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Assessment Of Neurocognitive Impairment In Patients With Solid Malignancies.

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Abstract

Background: Cognitive impairment is increasingly recognized among patients with cancer and may affect daily functioning, quality of life and participation in treatment decisions. Most available studies have focused on selected cancer types or patients receiving chemotherapy, while information regarding cognitive function at the time of diagnosis of solid malignancies remains limited in the Indian population. This study evaluated the prevalence of neurocognitive impairment among patients with newly diagnosed solid malignancies before exposure to chemotherapy. ***Methods:*** A hospital-based cross-sectional study was conducted among patients aged >18 years with recently diagnosed, biopsy-proven solid malignancies attending the Medical and Surgical Oncology outpatient departments of SVRR Government General Hospital, Tirupati. Patients with previous chemotherapy, CNS metastases, psychiatric or neurological disorders, substance abuse and other conditions known to cause cognitive impairment were excluded. Cognitive function was assessed using the Telugu version of the Montreal Cognitive Assessment (MoCA). A MoCA score ≥26 was considered normal, 18–25 as mild cognitive impairment and 10–17 as moderate cognitive impairment. Demographic and clinical variables were recorded and analyzed using descriptive statistics and regression analysis. ***Results:*** Thirty-nine patients were included. The mean age was 54.6 ± 10.2 years and 24 (61.5%) were females. Twenty-five patients (64.1%) had no formal education. Breast cancer was the most common malignancy (48.7%). The mean MoCA score was 21.3 ± 4.4. Cognitive impairment (MoCA <26) was observed in 33 patients (84.6%), including mild impairment in 27 (69.2%) and moderate impairment in 6 (15.4%). Educational status was significantly associated with MoCA score; patients without formal education had significantly lower scores than those with high-school education. ***Conclusion:*** Cognitive impairment was common among patients with newly diagnosed solid malignancies before chemotherapy. Educational attainment was significantly associated with cognitive performance. Larger longitudinal studies using population-specific cognitive thresholds are needed to better define clinically meaningful cognitive impairment in Indian oncology populations.

Keywords: Cancer, cognitive impairment, neurocognitive impairment, Montreal Cognitive Assessment.

INTRODUCTION

Cancer is an increasing public health concern in India, with a steady rise in the number of people being diagnosed with malignancy. At the same time, advances in cancer diagnosis and treatment have improved survival, allowing more patients to live longer with their disease. With this improvement in survival, increasing attention is being given to health problems that can affect patients during and after cancer treatment. Cognitive impairment is one such problem and can have an important effect on a patient's daily activities, independence and overall quality of life.[1,2]

Cancer-related cognitive impairment (CRCI) has been increasingly recognized in patients with cancer. Patients may experience problems with memory, attention, concentration, executive functions and processing speed. These difficulties can occur at different stages of the cancer journey and may interfere with communication, treatment adherence, decision-making and everyday activities. Although cognitive impairment has been studied extensively in certain groups of patients, particularly those with breast or lung cancer and those receiving chemotherapy, information about cognitive function in patients with newly diagnosed solid malignancies is still limited.[2,3]

The situation in India is of particular interest because cognitive performance can be influenced by several factors, including age, education and place of residence. Cognitive impairment is also relatively common in the general older Indian population. However, there is limited information regarding the prevalence of cognitive impairment among patients with cancer in India. Available Indian studies have mainly examined selected groups, such as older patients with cancer or those with brain metastases, rather than patients with different types of solid malignancies.[4,5]

Another important issue in the Indian setting is the wide variation in educational background among patients. Educational attainment can have a considerable influence on performance on cognitive screening tests, and this becomes particularly relevant when assessing patients with little or no formal education. Studies from India and other countries have reported lower cognitive screening scores among individuals with limited education, emphasizing the need for caution when interpreting cognitive assessment results in such populations.

The Montreal Cognitive Assessment (MoCA) is a commonly used screening tool for identifying mild cognitive impairment and other forms of cognitive dysfunction. It assesses several cognitive domains and is considered useful for detecting cognitive changes that may not be identified by more limited screening instruments. The Telugu version of the MoCA, standardized for Telugu-speaking populations, provides an opportunity to assess cognition in patients attending healthcare facilities in this region.[6,7]

Cognitive impairment in patients with cancer may not necessarily be related only to chemotherapy or other cancer treatments. Disease-related factors, increasing age, educational status, psychological factors and other medical conditions may also contribute. Therefore, assessing cognition before the initiation of chemotherapy is useful for understanding the baseline cognitive status of patients and for distinguishing pre-existing impairment from cognitive changes that may develop during treatment.[8]

In the present study, patients with recently diagnosed, histologically confirmed solid malignancies were assessed using the Telugu version of the MoCA before receiving prior chemotherapy. Patients with conditions that could independently affect cognition, including central nervous system metastases, psychiatric illness, neurological disease, substance abuse and drug-induced cognitive impairment, were excluded. This allowed an assessment of cognitive function at the time of cancer diagnosis while reducing the influence of some important confounding factors.

The present study was therefore undertaken to determine the prevalence of neurocognitive impairment among patients with solid malignancies and to examine its relationship with selected demographic and clinical characteristics. Identifying cognitive impairment early may be important in cancer care, particularly when counselling patients, discussing treatment options and assessing their ability to understand and participate in decisions regarding their treatment.

MATERIALS AND METHODS

Study design and setting

This was a hospital-based cross-sectional study conducted in the Medical and Surgical Oncology outpatient departments of SVRR Government General Hospital, Tirupati, under Sri Venkateswara Medical College (SVMC), Tirupati. The study was conducted over a period of three months following approval from the Scientific and Ethics Committee of SVMC.

Study population

Patients aged more than 18 years with a recently diagnosed, biopsy-proven solid malignancy who attended the Medical or Surgical Oncology outpatient departments were considered for inclusion. Written informed consent was obtained from all participants before enrolment in the study.

Eligibility criteria

Inclusion Criteria:

1. Patients with recently diagnosed solid malignancy
2. Age more than 18 years

Exclusion Criteria:

1. Patients underwent prior chemotherapy
2. CNS metastasis
3. Psychiatric illnesses
4. Neurological diseases causing cognitive impairment
5. Systemic illnesses causing cognitive impairment such as hepatic dysfunction, respiratory failure, neurological disorders etc..
6. Substance abuse

7. Drug induced cognitive impairment

Data collection

After obtaining informed consent, demographic and clinical information was collected for each participant. Details related to the malignancy, including the stage of disease and performance status, were recorded. Relevant organ function test results were also collected. These data were recorded along with the cognitive assessment results for further analysis.

Assessment of cognitive function

Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA). The Telugu version of the MoCA, which has been standardized for the Telugu-speaking population, was used for participants in the study. The MoCA evaluates multiple cognitive domains and is commonly used for screening cognitive impairment.

For the purpose of this study, a MoCA score of 26 or above was considered to indicate normal cognitive performance. Scores between 18 and 25 were classified as mild cognitive impairment, while scores between 10 and 17 were classified as moderate cognitive impairment. Scores from 0 to 9 were considered severe impairment according to the categorization used in the study protocol. Since none of the participants had received chemotherapy before enrolment, the cognitive assessment was performed before exposure to chemotherapy. This allowed the study to assess the baseline cognitive status of patients with newly diagnosed solid malignancies.

Data management and statistical analysis

All demographic, clinical and cognitive assessment data were entered into a Microsoft Excel spreadsheet. The entries were double-checked to minimize data-entry errors. Data were subsequently analyzed using Epi Info version 7. Continuous variables were summarized using mean or median values, as appropriate.

Participants were categorized into normal cognition and impaired cognition groups based on their MoCA scores. Continuous variables were compared between the cognitive function groups using the independent t-test or Mann–Whitney U-test, depending on the distribution of the data. Categorical variables were compared using the chi-square (χ^2) test.

Logistic regression analysis was performed to identify factors associated with cognitive impairment. Variables showing a significant difference between the cognitive function groups in the univariate analysis were considered as independent variables, with cognitive impairment as the dependent variable. A P value of <0.05 was considered statistically significant.

RESULTS

Table 1. Demographic characteristics of the study population (N = 39)

Characteristic	n	%
Age (years)		
Mean ± SD	54.6 ± 10.2	
Median (range)	54 (35–75)	
<60 years	24	61.5
≥60 years	15	38.5
Sex		
Female	24	61.5
Male	15	38.5
Education		
No formal education	25	64.1
Primary	6	15.4
High school	7	17.9
Professional	1	2.6

A total of 39 patients with recently diagnosed solid malignancies were included in the study. The mean age of the study population was 54.6 ± 10.2 years, with a median age of 54 years (range, 35–75 years). Fifteen patients (38.5%) were aged 60 years or older, while 24 (61.5%) were below 60 years of age.

There were 24 females (61.5%) and 15 males (38.5%). With regard to educational status, 25 patients (64.1%) had no formal education recorded, six (15.4%) had primary education, seven (17.9%) had high-school education and one patient (2.6%) had professional education.

Table 2. Distribution of primary malignancy

Primary site	n	%
Breast	19	48.7
Lung	5	12.8
Buccal mucosa	5	12.8
Stomach	3	7.7
Colon	2	5.1
Rectum	2	5.1
Liver	1	2.6
Small intestine	1	2.6
Adrenocortical	1	2.6
Total	**39**	**100.0**

Breast cancer was the most common malignancy, accounting for 19 patients (48.7%), followed by lung cancer and buccal mucosal cancer, with five patients (12.8%) each. Stomach cancer was diagnosed in three patients (7.7%), while colon and rectal cancers were present in two patients (5.1%) each. Liver, small-intestinal and adrenocortical malignancies were each represented by one patient (2.6%). Breast malignancy constituted almost half of the study population. The remaining patients had a range of gastrointestinal, thoracic and head-and-neck malignancies.

Table 3. Disease stage and performance status

Variable	n	%
Stage		
Stage II	7	17.9
Stage III	21	53.8
Stage IV	11	28.2
Performance status		
PS 0	16	41.0
PS 1	11	28.2
PS 2	8	20.5
PS 3	4	10.3

Most patients had advanced-stage disease at the time of assessment. Twenty-one patients (53.8%) had stage III disease and 11 (28.2%) had stage IV disease, while seven patients (17.9%) had stage II disease. No patient in the study population was recorded as having stage I disease.

Regarding performance status, 16 patients (41.0%) had a performance status of 0, 11 (28.2%) had a performance status of 1, eight (20.5%) had a performance status of 2 and four (10.3%) had a performance status of 3. Overall, 32 of 39 patients (82.1%) had stage III or IV disease. Performance status was 0–1 in 27 patients (69.2%).

Table 4. Distribution of patients according to MoCA score

MoCA category	Score range	n	%
Normal cognitive performance	≥26	6	15.4
Mild cognitive impairment	18–25	27	69.2
Moderate cognitive impairment	10–17	6	15.4
Severe cognitive impairment	0–9	0	0
Total		**39**	**100.0**

The mean MoCA score for the study population was 21.3 ± 4.4, with a median score of 22 (IQR, 19–24). Based on the predefined MoCA categories, 27 patients (69.2%) had mild cognitive impairment, six (15.4%) had moderate cognitive impairment and six (15.4%) had normal cognitive performance. No patient had a MoCA score in the severe impairment range.

Overall, 33 of 39 patients (84.6%) had a MoCA score below 26 and were therefore classified as having cognitive impairment according to the study definition.

Table 5. MoCA category according to sex

Sex	Moderate impairment n (%)	Mild impairment n (%)	Normal n (%)	Total
Female	6 (25.0)	14 (58.3)	4 (16.7)	24
Male	0 (0.0)	13 (86.7)	2 (13.3)	15
Total	**6 (15.4)**	**27 (69.2)**	**6 (15.4)**	**39**

The mean MoCA score was higher among males than females (22.7 ± 3.3 versus 20.4 ± 4.9). Among females, six patients had moderate impairment, 14 had mild impairment and four had normal cognitive performance. Among males, none had moderate impairment, 13 had mild impairment and two had normal cognitive performance.

Table 6. MoCA score according to educational status

Education	n	Mean MoCA ± SD	Median	Mild n (%)	Moderate n (%)	Normal n (%)
No formal education	25	20.0 ± 4.6	21	17 (68.0)	6 (24.0)	2 (8.0)
Primary	6	21.7 ± 3.1	21	5 (83.3)	0	1 (16.7)
High school	7	24.9 ± 2.7	25	5 (71.4)	0	2 (28.6)
Professional	1	26.0	26	0	0	1 (100.0)
Total	**39**	**21.3 ± 4.4**	**22**	**27 (69.2)**	**6 (15.4)**	**6 (15.4)**

Educational status showed a clear pattern in relation to MoCA performance. Patients with high-school education had a mean MoCA score of 24.9 ± 2.7, compared with 21.7 ± 3.1 among those with primary education and 20.0 ± 4.6 among those with no formal education. The single patient with professional education had a score of 26.
Among patients with no formal education, 23 of 25 (92.0%) had cognitive impairment, including six with moderate and 17 with mild impairment. In comparison, five of seven patients (71.4%) with high-school education had cognitive impairment.

Table 7. Linear regression analysis of factors associated with MoCA score

Educational category	Coefficient	95% CI	SE	*P* value
No formal education vs high school	−4.817	−8.379 to −1.255	1.754	0.0095
Primary vs high school	−3.190	−7.824 to 1.443	2.283	0.1710
Professional vs high school	1.143	−7.761 to 10.047	4.386	0.7960
Constant	24.857	21.709 to 28.005	1.551	<0.001

Overall model: F = 2.9933, $P = 0.0439$; $R^2 = 0.20$.
Linear regression analysis was performed with MoCA score as the outcome variable and educational status as the explanatory variable. The overall regression model was statistically significant (F = 2.993, $P = 0.0439$) and explained approximately 20% of the variability in MoCA scores ($R^2 = 0.20$).

Using high-school education as the reference category, patients with no formal education had MoCA scores that were, on average, 4.82 points lower (95% CI, −8.38 to −1.26; $P = 0.0095$). The difference between primary and high-school education was not statistically significant ($P = 0.171$).

The professional-education category was also not statistically significant ($P = 0.796$), although interpretation is limited by the presence of only one patient in this group. Educational status was significantly associated with MoCA score in the overall regression model. The strongest individual association was observed for patients with no formal education compared with those with high-school education.

Table 8. MoCA score according to age group

Age group	n	Mean MoCA	Median MoCA
<60 years	24	21.6	23
≥60 years	15	20.9	21
Total	**39**	**21.3**	**22**

Fifteen patients were aged 60 years or older and 24 were younger than 60 years. The mean MoCA score was 20.9 among patients aged ≥60 years and 21.6 among those aged <60 years. The median scores were 21 and 23, respectively. MoCA scores were somewhat lower among patients aged ≥60 years, although the difference was modest in this small study population.

Table 9. MoCA category according to stage of malignancy

Stage	n	Mild n (%)	Moderate n (%)	Normal n (%)
II	7	2 (28.6)	2 (28.6)	3 (42.9)
III	21	17 (81.0)	3 (14.3)	1 (4.8)
IV	11	8 (72.7)	1 (9.1)	2 (18.2)
Total	**39**	**27 (69.2)**	**6 (15.4)**	**6 (15.4)**

Cognitive impairment was observed across all disease stages represented in the study. Among patients with stage II disease, three of seven had normal cognitive performance, two had mild impairment and two had moderate impairment. Among patients with stage III disease, 17 of 21 had mild impairment, three had moderate impairment and one had normal cognition. Among stage IV patients, eight had mild impairment, one had moderate impairment and two had normal cognition. The proportion of patients with normal cognition was highest in stage II disease; however, the small sample size limits conclusions regarding an association between disease stage and cognitive impairment.

DISCUSSION

The present study evaluated cognitive function in patients with recently diagnosed solid malignancies before exposure to chemotherapy. Among the 39 patients included, 33 (84.6%) had a MoCA score below 26, with mild cognitive impairment being the most frequent category. The mean MoCA score of the study population was 21.3 ± 4.4. An important finding was that this cognitive impairment was identified before chemotherapy, suggesting that cognitive difficulties in patients with cancer may not be attributable solely to treatment-related neurotoxicity.

Our findings are consistent with the growing evidence that cognitive impairment can be present even before cancer treatment begins. Lange et al. [9], in a subgroup analysis of the prospective CANTO cohort, evaluated women with newly diagnosed breast cancer before any cancer treatment. They reported objective cognitive impairment in 28% of patients compared with 8% of healthy controls. Their study emphasized the importance of performing cognitive assessment before treatment in order to distinguish pre-existing cognitive difficulties from treatment-related changes. The high prevalence observed in our study, although considerably greater than that reported by Lange et al., may be explained partly by differences in study population, educational background, cognitive assessment methods and the cut-off used for defining impairment.

The findings of Sousa et al.[10] also support the concept that cognitive changes may begin early in the cancer trajectory. In their systematic review of longitudinal neuroimaging studies in breast cancer, the authors noted evidence of functional brain changes even before chemotherapy and suggested that cognitive and neurological alterations may begin early in the disease course. They also highlighted the importance of longitudinal studies with a pre-treatment assessment. The present study similarly provides baseline information by assessing patients before prior chemotherapy, although its cross-sectional design does not allow us to determine how cognition changes during subsequent cancer treatment.

A particularly important finding in our study was the strong relationship between educational status and cognitive performance. Patients with no formal education had a mean MoCA score of approximately 20, whereas patients with primary and high-school education had higher mean scores. The regression analysis also demonstrated a statistically significant overall association between educational status and MoCA score, with patients without formal education having significantly lower scores than those with high-school education. This finding is clinically important because educational attainment can substantially influence performance on cognitive screening tests.

The influence of education on MoCA performance has been demonstrated in Indian populations. Kaul et al[11], in a multicentre study involving five Indian languages, including Telugu, adapted and validated the MoCA for the Indian population. They demonstrated good diagnostic performance of the Indian-language versions and established language-specific cut-offs for identifying dementia and mild cognitive impairment. Their work emphasized that culturally and linguistically appropriate cognitive assessment is particularly important in India because of the considerable variation in educational and linguistic backgrounds. This supports our decision to use the Telugu version of the MoCA in the present study.

The effect of education is further supported by the recent normative study by Iype et al[3] (2024) from Kerala. In a large community-based sample of 959 cognitively normal older adults, the authors reported a mean MoCA score of 19.4 ± 7.3 and demonstrated that scores increased with higher educational attainment and decreased with advancing age. Importantly, they concluded that the conventional MoCA threshold may falsely classify a substantial proportion of Indian individuals as having mild cognitive impairment and suggested the need for population-specific thresholds. The mean score observed in our cancer cohort (21.3 ± 4.4) is therefore comparable with the normative scores reported from South India and raises an important concern regarding the use of the conventional cut-off of 26 in populations with limited education.[6]

This issue may partly explain the apparently high prevalence of cognitive impairment in our study. Using a cut-off of 26, 84.6% of our patients were classified as cognitively impaired. However, the high proportion of patients with no formal education makes it difficult to interpret all low MoCA scores as evidence of pathological cognitive impairment. The finding should therefore be considered as a high prevalence of low MoCA performance, rather than automatically equating every score below 26 with clinically established neurocognitive disorder. The results of Iype et al[3] and Kaul et al[11] strongly support the need for education- and population-specific interpretation of MoCA scores in Indian patients.

Our findings can also be compared with the Indian oncology literature. Dhanawat et al [5] evaluated cognitive impairment among older Indian patients with cancer, including patients with and without brain metastases. They reported cognitive impairment in 16% of patients with brain metastases and 16.2% of those without brain metastases, with no significant difference between the two groups. The prevalence observed in our study was considerably higher. However, the two studies are not directly comparable because Dhanawat et al[5] studied an older oncology population using a different clinical setting and methodology, whereas our study included patients with recently diagnosed solid malignancies and had a large proportion of patients with limited education. In addition, our study used the conventional MoCA cut-off of 26, which may increase the number of patients classified as impaired in low-education populations.

The difference between our findings and those of Dhanawat et al[5] also highlights the importance of the population in which cognitive impairment is assessed. In our study, patients with central nervous system metastases and known neurological or psychiatric conditions were excluded. Therefore, the cognitive impairment identified cannot simply be explained by brain metastases or established neurological disease. Instead, the findings suggest that low cognitive performance may be present in patients with systemic malignancy even in the absence of these recognized neurological risk factors.

The age-related findings in our study were also consistent with previous Indian normative data. Patients aged 60 years or older had somewhat lower MoCA scores than younger patients. Iype et al.[5] similarly demonstrated a significant reduction in MoCA scores with advancing age in their South Indian population. Their mean MoCA score decreased progressively across older age groups, while higher educational attainment was associated with better scores. Although our sample was too small to establish an independent effect of age, the similarity in direction of the findings supports the importance of considering age when interpreting cognitive scores in oncology patients.

The present study included patients with different types of solid malignancies, with breast cancer being the most common diagnosis, followed by lung and buccal mucosal cancers and several gastrointestinal malignancies. This broader representation differs from much of the existing cancer-related cognitive impairment literature, which has focused predominantly on breast cancer survivors. Janelsins et al[12] have demonstrated cognitive changes in breast cancer populations during and following chemotherapy, highlighting the importance of cognitive function as a treatment-related outcome. However, because our participants were assessed before prior chemotherapy, our study addresses a different question: the extent of cognitive impairment already present at the time of cancer diagnosis.

The findings from Gates et al[13] further support the value of baseline cognitive assessment. In their longitudinal study of patients with newly diagnosed aggressive lymphoma, cognitive function was evaluated before and during standard chemotherapy, allowing the investigators to examine cognitive changes over time. A similar longitudinal approach in our patient population would be useful because it could determine whether the cognitive impairment identified at baseline remains stable or changes following chemotherapy, radiotherapy or other cancer-directed treatments.

The high proportion of advanced-stage disease in our cohort is another factor that may have contributed to the observed cognitive findings. Most patients had stage III or IV malignancy. However, because of the small number of patients and the cross-sectional nature of the study, no firm conclusion can be drawn regarding the independent effect of cancer stage on cognition. Cancer-related factors such as disease burden, fatigue, nutritional status, pain, psychological distress and systemic inflammation may potentially influence cognitive function. Lange et al[9] also reported an association between cognitive complaints and fatigue in patients assessed before treatment, emphasizing that cognitive symptoms may occur alongside other cancer-related symptoms.

The clinical importance of these findings lies in the potential effect of cognitive impairment on cancer care. Cognitive difficulties may influence a patient's ability to understand information, participate in treatment decisions, remember instructions and adhere to complex treatment schedules. This may be particularly relevant in patients with limited educational backgrounds. Identification of low cognitive performance at the beginning of cancer care may therefore allow clinicians to provide additional counselling, simplify information, involve family members when appropriate and provide closer follow-up.

At the same time, the findings should not be interpreted as evidence that all patients with a MoCA score below 26 have clinically significant cognitive disease. The recent work of Kaul et al[11] and Iype et al[3] demonstrates that MoCA performance varies substantially across Indian languages, age groups and educational levels. Thus, the conventional international cut-off may not be appropriate when applied without consideration of local population characteristics. This is particularly relevant to our study because a large proportion of participants had no formal education.

Strengths of the study

One of the strengths of the present study is that cognitive assessment was performed in patients with newly diagnosed solid malignancies before prior chemotherapy exposure. The exclusion of patients with CNS metastases, psychiatric disorders, neurological disease and other recognized causes of cognitive impairment also reduced some important potential confounding factors. In addition, use of the Telugu version of the MoCA allowed assessment in the local language and made the screening process more appropriate for the study population.

Limitations

The study has several limitations. First, the sample size was small, with only 39 participants, which limits the statistical power of subgroup comparisons and the ability to identify independent predictors of cognitive impairment. Second, this was a single-centre, hospital-based cross-sectional study, and therefore the findings may not be generalizable to the wider Indian cancer population. Third, the study population had substantial variation in educational attainment, including a large proportion of participants with no formal education. This makes interpretation of MoCA scores using the conventional cut-off of 26 challenging.

In addition, the cross-sectional design does not allow assessment of changes in cognitive function over time or determination of whether cognition deteriorates, improves or remains stable during cancer treatment. Longitudinal assessment before and after chemotherapy or other cancer-directed treatment would provide a better understanding of treatment-related cognitive changes. Finally, the study did not include a matched healthy control group, which limits the ability to distinguish cognitive impairment related specifically to malignancy from the background prevalence of low cognitive scores in the local population.

Implications and future research

The findings suggest that cognitive screening may be worth considering as part of the baseline assessment of selected patients with newly diagnosed cancer, particularly older patients and those with limited educational attainment. However, the high prevalence observed in this study should be interpreted cautiously because educational background has a major influence on MoCA performance.

Future studies should include larger, multicentre cohorts with appropriate representation of different educational and socioeconomic groups. Population-specific normative data for the Telugu-speaking population, particularly for individuals with little or no formal education, would be valuable. Longitudinal studies incorporating assessment before and after cancer treatment would also help determine the contribution of malignancy and treatment to cognitive changes.

CONCLUSION

In this hospital-based cohort of patients with newly diagnosed solid malignancies, cognitive impairment was common even before exposure to chemotherapy. Lower educational attainment was significantly associated with lower MoCA scores. The findings highlight the importance of considering age and, particularly, educational background when interpreting cognitive screening results in Indian oncology patients. Larger longitudinal studies are needed to establish appropriate population-specific cut-offs and to determine the clinical significance and course of cognitive impairment in patients with cancer.

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