

Delirium in the Geriatric Intermediate Care Unit in Ain-Shams University Hospitals

ABEER H. MATTER, M.D. and MONA H. HEGAZY, M.D.

The Department of Geriatric Medicine and Gerontology, Faculty of Medicine, Ain Shams University

Abstract

Background: Delirium in geriatric patients is one of the most severe and fatal complications during hospital stays, being related to poor prognosis.

Aim of Study: Assess the prevalence of delirium in senior patients in the Geriatric Intermediate Care Unit (IMCU), and any potential risk factors.

Subjects and Methods: From November 2024 to March 2025, 196 senior patients admitted to the IMCU participated in a cross-sectional study. Delirium was diagnosed using the Confusion Assessment Method (CAM) criteria, and its severity was evaluated using the Confusion Assessment Method Severity (CAM-S) short form. Every participant received a thorough evaluation that included laboratory tests, Glasgow Coma Scale (GCS), Clinical Frailty Scale (CFS), Sequential Organ Failure Assessment (SOFA) score, Faces Pain Scale – Revised (FPS-R), Charlson Comorbidity Index (CCI), and history of cognitive impairment.

Results: The most frequent reason for the geriatric IMCU admission was delirium the prevalence was 37.8%. Hypoactive, hyperactive, and mixed were 70.8%, 27.8%, and 1.4%, respectively. Infections are the most frequent cause of delirium. Functional, cognitive impairment, length of stay in the IMCU >5 days, GCS ≤13, CFS >7, and WBC >11.5 ×10³/uL were risk factors.

Conclusion: Elderly patients had a high prevalence of delirium; improved results require early detection and control of independent risk factors.

Key Words: Delirium – Geriatric – Prevalence – IMCU.

Introduction

THE hallmark of delirium, a serious mental illness, is a brief, significant, and ephemeral disruption of cognitive function brought on by modifications in brain metabolism. With a prevalence of 14–56% and a hospital mortality rate of 25–33%, it is a common issue among elderly people admitted to hospitals [1]. Hyperactive, hypoactive, and mixed are its three subtypes. Even while delirium responds well to nursing care, up to 70% of elderly people do not have it recognized or are misdiagnosed [2], and medical practitioners frequently manage it poorly, which can worsen the associated adverse consequences. Around 60% of cases go undetected [3], and there are a number of reasons for this, including the erratic nature of delirium and its frequent comorbidity with depression and cognitive impairment [4].

One of the most serious and deadly side effects of hospitalization is delirium. Longer hospital stays [5], higher readmission rates [6], patient falls [7], nursing home admission [8], and increased in-hospital mortality and death after discharge [9,10] have all been linked to delirium, according to many studies. Additionally, this condition is a known risk factor for the development and exacerbation of a preexisting cognitive impairment [4,11,12]. Thus, it establishes a substantial rise in health care utilization and expenses [13] as well as a financial strain [14].

Due to the lack of indicators, delirium is difficult to diagnose and frequently goes unnoticed [15]. Furthermore, a study of the literature revealed that additional research is required to examine delirium in intermediate care units (IMCU).

Correspondence to: Dr. Abeer H. Matter,
E-Mail: abeerhassan@med.asu.edu.eg

Aim of the work:

This study aimed to assess the prevalence of delirium in this population, to identify possible risk factors, and to identify associations with bad outcome.

Patients and Methods

Study design:

Elderly patients aged 60 and over who were hospitalized to the intermediate care unit (IMCU) of the Geriatric Hospital of ASUHS, a tertiary referral center in Cairo, Egypt, were included in this cross-sectional study.

Over the course of five months, from November 2024 to March 2025, participants were gathered. Refusing to participate by the patient or their caregiver was the exclusion criterion for this study, whereas being elderly (≥ 60 years old) and admitted to the intermediate care unit was the inclusion criterion.

Method of sampling:

A convenient sample of patients who satisfied our inclusion criteria was carefully examined.

Sample size:

Using the PASS 15 program for sample size calculation, setting the confidence level at 95% and the margin of error at 10%, to detect an expected prevalence rate of delirium of 63.1% among patients [15], we recruited 196 elderly patients fulfilling our inclusion criterion.

Study tools:

- 1- Age, sex, Charlson Comorbidity Index (CCI) [16], number of drug intakes, functional assessment (Barthel Index) [17], Confusion Assessment Method (CAM) diagnosis of delirium [18], and Confusion Assessment Method Severity (CAM-S) short form [19] were among the variables used in data collection. The Glasgow Coma Scale (GCS) [20], Sequential Organ Failure Assessment (SOFA) score [21], Faces Pain Scale – Revised (FPS-R) [22], and clinical frailty scale (CFS) [23] were completed.
- 2- Each participant had a venous blood sample taken in order to measure different electrolytes, CBC, CRP, and KFT.

Statistical analysis:

Version 27.0 of the Statistical Package for Social Sciences (SPSS) was used to gather, edit, code, and enter the data [24]. When the quantitative data were parametric, they were displayed as means and standard deviations; when they were non-paramet-

ric, they were displayed as medians and interquartile ranges (IQR). Qualitative variables were also displayed as percentages and figures. For quantitative variables, inferential analyses were performed using the Mann-Whitney U in the case of two independent groups with non-normally distributed data and the independent *t*-test in the case of two separate groups with regularly distributed data. The chi-square test for proportional differences was used in inferential analysis for independent variables in qualitative data. To identify the risk factors for delirium, regression analysis was employed.

Results

196 geriatric patients admitted to IMCU were included in this study, from November 2024 to March 2025, with mean age 72.81 ± 7.89 , with female predominance (66.8%), 74 patients (37.8%) had delirium on admission, which was the most common cause of admission, followed by respiratory diseases (15.8%), neurological causes (14.8%), cardiac diseases (13.8%), renal diseases (8.2%), while Metabolic, Gastrointestinal, Blood pressure abnormality, and hepatic causes were the least common (5.6, 4.1, 3.6, 1.5% respectively) (Table 1), hypoactive delirium was the most common subtype as its prevalence was 70.8%, followed by hyperactive delirium, its prevalence was 27.8%, and the least percentage was mixed delirium with prevalence 1.4% (Fig. 1).

Table (1): Causes of admission to IMCU among the studied patients.

Cause of IMCU admission	No. = 196 (100%)
Delirium	74 (37.8%)
Cardiac causes	27 (13.8%)
Hepatic causes	3 (1.5%)
Renal causes	16 (8.2%)
Respiratory causes	31 (15.8%)
Neurological causes	29 (14.8%)
Metabolic causes	11 (5.6%)
Gastrointestinal causes	8 (4.1%)
Blood pressure abnormality	7 (3.6%)
Others	2 (1%)

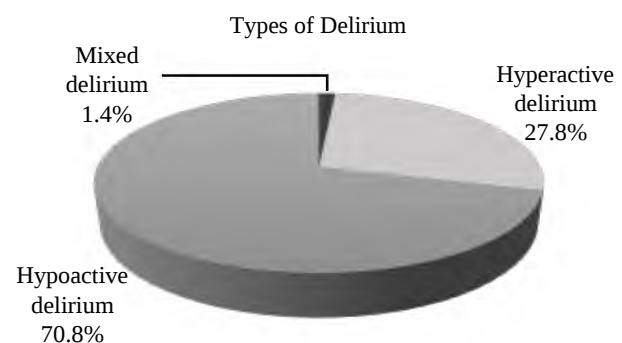


Fig. (1): Prevalence of types of delirium.

Multiple precipitating factors are the most common cause of delirium in the elderly. Infections were the most common precipitating cause (70.3%), primarily respiratory tract infections (35.1%) and urinary tract infections (24.3%), followed by dehydration (31.1%), liver cell failure (17.6%), and uremic encephalopathy/AKI (16.2%). Electrolyte disturbances, cardiac and neurological causes, pain, drugs, and hypo/hyperglycemia occupied lesser percentages (Fig. 3).

Patients with delirium had more functional and cognitive impairment, a longer IMCU length of stay, a lower GCS score, a higher clinical frailty scale, and a bad outcome than those without delirium

(p -value = 0.000, 0.000, 0.003, 0.000, 0.002, and 0.001 respectively) (Table 2).

There was no significant difference between patients with or without delirium regarding laboratory investigations, except for WBC count (p -value = 0.037) (Table 2) being higher in patients with delirium, matching with the results that infection is the most common cause of delirium.

Risk factors of delirium were functional impairment, cognitive impairment, IMCU length of stay more than 5 days, WBC count more than $11.5 \times 10^3/\mu\text{L}$, GCS less than or equal to 13, and CFS more than 7. (Table 3).

Table (2): Different characteristics of patients with delirium.

		Patients with delirium				
		No = 122 (62.2%)	Yes = 74 (37.8%)	Test value	p -value	Sig.
Age	Mean $\pm$ SD	72.3 $\pm$ 7.35	73.66 $\pm$ 8.69	-1.177•	0.24	NS
Barthel Index	Median (IQR)	60 (40-90)	40 (10-70)	-4.362#	0	HS
CCI	Mean $\pm$ SD	8.02 $\pm$ 1.96	8.24 $\pm$ 2.24	-0.717•	0.474	NS
Cognitive Impairment		35 (28.7%)	43 (58.1%)	16.640*	0.000	HS
Sensory impairment		45 (36.90%)	28 (37.8%)	0.018*	0.894	NS
Polypharmacy	Median (IQR)	3 (1-5)	3 (2-5)	-0.397#	0.691	NS
IMCU length of stay	Median (IQR)	5 (3-7)	6 (5-10)	-2.951#	0.003	HS
Outcome	Improved	103 (84.4%)	58 (78.4%)	16.997*	0.001	HS
	ICU transfer	19 (15.6%)	14 (18.9%)			
	Died	0 (0%)	2 (2.7%)			
WBC $\times 10^3/\mu\text{L}$	Median (IQR)	10 (7.5-12)	11.55 (7.7-16)	-2.085#	0.037	S
Hb g/dL	Mean $\pm$ SD	10.69 $\pm$ 2.47	10.53 $\pm$ 2.08	0.462•	0.645	NS
PLT $\times 10^9/\text{L}$	Median (IQR)	231 (160-296)	210.5 (133-324)	-0.868#	0.386	NS
CRP level mg/dL	Median (IQR)	51.5 (32.5-95)	69 (33.5-120)	-1.296#	0.195	NS
BUN mg/dL	Median (IQR)	30 (17-59)	27 (20-50)	-0.096#	0.924	NS
S. Creatinine mg/dL	Median (IQR)	1.2 (0.9-2)	1.15 (0.8-2)	-0.851#	0.395	NS
s. Na mmol/ L	Mean $\pm$ SD	134.07 $\pm$ 8.15	136.09 $\pm$ 8.21	-1.685•	0.094	NS
s. Kmmol/L	Mean $\pm$ SD	4.11 $\pm$ 0.75	4.13 $\pm$ 0.8	-0.213•	0.832	NS
s. Mg mg/dL	Mean $\pm$ SD	2.02 $\pm$ 0.53	1.98 $\pm$ 0.41	0.545•	0.586	NS
s. Ca mg/dL	Mean $\pm$ SD	9.03 $\pm$ 0.94	9.22 $\pm$ 0.83	-1.416•	0.158	NS
GCS score	Mean $\pm$ SD	14 $\pm$ 1.85	11.91 $\pm$ 1.36	8.440•	0	HS
SOFA score	Median (IQR)	2 (1-4)	3 (2-4)	-1.502#	0.133	NS
FPS-R	Median (IQR)	0 (0-0)	0 (0-2)	-1.847#	0.065	NS
CFS	Median (IQR)	5 (4-7)	6.5 (4-8)	-3.032#	0.002	HS

CCI : Charlson Comorbidities Index.

IMCU: Intermediate care unit.

WBC : White blood cells.

Hb : Hemoglobin.

PLT : Platelets.

CRP : C-reactive protein.

BUN : Blood Urea Nitrogen.

s. Na : Serum sodium.

s. K. : Serum potassium.

s. Mg : Serum magnesium.

s. Ca : Serum calcium.

CGS: Glasgow Coma Scale.

SOFA score: Sequential Organ Failure Assessment score.

FPS-R: Faces Pain Scale-Revised.

CFS: Clinical Frailty Scale.

p -value >0.05: Non-significant.

p -value <0.05: Significant.

p -value <0.01: Highly significant.

•: Independent t -test.

*: Chi-square test.

#: Mann-Whitney test.

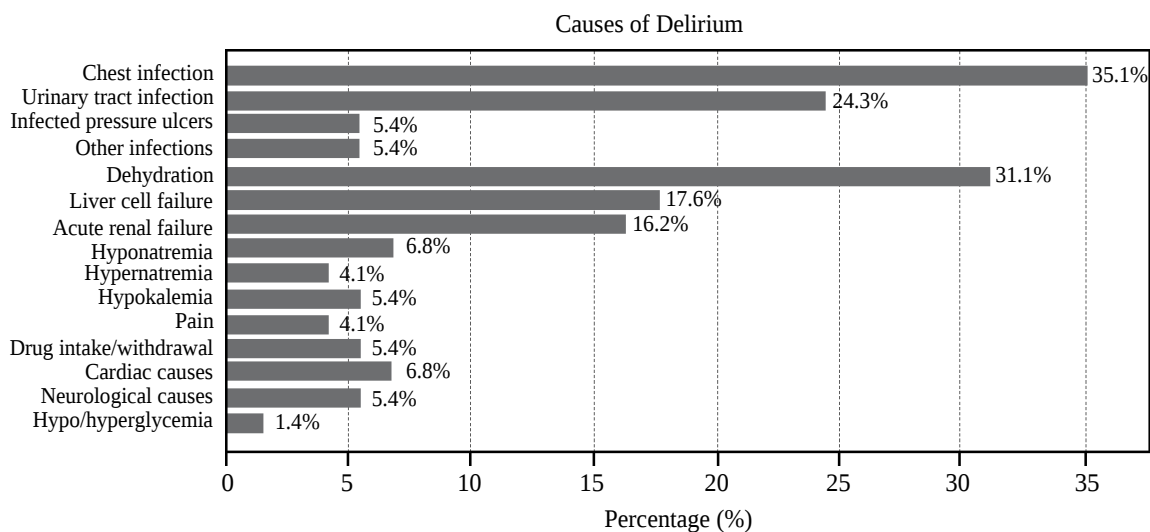


Fig. (2): Causes of delirium.

Table (3): Logistic regression analysis for detecting factors of delirium on admission.

	<i>p</i> -value	OR	95% C.I. for OR	
			Lower	Upper
Barthel Index ≤40	0.000	3.853	2.084	7.123
Cognitive impairment	0.000	3.98	1.99	7.96
IMCU length of stay >5 days	0.018	2.023	1.126	3.636
WBC >11.5 ×10 ³ /uL	0.003	2.486	1.362	4.535
GCS ≤13	0.000	33.269	13.141	84.228
Clinical Frailty Scale >7	0.001	3.3	1.674	6.503

IMCU : Intermediate care unit.

WBC : White blood cells.

Hb : Hemoglobin.

s. Na : Serum sodium.

CGS : Glasgow Coma Scale.

CFS : Clinical Frailty Scale.

OR: Odds ratio.

CI : Confidence interval.

p-value >0.05: Non-significant.*p*-value <0.05: Significant.*p*-value <0.01: Highly significant.

Discussion

Delirium is an elderly syndrome characterized by acute attention alterations, cognition, and awareness. Its precipitating factor may be a medical condition that cannot be well explained by a previous neurocognitive disorder [25]. It is very common in all healthcare settings for elderly patients [26–29].

Delirium is one of the most common neuropsychiatric syndromes in elderly patients >65 years; its prevalence ranges between 11% and 50% during their IMCU stay. Delirium is considered a typical and serious complication in geriatric patients associated with extended hospital stays and health care costs [26].

The prevalence rate of delirium differs in different geriatric settings (medical/surgical, ward/IMCU/ICU), as illustrated by many studies [30–36].

In the current study, the prevalence of delirium among geriatric patients in the IMCU was 37.8%, which agreed with a study that demonstrated that this percentage was 20.1% in the Emergency Department IMCU [37]. The overall prevalence of delirium in community individuals is just 1–2%, but in the setting of general hospital admission, this increased to 14–24% [38].

The pathophysiology of delirium is not fully understood; many pathogenic mechanisms, such as inflammation, drug toxicity, and acute stress response, all significantly lead to the interruption of neurotransmission, eventually resulting in the development of delirium [38].

Delirium in elderly patients is a multifactorial disease of etiology. In most cases, it was hard to recognize a single cause of delirium; a healthy geriatric patient develop delirium only through continuous exposure to many triggering factors. By increasing predisposing factors in patients, fewer triggering factors are needed to lead to the onset of delirium [39], and specialists identified 60 risk factors for delirium in older patients [40]. In the current study, the highest percentage was due to infections, which is confirmed by higher WBC counts in patients with delirium, mostly respiratory infections and urinary tract infections, followed by dehydration, liver cell failure, and others.

Delirium progresses through a multifarious interaction between several risk factors. Among geriatric patients, one of the most important risk factors for delirium is cognitive impairment, with two-

thirds of all patients with delirium in this age group occurring in those with cognitive impairment [38]. Studies have illustrated that delirium and cognitive impairment are both associated with impaired cerebral blood flow or metabolism [41,42], cholinergic deficit [43], and inflammation, and these similar etiologies might describe the close relation between these two conditions [44]. This highlights the necessity to delay cognitive deficit and avoid delirium whenever possible [45].

The current study showed that cognitive impairment was one of the independent risk factors for the occurrence of delirium, as agreed in various studies [4,32-34,36,45-50]. Fong et al., concluded that when cognitive impairment was present at baseline, the risk of delirium increased by 2-fold to 5-fold and outcomes got worse [4]. Biomarkers of systemic inflammation, neuronal damage, and Alzheimer's disease, in addition to genetic causes, were found to be shared between delirium and cognitive impairment and thought to be the reason for the strong link between both of them [51].

The current study showed that functional impairment was one of the independent risk factors for the development of delirium. Many studies have proved the association between functional impairment before hospital admission and the development of delirium [33,35,36,45,52-54].

In this study, the length of stay in IMCU was one of the independent risk factors of delirium, as discussed in previous studies [32,35,37,45,55,56]. Bo et al.'s study analyzed the relationship between the length of Emergency Department (ED) admission and the occurrence of delirium [57]; this result might be due to the features of ED, such as excess noise, overcrowding, late transfer to the ward of admitted patients, or drug administration [58,59]. These factors could make acute stress reactions a commonly thought hypothesis for the pathophysiology of delirium. Therefore, the incidence of delirium might reveal exposure to more serious environmental factors and greater susceptibility in older adults. The hospital setting may be a target for delirium prevention agencies, along with delirium interference plans [60].

Also, this study demonstrated that other risk factors for the development of delirium were lower GCS score, higher clinical frailty scale consistent with the Wu CR study [34], and poorer outcome as illustrated in previous studies [32,55].

Concerning the types of delirium in the studied patients, most of the patients with delirium had hypoactive delirium (70.8%), fewer had the hy-

peractive type (27.8%), and many previous studies [15,33,45] discussed the types of delirium in different settings, such as the Tran et al., study [15], which found that the prevalence of delirium was 49%, 34%, and 17% for hypoactive, hyperactive, and mixed types, respectively.

Conclusion:

Elderly patients admitted to the intermediate-care unit had a high prevalence of delirium; the most prevalent subtype of delirium is hypoactive delirium. Functional impairment, cognitive impairment, longer duration of IMCU stay, high WBC count, low GCS, and high CFS were risk factors for delirium.

Study Point of Strength:

The current study's strength was that it was the first to determine the prevalence of delirium in the intermediate care unit (IMCU) among elderly Egyptian patients admitted to medical wards, as well as the risk factors for this demographic.

Study Limitation:

The study's primary drawback is that it only included medical patients, which makes extrapolating the findings to surgical patients challenging. Additionally, because research was only done at one hospital and one context (the intermediate care unit), the findings might not be generalizable to other clinical settings or communities. Abbreviations: IMCU: Intermediate Care Unit, ASUHS: Ain Shams University Hospitals, CCI: Charlson Comorbidity Index, CAM: Confusion Assessment Method, CAM-S: Confusion Assessment Method-Severity, GCS: Glasgow Coma Scale, SOFA: Sequential Organ Failure Assessment, FPS-R: Faces Pain Scale – Revised, CFS: Clinical Frailty Scale, ICU: Intensive Care Unit.

Declarations:

Ethical Approval: This study adhered to all relevant local guidelines and regulations. The Ain Shams University Ethical Committee approved them (FMASU R247/2024). The FMASU REC is organised and operated according to guidelines of the International Council on Harmonisation (ICH) and the Islamic Organisation for Medical Sciences (IOMS), the United States Office for Human Research Protections and the United States Code of Federal Regulations and operates under Federal Wide Assurance No. FWA 000017585.

Informed consent: Written informed consent was obtained from all participants or their caregivers.

Consent for publish declaration: Not applicable.

The datasets supporting the conclusions of this article are available with the corresponding author on reasonable request.

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Conflict of interest: On behalf of all the authors, the corresponding author states that there is no conflict of interest.

Authors' contributions:

Abeer Matter conceptualized and designed the study, collected the data, and wrote the manuscript. Mona Hegazy supervised the study design and revised the intellectual content of the manuscript. All authors read and approved the final manuscript.

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الهذيان في وحدة الرعاية المتوسطة لكبار السن بمستشفيات جامعة عين شمس

الخلفية: يعد الهذيان لدى المرضى المسنين من أخطر وأشد المضاعفات فتكاً أثناء الإقامة في المستشفى، ويرتبط بتدهور في التنبؤ بالمآل.

الهدف: تقييم معدل انتشار الهذيان بين المرضى المسنين في وحدة الرعاية المتوسطة لكبار السن (IMCU)، وتحديد عوامل الخطورة المحتملة.

المواد والطرق: خلال الفترة من نوفمبر ٢٠٢٤ إلى مارس ٢٠٢٥، شملت دراسة مقطعية ١٩٦ مريضاً مسناً تم إدخالهم إلى وحدة الرعاية المتوسطة لكبار السن. تم تشخيص الهذيان باستخدام معايير طريقة تقييم الارتباك (CAM)، كما تم تقييم شدته باستخدام نموذج طريقة تقييم الارتباك القصير (CAM-S). خضع جميع المشاركين لتقييم شامل شمل الفحوصات المخبرية، مقياس غلاسكو للغيوبة (GCS)، مقياس الضعف السريري (CFS)، مقياس تقييم فشل الأعضاء المتتابع (SOFA)، مقياس الألم بالوجوه – النسخة المعدلة (FPS-R)، مؤشر شارلسون للأمراض المصاحبة (CCI)، وتاريخ الإصابة بضعف إدراكي.

النتائج: كان الهذيان السبب الأكثر شيوعاً لدخول وحدة الرعاية المتوسطة لكبار السن بنسبة انتشار بلغت ٣٧,٨٪. جاءت أنماط الهذيان كما يلي: الخامل بنسبة ٧٠,٨٪، النشاط بنسبة ٢٧,٨٪، والمختلط بنسبة ١,٤٪. كانت العدوى السبب الأكثر شيوعاً للهذيان. شملت عوامل الخطورة: الضعف الوظيفي والإدراكي، مدة البقاء في الوحدة أكثر من ٥ أيام، درجة GCS ≥ ١٣ ، مقياس CFS < ٧ ، وعدد كريات الدم البيضاء $< 11.5 \times 10^3$ /ميكرو لتر.

الاستنتاج: كان انتشار الهذيان مرتفعاً لدى المرضى المسنين؛ ويتطلب تحسين النتائج الكشف المبكر والسيطرة على عوامل الخطورة المستقلة.