ORIGINAL RESEARCH PAPER

Medicine

THE PREVALENCE STUDY OF DELIRIUM IN ELDERLY HOSPITALIZED PATIENTS IN MEDICAL WARDS IN KING ABDULAZIZ UNIVERSITY HOSPITAL, JEDDAH: DETECTION, POSSIBLE CAUSES AND OUTCOMES

KEY WORDS: Prevalence, Delirium, Elderly, Patients, Hospital.

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ABSTRACT

Background: Delirium is a serious mental disorder commonly experienced by hospitalized elderly patients. The prevalence, detection, pathophysiology, prevention, treatment and outcomes of delirium are still leading challenges for medical practitioners and other healthcare providers.

Objectives: The current study was undertaken to measure the prevalence of delirium in patients admitted to medical wards in our institute. The potential risk factors associated with delirium including effects of delirium on mortality and length of stay of the patients in the hospital were also studied.

Methods: We assessed elderly patients admitted to the medical wards at King Abdulaziz University Hospital in Jeddah for the presence or absence of delirium. Testing took place between March 27th, 2012 and March 31st, 2012. The diagnosis of delirium was based on the confusion assessment method (CAM).

Results: A total of 144 patients were admitted to the medical wards at the time of the study, of whom, 52 were eligible for the study. Thirteen cases of delirium were detected, with a prevalence of 36.1%. Factors associated with the development of delirium were hypertension and bronchial asthma (p=0.040 and 0.038, respectively). The regression adjustment model showed that coronary artery diseases (p=0.018) and chronic kidney diseases (p=0.009) were also significant predictors of delirium. Furthermore, the diagnosis of delirium was strongly related to a longer hospital stay (p=0.011), and deaths were more frequent among patients with delirium, but the association between delirium and mortality did not reach statistical significance (p=0.242).

Conclusions: Delirium was highly prevalent in this sample of elderly medical inpatients in Saudi Arabia, with a significant impact on hospital length of stay and a possible increase in mortality. Further studies are needed to elucidate the details of this condition in our hospitals and to guide preventive and educational efforts.

Introduction:

Delirium is defined by the American Psychiatric Association as an acute medical illness or syndrome characterized by disturbance of consciousness, accompanied with diminished ability of a person in cognition, attention, and awareness. The delirium usually develops over a short period of time from few hours to days. The delirium has a tendency to fluctuate throughout the day with concomitant behavioral abnormalities; additionally, delirium can include delusions, hallucinations and disorganized thinking[1]. Delirium is an acute illness commonly occurred in aged patients, and the prevalence of delirium reaches up to 42% in some medical wards[2] and up to 74% in surgical wards[3]. The importance of detecting delirium is linked to the search for the underlying cause, as delirium may result in increased morbidity, mortality, and prolonged hospital stays if not diagnosed or detected [4, 5, 6, 7, 8]. The confusion assessment method (CAM) is a well-validated instrument for detecting delirium with worldwide acceptance. This method allows the rapid and accurate detection of delirium with an excellent sensitivity of 94-100% and a specificity of 89-95 % [9]. Furthermore, the CAM has demonstrated the best supporting evidence for detecting delirium, with the best positive and negative likelihood ratios[10]. The Saudi population is growing and aging, and the life expectancy has risen from 49.75 years in 1974 to 76.51 years in 2010[11]. The percentage of the population more than 60 years old has risen from 2.8% in 1992 to 3.4% in 2004, and it is expected that the percentage of the population more than 60 years old in Saudi Arabia will reach up to 13% of the general population by 2050. The WHO in 2013 estimated that approximately 4.3% of the population in Saudi Arabia to be between 55 and 64 years of age[12]. On the other hand, the United Nations in 2014 had forecast that population of peoples of Saudi Arabia of aged 65 and above will continue to increase, and this older population will constitute 18.4% of the total population of Saudi Arabia in 2050 [13].

This increase represents a challenge for the health system in several different areas. For example, the increased number of elderly individuals in Saudi Arabia may lead to an increased prevalence of delirium in elderly Saudis. In this study, we determined the prevalence of delirium in a Saudi university hospital using CAM and also investigated the possible causes of delirium in Saudi Arabia.

Materials and methods:

Study population and sample size:

This study took place in King Abdulaziz University Hospital (KAUH), a well-known and reputed teaching hospital in Jeddah city, Saudi Arabia. Sample collection began after the approval to conduct the study was granted by the ethics committee at KAUH. The samples were collected from admitted patients of different medical wards namely; the male medical ward (MMW), where all male patients with internal medicine diagnoses were admitted; the female medical ward (FMW), where all female patients with internal medicine diagnoses were admitted; the emergency room unit (ERU), where acute medical patients who needed rapid and close observation were admitted; and the isolation ward (ISO). A total of 141 patients were included in the study after proper screening. The patients over 60 years of age were considered to be eligible for this study. Patients who were unable to communicate (due to coma, aphasia, or language barriers) and who were terminally ill were excluded. The screening, enrolment, and testing took place between March 27th, 2012 and March 31st, 2012. Collected data

included demographic data, medications taken both at home and during the hospital stay and co-morbidities. Confusion was assessed by two trained physicians using the CAM. The diagnosis of delirium was done by CAM which is derived from criteria of the diagnostic and statistical manual of mental disorders, third edition, revised (DSM-III-R). The CAM is a simple test with high sensitivity and specificity, which makes it appropriate for use by general health professionals[9]. The CAM has been previously validated and found to be 94–100 % sensitive and 90–95 % specific for diagnosing delirium[9]. The CAM is comprised of four criteria: altered level of consciousness, inattention, disorganized thinking and acute onset and fluctuating course. According to the CAM, The diagnosis of delirium involves an altered level of consciousness, inattention with either disorganized thinking, the presence of acute onset and fluctuating course.

Recruitment, training, and tools:

Patient testing was performed by 2 physicians, who received training as follows. First, an overview of delirium was given by a geriatric medicine consultant, followed by practical training sessions. The comprehensive details on delirium and practice opportunities for the use of the screening tools of the delirium were included in the training sessions. This training on delirium was performed in accordance with the CAM Training Manual and Coding Guide (Inouye SK. 2003; New Haven, Yale University School of Medicine). Next, select patient screening by the same geriatrician was performed to assess the inter-rater reliability of diagnosing delirium using the CAM. These steps were performed to assure the accuracy of the assessment. The assessment was found to be highly accurate, mainly reflecting the ease of use and reliability of the CAM test itself. The use and aim of all data sheet filling, consent and CAM test details were reviewed as an additional measure of quality control. The interviews consisted of 3 steps: an interview with the admitted patient, an interview with the nurse attending the patient and/or available caregiver, and a review of the patient's chart.

Procedure:

During the study period, all patients aged 60 years and older in our target wards were identified through the hospital information databases. Screening took place during the day. A data collection sheet, a consent form, and a CAM test form were prepared to record the findings.

An oral description of the undertaken study was explained to every eligible participant patient, and consent forms were signed either by the patient or the accompanying family member or caregiver when appropriate. Screeners of the study recorded different parameters. Screeners ensured that all items on the CAM were precisely noted down in the chart and confirmed that different terms "delirium", "acute confusion" or "confusion" shown in the 24-hour period preceding the day of delirium. Then, the screeners were also concluded whether the patient was found positive for delirium. The testing was supervised by one of the geriatricians available in the ward, and the data collection forms were reviewed regularly.

Data collection and analysis:

The completed forms were precisely collected and stored centrally, and the obtained data were reviewed by 2 experienced geriatricians. Delirium prevalence rates were calculated using simple prevalence calculations.

Results:

The sample that consist of 36 in-patients having a mean age of 70.2 years (SD: 7.7) was obtained. A total of 58.3% (N: 21) of the patients were women, and the remaining 41.7% (N: 15) were men. Non-Saudis comprised the majority of the sample (72.2%). The female patients were older than the male patients, with mean ages of 71.5 and 68.5 years, respectively, However, this difference was not statistically significant (p=0.054). The majority of the subjects (63.9%; N: 23) had at least one caregiver available at the time of cognitive assessment. The presence of co-morbidities was also assessed; hypertension was found to be the leading co-morbidity affecting 75% of the sample, followed by diabetes mellitus (66.7%). Only one patient was found to have a pre-established diagnosis of a psychiatric illness. The clinical and socio-demographic characteristics of the enrolled patients are given in **Table 1**.

Using the CAM, 13 cases of delirium were detected, which represented a community prevalence of 36.1%. During the period of the assessment, the subjects were taken from four sectors in the hospital; most of the subjects were recruited from the emergency ward (41.7%; **Table 2**). The median duration of stay in days from the time of admission into the hospital until the cognitive test assessment was 6 days (0-1,700), while the median duration from the time of admission until the day of discharge was 15 days (3-1,739). For simplicity, the length of stay was divided into 4 categories, as shown in **Table 3**. The length of stay was less than 6 days in 23 patients (63.9%), between 6 and 10 days in 4 patients (11.1%) and between 11 and 15 days in 3 patients (8.3%). The remaining 6 patients (16.7%) had a hospital stay of more than 15 days. Patient follow-up involved one month of post-assessment. Four of the patients had succumbed to hospital mortality, and another four were still admitted during this time frame. The remaining 78% (N: 28) of patients were discharged by the time of post-assessment **(Table 4)**. The relationship between delirium and different risk factors was found to be statistically significant for hypertension and bronchial asthma (p-values 0.040 and 0.038, respectively; **Table 6**). We also found that the odds of having hypertension were greater for a patient with delirium compared to a patient without delirium **(Table 7)**; the same results were observed for asthmatic subjects **(Table 8).** In contrast, the relationship between age, total number of co-morbidities, total number of medications, numbers of medications affecting the CNS, or an established psychiatric diagnosis with the diagnosis of delirium was not there. The regression adjustment model showed statistically significant results for coronary artery diseases (p=0.018) and chronic kidney diseases (p=0.009) as predictors for delirium **(Table 5)**. Moreover, the presence of delirium was strongly related to a prolonged hospital stay (p=0.011) **(Table 9)**.

There was also a relationship between delirium and mortality, as 2 patients with delirium (15.4%) and 2 patients without delirium (8.7%) died during the study time frame. However, the association between delirium and mortality did not reach statistical significance (p=0.242). All 4 reported deaths were among Non-Saudi men, and all of them were reported within the first 20 days of admission. After exclusion of mortality cases, the association between the length of stay and delirium was more significant (p=0.007).

Discussion:

Delirium is an acute life-threatening medical illness, but preventable clinical syndrome among older elderly persons of 65 years of age or older. It is characterized by disturbance of consciousness, accompanied with diminished ability of a person in cognition, attention, and awareness. The delirium usually develops over a short period of time from few hours to days[14,15,16,17]. Delirium is very common in hospitalized elderly patients, with a worldwide prevalence reported to range from 15-42 %, and this syndrome carries a large burden of morbidity and mortality [2,3,7,8]. Delirium, along with other geriatric syndromes, is particularly important for developing countries such as Saudi Arabia due to the increasing life expectancy and the growing geriatric population [11,12].

To the best of our knowledge, epidemiological data on delirium have not previously been reported in Saudi Arabia, and our study is the first study to address the prevalence of this very important condition. We sought to highlight the importance of this condition in our population, including its widespread prevalence, effects, and under-reporting. The results of this study showed a prevalence of 36.1% in our sample, whereas worldwide data have previously shown a prevalence that ranges between 10-31% among medical in-patients.[18] Thus, in our sample, the prevalence of delirium was higher, and this alarming result deserves further study given the profound impact of this common problem on elderly individuals. We found that the mean age in patients with this condition was seventy years (70.2). The role of gender and its effects on the

development of delirium remain unclear; however, in our sample, females showed a higher prevalence of delirium than males. This result might suggest a specific gender bias for the development of delirium, but it is very difficult to draw hard conclusions given the small sample size of our study. We found that non-Saudi patients were also at a higher risk of developing delirium, which could be related to the low socioeconomic status in this group, delay in management due to eligibility issues, language barriers hindering effective communication, or delayed presentation to the hospital. Our data are in agreement with previous findings that demonstrated the ability of the CAM as a validated measure to easily and accurately diagnose delirium. The relationship between the severity of illness and delirium has been reported previously[19], and this finding was consistent with our results. We found that patients in the emergency ward showed a higher prevalence of delirium (41.7%) compared to other medical wards, which is likely related to the fact that these patients present with more acute active diseases and may harbor impending critical conditions such as sepsis, stroke and respiratory failure. Indeed, this association was previously observed in studies that addressed these special groups e.g., patients in the postoperative care[20], critical care and chronic medical care areas[21].

In our study, patients with an underlying diagnosis of either hypertension or bronchial asthma were more likely to develop delirium. While the association between the presence of hypertension and the development of delirium has been previously documented [22, 23, 24], to the best of our knowledge, no previous study has shown an association with an underlying diagnosis of bronchial asthma. However, this relationship might be explained by the increased use of steroids in the hospital in this group, which by itself is a well-known potential risk factor associated with the cause and progress of delirium[25]. Consistent with previous literature[26], our regression analysis showed a statistically significant association with the presence of chronic kidney disease. Furthermore, we also found an association with coronary artery disease, which along with other cardiac diagnoses has been reported to be a risk factor for delirium [27,28]. However, we were not able to establish a relationship with other predisposing clinical factors, such as diabetes, the number of co-morbidities, or the number of medications, which might be explained by our sample size being underpowered to draw such conclusions. Our results showed a statistically significant association between the presence of delirium and a prolonged hospital stay. Indeed, other recent studies have reported the association between the development of delirium in patients with pre-existing dementia and a prolonged hospital stay [29], as well in the general medical population [30]. Our study also observed a higher mortality rate in patients with delirium. Although this association did not reach statistical significance (likely due to our small sample size), it is indeed alarming because it has been previously documented in the literature in different clinical situations [31,32,33], Thus, our findings are extremely important because they draw attention to this deadly yet under-recognized condition and highlight its high prevalence in our local hospitals. Identifying delirium is crucial, and a large body of evidence has shown that it is very possible to prevent many cases of delirium through non-pharmacological methods [34, 35, 36, 37]. The main strengths of our study are the use of a well-validated tool to test for delirium and the collection of a large number of variables, allowing extensive testing of risk factors and outcomes. We believe that because this is the first study of its kind in our area, the findings will help boost much-needed research in this field. On the other hand, the major drawback of the current study is the small sample size of the patients. However, the fact that our results are in agreement with existing evidence is very reassuring. Nevertheless, it is important to note that one inherent problem in any study addressing delirium is the fluctuating nature of this condition, which may lead to an under-estimation of the prevalence of delirium at the time of testing. We tried to eliminate this variable as much as possible by incorporating collateral patient history from the nursing staff and caregivers. Furthermore, the consistency of our results with previous data is again reassuring.

Conclusion:

We observed a significant prevalence of delirium among internal medicine in-patients at our tertiary care institute in Saudi Arabia, with a similar but slightly higher value than the worldwide reported prevalence of delirium. Our results showed that delirium had a significant impact on prolonging the patients' length of stay in the hospital and was associated with an increase in mortality that was not statistically significant.

Future research should include other medical institutes in the area, as well as patients in other medical services such as surgical departments and intensive care units. Province- and nation-wide collaborations should also be encouraged, as collaborations would enable larger studies to perform more accurate detection of specific risk factors that may be targeted individually, thereby enabling the prevention of delirium. At this point in time, the results of our study highlight the need for serious educational as well as preventive efforts towards this devastating but potentially preventable condition.

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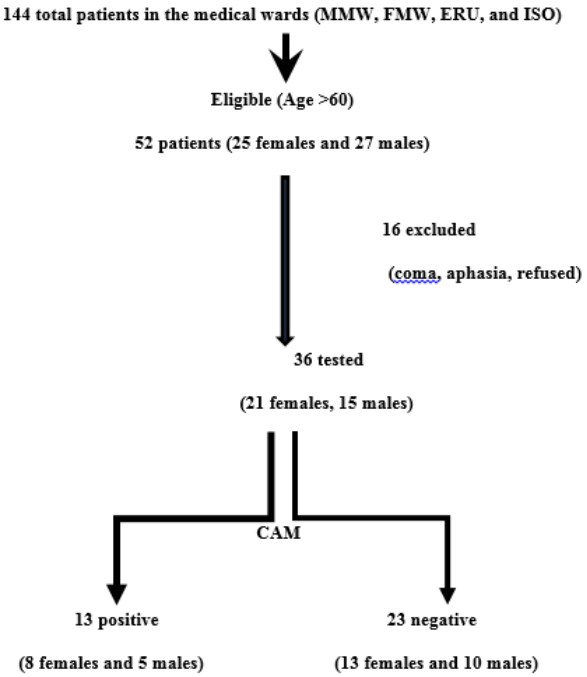
Figure 1: Overview of the recruitment of patients



List of Tables:

Table 1: Patient characteristics and demographic data

Variables		Number of patients out of a total of 36
Gender	Male	15 (41.7%)
	Female	21 (58.3%)
Nationality	Saudi	10 (27.8%)
	Non-Saudi	26 (72.2%)
Caregiver Availability		23 (63.9%)
Diabetes Mellitus		24 (66.7%)
Hypertension		27 (75%)
Stroke		9 (25%)
Coronary Artery Disease		15 (41.7%)
Chronic Liver Disease		3 (8.3%)
Bronchial Asthma		5 (13.9%)
Chronic Kidney Disease		7 (19.4%)
Chronic Obstructive Pulmonary Disease		2 (5.6%)
Delirium		13 (36.1%)
Smoking		7 (19.4%)

Table 2: Number of patients from different hospital wards

Ward	Frequency	Percent
Male Medical Ward	11	30.6
Female Medical Ward	8	22.2
Emergency Ward	15	41.7
Isolation	2	5.6
Total	36	100.0

Table 3: Length of stay categories

Length of Stay Groups	Frequency	Percent
1-5 days	23	63.9
6-10 days	4	11.1
11-15 days	3	8.3
16 days	6	16.7
Total	36	100.0

Table 4: One-month follow-up outcomes

Status	Frequency	Percent
Inpatient	4	11.1
Discharged	28	77.8
Deceased	4	11.1
Total	36	100.0

Table 5: Risk factors and delirium (regression analysis)

Factor	Significance
Diabetes Mellitus	0.293
Hypertension	0.478
Stroke	0.686
Coronary Artery Disease	0.018
Chronic Liver Disease	0.213
Bronchial Asthma	0.608
Chronic Obstructive Pulmonary Disease	0.995
Chronic Kidney Disease	0.009
Smoking	0.706
Hospital Ward Category	0.663
Gender	0.172
Age	0.097
Nationality	0.085
Caregiver Availability	0.905
Length of Stay (days)	0.011
Number of Co-morbidities	0.186
Number of Total Medications	0.176
Number of Drugs Affecting CNS	0.631
Established Psychiatric Diagnosis	0.501

Table 5: Risk factors and delirium (regression analysis) including b-coefficients

Model	Unstandardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.700	2.973		-0.235	0.817
Diabetes Mellitus	0.275	0.253	0.270	1.087	0.293
Hypertension	-0.185	0.255	-0.167	-0.726	0.478
Stroke	0.086	0.210	0.093	0.412	0.686
Coronary Artery Disease	0.603	0.229	0.619	2.633	0.018
Chronic Liver Disease	0.580	0.446	0.333	1.298	0.213
Bronchial Asthma	-0.145	0.278	-0.105	-0.523	0.608
Chronic Obstructive Pulmonary Disease	0.003	0.399	0.001	0.007	0.995
Chronic Kidney Disease	0.901	0.303	0.743	2.979	0.009
Smoking	0.110	0.285	0.090	0.384	0.706
Hospital Ward Category	-0.064	0.144	-0.126	-0.444	0.663
Gender	-0.508	0.355	-0.521	-1.429	0.172
Age	-0.024	0.014	-0.387	-1.762	0.097
Nationality	-0.475	0.258	-0.443	-1.838	0.085
Caregiver Availability	-0.029	0.240	-0.029	-0.121	0.905
Length of Stay (days)	1.304E-5	0.000	0.008	0.033	0.974
Number of Co-morbidities	0.130	0.094	0.451	1.383	0.186
Number of Total Medications Taken	0.061	0.043	0.404	1.417	0.176
Number of Drugs Affecting CNS	-0.141	0.288	-0.145	-0.489	0.631
Established Psychiatric Diagnosis	0.469	0.681	0.160	0.689	0.501

Table 6: Risk factors and delirium (Chi-square testing)

Factor	Pearson Chi-square
Diabetes Mellitus	0.060
Hypertension	0.040
Stroke	1.825
Coronary Artery Disease	6.361
Chronic Liver Disease	1.324
Bronchial Asthma	0.038
Chronic Obstructive Pulmonary Disease	0.177
Chronic Kidney Disease	1.666
Smoking	0.214
Hospital Ward Category	2.234
Gender	0.086
Nationality	1.558
Established Psychiatric Diagnosis	0.581

Table 7: Risk estimates (hypertension and delirium)

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for HTN (yes / no)	1.176	0.240	5.774
For cohort delirium = positive	1.111	0.390	3.165
For cohort delirium = negative	0.944	0.548	1.629
No. of Valid Cases	36		

Table 8: Risk estimates (bronchial asthma and delirium)

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for BA (yes / no)	1.212	0.175	8.389
For cohort delirium = positive	1.127	0.349	3.646
For cohort delirium = negative	0.930	0.434	1.992
No. of Valid Cases	36		

Table 9: Risk factors and delirium (t-testing)

Factor	Significance
Age	0.498
Length of Stay (days)	0.011
Number of Co-morbidities	0.379
Number of Total Medications	0.191
Number of Drugs Affecting CNS	0.624

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