# Etiologic and Cognitive Differences in Hyperactive and Hypoactive Delirium

Abhishek Kumar, MBBS, MD[a,*]; Ajay Kumar Bakhla, MBBS, MD, DPM[a]; Sriniwas Gupta, MBBS, MD[b]; Brig M. S. V. K. Raju, MBBS, MD[c]; and Ashok Prasad, MBBS, MD, DPM[a]

## ABSTRACT

***Objective:*** To assess the differing patterns of cognitive impairment in the hyperactive and hypoactive subtypes of delirium and test the hypothesis that cognitive disturbances are high in patients with hypoactive delirium.

***Method:*** The study was conducted in a general hospital in Pune, India from 2007 to 2009 and included 80 patients with delirium (*DSM-IV-TR* criteria). A detailed sociodemographic profile was obtained for each patient, and their cognitive function was assessed with the Mini-Mental State Examination (MMSE) and Memorial Delirium Assessment Scale (MDAS). Patients were classified as hyperactive or hypoactive using the MDAS.

***Results:*** Of the 80 patients, 70% (n = 56) were identified as hyperactive, with a mean ± SD age of 33.42 ± 7.37 years, and 30% (n = 24) as hypoactive, with a mean ± SD age of 34.62 ± 6.64 years. Alcohol and other substance use disorders were the most frequent diagnosis associated with the hyperactive subtype, whereas other psychiatric disorders such as schizophrenia and mood disorders, infection, and chronic medical conditions were associated with the hypoactive subtype. Cognitive impairments were significantly high in the hypoactive subtype, as found in various cognitive domains of the MMSE and MDAS ($P = .000$).

***Conclusions:*** The hyperactive and hypoactive subtypes of delirium appear to be etiologically associated with a different diagnostic group. Severe cognitive impairment was associated with the hypoactive subtype.

*Prim Care Companion CNS Disord 2015;17(6):doi:10.4088/PCC.15br01810*



[a]Department of Psychiatry, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

[b]Department of Psychiatry, 154 General Hospital, Zakhama, Nagaland

[c]Department of Psychiatry, People's College of Medical Sciences and Research Centre, Bhopal, Madhya Pradesh, India

**Corresponding author:* Abhishek Kumar, MBBS, MD, Department of Psychiatry, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India 834009 (drabhishek_kr@yahoo.com).

Delirium is classified as hyperactive and hypoactive with an intermediate "mixed" subtype. Hyperactive delirium is characterized by restlessness, hypervigilance, rapid speech, irritability, and combativeness, whereas hypoactive delirium is characterized by psychomotor retardation, apathy, and reduced alertness. The incidence of hyperactive delirium ranges from 9% to 31%, and the hypoactive subtype ranges from 19% to 72%.[1] The hypoactive and hyperactive subtypes of delirium have different precipitants and causes.[1] Hypoactive patients have been noted to have more severe cognitive disturbances and poor prognosis.[2]

In this study, we investigated the hyperactive and hypomanic subtypes of delirium. The objective was to assess the differing patterns of cognitive impairment among various domains of cognitive function and test the hypothesis that cognitive disturbances are high in patients with hypoactive delirium.

## METHOD

This study was conducted at a general hospital affiliated with Bharati Vidyapeeth Medical College in Pune, India from 2007 to 2009. The study was approved by the college's institutional review board. The sample included 80 patients with *DSM-IV-TR*[3]–identified delirium. Sampling was purposive convenience, wherein half of the patients were from the psychiatry ward and the other half were age-matched patients from various other departments of the hospital, including the general medical and surgical/postoperative wards and the intensive care unit. The inclusion criteria were patients aged ≥ 18 years who consented to participate in the study (consent received from the patient or primary medical caregiver). The exclusion criteria were diagnosis of the mixed delirium subtype, patient's condition too incapacitated to participate in the study due to poor medical status, and extremely disturbed and excited patients.

A detailed history for each patient was obtained with a sociodemographic clinical data sheet, a checklist of etiologic factors, and a mental status evaluation and rating using the Mini-Mental State Examination (MMSE)[4] and Memorial Delirium Assessment Scale (MDAS).[5] The 2 delirium subtypes were identified using the MDAS items. The collected data for all patients were statistically analyzed using SPSS version 16.0 (SPSS, Inc, Chicago, Illinois).

## RESULTS

A total of 80 patients (men: n = 57, 71.2% and women: n = 23, 28.3%) were included in the study. Of the 80 patients, 70% (n = 56) were identified as hyperactive, with a mean ± SD age of 33.42 ± 7.37 years, and 30% (n = 24) as hypoactive, with a mean ± SD age of 34.62 ± 6.64 years. Patients in both subtype groups were statistically similar in age, education, gender distribution, and occupation. The hyperactive subtype was most frequently found in patients with alcohol and other substance use disorders (n = 38, 67.8%) and in those treated in the trauma and intensive care unit environments (n = 7, 12.5%). The hypoactive subtype was more often found in patients with diagnoses of

**Clinical Points**

- Hyperactive or hypoactive subtypes of delirium appear to have an etiologically different underlying diagnosis.
- Alcoholism and substance use disorders are usually associated with the hyperactive subtype of delirium.
- The hypoactive subtype of delirium is associated with more severe cognitive impairment.

**Table 1. MMSE and MDAS Subscale Scores for Patients With Hyperactive and Hypoactive Subtypes of Delirium[a]**

| Scale | Hyperactive | Hypoactive | *t* | *df* | *P* (2-tailed) |
|---|---|---|---|---|---|
| MMSE | | | | | |
| Orientation | 5.55 ± 0.98 | 5.37 ± 0.71 | 0.799 | 78 | .427 |
| Registration | 2.09 ± 0.61 | 1.00 ± 0.72 | 6.911 | 78 | .000** |
| Attention | 2.71 ± 0.86 | 1.12 ± 0.53 | 8.299 | 78 | .000** |
| Recall | 1.37 ± 0.64 | 0.79 ± 0.72 | 3.565 | 78 | .001* |
| Language | 2.61 ± 0.73 | 2.37 ± 1.01 | 1.154 | 78 | .252 |
| Copying | 0.64 ± 0.48 | 0.29 ± 0.46 | 3.012 | 78 | .003* |
| MMSE total score | 14.98 ± 1.93 | 10.96 ± 2.03 | 8.238 | 41.633 | .000** |
| MDAS | | | | | |
| Awareness | 2.03 ± 0.65 | 2.16 ± 0.48 | −0.876 | 78 | .384 |
| Disorientation | 2.91 ± 0.28 | 3.00 ± 0.00 | −1.515 | 78 | .134 |
| Short-term memory impairment | 2.51 ± 0.50 | 2.87 ± 0.33 | −3.172 | 78 | .002* |
| Impaired digit span | 2.92 ± 0.25 | 3.00 ± 0.00 | −1.342 | 78 | .184 |
| Attention shifting | 2.39 ± 0.52 | 2.70 ± 0.46 | −2.534 | 78 | .013* |
| Disorganized thinking | 1.82 ± 0.43 | 2.54 ± 0.53 | −6.483 | 78 | .000** |
| Perceptual disturbances | 1.14 ± 0.51 | 2.33 ± 0.63 | −8.762 | 78 | .000** |
| Delusions | 1.05 ± 1.05 | 0.33 ± 0.33 | 2.987 | 78 | .004* |
| Motor activity | 1.44 ± 1.07 | 1.50 ± 0.88 | −0.214 | 78 | .831 |
| Sleep-wake arousal | 1.64 ± 0.55 | 1.75 ± 0.44 | −0.839 | 78 | .404 |
| MDAS total score | 19.89 ± 2.12 | 22.20 ± 1.47 | −4.861 | 78 | .000** |

[a]All data are presented as mean ± SD.
*Significant at $P \leq .05$.
**Significant at $P \leq .01$.
Abbreviations: MDAS = Memorial Delirium Assessment Scale, MMSE = Mini-Mental State Examination.

psychotic disorder, schizophrenia, and mood disorder; diabetes mellitus; and infection. Postoperative patients (n = 15, 18.75%) were equally present in both groups; however, many patients had a dual diagnosis. Table 1 provides a comparison of the hyperactive and hypoactive subtypes of delirium across all subscales of the MMSE and MDAS.

The mean ± SD MMSE total score for patients with the hyperactive subtype was 14.98 ± 1.93 and for patients with the hypoactive subtype was 10.96 ± 2.03. The MDAS total scores were 19.89 ± 2.12 for patients with the hyperactive subtype and 22.20 ± 1.47 for patients with the hypoactive subtype. The mean scores of both the MMSE and MDAS showed statistically significantly higher cognitive impairment in patients with the hypoactive subtype ($P = .000$). On the MMSE, the significant difference between the 2 subtypes was found in the cognitive domains of registration ($P = .000$), attention ($P = .000$), recall ($P = .001$), and copying ($P = .003$), but no significant differences were found in the domains of orientation and language. Similarly, on the subscales of the MDAS, a significant difference was found in the domains of short-term memory impairment ($P = .002$), shifting attention ($P = .013$), disorganized thinking ($P = .000$), perceptual disturbances ($P = .000$), and delusions ($P = .004$) (Table 1).

## DISCUSSION

This study tested the hypotheses that cognitive disturbances are high in hypoactive delirium and differing patterns of cognitive impairment exist across various domains of cognitive functions. We found that 70% of the patients had hyperactive delirium. This finding is comparable to a previous study[6] that reported rates of 86% hyperactive and 40% mixed; however, Liptzin and Levkoff[7] reported rates of 15% hyperactive and 52% mixed. A predominance of the mixed subtype was also mentioned by others.[8,9] However, all of these studies[6–9] were related to old and debilitated patients. One Indian study[10] found a similarly high percentage (45.9%) of hyperactive subtypes, but the study sample consisted mainly of geriatric patients and excluded 23% of those with the mixed subtype. Moreover, the higher percentage of the hyperactive subtype in our study may be attributed to the fact that this sample had a large number of patients with alcohol withdrawal delirium (n = 39, 48.75), which is known to be hyperactive.[9,11] On the other hand, we found that the hypoactive subtype was common in psychiatric disorders and other medical conditions such as infection and diabetes and in postoperative patients. Hence, the distribution of hyperactive or hypoactive subtypes depends on the age group and diagnostic category of the sample.

We found statistically significantly higher cognitive impairment with the hypoactive subtype, which conforms with findings of other studies.[12–17] In this study, we found a significant difference in total MMSE score across the 2 subtypes. Patients with hypoactive delirium presented with more dysfunction in the domains of registration, attention, recall, and copying, but no significant difference was found in the domains of orientation and language. On the MDAS, a significant difference was found in short-term memory, shifting attention, disorganized thinking, perceptual disturbances, and delusions, which corresponds with the findings of Meagher and Trzepacz.[1]

The strengths of this study include a general hospital setting, a nongeriatric population, and exclusion of mixed subtypes of delirium. The geriatric population poses various limitations with cognitive decline and possible mild cognitive impairments. Future studies may be planned with a larger sample size, more sensitive and extensive neuropsychological and cognitive function tests, and a longer observation period.

## CONCLUSION

The present study concludes that hyperactive and hypoactive subtypes of delirium appear to be etiologically







Prim Care Companion CNS Disord
2015;17(6):doi:10.4088/PCC.15br01810

associated with a different diagnostic group. Severe cognitive impairment was associated with the hypoactive subtype.

***Submitted:*** March 3, 2015; accepted June 26, 2015.

***Published online:*** November 12, 2015.

***Potential conflicts of interest:*** None reported.

***Funding/support:*** None reported.

## REFERENCES

1. Meagher DJ, Trzepacz PT. Delirium phenomenology illuminates pathophysiology, management, and course. *J Geriatr Psychiatry Neurol*. 1998;11(3):150–156, discussion 157–158.
2. Koponen H, Stenbäck U, Mattila E, et al. Delirium among elderly persons admitted to a psychiatric hospital: clinical course during the acute stage and one-year follow-up. *Acta Psychiatr Scand*. 1989;79(6):579–585.
3. American Psychiatric Association. *Diagnostic and Statistical Manual for Mental Disorders*, Fourth Edition, Text Revision. Washington, DC: American Psychiatric Association; 2000.
4. Folstein MF, Folstein SE, McHugh PR. Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12(3):189–198.
5. Breitbart W, Rosenfeld B, Roth A, et al. The Memorial Delirium Assessment Scale. *J Pain Symptom Manage*. 1997;13(3):128–137.
6. Fann JR, Alfano CM, Burington BE, et al. Clinical presentation of delirium in patients undergoing hematopoietic stem cell transplantation. *Cancer*. 2005;103(4):810–820.
7. Liptzin B, Levkoff SE. An empirical study of delirium subtypes. *Br J Psychiatry*. 1992;161(6):843–845.
8. Lipowski ZJ. Delirium (acute confusional states). *JAMA*. 1987;258(13):1789–1792.
9. Solai LKK. Delirium. In: Saddock BJ, Saddock VA, Ruiz P, eds. *Comprehensive Textbook of Psychiatry*. Vol 1. 9th ed. Philadelphia, PA: Wolters Kluwer Lippincott William and Wilkins Baltimore; 2009:1153–1166.
10. Grover S, Avasthi A, Sharma A. Motoric subtypes of delirium in geriatric patients. *J Geriatr Ment Health*. 2014;1(1):14–19.
11. Trzepacz PT, Meagher DJ. Delirium In: Levenson JL, ed. *The American Psychiatric Publishing Textbook of Psychosomatic Medicine*. 2nd ed. Washington, DC: American Psychiatric Publishing; 2005:91–130.
12. Cutting J. The phenomenology of acute organic psychosis: comparison with acute schizophrenia. *Br J Psychiatry*. 1987;151(3):324–332.
13. Laurila JV, Pitkala KH, Strandberg TE, et al. The impact of different diagnostic criteria on prevalence rates for delirium. *Dement Geriatr Cogn Disord*. 2003;16(3):156–162.
14. Morita T, Tei Y, Tsunoda J, et al. Underlying pathologies and their associations with clinical features in terminal delirium of cancer patients. *J Pain Symptom Manage*. 2001;22(6):997–1006.
15. O'Leary DS, Flaum M, Kesler ML, et al. Cognitive correlates of the negative, disorganized, and psychotic symptom dimensions of schizophrenia. *J Neuropsychiatry Clin Neurosci*. 2000;12(1):4–15.
16. Turkel SB, Trzepacz PT, Tavaré CJ. Comparing symptoms of delirium in adults and children. *Psychosomatics*. 2006;47(4):320–324.
17. Trzepacz PT, Teague GB, Lipowski ZJ. Delirium and other organic mental disorders in a general hospital. *Gen Hosp Psychiatry*. 1985;7(2):101–106.