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NEUROLOGICAL INTENSIVE CARE UNIT IN RURAL SET UP: AN EXPERIENCE

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ABSTRACT
Dedicated neurologocal intensive care units (INCU) came into existence in India since last two decades. Present study is an epidemological profile of a dedicated neurological intensive care unit from central India over a period of 4 years. This study was performed in a 1165 bedded tertiary care hospital in central India. All consecutive patients more than 15 years age, admitted in INCU during a period of 48 month (1st January 2010- 31st December 2013) were enrolled. Data analysis of these 1575 patients was done. Result of the study population 62.65% (968) were males while 37.35% (577) were females. Strokes composed majority of the patients consisting of 63% of our patients. Majority of the patients (35.47%) fell in the age group of 41-60 years. 46.86% (n=724) of the patients came from rural areas. 35.47% patients left the hospital against medical advice with 71.71% of these patients admitted with strokes. The in hospital mortality rate was 6.86%. It may be concluded from the study that the morbidity and mortality trends of our patients from central India is similar to those seen in earlier reports.

Keywords: Epidemology, Neurology, ICU

INTRODUCTION
The concept of intensive care unit (ICU) was originally developed as a multidisciplinary area to manage critically ill patients (martin cm 2005). Dedicated neurologocal intensive care units (INCU) came into existence in India since last two decades (Desai, 1991). Although, thousands of patients have been admitted and treated in such units, there is sparse data about the patients admitted in such units. Zacharia *et al.,* (2012) analyzed retrospectively patients admitted in neurological intensive care unit over a period of 8 years. The authors noted a longer length of stay (LOS) among these patients. However, there is paucity of epidemological data on the patients admitted in INCU from central India. Present study is a retrospective analysis of 1575 patients admitted in INCU over a period of 4 years. Present study also takes into consideration, the urban-rural epidemology of our patents. The study also tries to quantify the number of patients who left the hospital against medical advice. The main objective of this study was to analyze the epidemological profile among patients admitted to a dedicated INCU in rural set up from central India. In hospital variables like age, sex, los, diagnosis and mode of discharge/mortality were analyzed.

MATERIALS AND METHODS
Setting: This study was performed in a 1165 bedded tertiary care hospital in central India. The hospital provides nine specialty ICU (neurological, general, labor, pediatric, respiratory, medical, surgical, pediatric surgical and cardiac).
The INCU is a ten bed critical care unit admitting approximately 400-450 adults per year.
Duration of Study: 48 month (1st January 2010 to 31st December 2013)
Type of Study: Retrospective
Patients**:**
Inclusion Criteria: All consecutive patients more than 15 years age admitted in INCU during a 48 month period were enrolled (1st January 2010 to 31st December 2013)
Exclusion Criteria: Patients admitted with craniocerebral trauma or other neurosurgical indications were excluded from the study. Patient admitted in the general wards and other ICUs of the institute were excluded from the study. Written informed consent was taken from all the patients included in the study.

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Data Collection: In hospital variables like age, sex, los, diagnosis and mode of discharge/mortality were collected retrospectively for all patients by review of electronic database.

Statistical Analysis: Baseline characteristics like sex, diagnosis and mode of discharge/mortality were analyzed using simple percentages. While age and los were analyzed by calculating the arithmetic mean, median and standard deviations.

The categories of age and length of stay were arbitrarily chosen. Z-test was applied to compare the mortality among patients more than and less than 60 years age. The upper and lower limits were calculated using 95% confidence intervals (2sd), on either side of the mean.

RESULTS AND DISCUSSION

During the study period of 48 months 1545 patients were enrolled. Of the study population 62.65 % (968) were males while 37.35 % (577) were females. The admitting diagnosis and age characteristics of the patient are described in table 1.

Strokes composed majority of the patients consisting of 63% of our patients. Other groups included acute transverse myelitis, adem, alcohol withdrawal state, severe positional vertigo, compressive mylopathies, CJD, dystonia, headaches, parkinsons disease, syncope.

Majority of the patients (35.47%) fell in the age group of 41-60 years. Gender trends, show a male dominance among all major groups. 46.86% (n=724) of our patients came from rural areas while 53.14% (n=821) came from urban areas.

The median length of hospital stay was 5 days with maximum length of stay of 177 days and a minimum of few hours. Length of stay of majority of patients (69.25 %) was less than 7 days. Analysis of length of stay among various diagnostic groups is shown in table 2.

Discharge disposition of patients was grouped in those discharged, expired and those who left against medical advice (lama). Table 3 and 4 shows the analysis of these patient groups.

The in hospital mortality was 6.86%. Mortality rates were compared between populations aged more than or less than 60 years. 33 patients expired in the first group while 72 patients expired in the second. Z test was applied among the populations which showed a z score of 0.3135 and an insignificant p value of 0.75 showing no correlation of mortality with age in our patients.

The study was undertaken to assess the epidemological profile of patients admitted in INCU from central India.

In present study the mean age of patients was found to be 51.1 years and a median of 54 years. It was observed in this study that majority of the patients (65%) were between the age group of 40-80 years. Gregor (2007) evaluated survival and long term outcome of 1155 patients admitted to neurocritical care unit over a period of 36 months. The authors retrospectively reviewed ICU charts and electronic data bases of the patients and found a mean age of 50 years which is similar to present study. Kiphuth *et al.,* (2010) Studied functional outcome of 796 patients admitted in INCU over a period of 2 years. The authors found a median age of 67 years. A similar study by Desai *et al.,* (1991) of 271 patients admitted in neurocritical care unit in South India found a lower mean age of 37 years patients. The observation may be explained by the inclusion of paediatric patients in the study. The minimum age of the patient in the study by Desai *et al.,* (1991) was 2 years, while, in present study patients less than 15 years age were excluded.

Present study shows a male dominance with a ratio of 63:37 which is similar to previous studies (Desai, 1991; Broessner, 2007).

Similar to the observations of previous studies (Desai, 1991; Broessner, 2007; Kiphuth, 2010) majority (63%) patients were strokes. Ischemic strokes comprised (37%) of the total number of patients. Status epilepticus and cluster seizures composed 18% of our patients comparable to 12.7% in previous studies (Kiphuth, 2010).

The mean length of stay of patients in this study was 6.9 days with a median stay of 5 days which is shorter than observations in previous studies (Desai, 1991; Broessner, 2007). Desai *et al.,* found the mean length of stay among these patients to be 10 days while Brossner *et al.,* found mean and median los at neuro-icu to be 9.1 days and 4 days respectively.

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Table 1: Age characteristics of the patients admitted in INCU

	Patients	Female	Male	Stroke CVA Hemorrhagic Stroke	CVA Ischemic stroke	CVT	Clusters seizures/ status Epileptics	CNS Infections	Dementia	Neuromuscular disorder	Dissociative Disorder	Encephalopathies	Others
Total	1545	577	968	341 (22%)	573 (37%)	58 (3.75%)	276 (18%)	126 (8.15%)	12 (0.77%)	29 (1.9%)	13 (0.84%)	27 (1.75%)	90 (5.8%)
Mean (Years)	51.11	50.31	51.6	58.15	60.24	28.88	38.01	39.78	67.83	35.76	25.08	46.48	44.11
Std Dev	18.52	19.57	17.87	28.61	26.11	8.32	17.13	17.29	13.15	17.92	8.72	18.91	18.6
Median (Years)	54	52	55										
Max (Years)	98	98	97	97	98	50	88	85	85	68	45	77	85
Min (Years)	16	16	16	18	20	17	16	16	45	16	17	18	16
15-20 (Years)	96	36	60	2	3	5	43	16	Nil	10	5	2	10
21-40 (Years)	394	174	220	50	46	47	134	58	Nil	9	7	10	34
41-60 (Years)	548	172	376	146	251	6	64	35	4	7	1	7	26
61-80 (Years)	458	170	288	131	242	Nil	33	16	6	3	Nil	8	19
>80 (Years)	49	25	24	12	31	Nil	2	1	2	Nil	Nil	Nil	1

CVA- Cerebrovascular accident, CVT- Cerebravenous thrombosis, CNS- Central nervous system

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Table 2: Length of stay among various diagnostic groups

| | Patients | Stroke (972) | | | Clusters seizures/ status Epilepticus | CNS Infections | Dementia | Neuromuscular disorder | Dissociative Disorder | Encephalopathies | Others |
		CVA Hemorrhagic Stroke	CVA Ischemic stroke	CVT							
Total	1545	341	573	58	276	126	12	29	13	27	90
Mean	6.9	7.2	6.86	11.88	5.25	7.8	7.75	16.27	5	5.52	5.37
SD	8.67	7.73	6.8	23.27	5.2	6.58	7.39	20.79	4.91	4.76	8.76
Median	5	5	5	7	4	6	5.5	10	3	5	3
Mode	1	1	1	1	3	1	2	1	1	1	1
Max	177	53	71	177	52	31	28	90	18	18	71
Min	0	1	1	1	1	1	2	1	1	1	0
0-7 Days	1070	223	397	29	223	72	8	12	11	20	75
8-14 Days	317	74	117	18	43	38	3	8	1	5	10
15-21 Days	101	27	41	8	7	10	Nil	3	1	2	2
>21 Days	57	17	18	3	3	6	1	6	Nil	Nil	3

CVA- Cerebrovascular accident, CVT- Cerebravenous thrombosis, CNS- Central nervous system

Table 3: Modalities of disposal of patients among various diagnostic groups

| | Patients | Stroke (972) | | | Clusters seizures/ status Epilepticus | CNS Infections | Dementia | Neuromuscular disorder | Dissociative Disorder | Encephalopathies | Others |
		CVA Hemorrhagic Stroke	CVA Ischemic stroke	CVT							
Total	1545	341	573	58	276	126	12	29	13	27	90
Discharge	891	118	351	41	209	62	10	16	12	11	61
LAMA	548	184	195	14	56	42	2	12	1	15	27
Expired	106	39	27	3	11	22	Nil	1	Nil	1	2

CVA- Cerebrovascular accident, CVT- Cerebravenous thrombosis, CNS- Central nervous system, LAMA- left against medical advice

Table 4: Disposal of patients by age

	15-20 years	**20-40 years**	**40-60 years**	**60-80 years**	**>80 years**
Total	90	394	548	458	49
Male	60	220	376	288	24
Female	36	174	172	170	25
Discharge	66	264	308	239	16
Expired	6	18	48	28	5
LAMA	25	111	192	191	28
Mean duration discharge	9.09	9.37	8.91	8.03	7.19
SD discharge	11.06	13.82	7.9	7.26	5.4
Mean duration discharge Male	8.53	9.73	9.23	8.39	6
SD Discharge Male	9.41	16.98	8.76	8.16	6.29
Mean Duration discharge Female	10.13	8.92	8.28	7.4	8.37
SD discharge Female	13.81	8.35	5.83	5.37	5.6
Mean duration expired	1.67	5.79	6.58	7.46	7
SD expired	1.21	6.33	6.78	7.42	5.34
Mean duration expired Male	2.33	7.46	7.38	7	7
SD duration expired Male					
Mean Duration expired Female					
SD duration expired Female	0	1.86	6.04	8.92	Nil

CVA- Cerebrovascular accident, CVT- Cerebravenous thrombosis, CNS- Central nervous system, LAMA-Left against medical advice, SD- Standard deviation

The mean age of patients admitted with stroke in present study group was 58.15±28.61 years and 60.24±26.11 years for hemorrhagic and ischemic strokes respectively which is comparable to previous studies (Das, 2012). 42.81% and 43.80% of the hemorrhagic and ischemic strokes respectively were of the age group of 40-60 years. The mean lengths of stay for patients was 7.2 and 6.86 days respectively for ischemic and hemorrhagic strokes which is comparable to previous study (Aksoy, 2014; Pandian, 2013; Pandian, 2012). In present study, 64.3% of the strokes were males which is comparable to previous study (Pandian, 2013; Nagaraja, 2009). Among the stroke patients 54.42% patients came from urban areas which is comparable to previous study from south India (Sridharan, 2009).

Patients admitted with cluster seizures and status epilepticus composed 17.86% of the patients. The mean age of the patients in this study was 38.01 years with ares ranging from 16-88 years similar to previous studies. However in our study females composed of 35.5% as compared to 51.6% in previous study (Kiphuth, 2010). The median length of hospital stay was 4 days as compared to one day in previous study (Zacharia, 2012).

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Majority (49.63%) of our patients were discharged within 7 days of admission comparable to the observation in previous study (Zacharia, 2012).

Central nervous system infections composed 17.86% of our patients, much more than previous studies. 54.76% of these cases were males which is comparable to previous study (Kiphuth, 2010). In contrast to a general trend in this study majority (69.84%) of these patients came from rural areas. The median length of hospital stay for these patients was 6 days.

We also took into consideration the patients opting to leave medical care in a critically ill state..in present study 35.47% patients left the hospital against medical advice with 71.71% of them admitted with strokes. The in hospital mortality in this study was 6.86% which is much lower than 18- 45% reported in previous studies (Desai, 1991; Broessner, 2007; Kiphuth, 2010). Previous Indian study from south India showed a high mortality rate of 45%. The difference in the observation may be explained by the fact that the study was conducted 29 years back, when the management protocols were different and patients were admitted predominantly for mechanical ventilation (Desai, 1991). A more recent study from a critical care set up in Germany showed a lower mortality rate of 22.5% (Kiphuth, 2010).

Majority (65.1%) of the patients who expired were strokes. The case fatality rate in our study was 11.43% and 4.71% for hemorrhagic and ischemic strokes respectively which is much less as compared to previous studies (Desai, 1991; Zacharia, 2012; Kiphuth, 2010; Pandian, 2013). The case fatality rate of epilepsy including status epilepticus was 3.98% which is comparable to previous studies (Kiphuth, 2010).

The study is associated with certain limitations. The neurological status of the patients at admission and disposition were not taken into account. An insight into the reasons behind lama was beyond the scope of the article. The final prognosis of the patients leaving against medical advice is not available. No follow up of the patients was done. But despite all limitations the study tries to describe the morbidity and mortality pattern of critically ill neurological patients from central India. The study has recruited largest number of patients till date for a dedicated neurological intensive care unit. This study shows the utilization of neurological services by the rural population in a country like India.

The study shows that the epidemological trends of critically ill neurological patients from central India are similar to those of rest of the world.

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