

Mini-Mental State Examination Performance Among Indian Army Veterans in Nepal: A Descriptive Cross-Sectional Study at ECHS Polyclinic Pokhara

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ABSTRACT

Introduction: Cognitive impairment and dementia are increasing public health concerns in low- and middle-income countries, yet little is known about cognitive status among Indian Army veterans residing in Nepal. This study described Mini-Mental State Examination performance among veterans attending an ECHS polyclinic using a locally translated Nepali-language version of the instrument; the adaptation was not treated as a population-validated diagnostic tool.

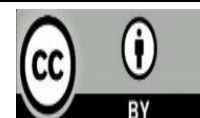
Methods: A descriptive cross-sectional study was conducted among 400 Indian Army ex-servicemen aged 50 years and above attending ECHS Polyclinic Pokhara for routine outpatient services between July and November 2025. The Nepali-language Mini-Mental State Examination retained the original domains and scoring. As formal educational data and diagnostic confirmation were not collected, results were interpreted descriptively using conventional cut-offs. Descriptive statistics, Pearson correlation, Spearman correlation, one-way analysis of variance and Tukey post-hoc testing were used.

Results: The mean Mini-Mental State Examination score was 29.14 ± 1.74 ; 392/400 (98.00%) veterans scored in the normal range. Age showed a moderate negative correlation with score ($r = -0.46$), with decline most evident after 80 years. Rank-related differences were statistically significant but clinically small.

Conclusion: Cognitive impairment was uncommon in this outpatient veteran cohort. The low prevalence should be interpreted cautiously because the sample was drawn from routine OPD attendees, formal educational data were unavailable, and the Nepali-language adaptation was not validated specifically in this veteran population. Opportunistic cognitive screening remains feasible in ECHS primary care settings and may help identify older veterans requiring further assessment.

Keywords: *Cognition; Dementia; Mass screening; Nepal; Veterans*

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INTRODUCTION

Dementia is a growing public health concern, with global prevalence projected to rise substantially in low- and middle-income countries. [1,2] The Mini-Mental State Examination is widely used for brief cognitive screening, but its performance is influenced by age, education, language and culture. [3,4] South Asian work on the Hindi Mental State Examination and Nepali cognitive tools shows the need for locally appropriate screening approaches. [5,6,7] Indian Army veterans residing in Nepal are an ageing, organized healthcare cohort, yet their cognitive screening profile has not been systematically reported. This study aimed to describe Mini-Mental State Examination score distribution among Indian Army veterans attending ECHS Polyclinic Pokhara, and to examine its association with age and military rank.

METHODS

Study Design: A descriptive cross-sectional study was conducted among veterans attending ECHS

Polyclinic Pokhara between July and November 2025.

Setting: ECHS Polyclinic Pokhara provides outpatient, diagnostic, pharmaceutical and referral services for Indian Army ex-servicemen and their dependants across Gandaki Province, Nepal.

Participants: Indian Army ex-servicemen aged 50 years and above who attended routine outpatient services and were able to provide verbal consent were eligible. All consecutive eligible veterans were included. No exclusions were made based on comorbidity, literacy or sensory limitations.

Ethical approval: Ethical clearance was obtained from the Institutional Review Committee, Manipal College of Medical Sciences, Pokhara, Nepal (Approval No. MCOMS/IRC/679/GA; Date: 10 June 2025). Verbal informed consent was obtained from all participants.

Data collection and Mini-Mental State Examination score: A Nepali-language version of the Mini-Mental State Examination was administered by trained staff. The instrument retained the original domains of orientation, registration, attention/calculation, recall,

language and visuoconstruction. Conventional interpretive categories were used: normal cognition, 24-30; mild impairment, 18-23; and severe impairment, 17 or below. [8,9]

Rank coding: Individual ranks were mapped to a seven-level Indian Army hierarchy and then grouped as other ranks, non-commissioned officers, junior commissioned officers and officers. Rank was used as a proxy for military seniority and occupational responsibility.

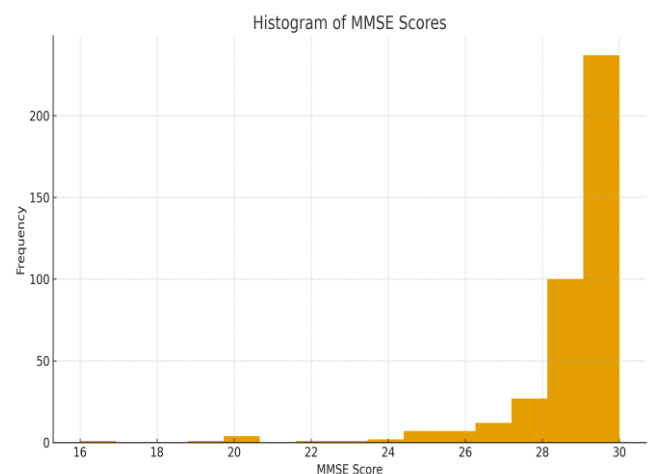
Statistical analysis: Data were analysed using Python. Descriptive statistics summarised age and Mini-Mental State Examination score. Age was grouped into six bands: 50-59, 60-69, 70-79, 80-89, 90-99 and 100 years or above. Pearson correlation assessed age-score association. Pearson and Spearman correlations assessed rank-score association. One-way analysis of variance with Tukey post-hoc tests assessed between-rank differences. Eta-squared was reported as effect size.

RESULTS

Sample characteristics: A total of 400 veterans were assessed. Mean age was 69.3 ± 9.4 years (range 50-100 years), with the highest proportions in the 60-69 years (153/400, 38.25%) and 70-79 years (116/400, 29.00%) groups.

Distribution of Mini Mental State Examination Score: The mean score was 29.14 ± 1.74 (median 30; range 16-30). The distribution was strongly left-skewed, with most participants scoring 29 or 30 (Figure 1).

Figure 1: Histogram of Mini-Mental State Examination scores among Indian Army veterans attending ECHS Polyclinic Pokhara, 2025 (n = 400).



Using conventional cut-offs, 392/400 (98.00%) had normal cognition, 7/400 (1.75%) had mild

impairment and 1/400 (0.25%) had severe impairment.

Age and Mini-Mental State Examination score: Age showed a moderate negative correlation with score (Pearson $r = -0.46$). Median scores remained near the ceiling up to 79 years, followed by a downward shift in the 80-89 and 90-99-year groups (Figures 2 and 3). Mean score remained above 29 up to 79 years, declined to 27.81 in the 80-89-year group, 23.71 in the 90-99-year group and 20.00 in the single participant aged 100 years or above (Table 1).

Table 1: Mini-Mental State Examination scores by age group (n=400)

Age group	No.	Mean	SD	Minimum	Maximum
50-59	60	29.73	0.45	29	30
60-69	154	29.57	1.43	16	30
70-79	115	29.38	0.98	25	30
80-89	63	27.81	1.88	22	30
90-99	7	23.71	3.99	19	29
100 or above	1	20.00	-	20	20

Rank and Mini-Mental State Examination score: Mean scores were high across rank groups: other

ranks, 28.47 ± 2.22 ($n = 43$); non-commissioned officers, 29.23 ± 1.75 ($n = 211$); junior commissioned officers, 29.12 ± 1.69 ($n = 112$); and officers, 29.50 ± 0.66 ($n = 34$). Correlation with rank seniority was weak and non-significant (Pearson $r = 0.08$, $p = 0.12$; Spearman $\rho = 0.04$, $p = 0.40$). One-way analysis of variance showed a statistically significant but small difference: $F(3,396) = 2.87$, $p = 0.036$, eta-squared = 0.021. Tukey testing showed higher scores for non-commissioned officers than other ranks (mean difference 0.76, $p = 0.043$) and officers than other ranks (mean difference 1.03, $p = 0.046$), with no significant differences among non-commissioned officers, junior commissioned officers and officers (Table 2, Table 3).

Table 2: Mini-Mental State Examination scores by rank group. (n=400)

Rank group	No.	Mean	SD	Minimum	Maximum
JCO	112	29.12	1.69	20	30
NCO	211	29.23	1.75	16	30
Officers	34	29.50	0.66	25	30

OR	43	28.47	2.2 2	20	30
Office r	34	29.50	0.6 6	28	30

Table 3: Mini-Mental State Examination scores by rank code. (n=400)

Rank code	No.	Mean	SD	Minimum	Maximum
1	43	28.47	2.22	20	30
2	116	29.39	1.40	19	30
3	95	29.03	2.10	16	30
4	41	28.76	2.06	20	30
5	65	29.31	1.45	20	30
6	6	29.50	0.84	28	30
7	34	29.50	0.66	28	30

DISCUSSION

This study found preserved cognitive performance among Indian Army veterans attending ECHS Polyclinic Pokhara: 392/400 (98.00%) participants scored in the normal range and the mean score was 29.14 ± 1.74 . The finding is consistent with the use of the Mini-Mental State Examination as a brief screening rather than diagnostic instrument, and with evidence that

population scores vary with demographic characteristics. [3,4,9,10]

The low proportion scoring below 24 contrasts with concerns about the rising global dementia burden, particularly in South Asia. [1,2] A probable explanation is a healthy-veteran effect: long-term military service may select and retain individuals with better baseline health, discipline, physical activity and continuing contact with organized healthcare. The high ceiling distribution also suggests that the Mini-Mental State Examination may be less sensitive for mild cognitive impairment in this setting. [4,8]

Age showed a moderate negative correlation with score, with the clearest decline after 80 years.

This pattern is consistent with international evidence that cognitive screening scores decline with advancing age and require cautious interpretation against age and education. [4,8,9]

The single centenarian and the small 90-99-year subgroup should not be over-interpreted, but they support prioritizing older veterans for more detailed assessment.

Rank was only weakly associated with score.

Although officers and non-commissioned officers

had slightly higher mean scores than other ranks, the effect size was small. Rank may partly reflect education and occupational complexity, but the near-ceiling scores across all groups indicate limited clinical importance. Education-fair tools such as the Nepali Rowland Universal Dementia Assessment Scale or Nepali Montreal Cognitive Assessment may add value in future studies. [6,7,11]

The major strength of this study is its routine-care sample of 400 veterans assessed in a Nepali-speaking clinical environment. Limitations include the single-center design, absence of formal diagnostic confirmation, possible ceiling effect, and lack of population-specific validation of the Nepali-language Mini-Mental State Examination. Longitudinal follow-up with comorbidity data and validated Nepali cognitive instruments is warranted.

CONCLUSIONS

Cognitive impairment was uncommon among Indian Army veterans attending ECHS Polyclinic Pokhara. Mini-Mental State Examination scores were high across age and rank groups, although a

clear age-related decline emerged after 80 years. Opportunistic cognitive screening is feasible within ECHS settings and can support early identification of older veterans requiring further evaluation.

CONFLICT OF INTEREST

None

SOURCES OF FUNDING

None

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