

Original Research Article

STUDY OF PREVALENCE, SOCIO-DEMOGRAPHIC AND CLINICAL CORRELATES OF DELIRIUM AMONG HOSPITALIZED PATIENTS IN A RURAL TERTIARY TEACHING CENTRE

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ABSTRACT

Background: Delirium is a common, but underdiagnosed, acute neuropsychiatric syndrome that is associated with adverse outcomes in hospitalised patients. However, data on its prevalence and correlates in rural tertiary teaching centres in India are limited. The objective is to determine the prevalence, socio-demographic and clinical correlates of delirium among hospitalized patients in a rural tertiary teaching institution.

Materials and Methods: The study was a hospital based cross sectional study conducted at PES Institute of Medical Sciences and Research, Andhra Pradesh from December 2019 to March 2021. A total of 102 patients aged >18 years referred for suspected delirium were assessed with the Nursing Delirium Screening Scale (Nu-DESC) and Delirium Rating Scale-Revised 98 (DRS-R98). The diagnosis was confirmed according to the ICD-10 criteria. Sociodemographic and clinical data were collected and analysed for associations using Chi-square and t-tests with odds ratios and 95% confidence intervals.

Results: Delirium was diagnosed in 63.7% (n=65) of patients. Significant socio-demographic correlates were age >50 years (p<0.0001); urban residence (p=0.03); functional impairment (p=0.0001) and presence of medical comorbidities (p < 0.0001). Major precipitating factors were infections (OR=5.27, p<0.0001), psychoactive/sedative drug use or polypharmacy (OR=11.08, p=0.02) and hypoxia/pulmonary compromise (OR=4.20, p=0.0003). The presence of comorbidities was highly correlated with diabetes mellitus (OR=4.42, p < 0.001), hypertension (OR=3.80, p=0.002), and coronary artery disease (OR=10.80, p=0.006). The most significant metabolic correlate was hyperglycaemia (OR=4.42, p < 0.0001).

Conclusion: Delirium was very common in this rural tertiary centre, especially in older patients with comorbidities and functional impairment. Key precipitating factors were infections, drug-related factors, hypoxia, and metabolic derangements. It is important to identify and manage these risk factors early to reduce morbidity and improve outcomes in hospitalised patients.

Keywords: Delirium, Nursing delirium screening scale, Socio-demographic correlates, Clinical correlates, Hospitalized inpatients

INTRODUCTION

Delirium is an acute neuropsychiatric syndrome marked by deficits in attention, awareness and cognition that occurs in a variety of health care settings and is associated with adverse outcomes,

including prolonged hospital stay, institutionalization, and increased mortality.^[1,2]

It is the most common diagnosis made in patients directed to psychiatric services from other departments, and a recent review reported that delirium affects half of all hospitalized Individuals

over age 65 years.^[3] In intensive care units it can be as high as 80%, 85% in palliative care units and 70% in post-surgical settings.^[4]

It is very common but frequently underdiagnosed because of its atypical presentations and altered symptoms.^[4] Although several studies have evaluated delirium in hospitalized geriatric populations, data regarding its prevalence in medico-surgical settings, especially in rural tertiary teaching institutions, are scarce in the Indian subcontinent.

The aim of our study was to ascertain the prevalence and the socio-demographic and clinical correlates of delirium in patients admitted to a rural tertiary teaching centre.

MATERIALS AND METHODS

Study Design and Setting: This was a hospital based cross sectional study conducted at PES Institute of Medical Sciences and Research (PESIMSR), Kuppam, Andhra Pradesh. The study was conducted over one and half years, from December 2019 to March 2021. The study was approved by the Institutional Ethics Committee (Approval No.: PESIMSR/IHEC/87/2019) prior to data collection and informed consent was obtained from all participants or their informants when necessary.

Study Population: The study population consisted of psychiatric inpatients and patients referred from other departments where delirium was suspected. Inclusion criteria were patients >18 years of age. Those with dementia or in a comatose state or other psychotic disorders were excluded from participation.

Sample Size: A total of 102 patients were recruited for the study. The sample size was estimated based on a 95% confidence interval ($Z_{(1-\alpha/2)}^2=1.96$), prevalence ($p=0.218$), and precision ($\delta=0.08$) as reported in a recent study.^[4]

Tools: Data was collected using a specially designed proforma which included sociodemographic details like age, sex, education, occupation, monthly income, residence, marital status and family type along with clinical information recorded by semi-structured questionnaire. Delirium was diagnosed according to ICD-10 criteria. Screening was done with the Nursing Delirium Screening Scale (Nu-DESC), a five-item scale evaluating disorientation, inappropriate behaviour, inappropriate communication, hallucinations, and psychomotor retardation with a

cutoff score of ≥ 2 indicating delirium. Severity was measured with the Delirium Rating Scale-Revised 98 (DRS-R98), a 16-item scale with three diagnostic items and 13 severity items, with higher scores indicating greater severity.

Study Procedure: The first screening was done in the in-patient department to determine whether the inclusion and exclusion criteria were met. Informed consent was obtained from patients or, if patients were unable to give consent, from their informants. Psychiatric inpatients and referred patients with suspected delirium were assessed on the day of referral and Nu-DESC and DRS-R98 were administered to screen and rate severity. Sociodemographic and clinical data were obtained by use of a semi-structured questionnaire and diagnosis was confirmed according to the International Classification of Diseases 10th version (ICD-10). All diagnosed cases were subjected to routine investigations including complete blood count, ESR, fasting and post prandial blood sugar, serum electrolytes and urine analysis. Specific investigations like Peripheral smear, Renal and Liver function tests, ECG, EEG, chest X-ray, Lumbar puncture and imaging studies CT, MRI, USG were done wherever indicated. Patients were re-evaluated on days 7 and 14 to assess for continued presence or resolution of delirium. The study endpoint was resolution of delirium, discharge, discharge against medical advice, or death. Feedback was given to the patients or their informants and treatment was started in case of delirium.

Data Collection and Analysis: Data were entered in Microsoft Excel (2007) and analysed using SPSS version 21. Percentages were used to describe categorical variables and mean and standard deviation were used for continuous variables. Inferential statistics were performed using Chi-square test and Student's t-test. Odds ratios with 95% confidence intervals were calculated, and p-values < 0.05 were considered statistically significant.

RESULTS

Prevalence: A total of 102 patients were included. Delirium was diagnosed in 63.7% ($n=65$) of the study population, while 36.3% ($n=37$) were negative for delirium.

Table 1: Sociodemographic Correlates of Delirium

Variable	Category	Delirium Present (n)	Delirium Absent (n)	Odds Ratio	p-value
Age	<50 years	8	24	0.07	<0.0001*
	>50 years	57	13		
Gender	Male	37	15	1.93	0.11
	Female	28	22		
Education	Illiterate	16	4	2.69	0.09
	Literate	49	33		
Occupation	Not working	13	5	1.60	0.41
	Working	52	32		
Place of residence	Rural	30	25	0.41	0.03*
	Urban	35	12		
Functional impairment / disability	Yes	25	0	47.22	0.0001*

	No	40	37		
Vision / hearing impairment	Yes	12	2	3.96	0.06
	No	53	35		
History of alcohol use	Yes	9	7	0.68	0.50
	No	56	30		
Malnutrition	Yes	5	0	6.81	0.29
	No	60	37		
Medical comorbidities	Yes	61	12	3.12	<0.0001*
	No	4	25		
Total		65	37	102	

Socio-demographic Correlates: The socio-demographic and clinical factors were examined in the present study to find their association with delirium. Delirium was significantly more common in patients >50 years compared to patients <50 years ($p < 0.0001$, $OR=0.07$). Males represented a slightly larger proportion (56.9%) compared to females (43.1%), although this difference was not statistically significant ($p=0.11$). Also, delirious patients were more likely to be illiterate ($p=0.09$), suggesting a trend but not reaching statistical significance. Occupational status was not significantly associated with delirium ($p=0.41$). A significant difference was observed regarding a domicile. Delirium was more prevalent among urban than rural residents ($p=0.03$, $OR=0.41$).

Functional impairment or physical disability was highly significantly associated with delirium ($p=0.0001$, $OR=47.22$) showing that decreased functional capacity increases susceptibility. Delirium patients were more likely to have vision or hearing impairment ($p=0.06$), indicating an almost significant association. However, the history of alcohol consumption ($p=0.50$) and malnutrition ($p=0.29$) did not correlate significantly. Delirium was significantly and strongly associated with medical comorbidities such as hypertension, diabetes or cardiac disease ($p < 0.0001$, $OR=3.12$). Patients with such comorbidities had a three-fold increased risk of developing delirium compared with those without underlying medical illnesses.

Table 2: Clinical Correlates of Delirium (Precipitating factors)

Precipitating Factor	Category	Delirium Present (n)	Delirium Absent (n)	Odds Ratio	p-value
Infection	Yes	43	10	5.27	<0.0001*
	No	22	27		
Drugs (psychoactive, sedative use, or polypharmacy)	Yes	8	0	11.08	0.02*
	No	57	37		
Hypoxia / Pulmonary compromise	Yes	25	4	4.20	0.0003*
	No	49	33		
Major surgery	Yes	0	0	—	—
	No	65	37		
Vascular events	Yes	17	6	1.82	0.25
	No	48	31		
Dehydration	Yes	7	1	4.34	0.14
	No	58	36		
Metabolic / Endocrine disorder	Yes	41	6	8.82	0.06
	No	24	31		
Toxic metabolic encephalopathy	Yes	1	1	0.56	0.50
	No	64	36		

Clinical Correlates- Precipitating factors: Analysis of precipitating factors showed infections as the most common and significantly important cause of delirium among hospitalised patients. An identifiable infection was present in 43 of 53 patients with delirium compared with 10 of 54 patients without delirium ($p < 0.0001$, $OR=5.27$). This means that the odds of delirium were more than five times higher if there was an infection. Delirium was also significantly associated with drug-related causes such as psychoactive medications, sedatives and polypharmacy ($p=0.02$, $OR=11.08$). The complete absence of such exposures in the non-delirium group highlights the contribution of medication or iatrogenic delirium especially in medically complex patients receiving multiple agents. Likewise, hypoxia and pulmonary compromise were significantly related to delirium

($p=0.0003$, $OR=4.20$), indicating that impaired oxygenation is a major physiological trigger contributing to acute cognitive dysfunction. Other factors, such as vascular events ($p=0.25$) and dehydration ($p=0.14$), had increased odds ratios, but were not statistically significant, suggesting possible contributory mechanisms in predisposed patients. Delirious patients were more likely to have metabolic or endocrine abnormalities ($p=0.06$, $OR=8.82$) with a borderline significant association, in keeping with literature linking metabolic derangements (e.g. hyperglycemia or thyroid dysfunction) with acute confusion. No cases of delirium were reported in patients who underwent major surgery during the entire study period and toxic metabolic encephalopathy was not significantly associated ($p=0.50$).

Table 3: Clinical Correlates of Delirium (Medical comorbidities)

Medical Comorbidity	Category	Delirium Present (n)	Delirium Absent (n)	Odds Ratio	p-value
Diabetes Mellitus (DM)	Yes	30	6	4.42	<0.001*
	No	35	31		
Hypertension (HTN)	Yes	38	10	3.80	0.002*
	No	27	27		
Coronary Artery Disease (CAD)	Yes	15	1	10.80	0.006*
	No	50	36		
Cerebrovascular Accident (CVA)	Yes	9	1	5.78	0.07
	No	56	36		
Deranged Renal Function / Raised Creatinine	Yes	13	7	1.07	0.89
	No	52	30		
Chronic Kidney Disease (CKD)	Yes	13	7	1.07	0.89
	No	52	30		
Congestive Cardiac Failure (CCF)	Yes	3	0	4.06	0.18
	No	62	37		
Chronic Obstructive Pulmonary Disease (COPD)	Yes	4	0	5.48	0.12
	No	61	37		
Chronic Liver Disease (CLD)	Yes	4	5	0.41	0.20
	No	61	32		
Malignancy	Yes	5	1	3.00	0.30
	No	60	36		

Clinical correlates- Medical comorbidities:

Among the various medical comorbidities assessed, diabetes mellitus, hypertension, and coronary artery disease (CAD) were found to have a significant association with the occurrence of delirium. Patients with diabetes mellitus showed a 4.4-fold higher likelihood of developing delirium compared to non-diabetics ($p < 0.001$). Similarly, hypertension was significantly associated ($p=0.002$, $OR=3.80$), highlighting the role of vascular pathology and endothelial dysfunction in delirium pathogenesis. Coronary artery disease emerged as another important risk factor, with delirium being over ten times more likely in these patients ($p=0.006$, $OR=10.80$). These findings align with existing literature suggesting that vascular comorbidities increase susceptibility due to impaired cerebral perfusion and chronic ischemic changes.

Cerebrovascular accident (CVA) also demonstrated a higher prevalence among delirious patients, showing a trend toward statistical significance ($p=0.07$). Although not reaching the 0.05 threshold, the elevated odds ratio (5.78) suggests a possible link that could be substantiated with a larger sample size. Renal dysfunctions, including deranged renal function tests and chronic kidney disease, did not show a significant correlation with delirium in this cohort ($p=0.89$), though mild elevations in creatinine were frequently observed in delirious patients. Likewise, congestive cardiac failure ($p=0.18$), chronic obstructive pulmonary disease ($p=0.12$), chronic liver disease ($p=0.20$), malignancy ($p=0.30$) did not reach statistical significance, though several showed numerically higher odds ratios suggestive of a clinical trend.

Table 4: Clinical Correlates of Delirium (Metabolic events)

Metabolic Event	Category	Delirium Present (n)	Delirium Absent (n)	Odds Ratio	p-value
Hypoglycemia	Yes	4	1	2.36	0.43
	No	61	36		
Hyperglycemia	Yes	30	6	4.42	<0.0001*
	No	35	31		
Hyponatremia	Yes	19	5	2.64	0.07
	No	46	32		
Hypernatremia	Yes	2	1	1.14	0.91
	No	63	36		
Hypercalcemia	Yes	0	0	—	—
	No	65	37		
Uremia	Yes	16	5	2.08	0.18
	No	49	32		

Clinical correlates- Metabolic events: Of the metabolic abnormalities investigated, hyperglycemia was strongly and significantly associated with delirium. Thirty patients with delirium had elevated blood glucose levels compared to six patients without delirium ($p < 0.0001$, $OR=4.42$). This implies that hyperglycemia increased the odds of delirium by more than fourfold, highlighting the significance of controlling blood glucose levels in hospitalised patients. Hyponatraemia was more frequent in

delirious patients ($n=19$) than in non-delirious patients ($n=5$), showing a borderline significant association ($p=0.07$, $OR=2.64$). Electrolyte imbalance leading to neuronal excitability or cerebral oedema may partly contribute to this association. Hypoglycemia, uremia and hypernatraemia were noted in a small proportion of delirious patients, but these findings were not statistically significant ($p > 0.05$). Hypercalcemia was not observed in any participant during the study period.

DISCUSSION

Delirium is a brief, abrupt deficit in awareness, attention, and cognition that varies in intensity.^[5] Risk factors for delirium include both predisposing and precipitating factors. Older age, dementia, functional disabilities, male gender, poor vision and hearing, mild cognitive impairment, alcohol use disorder, and laboratory abnormalities are common predisposing factors. Drugs, particularly sedative-hypnotic and anticholinergic agents, are among the most important precipitating factors, with the risk increasing in the presence of polypharmacy. Other precipitating factors include surgery, anaesthesia, high pain levels, anaemia, infections, acute illness, and acute exacerbation of chronic illness.^[5]

In the present study, delirium was diagnosed in 63.7% of 102 hospitalised patients evaluated for suspected delirium. This prevalence is higher than that reported previously by Jayaswal AK et al,^[6] (31.4% in ICU, hypoactive being the commonest motor subtype), Goyal S et al,^[7] (16.5% within 24 hours and 33% after 24 hours of ICU stay), Vijayalakshmi S et al,^[8] (21.6%), Francis et al,^[9] (30%), Fuchs et al,^[10] (32%) and Banerdt et al,^[11] (48.5%). This higher rate reflects the evaluation of a targeted population referred from ICUs, general medical and psychiatry units with a clinical suspicion of delirium rather than unselected cohorts. Differences in study design, diagnostic criteria, screening instruments and patient selection are also responsible for variation between studies.

Sociodemographic Factors and delirium correlation

Age: Mean age was 58.60 ± 16.53 years (peak: 56–65 years), delirium was significantly more common in patients above 50 years ($p < 0.0001$). Similar to our cohort, Jayaswal AK et al,^[6] and Goyal S et al,^[7] reported mean ages of 56.72 ± 18.9 and 61.09 ± 16 years, respectively, which are closely matching to our cohort. Such a significant association of advancing age and delirium is in accordance with the above findings. Limited comparison is possible with Ristescu AI et al,^[12] 72.1 ± 5.9 Years and Ren A et al,^[13] 74.2 ± 7.3 Years due to a wider age range. The lower mean age reported by Goyal S et al,^[7] is due to the exclusion of neurological and hearing-impaired patients, whereas the higher mean age reported by Peralta et al,^[14] is due to the geriatric setting.

Gender, Education & Socioeconomics: Males comprised 51% of the patients and had a 1.93 times higher prevalence of delirium ($p=0.11$) which was not significant, similar gender distribution was reported by Goyal S et al,^[7] Ristescu AI et al,^[12] and Forget MF et al,^[15] Jayaswal AK et al,^[6] also reported a higher proportion of males among patients with delirium without statistically significant association. Male predominance may be explained by higher male admission rates due to cultural/socioeconomic factors or male sex as an independent risk factor. Educational status was non-significant ($p=0.09$, 2.69 times higher in literates) in agreement with Ren A et

al,^[13] and McCusker J et al.^[16] Differences are literacy opportunities, not real risk. Most of the participants were married working people of rural areas. Delirium was more frequent in working subjects, but not significantly as opposed to Alamri et al,^[4] who found higher rates in unemployed subjects. Residence (rural vs. urban) was statistically significant, though there is limited comparative literature. Functional impairment, visual/hearing impairment, history of alcohol use and malnutrition were not significantly associated. However, sensory aids are known preventive strategies.

Length of Stay: The mean hospital stay was 8.81 ± 5.64 days (most between 6 and 10 days) which supports the findings of Inouye SK et al,^[3] McCusker J et al,^[16] and O'Keeffe et al,^[17] that delirium prolongs hospitalisation and that the severity correlates with the length of stay.

Precipitating Factors and Correlation: Infections were significantly associated ($p < 0.0001$) as precipitating factors for delirium, with respiratory tract infections being the most common, followed by urinary tract infections and skin or soft tissue infections. This finding is in agreement with the observations of Peralta et al,^[14] Laurila et al,^[18] in frail elderly cohorts, Aldemir M et al,^[19] Fong TG et al,^[2] and Manepalli J et al,^[20] Inouye et al,^[3] highlighted the need for differentiating predisposing factors like dehydration and malnutrition from precipitating ones.

Drug-related factors, particularly psychoactive medications, sedatives and polypharmacy, were significantly associated with delirium. These results are in line with the findings of Alagiakrishnan K et al,^[21] Tune LE et al,^[22] Francis J et al,^[9] Korevaar JC et al,^[23] Inouye SK et al,^[3] and Martin et al,^[24] who emphasised anticholinergics, benzodiazepines, corticosteroids, and opioids as reversible precipitants.

Other important precipitants included hypoxia and pulmonary compromise, toxic metabolic encephalopathy, vascular events, dehydration, physical restraints, indwelling catheters, surgery, anaesthesia, high levels of pain and anaemia. Each of these factors was a significant contributor to the development of delirium in the study population. Infections, particularly respiratory tract infections, were the most common precipitating factors for delirium, followed by urinary tract infections and skin or soft tissue infections. This finding is consistent with observations by Peralta et al,^[14] Laurila et al,^[18] in frail elderly cohorts, Aldemir M et al,^[19] Fong TG et al,^[2] and Manepalli J et al,^[20] Inouye et al,^[3] highlighted the need for differentiating predisposing factors like dehydration and malnutrition from precipitating ones.

Medical Comorbidities and Correlation: Medical comorbidities were the most common predisposing factor (71.6% of patients) and were highly significantly associated with delirium ($p < 0.0001$). Hypertension, diabetes mellitus and coronary artery disease (CAD) were significantly associated ($p <$

0.05). Diabetes was found in nearly half of the delirious patients, similar to Goyal S et al,^[7] but lower non-significant proportions were reported by Jayaswal AK et al^[6] and Ren A et al. The trends of hypertension and CAD were similar to those described by Goyal S et al,^[7] Ren A et al,^[13] and Chrispal A et al,^[25] but statistical significance was not demonstrated in those studies.

Other comorbidities like cerebrovascular accidents (CVA), deranged renal function, chronic kidney disease (CKD), congestive cardiac failure (CCF), chronic obstructive pulmonary disease (COPD), chronic liver disease (CLD) and malignancy showed no significant associations in this cohort. These patterns of comorbidity are contrary to the findings of Alamri et al,^[4] who found a predominance of cardiac disorders over gastrointestinal and neurological disorders and probably reflects patient selection and the relative composition of medical and surgical wards.

Metabolic Derangements and Correlation: Among metabolic derangements, hyperglycaemia showed a significant association with delirium ($p < 0.05$). Hyponatremia was observed in a considerable proportion of patients; although not statistically significant in this cohort, it has been identified as a key precipitant in previous studies by Francis J et al,^[9] Aldemir M et al,^[19] and Goyal S et al,^[7] No significant correlations were found for hypoglycemia, hypernatremia, or uremia in this study population.

Delirium Severity: Patients with vascular disorders, metabolic/endocrine disorders, CVA, deranged renal function, CKD, and uremia had higher Delirium Rating Scale-Revised-98 (DRS-R98) severity scores, demonstrating that delirium severity directly mirrors the acute physiological strain of underlying medical conditions.

Overall Interpretation: Delirium in hospitalized patients is a complex, multifactorial clinical syndrome predominantly driven by advancing age, chronic comorbidities (hypertension, diabetes, CAD), systemic infections, acute metabolic disturbances (hyperglycemia), and psychoactive drug exposure.

Generalizability: Findings originate from a single rural tertiary teaching hospital using purposive sampling of clinically suspected cases. Consequently, results reflect delirium frequency among suspected inpatients rather than true prevalence in the general population or unselected hospital cohorts.

Limitations: The cross-sectional design does not allow for causal inference. Without a control group and follow-up after discharge, it is difficult to confirm direct risk causality and long-term outcomes.

CONCLUSION

Delirium was confirmed in 63.7% of clinically suspected hospitalized patients. Increasing age (>50

years), medical comorbidities (hypertension, diabetes, CAD), infections, hyperglycemia, and medication factors showed significant associations with delirium and prolonged hospital stay. Early identification of these predisposing and precipitating factors is vital for prompt diagnosis and clinical management.

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