

# Magnitude and Associated Factors of Delirium among Hospitalized Patients, Ethiopia: A Cross Sectional Study

Tesfa Mekonen<sup>1\*</sup>, Getnet Mihretie<sup>2</sup>, Dereje Assefa<sup>3</sup>, Wubalem Fekadu<sup>1</sup> and Yohannes Mehretie<sup>1</sup>

<sup>1</sup>College of Health Sciences and Medicine, Wolaita Sodo University, Ethiopia

<sup>2</sup>Psychiatry Department, College of Health Sciences and Medicine, University of Gondar, Ethiopia

<sup>3</sup>Amanuel Mental Specialized Hospital, Addis Ababa, Ethiopia

## Abstract

**Background:** Delirium is an acute onset of fluctuating cognitive impairment and disturbance of consciousness. Its prevalence ranged from 10% to 85% across different hospital settings. Even though delirium is with significantly high prevalence and has negative sequel on the hospitalized patients, its recognition and management is poorly practiced. So this study was aimed to assess magnitude and associated factors of delirium among St. Paul's Hospital Millennium Medical College inpatients.

**Methods:** Institution based cross sectional survey was conducted among 423 St. Paul's Hospital Millennium Medical College inpatients selected by systematic random sampling from April 25 to May 25, 2014. A pretested and interviewer administered questionnaire was used for data collection. Descriptive statistics was used to describe the study population in relation to relevant variables. Bivariate and multivariate logistic regression was also carried out to see the effect of each independent variable on the dependent variable.

**Result:** The prevalence of delirium was found to be 16.6%. Being age of  $\geq 60$  years (AOR=7.8, 95% CI: 3.1, 19.5), having visual impairment (AOR=3.4, 95%CI: 1.3, 8.9), poly therapy (AOR=2.4, 95% CI: 1.2, 4.6) and benzodiazepine exposure (AOR=11.3, 95% CI: 4.9, 25.8) were positively associated with delirium.

**Conclusion:** Delirium was high among St. Paul's Hospital Millennium Medical College inpatients. Older age, poly therapy, benzodiazepine exposure, visual impairment and current use of alcohol were factors associated with delirium. Strict controlling and monitoring modifiable factors are necessary to minimize its consequence.

**Keywords:** Delirium; Hospitalized patients; Associated factors; Ethiopia

## Background

Delirium is an acute organic mental syndrome characterized by disturbance of consciousness, global cognitive impairment, disorientation and attention deficits, perceptual disturbance, decreased or increased psychomotor activity and fluctuation in presentation [1,2].

As different review articles and one international study done in 11 countries of South America, North America and Spain by using RASS and CAM - ICU indicates, the prevalence of delirium among medically ill patients was ranges from 10% in the general medicine ward, up to 80% in ICU (intensive care unit) to 85% in advanced cancer [3-6]. As a study conducted in Portugal on 562 participants, delirium prevalence was 16% [7]. Delirium prevalence was also indicated in different countries with different study population. For instance, in Australian hospitals on 499 elderly about 17%, Canada on 548 elderly 11%, and Mexico 38.3% [8-10]. In ICU patients the prevalence was even higher; as studies in USA indicated that delirium was about 77% in ventilated burn patients and 70% in surgical & trauma ICU [11,12]. Delirium was also 37% in ICU patients as a study conducted in Netherlands on 412 participants [13]. The studies in Iran indicated that delirium was about 23.5 in cardiac surgery ICU and 4.9% in participants with open heart surgery [14,15].

Delirium was associated with multiple factors like prior cognitive impairment, benzodiazepine exposure, being male, high blood pressure, infections like UTI, and pain. Delirium was also independent risk for long term problems with cognitive functioning [2,5,11,13,16].

Delirium can have serious consequences, and is associated with longer admissions, independent predictor of ICU and hospital mortality, a greater likelihood of admission to institutional care, and increased

hospital costs [8,17]. Delirious patients have increased mortality as high as 8% compared with 1% in non delirious patients, impairment in long-term cognitive function, increases in hospital length of stay and increased complications of hospital care [18,19]. Delirium also can end up the patient with poor activity of daily life after discharge from hospital [7].

Despite its high prevalence, delirium is not well recognized in hospitals and left untreated; which in turn produces negative consequences on the patients' prognosis [1]. The topic under study is not well investigated in Ethiopia and the result of this study will help the clinicians to have a good insight about delirium prevalence and associated factors. So this study was aimed to assess prevalence and associated factors of delirium among St. Paul's Hospital Millennium Medical College inpatients; which will help the clinicians to be aware of delirium magnitude and its impact on the hospitalized patients.

## Methods

An institution-based, cross-sectional study was conducted from

**\*Corresponding author:** Tesfa Mekonen Yimer, College of Health Sciences and Medicine, Wolaita Sodo University, Ethiopia, Tel: 251 913 99 04; E-mail: [smarthope1@gmail.com](mailto:smarthope1@gmail.com)

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April 25 to May 25, 2014 at St. Paul's Hospital Millennium Medical College, Addis Ababa.

The study populations were adult inpatients in the hospital during the study period. All adult ( $\geq 18$  years) patients who were admitted to inpatient department were included in the study while patients who were unconscious during the data collection time were excluded. Sample was calculated by using single population proportion formula. By taking proportion of delirium 50%, with 5% margin of error, 95% CI and 10% non-response rate the total sample size was calculated to be 423. The outcome variable of the study was delirium while the independent variables were with the category of socio-demographic variables, medical-surgical/psychiatric factors, and medication and drug exposures.

The study participants were recruited from the admission registration book of the hospital by using systematic random sampling. The number of patient sampled from each unit was proportional to the total number of patients thereof.

In this study; patients were considered to have delirium when both feature 1 and 2 and either of feature 3 or 4 presents in CAM- ICU/CAM. Current use of substance was also defined when the study participants are using substances (tobacco products, alcohol and khat) in the last three months [20].

The presence or absence of delirium was identified by using Confusion Assessment Method (CAM) for participants who were not critically ill and not mechanically ventilated; and Confusion Assessment Method for Intensive Care Unit (CAM- ICU) for participants who were mechanically ventilated and unable to communicate verbally [21,22]. All the data were gathered from the participants, participants' family and/or health care providers, and patient chart. Both CAM and CAM -ICU have four features to diagnose delirium; acute onset and fluctuating course (feature 1), inattention (feature 2), disorganized thinking (feature 3), and altered level of consciousness (feature 4). The presence of delirium was detected when both feature 1 and 2 and either of feature 3 or 4 presents [23]. Both of the instruments need the exclusion of unconscious patients which was done by Richmond Agitation Sedation Scale (RASS), a 10 point scale which scores from +4 to -5 [24]. Patients were evaluated for delirium by CAM and CAM - ICU if they were responsive to verbal commands (a RASS score of other than -4 and -5).

A pre test was done by 10% of the sample size in order to assess the quality of the data collection tool. Based on the pretest some arrangements were done on the chronological order of the questionnaire. The reliability test for CAM & CAM- ICU was also done (Cronbach's Alpha, 0.93 for CAM and 0.82 for CAM- ICU).

The filled questionnaires were checked for completeness and entered into EPI INFO version 3.5.1 statistical software and then exported to SPSS version 20 for further analysis. Descriptive statistics was used to describe the study population in relation to relevant variables. Both bivariate and multivariate logistic regression models were used to identify associated factors. Odds Ratios and their 95% Confidence Intervals were computed and variables with p - value less than 0.05 were considered as significantly associated with the outcome variable.

Ethical clearance was obtained from the Institution review board of University of Gondar and Amanuel Mental Specialized Hospital. Communication with the hospital administrators were made through formal letter obtained from University of Gondar. After the purpose of the study has been informed, Verbal consent was obtained from

each study participants or family. Confidentiality was maintained by making the data collection procedure anonymous. Participation was on voluntary basis and they had a right to refuse the procedure whenever they want. For participants who were found delirious during the study, communication to their respective health care providers were done in order to have good control of their condition.

## Results

### Socio-demographic characteristics of the study participants

Out of the expected 423 respondents, 410 agreed to participate in the study, yielding a response rate of 97%.

The mean age of the participants was 41.66 years (SD  $\pm$  17.54). Nearly half (52.7%) were female. Around two third (63.7%) of the participants were Married. Majority (67.8%) of respondents identified orthodox as their religion. Regarding permanent residence, 274 (66.8%) of them were from urban areas. Around one third (33.7 %) of them attended primary school (Table 1).

### Clinical and medication characteristics

Nearly half (51.2%) of the participants were in surgical ward and the main reason for admission was non traumatic surgical conditions like acute abdomen and genito-urinary system surgical problems 194(47.3%). About 156(38%) of the participants took three or more medications and 107(26.1%) took anti pain medications. Majority, 315(76.8%) of the participants had the duration less than the average length of stay of the hospital which was 7 days (Table 2).

### Substance use

The current and life time prevalence of substance use was found to be 23.9% and 52.2% respectively. Daily drinkers were 3.9%, while 4.1% were daily smokers and 6.3% chewed khat at least weekly (Table 3).

### Prevalence of delirium

The overall prevalence of delirium was found to be 16.6%. From those who were delirious, 43 (63.2%) were males. the prevalence was also detected across different units in the hospital as; 36.4% in intensive care unit (ICU), 27.8% in emergency ward, 22.5% in general medical ward, 14.3% in general surgical ward and 6.2% in obstetrics and gynecology ward.

### Factors associated with delirium

Older age, current use of alcohol, Benzodiazepine exposures, visual impairment and poly therapy were found to have significant and independent effect on delirium. While, ever use of substance and antipain were not significantly associated.

The development of delirium was increased with older ages. Those patients in age category of 35-59 were 3 times more likely to have delirium (AOR=3.18, 95% CI: 1.31, 7.77) while, those 60 and above were around 8 times (AOR=7.79, 95% CI: 3.10, 19.55) more likely to develop delirium than those age category of (18- 34 years).

Respondents who were on poly therapy were about 2 times more likely to have delirium (AOR=2.40, 95% CI: 1.24, 4.65) than those who were not. Patient with visual impairment were around 3 times more likely to have delirium (AOR=3.38, 95%CI: 1.27, 8.95) than those who do not. Those participants with benzodiazepine exposure were about 11 times more likely to have delirium (AOR=11.30, 95% CI: 4.94, 25.85) than those who do not. Patients currently using alcohol on weekly basis were about 5 times more likely to have delirium (AOR=5.05, 95% CI: 1.64, 15.55) than those who never do so (Table 4).

Characteristics	Sex		Total n (%)
	Male n (%)	Female n (%)	
<b>Age (years)</b>			
18- 34	56(13.7)	116(28.3)	172(42.0)
35- 59	70(17.1)	78(19.0)	148(36.1)
60 & above	68(16.6)	22(5.4)	90(22.0)
<b>Religion</b>			
Orthodox	134 (32.7)	144 (35.1)	276 (67.8)
Islam	40 (9.8)	41 (10)	81 (19.8)
Protestant	20 (4.9)	31 (7.6)	51 (12.4)
<b>Ethnicity</b>			
Oromo	71(17.3)	77(18.8)	148(36.1)
Amhara	65(15.9)	76(18.5)	141(34.4)
Tigrie	9(2.2)	17(4.1)	26(6.3)
Gurage	26(6.3)	30(7.3)	56(13.7)
Siltie	16(3.9)	10(2.4)	26(6.3)
Others*	7(1.7)	6(1.5)	13(3.2)
<b>Marital status</b>			
Married	124 (30.2)	137 (33.4)	261 (63.7)
Single	45 (11)	49 (12)	94 (22.9)
Divorced	12 (2.9)	14 (3.4)	26 (6.3)
Widowed	13 (3.2)	16 (3.9)	29 (7.1)
<b>Educational status</b>			
Unable to read & write	53 (12.9)	65 (15.9)	118 (28.8)
63 (15.4)	75 (18.3)	138 (33.7)	
Primary school	51 (12.4)	56 (13.7)	107 (26.1)
Secondary school	27 (6.6)	20 (4.9)	47 (11.5)
Diploma & above			
<b>Job</b>			
Employed	155 (37.8)	177 (43.2)	332 (81)
Unemployed	39 (9.5)	39 (9.5)	78 (19)
<b>Residence</b>			
Urban	115 (28)	159 (38.8)	274 (66.8)
Rural	79 (19.3)	57 (13.9)	136 (33.2)

**Table 1:** Socio demographic characteristics for the study on magnitude and associated factors of delirium among hospitalized patients, A.A, Ethiopia, 2014. Others\* (Wolaita, Sidama, kefa, Gamo).

Characteristics	Sex		Total n (%)
	Male n (%)	Female n (%)	
<b>Ward</b>			
Obstetrics and gynecology	--	64(15.6)	64(15.6)
Medical	50(12.2)	39(9.5)	89(21.7)
Surgical	118(28.8)	92(22.4)	210(51.2)
Emergency	21(5.1)	15(3.7)	36(8.8)
ICU	5(1.2)	6(1.5)	11(2.7)
<b>Reasons for admission</b>			
Obstetrics and gynecological	-----	54(13.2)	54(13.2)
Infectious medical condition	29(7.1)	19(4.6)	48(11.7)
Noninfectious medical	32(7.8)	40(9.8)	72(17.6)
Traumatic surgical condition	29(7.1)	13(3.2)	42(10.2)
Nontraumatic surgical	104(25.4)	90(22.0)	194(47.3)
<b>Duration in the hospital</b>			
1-6 days	153(37.3)	162(39.5)	315(76.8)
7 and above days	41(10.0)	54(13.2)	95(23.2)
<b>Poly therapy</b>			
Yes	68(16.6)	88(21.5)	156(38.0)
No	126(30.7)	128(31.2)	254(62.0)
<b>Anti pain medications</b>			
Yes	50(12.2)	57(13.9)	107(26.1)
No	144(35.1)	159(38.8)	303(73.9)
<b>Benzodiazepine exposure</b>			
Yes	25(6.1)	22(5.4)	47(11.5)
No	169(41.2)	194(47.3)	363(88.5)

**Table 2:** Clinical and medication characteristics for the study on magnitude and associated factors of delirium among hospitalized patients, A.A, Ethiopia, 2014

## Discussion

Even though delirium is with significantly high prevalence and has negative sequel on the hospitalized patients, its recognition and

management is poorly practiced. This in turn produces negative consequences on the patients' prognosis; so this study was aimed to assess magnitude of delirium and associated factors among St. Paul's Hospital Millennium Medical College inpatients.

This study clearly indicates that delirium is becoming a concern among hospitalized patients. Delirium was common among males and in intensive care unit. The overall prevalence of this study was supported by the study done in Ireland on hospitalized patients which was 17.6% by using confusion assessment method and 19.6% by DSM-IV TR, Australian hospitals 17%, and Portugal study 16% [7,8,17].

However, the finding of this study was slightly lower than that of Ireland's study which was done by using revised version of delirium rating scale (DRS - 98R), 20.7% [17]; USA ranges from 67 to 77% (67% in trauma ICU, 73% in surgical ICU and 77% in ventilated burn patients) [12,25], the international study conducted in 11 countries ICU, 32.3% [6], and the Iran study conducted on cardiac surgery ICU, 23.5% [15]. The possible reason for the above difference could be because of tool difference in which the Ireland's study used DRS- 98R while this study used CAM; due to the difference in study setting in which the studies from USA, Iran and the international study from 11 countries were conducted in ICU while this study was conducted in all units of the hospital. As different literatures disclose that, delirium rate is high in ICU [13-25].

Contrarily, the finding of this study was higher as compared to the study on hospitalized elderly patients of Canada 11% [9], Iran on participants undergo open heart surgery 4.9% [14]. The overall as well as the specific emergency department findings of this study were also higher as compared to the other prevalence study in emergency elderly patients in Canada, Montreal in which the prevalence was around 9.6% [26]. The possible explanation for the observed differences in delirium prevalence could be the difference in study population and study setting. For instance, the studies from Canada were one day prevalence on elderly participants and emergency department only; while this study were 30 days prevalence to all adult participants and in all hospital units. And the Iran study was on participants who undergo open heart surgery while this study was for all participants regardless of their specific health problem.

Older age was significantly and positively associated with delirium. This is may be due to the fact that delirium is common in elderly since aging is related with different physiological as well as psycho social changes and those changes may attribute to delirium development. Chronic illnesses and multiple co morbidity as prevalent in old age also

Characteristics	Sex		Total n (%)
	Male n (%)	Female n (%)	
<b>Lifetime substance use</b>			
No substance use	61(14.9)	135(32.9)	196(47.8)
Use one or more substances	133(32.4)	81(19.8)	214(52.2)
<b>Current substance use</b>			
<b>Current alcohol use</b>			
Never	136(33.2)	176(42.9)	312(76.1)
Once, twice or three times	32(7.8)	30(7.3)	62(15.1)
Weekly	15(3.7)	5(1.2)	20(4.9)
Daily	11(2.7)	5(1.2)	16(3.9)
<b>Current khat</b>			
Never	175(42.7)	209(51)	384(93.7)
Chew at least weekly	19(4.6)	7(1.7)	26(6.3)
<b>Current tobacco</b>			
Never	181(44.1)	212(51.7)	393(95.9)
Daily	13(3.2)	4(1.0)	17(4.1)

**Table 3:** Substance use information for the study on magnitude and associated factors of delirium among hospitalized patients, A.A, Ethiopia, 2014.

Variable		Delirium		COR (95% CI)	AOR (95% CI)
		Yes	No		
Sex	Male	43	151	2.17(1.3, 3.7)	1.65(0.79, 3.42)
	Female	25	191		
Age(years)	18 – 34	9	163	3.7(1.7, 8.2)	3.18(1.31, 7.77)*
	35 – 59	25	123		
	60 and above	34	56		
Marital status	Married	44	217	1	0.54(0.15, 1.87)
	Single	6	88		
	Divorced	5	21		
	Widowed	13	16		
Education	Illiterate	33	85	3.3(1.2, 8.9)	1.15(0.36, 3.67)
	Primary school	17	121		
	Secondary school	13	94		
	Diploma & above	5	42		
Ward	Ob/Gyn	4	60	1	0.63(0.13, 4.31)
	Medical	20	69		
	Surgical	30	180		
	Emergency	10	26		
	ICU	4	7		
Main diagnosis during admission	Obs/gynecological	4	50	1	0.79(0.15, 4.34)
	Infectious medical	11	37		
	Noninfectious medical	18	54		
	Trauma	8	34		
	Nontraumatic surgical	27	167		
Visual impairment	Yes	19	13	9.8(4.6, 21.1)	3.38(1.27, 8.95)*
	No	49	329		
Polytherapy	Yes	44	112	3.8(2.2, 6.5)	2.40(1.24, 4.65)**
	No	24	230		
Benzodiazepine	Yes	30	17	15.1(7.6, 29.9)	11.30(4.94, 25.85)***
	No	38	325		
Any antipain	Yes	27	80	2.2(1.2, 3.7)	1.68(0.81, 3.49)
	No	41	262		
Ever use of substance	Yes	23	173	2.0(1.2, 3.5)	0.73(0.29, 1.84)
	No	45	169		
Current alcohol use	Never	42	270	1	1.42(0.59, 3.39)
	At least once	11	51		
	Weekly	8	12		
	Daily	7	9		

**Table 4:** associated factors for the study on magnitude and associated factors of delirium among hospitalized patients, A.A, Ethiopia, 2014\**p*- value less than 0.05, \*\**p*-value less than 0.01, \*\*\**p*-value less than 0.001

contribute for delirium development. This finding was supported by an international study in countries of South America, North America and Spain, Netherlands and Iran [6,13,14].

Being visually impaired was also associated with delirium; those participants with visual impairment were 3.4 times more likely to have delirium as compared with their counter parts. This could be due to the fact that sensory deprivation may lead to development of delirium symptoms especially those symptoms related to disorientation. The concomitancy of visual impairment with old age was also could be another reason for delirium development.

The odds of participants with poly therapy to had delirium were 2.4 times the odds of those without poly therapy. More over this, those participants with benzodiazepine exposure were found to be 11.3 times more likely to had delirium as compared with those who were not exposed. The use of poly therapy may be associated to delirium, as multiple adverse effects of multiple drugs leads to delirium development and some drugs adverse effect may also mimic the symptoms of delirium [12]. Even if many health professionals use benzodiazepines for delirium management, this practice also perpetuate delirium by causing rebound effect [11,19].

Even though the use of substances in the life time of the study participants were insignificant; current (in the last three months from data collection time) alcohol use were strongly and positively

associated with delirium. Those who drank alcohol weekly (one to four times per week) were around five fold more likely to develop delirium as compared to participants who never drank currently and this finding was supported with other similar study done in Sweden [27]. This might be due to the fact that alcohol is the independent cause of delirium tremens and complications of chronic alcohol use like, chronic liver disease may have association with delirium. There was also a great possibility that the patient to be in alcohol withdrawal symptoms. This was supported by the study done in Sweden [27].

Some variables like anticholinergic agents, antipain medication, infections, and cardiovascular conditions were not significantly associated unlike other previous studies.

## Conclusion

Delirium prevalence was high among St. Paul's Hospital Millennium Medical College inpatients. Old age, use of three or more medications, exposure to benzodiazepines, visual impairment and current use of alcohol were significantly associated with delirium. Most of the contributing factors of delirium are modifiable. It is better to do prospective study to identify the real relationship of delirium and some variables like benzodiazepine exposure and poly therapy.

## Competing Interests

The authors declare that they have no competing interests.



### Authors' Contributions

TM developed the proposal, participated in data collection, analyzed and interpreted the result, and wrote the whole paper. GM, DA, WF and YM approved the proposal with some revisions, participated in data analysis and revised subsequent drafts of the paper. WF also participated in data collection. All authors read and approved the final manuscript.

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