



## Articles

# Delirium, polypharmacy and adverse outcomes: findings from a hospital in Kerala, India

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## Delirium Communications

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### Introduction

Delirium is an acute disorder of attention and awareness, a medical emergency associated with increased morbidity and mortality. Delirium remains under-recognised, and few studies are from India.

### Methods

This study aimed to estimate the prevalence of delirium and its risk factors among hospitalised older patients admitted to medical and surgical wards in a teaching hospital in Central South India. We performed a retrospective cross-sectional study on 100 older patients admitted to medical and surgical wards in April–October, 2020. Patient data were obtained from a record review, extracting information on comorbidities, medications, and terms indicating delirium.

### Results

Delirium was present in 39% of the study population and was significantly associated with older age (88%), abnormal electrolytes (59%), and polypharmacy (87%). Delirium was also significantly associated with mortality (28%) and prolonged hospital stay. (36%)

### Discussion

The prevalence of delirium is high among older hospitalised patients and is significantly related to adverse hospital outcomes. The findings of this study could trigger changes in hospital policies in screening for delirium in older persons for its prompt recognition and prevention of adverse health outcomes.

## INTRODUCTION

Delirium, an acute disorder of attention and awareness,<sup>1</sup> is a medical emergency that is often fatal in older people.<sup>2,3</sup> It is caused by multiple factors that directly or indirectly interfere with neurotransmission, disrupting large-scale neuronal networks in the brain. These may be secondary to direct interference, as with abnormal electrolytes and metabolic disturbances or due to a gradual accumulation of neuronal damage. Cerebrovascular disease and head trauma can also render individuals susceptible to delirium.<sup>2,4–6</sup>

Medications themselves are common causes of delirium, particularly in frail older people. Age- and comorbidity-related changes in pharmacokinetics and pharmacodynamics contribute to delirium risk.<sup>2,4</sup> The risk of anticholinergic toxicity is also greater in older people.<sup>7</sup> High-dose narcotics, benzodiazepines, and anticholinergic medications are common precipitants.<sup>4,7</sup> Multiple comorbidities and

multiple prescribers increase the risk of polypharmacy,<sup>8,9</sup> and its adverse effects.

Delirium can lead to adverse outcomes such as prolonged hospital stay, poor physical function, decreased quality of life, mortality, and substantial healthcare costs.<sup>2,4</sup> It is also linked to long-term consequences like cognitive decline and dementia.<sup>10</sup> The fact that this condition is potentially reversible makes it pertinent to diagnose delirium early in its course. Prompt diagnosis of delirium in hospitalised patients can help identify acute illnesses and prevent hospital-related complications.<sup>2,10</sup>

There are few prevalence estimates of delirium in Indian settings. Current data suggest delirium prevalence in hospitalised older people may vary from 5% to 44%.<sup>10–12</sup> This study aimed to estimate delirium prevalence and risk factors among hospitalised older people admitted in the medical and surgical wards of a teaching hospital in Central South India.

**Table 1.**

	Total	Delirium (n=39)		No delirium (n=61)		P
		N	%	N	%	
Age						0.01
65-74 years	63	21	54	42	69	
75-85 years	29	11	28	18	30	
>85 years	8	7	18	1	2	
Sex (men)	60	21	52	39	64	0.32
Setting						
Medical	53	25	64	28	46	0.08
Surgical	47	14	36	33	54	
Hypertension	68	26	67	42	69	0.82
Diabetes	59	23	59	36	59	1.0
History of stroke	14	8	21	6	10	0.13
Pain	48	18	47	30	49	0.77
Constipation	9	5	13	4	7	0.48
Abnormal electrolytes	59	31	80	28	46	<0.01
Hyponatremia	50	26	67	24	39	<0.01
Metabolic disturbance	44	20	51	24	39	0.24
Prolonged hospital stay	19	14	34	5	8	0.001
Death	11	11	28	0	0	0.000
Polypharmacy	87	34	87	53	87	0.97
Potentially inappropriate medication usage	26	11	28	15	25	0.69

## METHODS

We performed a retrospective, cross-sectional record review of 100 patients aged  $\geq 65$  years admitted to medical and surgical wards between April-October, 2020. We excluded patients with a previous diagnosis of dementia or a chronic psychiatric illness. Patient data, including name, age, sex, place of admission, and duration of hospital stay, were obtained from in-patient records. We stratified age into three categories: 65-74 years; 75-85 years; >85 years.<sup>13</sup> Admission records were searched for terms like *altered mental status*, *confusion*, *decreased responsiveness*, *disoriented speech/behaviour*, *increased drowsiness* or wherever a delirium diagnosis was documented. We recorded comorbidities and medication use. *Abnormal electrolytes* was defined by hyponatremia, hypokalaemia, hypomagnesemia, and hypocalcemia. *Metabolic dysfunction* included patients with hyper or hypoglycemia and alterations in serum urea, creatinine, and ammonia levels.

The medication list from the records was assessed for polypharmacy and use of potentially inappropriate medications at any point during admission. Polypharmacy was defined as the use of 5 or more concurrent medications. Potentially inappropriate medicine use was defined using Beer's Criteria 2019.<sup>14</sup> The updated AGS guidelines address: consideration of diagnosis, use of caution, simultaneous prescription of drugs that could interact, and avoidance/reduction of dosage according to individual kidney function.

The length of hospital stay was arbitrarily determined as prolonged, if the patient exceeded seven days of stay in the hospital.

The data was entered in MS Excel 2010 and analysed using IBM SPSS Statistics v20. Descriptive analyses calculated frequency, percentage, mean and standard deviation. Comparisons were done using  $\chi^2$  test, at 5% significance.

## RESULTS

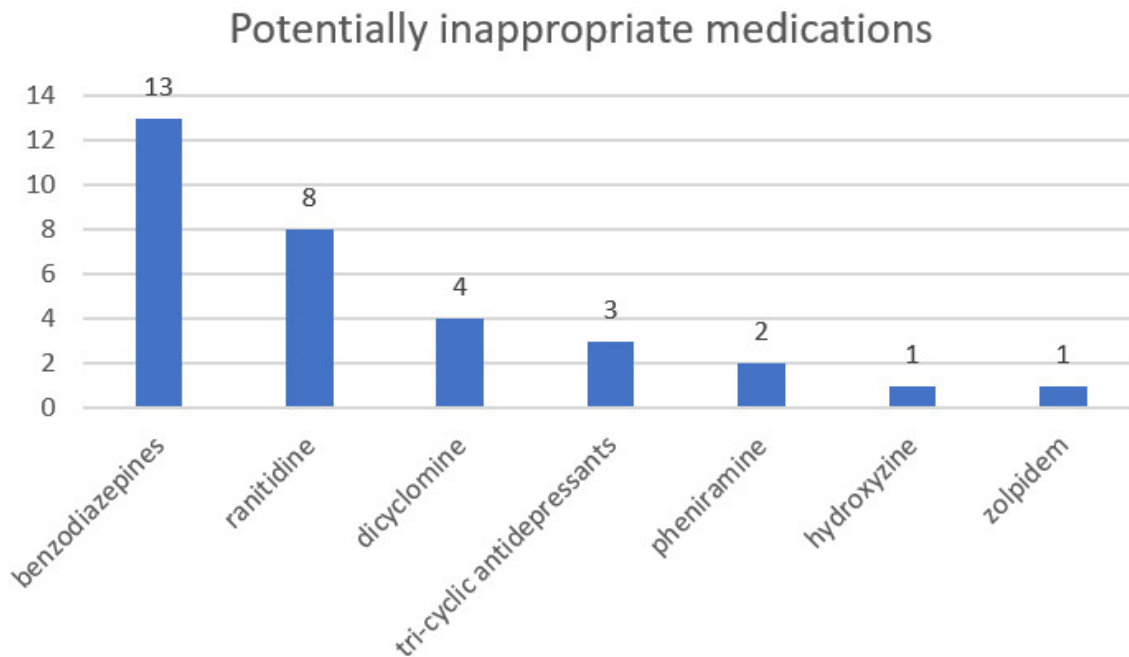
### STUDY POPULATION

The mean age of the study population was  $72.6 \pm 6.5$  years (Table 1). More than half of the sample were men aged 65 to 74 (n=63) and (n=53) admitted to medical wards. Delirium was present in 39 of the 100 study participants.

The most common comorbidities were hypertension and diabetes (n=68 and 59, respectively). Abnormal electrolytes were present in most of the study population (n=59). Pain was present in about half of the total number of patients (n=48), and constipation in 9 patients.

Polypharmacy was evident in 87% of the population, and a quarter of the study group was on potentially inappropriate medications. The most commonly prescribed PIM among delirious patients were benzodiazepines (n=13), followed by ranitidine, dicyclomine, tri-cyclic antidepressants, pheniramine, hydroxyzine and zolpidem (Figure 1).

Nearly one in five patients had a prolonged duration of hospitalisation and there were 11 inpatient deaths.



**Figure 1. Distribution of potentially inappropriate medications in the study population**

#### DELIRIUM AND PATIENT CHARACTERISTICS

Delirium was significantly associated with age ( $p=0.01$ ), with abnormal electrolytes (80%,  $p=0.001$ ) and hyponatremia (67%,  $p<0.01$ ). Nearly half of those with delirium had pain as a predominant symptom ( $p=0.77$ ). The presence of delirium had no significant association with any comorbidities, constipation ( $p=0.48$ ), or metabolic disturbances ( $p=0.24$ ).

#### DELIRIUM WITH MEDICATION USE, HOSPITAL STAY, AND MORTALITY

Delirium was significantly associated with mortality (28%,  $p<0.001$ ) and prolonged hospital stay. (36%,  $p=0.001$ ) (Table 1). Most of those with delirium were subject to polypharmacy, and nearly a third, had been prescribed potentially inappropriate medications (PIMs). (87%,  $p=0.97$  and 28%,  $p=0.69$ , respectively)

#### DISCUSSION

Delirium is frequently unrecognised and under-reported, especially in hospital settings. Our study showed delirium was prevalent in 39% overall, with 47% and 30% in medical and surgical wards, respectively. Overall, our findings are comparable to studies conducted across different hospitals in India.<sup>10–12,15</sup>

Similar studies in Kerala, South India, showed a lower prevalence of 16% in medical and surgical units<sup>16</sup> and 22% in intensive care units.<sup>17</sup> Another study further south reported an even lower prevalence of 10%. The same study also reported that 62% of delirium was undiagnosed.<sup>18</sup>

Older age is one of the most consistently identified risk factors for delirium,<sup>2,4,5</sup> and our study adds to the evidence that delirium increases with the increasing mean age of the population.<sup>19</sup> Men are known to be predisposed to delirium.<sup>4,5</sup> Although our study revealed an increased prevalence among men, we failed to find any statistical association. A larger sample size may have yielded different results.

The prevalence of diabetes was higher among patients with delirium. Patients with long-standing hyperglycemia are known to be at risk of developing delirium.<sup>20,21</sup> Pain and constipation are also known risk factors and contribute to the development of delirium in hospitalised patients.<sup>2,22,23</sup> We did not find any statistically significant association with these symptoms in our study. Poor documentation of patients' complaints or caregivers' observations could be possible reasons for our findings.

Our study revealed that delirium was strongly associated with abnormal electrolytes, particularly hyponatremia. This was consistent with results from other studies in India.<sup>6,24,25</sup>

The prevalence of polypharmacy in our study population was much higher than reported locally.<sup>26,27</sup> Most patients were on medications likely to exacerbate delirium. Hypoactive delirium can be misdiagnosed as simply fatigue, both by the medical professional and the caregivers.<sup>17</sup> This ageism is not uncommon among medical professionals and may account for poor identification of or association of delirium with medications. However, this study reiterates that polypharmacy and PIM use were prevalent, emphasising the need for careful prescribing in older patients.

As in other studies, patients with delirium had a significantly increased length of hospital stay.<sup>10,17,28</sup> Delirium could be a harbinger of hospital-acquired infec-

tion,<sup>10,16,24,25</sup> or a consequence of a new drug-related event<sup>7</sup> often disrupting the discharge plans, indirectly increasing caregiver burden and health care expenditure.<sup>29-31</sup>

We also found a strong association between delirium and mortality in our study. Delirium increases the risk of poor nutrition, swallowing, and immobility, risking the vulnerable patient to further infections, and adverse health outcomes.<sup>24,25,32</sup>

In India, where research in geriatrics is still nascent, this study is among the few that have explored the risk factors and outcomes of delirium in hospitalised older patients.<sup>16,17,24</sup> Our study also showed that delirium is strongly associated with complicated hospital outcomes, including mortality, emphasising the need for adequate delirium screening on admission in elderly patients.

Our study, however, has its limitations. Besides the relatively small sample size and its retrospective design, data were primarily collected from medical records and thus relied heavily on identifying keywords, without the benefit of standardised screening tools. The study setting was in medical and surgical wards, which precluded most acutely ill patients, and therefore a few early onset delirious patients. There were limited data on other symptoms like sleep issues, sensory impairments, and baseline cognition that could have impacted our results. And lastly, as this was a record review, a direct cause-effect relationship between delirium and medication use or the patient's functional status at discharge could not be ascertained.

## CONCLUSION

Despite various guidelines and recommendations, the prevalence of delirium among hospitalised older people still remains high. Delirium could also predict complicated hospital outcomes, increased healthcare costs, morbidity, and mortality. A focused and systematic approach by healthcare workers to screen for delirium can revolutionise

geriatric care and is paramount in preventing adverse health outcomes.

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## AUTHOR CONTRIBUTIONS

1. Dr. Manjaly, Steve: (Corresponding author)- Study design, writing and reviewing the manuscript, data analysis.
2. Dr. Francis, Anu: Data collection, reviewing the manuscript.
3. Dr. Joju, Aqueen: Writing the manuscript, data collection and analysis.

## ETHICS STATEMENT

The study was approved by the Institutional Ethics and Review Board of JMMC & RI.

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## DECLARATION OF INTERESTS

The authors do not have any declaration of interests.

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