

## RISK FACTORS IN DELIRIOUS GERIATRIC GENERAL MEDICAL INPATIENTS

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### ABSTRACT

*The present study was carried out on the hospitalized geriatric general medical patients with the aim to identify the possible risk factors associated with delirium in the elderly. The assessment of the patients was carried out using Mini Mental Status Examination (MMSE), Delirium Symptom Interview (DSI), Delirium Rating Scale (DRS) and ICD-10 Diagnostic Criteria for Research for delirium. Details of medical records were collected. An overall rate of delirium of 27% was found in the 100 patients who constituted the sample. Pre-existing cognitive deficits, neurological illnesses, urinary tract infections, visual impairment, hearing impairment, current proteinuria, leukocytosis, raised blood ammonia, hyponatremia and potassium level disturbances were the risk factors identified.*

*Key Words: Delirium, elderly, geriatric, risk factors*

Delirium is by definition, an organic mental syndrome. This implies that demonstrable brain dysfunction is a necessary condition for its occurrence. Such dysfunction, in turn, may be caused by one or more of wide range of potential organic etiological factors originating in the brain itself, or elsewhere in the body, or introduced into the body in the form of toxic substances. Delirium is postulated to constitute the final common path for large variety of possible etiological factors that cause a widespread disorder of cerebral metabolism, one affecting a whole spectrum of psychological functions, especially the cognitive attentional ones. Several studies have sought to identify risk factors associated with delirium. At any age, polypharmacy, substance intoxication, and multiple medical problems are common risk factors for delirium (Trzepacz et al., 1985; Hales et al., 1988; Gustafson et al., 1988; Levkoff, 1988; Foreman, 1989; Rockwood, 1989; Inouye et al., 1990; Francis & Kapoor 1992; Schor et al., 1992; Pompeii et al., 1994). Delirium is a

multifactorial syndrome, involving the interrelationship between patients vulnerability, or predisposing factors at admission, and noxious insults or precipitating factors during hospitalisation.

Delirium occurs in 14% to 56% of elderly hospitalised medical patients (Francis et al., 1990; Inouye, 1994; Khurana, 1999). It has a high rate of associated morbidity and mortality and nursing home placement and with longer, costlier hospitalisation (Francis & Kapoor, 1992; Jitapunkul et al., 1992; Rabins & Folstein, 1982). No epidemiological study focusing on delirium in the elderly has been reported from India so far, either from population based or hospital based samples. The aim of this study was to identify risk factors that may be associated with delirium, in hospitalised geriatric general medical patients.

### MATERIAL AND METHOD

The present study was carried out on the hospitalised geriatric general medical patients of

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Kasturba Hospital, Manipal. 100 consecutive patients, aged 65 years and above, who were admitted in Department of Internal Medicine were included in the study. All such admitted patients were examined by the same investigator in their wards within 24 hours of admission. After introducing him self to the patients and their relatives, the investigator explained the nature and need for the present study. Co-operation was sought for participation in the study from the patients or their relatives. They were assured that their declining to participate would not prejudice treatment.

Patients who were not communicative because of their physical status, viz. being on ventilator, being intubated, were not included in the study. However, if such a patient became communicative on subsequent assessment, he or she was included in the study.

The Mini Mental Status Examination (Folstein, et al.,1975) and Delirium Symptom Interview (Albert et al.,1994) were used as screening methods to assess the patients cognitive functions. On the basis of all available sources of historical and objective information, subjects were rated on the Delirium Rating scale (Trzepacz et al.,1988). Delirium Rating Scale (DRS) is a 10-item clinician rating scale for delirium, which is best used to assess the severity of the delirium.

The clinical diagnosis of delirium was reached using the ICD-10 Classification of Mental and Behavioural Disorder-Diagnostic Criteria for Research (ICD-10,DCR, World Health Organization,1993) on the basis of information gathered both through history and examination. All the patients recruited in the study were followed up in the hospital till they were discharged or died. Medical records of all such patients were reviewed to collect details of present and past physical illness, physical examination, laboratory investigations, diagnosis, medication details and outcome of physical illness.

### RESULTS

Of the 100 patients there were 27 who were

delirious at some point during their hospital stay. 19 were delirious at the time of first assessment (within 24 hours of admission) and a further 8 patients developed delirium during their hospital stay (after the first assessment). The term "delirium" is used for patients who fulfilled ICD-10-DCR criteria of delirium hereafter.

TABLE 1  
COMPARISON OF SOCIO-DEMOGRAPHIC CHARACTERISTICS OF DELIRIOUS AND NON DELIRIOUS PATIENTS (N=100)

Variable	Non-delirious		Delirious	
	n	%	n	%
Mean age	71.05 (SD 6.30)		71.37 (SD 4.78)	
	$t=0.27; p=0.81$			
Age groups				
65-74 year	56	76.7	20	74.1
>74 years	17	23.3	7	25.9
	$X^2=0.00, p=0.99$			
Sex				
Male	47	64.4	17	63.0
Female	26	35.6	10	37.0
	$X^2=1.00, p=1.00$			
Income				
0-3,000	31	42.5	9	33.3
3,000-10,000	33	45.2	16	59.3
>10,000	9	12.3	2	7.4
	$X^2=1.66, p=0.43$			
Residence				
Rural	22	30.1	6	22.2
Urban	21	28.8	8	29.6
Suburban	30	41.1	3	11.1
	$X^2=0.69, p=0.70$			
Family				
Nuclear	15	20.6	4	14.8
Extended	57	78.1	23	85.2
Alone	1	1.3	-	-
	$X^2=1.11, p=0.57$			
Education				
< 8 class	40	54.8	15	55.6
>8 class	33	45.2	12	44.4
	$X^2=0.00, p=1.00$			

The socio demographic characteristics of the delirious patients are shown in table 1. The mean age of delirious patients was 71.05 years (SD 6.30), whereas the mean age of non-delirious patients was 71.37 years (SD 4.78). There was no statistical difference ( $p=0.99$ ) in the number of delirious patients in the 65-74 and more than 75 age group. The delirious and non-delirious groups did not differ significantly in terms of gender,

income, residence, family type or educational status.

TABLE 2  
COMPARISON OF CLINICAL AND LABORATORY DATA  
BETWEEN DELIRIUS AND NON DELIRIOUS PATIENTS  
(N=100)

Variable	Non-delirious n (%)	Delirious n (%)
<b>Neurological illness</b>		
Absent	66(90.4)	13(48.1)
Present	7(9.6)	14(51.9)
	X <sup>2</sup> =18.75, p=0.0001	
<b>Urinary tract infection</b>		
Absent	71(97.3)	23(85.2)
Present	2(2.27)	4(14.8)
	Fisher's , p=0.04	
<b>Visual Impairment</b>		
Absent	45(61.6)	9(33.3)
Present	28(38.4)	18(66.7)
	X <sup>2</sup> =6.35, p=0.01	
<b>Hearing Impairment</b>		
Absent	55(75.3)	13(48.1)
Present	18(24.7)	14(51.9)
	X <sup>2</sup> =6.69, p=0.01	
<b>Cognitive deficits</b>		
Absent	51(69.4)	8(29.6)
Present	22(30.1)	19(70.4)
	X <sup>2</sup> =13.18, p=0.0006	
<b>Proteinuria</b>		
Absent	56(76.8)	7(25.9)
Present	17(23.3)	20(74.1)
	X <sup>2</sup> =21.80, p=0.0001	
<b>Leukocytosis</b>		
Absent	18(24.7)	22(81.5)
Present	55(75.3)	5(18.50)
	X <sup>2</sup> =26.51, p<0.0001	
<b>Raised blood ammonia</b>		
Absent	73(100)	24(88.9)
Present	-	3(11.1)
	Fisher's , p=0.01	
<b>Hyponatremia</b>		
Absent	60(82.2)	14(51.9)
Present	13(17.8)	13(48.1)
	X <sup>2</sup> =9.42, p=0.04	
<b>Hyperkalemia/Hypokalemia</b>		
Absent	72(98.6)	23(85.2)
Present	1(1.4)	4(14.8)
	Fisher's, p=0.01	

All the patients recruited for the study had at least one specified physical illness. However some patients had more than one physical illness. Hypertension was the most common illness with 43% of the patients suffering from this. Anaemia was the second most common diagnosis (33

patients). Diabetes mellitus was the third most common diagnosis present in the study sample (30 patients). Neurological illnesses were present in 21 patients. Of these 11 had stroke, five had encephalopathy, four had epilepsy. 30 of 33 patients with metabolic and endocrinal disorders had diabetes mellitus. 13 of 22 patients with gastrointestinal disorders had gastritis. 27 of 39 patients with respiratory illness had chronic obstructive pulmonary disease. Genitourinary diseases were present in 11 patients. Of these, six had urinary tract infection. Musculoskeletal disorders were present in eight patients. Cancer was diagnosed in nine patients. 24 patients had one or the other infectious illness. Of these 24 patients respiratory infections were present in 15 patients. Haematological illnesses were present in 36 patients and a majority of these patients had anaemia. Cardiac diseases were present in 29 patients. 46 patients had visual impairment while 32 patients had hearing impairment. Of the 100 patients studied 73 patients had one or the other medical illness of more than two years duration. Some of the patients had more than one chronic illness. Out of 27 delirious patients 19 (70.4%) had chronic medical illness/es and out of 73 non-delirious patients 54(73.9%) had chronic medical illness/es. Statistically, delirious and non-delirious patients did not differ significantly(p=0.71) in the presence or absence of chronic medical illnesses.

Delirious and non-delirious groups were compared for the co-occurrence of different disorders (Table 2). Neurological illnesses, urinary tract infection, visual impairment, hearing impairment were significantly more common in delirious group as against non delirious group. Metabolic and endocrinal disorders ( p=0.84), neoplasm (p=0.09), anaemia (p=0.49), hypertension (p=0.46) and cardiac illnesses (p=0.93) did not differ significantly in these two groups.

According to the history given by the patient as well as the relatives, of the 27 delirious patients 19 (70.4%) had some preexisting cognitive deficits. While out of 73 non-delirious patients 22

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(30.1%) had some preexisting cognitive deficits. This was found to be significantly different ( $p=0.0006$ ), indicating a higher frequency of preexisting cognitive deficits in the delirious patients. Laboratory findings such as proteinuria, leukocytosis, raised blood ammonia levels, hyponatremia and potassium level disturbances were significantly more frequently seen in the delirious group.

Of the 100 patients 83 were exposed to drugs known to cause delirium. Statistical test showed that delirious and non-delirious patients did not differ significantly ( $p=0.34$ ) on this variable.

The mean DRS score was 18.67 (SD 4.48) at the time when they were first diagnosed as delirious. Median score was 20. There were 12 delirious patients who scored less and 15 delirious patients score more than 20 on DRS. Two groups were then made and defined as less severely delirious and more severely delirious. These two groups were compared against sociodemographic, clinical and laboratory variables. Statistically these two groups did not differ significantly except for the visual impairment. A higher frequency of visual impairment ( $p=0.03$ ) in the more severely delirious group was recorded.

### DISCUSSION

The present study was conducted to identify the possible risk factors associated with delirium in the elderly. 27% of the patients in this study were delirious at some point during their hospital stay as per ICD-10-DCR. This is in keeping with the range 15% to 25% in prevalence reports of different studies (Inouye et al., 1990; Erkinjuntii, 1986; Rockwood, 1989; Jitapunkul et al., 1992).

Although it is generally felt that the frequency of delirium increases with increasing age (Lipowski, 1983 and 1990; Hodkinson, 1976; Beresin, 1988; Liston, 1982), in this study sample there was no significant difference in the mean ages of the delirious and non-delirious patients. Even when the population was divided into 65-74 years and more than 74 years groups (as

frequency of delirium markedly increases after 75 years (as reported by Williams et al., 1985; Gustafson et al., 1988; Rockwood, 1989 & Schor et al., 1992), no significant difference was seen in the rates of delirium between the two age groups in this study. This may be because the present study sample had a mean age of only 71 years, with 76% of the patients being below 75 years of age and only 24% of patients being 75 years or above. Western studies such as (Inouye et al., 1990 and 1993; Levkoff et al., 1992; Jitapunkul et al., 1992) have population with a higher mean age and a higher proportion of over 75 years as compared to under 75 years age patients. Such a distribution of age may document higher rates of delirium in the above 75 years group than in the present study.

None of the other sociodemographic characteristics was found significantly different between the delirious and non-delirious group. It is interesting to note here that the education status of these two groups also did not differ significantly and half of the sample had an educational status of below eighth standard. This could mean that the MMSE scores would have been equally influenced by low educational status in both groups.

Several clinical, diagnostic and investigational factors have been studied as risk factors for delirium. Elucidating such risk factors applicable prior to hospitalization or during hospital stay may help in early pick-up of delirium and would be helpful in its effective management. Preexisting cognitive deficits have been suggested as risk factors for delirium in the elderly (Inouye et al., 1993; Williams et al., 1985; Gustafson et al., 1988; Francis et al., 1990; Schor et al., 1992). One third of elderly delirious may be suffering from a preexisting dementia (Morse and Litin, 1969). In this study information regarding preexisting cognitive deficits could only be collected retrospectively from the patients or their relatives. This limits the validity of the findings. It was found that significantly larger proportion of the delirious group (19/27) reported preexisting cognitive deficits than the non-delirious group (22/73). The exact

syndromal diagnosis of these deficits was however not attempted in the study.

With increasing age the frequency of a variety of physical disorders increases. As noted by Lipowski (1990) systemic diseases are more often implicated to cause delirium. Chronic medical illnesses are considered predisposing factors for delirium (Lipowski, 1990). In this study chronic medical illnesses (defined as illnesses of more than two years duration) did not differ in their frequency in the delirious and non-delirious. However Neurological illnesses, urinary tract infection, visual impairment and hearing impairment were significantly more common in the delirious as compared to nondelirious group. This is broadly in keeping with the findings of Inouye et al., (1993), and Lipowski (1990). The exact frequencies of these disorders will differ from study to study depending upon the location of the study, age group involved and inclusion criteria.

In this study proteinuria, leukocytosis, raised blood ammonia levels, hyponatremia and postassium level disturbances were significantly more frequently seen in the delirious group. These findings are in keeping with the independent predictive factors for delirium given by Levkoff et al., (1988) as also with the risk factors stated by the Lipowski (1990).

Exposure to a large number of drugs is common in the elderly and is commonly implicated in the causation of delirium. In this study however no statistical difference was seen between the groups on this account. A limitation here is that given the pharmacokinetics and pharmacodynamics of the elderly, not only the exposure of these drugs, but also the dosage, duration of use, drug interactions etc. would be of importance and all such drug factors have not been considered in this study. Since there was no difference in the frequency of chronic medical illnesses both the groups would have been exposed to similar drugs for these conditions.

On re-assessing the risk factors with the dichotomy of severity on DRS the only statistically significant findings were that the visually impaired were more likely to be severely delirious and that the hyperactive type of delirium was more

likely to be seen in severe delirium. The literature on this area is anecdotal.

The findings in this study should be interpreted with caution because of the small sample (27 delirious with 12 scoring less on severity and 15 scoring more). Further several other risk factors than addressed here may need to be studied against this variable. More investigation is needed to examine "partial" syndromes of delirium and their relationship to full delirium, as this area may hold the key to aetiology, pathogenesis and risk predictors for delirium. An attempt at documenting more risk factors and arriving at a system of weights for the risk factors to predict delirium in the elderly would be clinically useful.

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