natarajan S, Ramadhas K. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 2016:15(4):62-8.
14. Jeng JS, Tang SC, Yip PK. Stroke in women of reproductive age :comparison between stroke related and unrelated to pregnancy J Neurol Sci 2004; 221(1-2):25-9.

Cite this article as: Gupta M, Pradeep Y, Singh R, Shrivastava PK. A study of neurological disorders in pregnancy and puerperium. Int J Reprod Contracept Obstet Gynecol 2020;9:4236-44.

Working Proforma

Working proforma
Particulars
Name
Age
Handedness RT LT
Address
Phone no
Religion
Occupation
Diet Veg Non Veg
Education
Date of admission
Date of discharge
Date of expiry
Chief complaints
Headache
Altered consciousness
Visual disturbance
Seizures
Antepartum 1^{ST} 2^{ND} 3^{rd}
Intrapartum
Postpartum within 24 hrs >24 hrs >48hrs
Frequency
Duration
Type of seizures GCTS Focal
Last episode of seizure
Motor complaint
Weakness in upper limb left right
Weakness in lower limb left right
Sensory complaint
H/o suggestive of cranial nerve involvement
Bladder /bowel complaints
PAST H/O
Seizure disorder
Hypertension
Diabetes mellitus
Stroke
Ischaemic heart disease
Pregnancy induced hypertension
Family history
Diabetes mellitus
Hypertension
Stroke
Ischaemic heart disease
Seizure disorder
Obstetric history
Gravida/parity
Gestational age at the time of presentation
Gestational age at the time of delivery
Treatment history
Antihypertensive medication
Antiepileptic medication
Others

Physical examination
General examination
PR
B.P.
RR
TEMP
WT
HT
BMI
Pallor
Icterus
Cyanosis
Edema
Lymphadenopathy
Clubbing
CNS examination
GCS
Level of consciousness
Orientation
Speech
Cranial nerves
Motor system
RT. UL LT.UL. RT.LL LTLL
Nutrition
Tone
Power
Involuntary movements
Coordination
Reflexes
Biceps
Triceps
Supinator
Knee
Ankle
Plantar
Sensory system
Pain/touch /temperature
Joint position /vibration
Cortical sensation
Signs of meningeal irritation
CVS examination
Respiratory system examination
GI examination
Outcome of pregnancy
Abortion
Term delivery
Preterm delivery
IUD
Mode of delivery
Vaginal
C-section
BABY
LIVE/IUD/could not be revived

Birth WT
APGAR/IPPR +O2
Any birth defect
Outcome of neurological disorder
Recovery
Residual defect
Persisting seizure
Death
Investigations
Hb
Hct
MCV
TLC
DLC
PC
Blood urea
S creatinine
Urine protein
S.uric acid
S.bilirubin
SGOT
SGPT
SALP
Total Protein
S. LDH
S. Sodium
S. potassium
S. calcium
S. magnesium
CT/MRI/EEG
Others