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Validation of Amharic Version of Confusion Assessment Method for Intensive Care Unit among Patients Admitted to ICU at Two Centers in Addis Ababa, Ethiopia: A Cross-Sectional Study

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ABSTRACT

Background: Confusion Assessment Method for Intensive Care Unit (CAM-ICU) is a widely accepted, easily available, and quick tool for assessment of delirium in ICU. Globally, multiple studies have been conducted to cross culturally translate and validate the tool to make it fit the local setting. However, to the best of our knowledge, it has not been cross-culturally translated and validated into Amharic. Therefore, this study aims to bridge this gap.

Objective: This study aimed to assess the Validity of the Amharic Version of Confusion Assessment Method for Intensive Care Unit (CAM-ICU) among patients admitted to adult ICU in two centers in Addis Ababa, Ethiopia.

Methods and materials: An institution based cross-sectional study was conducted at the intensive care unit of Tikur Anbessa Specialized Hospital and Menelik-II Hospital. A total of 132 eligible patients were included in this study. Data were collected by nurses and resident physicians using Google form from 1-December-2023 to 30-April-2024. Data analysis was performed using to SPSS V.27. Descriptive analyses were performed using frequency and percentage for categorical variables and mean with standard deviation for continuous variables. Reliability, inter-rater reliability (k), and acceptability of the tool were assessed.

Results: The Amharic version was translated by group of experts, including anesthesiologists, psychiatrists, language experts, and the primary investigator, ensuring content and face validity. A total of 132 patients participated in this study, with a response rate of 95.65%. The Amharic version of CAM-ICU had high acceptance (100%), good reliability (Cronbach's alpha=0.718), and substantial inter-rater agreement (k=0.762). 11 (8.3%) and 7(5.3%) of 132 patients were diagnosed with delirium by doctors and nurses, respectively, using CAM-ICU Amharic. Moreover, 7 of 132 patients (5.3%) were diagnosed with delirium concurrently by both physicians and nurses.

Conclusion: The Amharic version of CAM-ICU is an acceptable, valid, and reliable tool for delirium assessment in ICU. Utilization of CAM-ICU Amharic in clinical practice after provision of proper training would enable better detection of delirium in ICU.

KEYWORDS: Validation, CAM-ICU, Amharic version, Delirium, TASH, Menelik-II, Ethiopia

INTRODUCTION

Delirium is an acute neuropsychiatric condition defined by the fifth edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-V) as "a disturbance in attention and awareness that develops acutely and fluctuates in severity, representing a change from baseline attention and awareness, and not better explained by another pre-existing neurocognitive disorder" [1, 2]. It is particularly prevalent among patients admitted to ICU, with a reported magnitude reaching up to 89% and a

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predilection for those on mechanical ventilation [3, 4]. Critically ill patients are at increased risk due to factors such as systemic inflammation, infections, metabolic imbalances, sedative use, surgical interventions, and environmental factors [5, 6]. Delirium is associated with numerous adverse outcomes, including prolonged ICU stay, longer mechanical ventilation, increased hospital costs, long-term cognitive decline, and increased mortality [4, 7, 8]. Despite these consequences, delirium remains significantly underdiagnosed, particularly in resource-limited settings. This is largely due to overlapping presentations with other ICU-related symptoms, lack of clinical training on cognitive screening, and inconsistent use of standardized assessment tools [3, 9, 10].

Confusion Assessment Method for the ICU (CAM-ICU) is one of the most widely validated tools for assessing delirium in critically ill patients [6, 9]. It was designed to be a quick, reliable, and usable delirium assessment tool in the ICU including for mechanically ventilated and nonverbal patients [11]. CAM-ICU has four features: acute onset of changes or fluctuations in the course of mental status, assessment of inattention, Richmond Agitation Sedation Scale (RASS) scoring, and disorganized thought. [11]. CAM-ICU has been cross-culturally translated and validated in 33 languages to date for use among critically ill ICU patients [12-18]. Moreover, the tool has been validated by assessing its performance against other standards for assessing delirium [19].

Ethiopia currently lacks a validated Amharic-language version of the Confusion Assessment Method for the ICU (CAM-ICU). Developing a culturally appropriate and psychometrically sound tool in the local language is essential for facilitating accurate delirium screening, supporting clinical decision-making, and enabling collaborative research efforts across the country. Given that Amharic is the most widely spoken language in Ethiopia, an Amharic version of the CAM-ICU could significantly enhance the consistency of delirium assessment in routine ICU care.

To the best of our knowledge, no prior study has translated and validated the CAM-ICU in Amharic. Thus, this study aimed to fill this gap by translating, culturally adapting, and validating the CAM-ICU for use in Amharic-speaking ICU populations. The validated tool is expected to provide clinicians with a user-friendly, culturally sensitive, and psychometrically tested instrument for delirium assessment and to serve as a foundation for future research on delirium in Ethiopian critical care settings.

METHOD AND MATERIAL

Study setting and design: The study was conducted at Tikur Anbessa Specialized Hospital and Menillik-II Hospital, located in Addis Ababa, the capital city of Ethiopia. Tikur Anbessa Specialized Hospital, which is the largest hospital in the country, has a surgical, medical, and pediatric ICU with 6 beds each and a total of 8 mechanical ventilators to the whole ICU, that is run by a responsible senior Anesthesiologist, Internist, and Pediatrician to the respective units. Menillik II Hospital has a general ICU which has a total of 7 beds with 6 mechanical ventilators and it is led by Anesthesiologist. An institution based cross-sectional study design was conducted from 1-December, 2023 to 30-April, 2024.

Source and study population: All adult patients admitted to the TASH-ICU and Menilik-II ICU who could understand and speak Amharic were the source population. The study population for the study were all adult patients admitted to the TASH-ICU and Menilik-II ICU during the study period who could understand and speak Amharic were the study population.

Eligibility criteria: The inclusion criteria for this study were all adult patients aged ≥18 years who were admitted to the TASH ICU and Menilik-II and stayed for more than 24 hours (to enable detection of fluctuation in mental status), patients who were responsive (RASS score > -2), and Understood and spoke Amharic well. Patients who have prior diagnosis of dementia or psychosis and those who have severe auditory impairment (deaf) were excluded from the study as they wouldn't be able to hear verbal questions and commands of feature 4, and those who were already diagnosed with delirium prior to assessment.

Sample size and sampling procedure: Sample size was calculated using a single population proportion formula using the following assumptions: 5% level of precision (d), magnitude of delirium (P) 12.6% [20], 95% C.I. after accounting for finite population correction using total population for the same previous calendar year (N=483), and considering a 10% non-response rate, a sample size of 138 was taken to be the final sample size for the study. All adult patients admitted to the ICU during the study period who fulfilled the inclusion criteria were included in the study.

Data collection instrument and procedures: The original English version of CAM-ICU was used as the source language for translation. The tool has 4 features which are acute onset or fluctuating courses, inattention, altered level of consciousness, and disorganized thinking. Cross cultural adaptation using a forward back ward translation of the tool was done by a team of psychiatrists, anesthesiologists, and language experts. First, the tool was translated to an Amharic version by a team consisting of

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the primary investigator, two senior anesthesiologists, two psychiatrists, and a language expert fluent in both Amharic and English. Secondly, the Amharic version of the tool was back translated to English by another language expert who was blinded to the initial translation. Finally, the tool was compared to the original English version of CAM-ICU to check its consistency. Disagreements were settled through discussion between the investigator and the research advisors. Assessments were done on each patient by anesthesiology residents and nurses separated by 1 hour taking into consideration the fluctuating nature of delirium and reducing risk of bias in assessment. Supervision of the overall data collection activity of the study was managed by the primary investigator.

Data processing and analysis: After exporting the data from Google form, the data were cleaned and verified on an Excel sheet. Data analysis was done using SPSS version 27. Descriptive analysis was done to describe the socio-demographic characteristics and clinical profile of the patients. Categorical variables were summarized using frequency and percentage. Continuous variables were summarized using mean and standard deviation after the normality of distribution was assessed using Kolmogrov-smirnov test. Cronbach's Alpha was calculated to assess the reliability of the tool and an alpha value of ≥0.7 was taken as reliable. The response rate and Completeness of the collected data were checked to assess the acceptability of the tool. In addition, agreement between the two assessors was evaluated using inter-rater reliability Cohen's Kappa (k) [21] and classified as fair (0.21-0.4), moderate (0.41-0.6), substantial (0.61-0.8), and perfect agreement (0.81-1.00).

Data quality assurance: Quality of the collected data was assured by carrying out a careful design of the data collection tool. Collected data were randomly checked for completeness manually by the Principal investigator.

Ethical consideration: Ethical approval was obtained from the Department of Anesthesiology, Addis Ababa University, School of Medicine. Informed consent from the participants or the primary caregivers was taken whichever was appropriate. The retrieved data was kept strictly confidential.

RESULT

Socio-demographic and clinical characteristics of respondents

In this study, 132 patients participated with a response rate of 96.56%. More than half of the respondents 75 (56.8%) were females and the mean age of respondents was 41 years (SD= ±15.72). The mean day since admission was 5.45 days (SD= ±6.39). The most common indications for admission were postoperative follow up 39(29.5%), respiratory failure 22(16.7%), and Congestive heart failure 19(14.4%). Of the study participants, 23(17.4%) were on mechanical ventilator and 128(97%) of the patients were on opioids. Furthermore, 6(4.5%) patients had a history of alcohol abuse, and 29 (22%) had electrolyte abnormalities. (**Table 1**)

Table 1. Socio-demographic and clinical characteristics of patients admitted to ICU at TASH and Menilik-II Hospitals Addis Ababa, Ethiopia, 2023-2024

Variables		Frequency (n=132)	Percentage (%)
Age (mean, SD)		41	15.72
Sex			
	Male	57	43.2
	Female	75	56.8
Days since Admission (mean, SD)		5.45	6.39
Admission diagnosis			
	CHF	19	14.4
	MI	13	9.8
	Post-op	39	29.5
	Pulmonary embolism	8	6.1
	Respiratory failure	22	16.7

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	Sepsis	16	12.1
	Shock	6	4.5
	others	9	6.8
Mechanically ventilated			
	Yes	23	17.4
	No	109	82.6
Alcohol abuse			
	Yes	6	4.5
	No	126	95.5
Electrolyte abnormality			
	Yes	29	22
	No	103	78
Medications			
	Opioid	128	97
	Benzodiazepine and opioid	4	3

Content and Face validity of the tool

A group of experts from various backgrounds, including anesthesiologists, psychiatrists, and language experts, were involved in the translation and adaptation of the tool. In addition, the draft tool was provided for assessment by third year anesthesiology residents, which were potential participants in the study. This ensured the tool had both content and face validity.

Acceptability of the tool

The acceptability of the tool in the study was 100% with all raters in the study completing all sections of the tool without missing data.

Reliability of the tool

In this study, we found that all four features had good reliability with Cronbachs-α for acute onset/fluctuating course, inattention, altered level of consciousness, and disorganized thinking of 0.846, 0.728, 0.888, and 0.729 respectively. (**Table 2**) The overall reliability of CAM-ICU Amharic was 0.718.

Table 2. Internal consistency of the Amharic version of CAM-ICU for assessment of delirium among patients admitted to ICU at TASH and Menilik-II Hospitals Addis Ababa, Ethiopia, 2023-2024

Features	Cronbach α
Feature 1(Acute onset or fluctuating course)	0.846
Feature 2 (Inattention)	0.728
Feature 3 (Altered level of consciousness)	0.888
Feature 4 (Disorganized thinking)	0.729
Overall	0.718

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Inter-rater reliability of the tool

The inter-rater reliability assessment for the acute onset or fluctuating course (k=0.730) and altered level of consciousness (k=0.798) showed a statistically significant substantial agreement. Meanwhile, for inattention (0.570) and disorganized thinking (0.570), there was a statistically significant moderate inter-rater agreement. Regarding the overall CAM-ICU score, there was a statistically significant substantial inter-rater agreement with kappa=0.762. (**Table 3**)

Table 3. CAM-ICU Amharic Inter-rater reliability between Resident doctors and nurses for assessment of delirium among patients admitted to ICU at TASH and Menelik-II Hospital, Addis Ababa, Ethiopia, 2023-2024

Features	Kappa (k)	p-value
Feature 1(Acute onset or fluctuating course)	0.730	<0.001
Feature 2 (Inattention)	0.570	<0.001
Feature 3 (Altered level of consciousness)	0.798	<0.001
Feature 4 (Disorganized thinking)	0.570	<0.001
Overall score	0.762	<0.001

Delirium features and delirium assessment

In this study, 19(14.4%) of patients and 15(14.4%) of patients were assessed to have acute or fluctuating course by doctors and nurses respectively. In addition, 17(12.9%) of patients and 21(15.9%) of patients were assessed to have inattention by doctors and nurses respectively. Moreover, 18(13.6%) of patients and 16(12.1%) of patients were assessed to have altered consciousness by doctors and nurses respectively. Furthermore, 27(20.5%) of patients and 33(25%) of patients were assessed to have disorganized thinking by doctors and nurses respectively. Finally, 11(8.3%) of patients and 7(5.3%) of patients were assessed to have delirium by doctors and nurses respectively. Of these, 7(5.3%) were concurrent diagnosis of delirium by both doctors and nurses.

Table 4: Delirium features assessment by doctors and nurses using CAM-ICU Amharic among patients admitted to ICU at TASH and Menelik-II Hospital, Addis Ababa, Ethiopia, 2023-2024

Features		Doctors assessment		Nurses assessment	
		N	%	N	%
Acute change or fluctuating course					
	Yes	19	14.4	15	11.4
	No	113	85.4	117	88.4
Inattention					
	Yes	17	12.9	21	15.9
	No	115	87.1	111	84.1
Altered consciousness					
	Yes	18	13.6	16	12.1
	No	114	86.4	116	87.9
Disorganized thinking					
	Yes	27	20.5	33	25.0
	No	105	79.5	99	75.0
Delirium based on CAM-ICU score					
	Yes	11	8.3	7	5.3
	No	121	91.7	125	94.7

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DISCUSSION

This study aimed to translate, psychometrically test, and validate the Amharic version of CAM-ICU. Rigorous translation and back translation were conducted by a group of experts composed of health professionals (psychiatrists and Anesthesiologist), published Amharic authors, and language experts to ensure the content and face validity. The tool demonstrated high acceptability, good internal consistency, and substantial inter-rater reliability, supporting its suitability for clinical use.

The Amharic version of CAM-ICU was found to have excellent acceptability (100%), indicating its user-friendliness across various professional groups and levels of training. Moreover, the tool was found to have a high internal consistency (Cronbachs alpha values of greater than 0.7) for all features of delirium. This finding is comparable to studies conducted in Spain [22], Japan[14], Greek [12], and Tunisia [13] that reported Cronbachs alpha values of 0.84, 0.71, 0.84, and 0.886 respectively. This shows that Amharic CAM-ICU performs similarly to other translations across the globe and it is a reliable assessment tool for delirium among ICU patients.

Furthermore, Amharic CAM-ICU was shown to have substantial overall inter-rater reliability between the two groups. This is in comparative agreement with previous studies conducted in Japan [14], Greece[12], Sweden[15], Tunisia[13], Egypt [17], and Thailand [23] that reported Cohen's Kappa 0.85, 0.75, 0.81 0.844, 0.82, and 0.81 respectively and higher than a study conducted in Saudi Arabia (k=0.66) [24]. This shows us that the tool can be used, after proper training, to reliably diagnose delirium in clinical setup and research. This is specifically important in busy ICUs like ours with limited staffing, enabling better and quicker assessment of delirium by multidisciplinary professionals following appropriate training.

Regarding each feature, substantial inter-rater reliability between nurses and doctors was noted for features 1 and 3 but moderate scores for inattention and disorganized thinking. This was also noted in studies done in Greece (k=0.63) [12], Tunisia (k=0.648) [13], Korea (k=0.60) [25], and Japan (k=0.69) [14]. This suggests cultural and linguistic adaptation challenges across various languages and it could also be related to the subjective nature of assessments of these features. This calls for further refinement in the translation and adaptation of those features. The inter-rater reliability could also be further improved through standardized and uniform training of health professionals [14].

Our study did not assess the criterion validity of Amharic CAM-ICU against the gold standard (DSM-V), and the sensitivity, specificity, and positive and negative predictive values of the tool. This hindered comparison of our tool with other global studies [12-14, 25]. While this study provides a strong foundation, these areas require further exploration. Future studies should assess the diagnostic accuracy of the tool against DSM-V administered by delirium experts or a psychiatrist.

Our study showed that 7 out of 132 (5.3%) patients were concurrently diagnosed with delirium by both nurses and physicians. This is lower than reported by previous studies done globally [12, 16, 24]. This difference could be due to the differences in the clinical characteristics of the patients included, the type of professionals included, and differences in methodology. Our study included a comparatively lower proportion of patients who are mechanically ventilated than in previous studies. This could potentially decrease the observed magnitude of delirium. Furthermore, previous studies included assessors from the same professional categories with nearly similar experience. This could potentially affect the concordance of the assessment of delirium between the assessors included in the study.

STRENGTH AND LIMITATION

This study is the first study conducted in Ethiopia to validate an Amharic version of CAM-ICU. The translation to Amharic version was done by a team of professionals with extensive expertise in their respective fields. Furthermore, the study included a comparatively larger sample size than previous studies conducted globally. However, the study was not without limitations. In this study, we were not able to test the sensitivity, specificity, positive predictive value, and negative predictive value of the tool against gold standard delirium assessment tools like the DSM-V. Secondly, due to multiple competing clinical activities carried out by the assessing professionals, strict adherence to the 1 hour inter-assessment interval was not achieved for some patients.

CONCLUSION

Amharic CAM-ICU is an acceptable, reliable, and valid tool for the assessment of delirium among patients admitted to the ICU. We recommend health professionals working in ICU to utilize the Amharic version of CAM-ICU in their daily practice to diagnose delirium. We recommend researchers utilize the tool in future researches to be conducted on delirium in ICU to enable uniformity

of assessment and comparability of output. Future researches should also be conducted to assess the criterion validity, sensitivity, specificity, and predictive values of the tool against gold standards.

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Data Availability Statement: The dataset for the study can be obtained from the corresponding author on upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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