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Research Article

Cognitive Proficiency Evaluation In Haemodialysis Patients: Unveiling Insights With The Montreal Cognitive Assessment Scale

V. Sathish Kumar[1,2]*, T. Sai Swapna[3], D. Sumalatha[4], M. Lakshmi Surya Prabha[5], P. Srikanth[6]

[1]Research scholar, Dr. Samuel George Institute of Pharmaceutical Sciences, Markapur, Andhra Pradesh, India.
[2]Associate Professor, Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh, India.
[3]Assistant Professor, Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh, India.
[4]Professor and Principal, Department of Pharmacology, Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh, India.
[5]Medical Superintendent andProfessor, Department of community medicine, Government Teaching General Hospital, Rajahmundry, Andhra Pradesh, India.
[6]Professor, Department of Pharmacology, Dr. Samuel George Institute of Pharmaceutical Sciences, Markapur, Andhra Pradesh, India.

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ABSTRACT

Background:
Chronic Kidney Disease (CKD) can indeed have various effects on cognitive function, potentially leading to cognitive impairment. The impact of cognitive impairment on the quality of life for CKD patients is significant. Cognitive decline can affect daily activities, medication adherence, and the ability to manage one's health effectively.Methodology:204 subjects were included and the MoCA scale was utilized for detailed neurological examinations. In this study one way ANOVA and Kruskal Wallis test were used for statistical analysis.Results:Cognitive decline in CKD patients undergoing hemodialysis is measured using the MoCA scale as an assessment tool. According to our findings, patients with CKD on hemodialysis (HD) are more prone to mild cognitive decline than those with moderate and severe forms.Conclusion:It is clear from the study findings that cognitive decline is more prevalent in CKD patients who

***Corresponding Author:** V. Sathish Kumar
Address: *Associate Professor, Department of Pharmacology and Pharmacy Practice*
Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh, India.
Research scholar, Dr. Samuel George Institute of Pharmaceutical Sciences, Markapur, Andhra Pradesh, India.
Email : sathishvivek345@gmail.com

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undergo hemodialysis. The study identifies several contributing factors to cognitive impairment in these patients, emphasizing the pivotal role of cognitive assessment in the diagnosis of CKD.

INTRODUCTION

Recently, CKD has become a major problem, causing a significant health challenge due to its involvement in a myriad of multi-system complications.1KDIGO guidelines define chronic kidney disease (CKD) as a condition that involves a decrease in glomerular filtration and the accumulation of waste products in the body.2The prevalence of cognitive decline in CKD patients is higher than in the general population, illuminating the unique impact of kidney disease on cognitive function.3There are subtle difficulties in six cognitive domains, including complex attention, executive function, learning and memory, language, perceptual-motor skills, and social cognition, which are all part of the spectrum of mild cognitive impairment.4Chronic kidney disease (CKD) patients are five times more likely to develop both clinical and subclinical cerebrovascular diseases, as revealed in the study. CKD patients experience a stroke incidence rate of approximately 10% each year, which is much higher than the 2.5% observed in an age- and sex-matched population without CKD.5The combination of poor physical function, vascular dysfunction, and cognitive impairment creates a challenging triad that significantly heightens the risk for loss of independence and diminished health-related quality of life in individuals coping with chronic kidney disease (CKD).6 In this study, the MoCA scale was used to assess cognitive decline and to assess how various risk factors affect cognition in CKD patients undergoing hemodialysis. In the assessment of cognitive impairment, the Montreal Cognitive Assessment (MoCA) is often regarded as a superior instrument compared to the Mini Mental State Examination, particularly in pathologies involving damage to the nervous system.7The MoCA scale encompasses various cognitive domains such as orientation, execution, naming, memory, learning, recall, and delayed recall. Language, attention, a comprehensive evaluation is provided based on individual responses, with patients classified into normal, mild, moderate, and severe cognitive status, determined by the corresponding score they obtained in the assessment.8A significant proportion of patients diagnosed with CKD experience cognitive dysfunction, which establishes CKD as a prominent risk factor for the onset of mild cognitive impairment.9

AIM & OBJECTIVES:

- To conduct a neurological examination using the Montreal Cognitive Assessment (MoCA) scale in chronic kidney disease (CKD) patients undergoing hemodialysis, who have no previous history of cognitive decline.
- To fully understand the factors that contribute to cognitive decline in CKD patients, it is crucial to identify various risk factors, such as vascular complications, co morbidities, and the potential effects of hemodialysis.
- To enhance patient care and outcomes, it is imperative to guide healthcare professionals in incorporating cognitive assessment as an integral component of the comprehensive evaluation for individuals with chronic kidney disease (CKD).

Methodology:

MATERIALS AND METHODS:

- Informed consent form
- Data collection form
- MoCA questionnaire
- We obtained data from the patient's case file and conducted a MoCA questionnaire interview with the patient.

- Our data collection form was created by us and we entered the data into it.
- The study duration per patient was up to 20 minutes.

A cross-sectional observational study was conducted over a period of 8-month duration, from November 2021 to July 2022, at the dialysis unit in Manipal Hospital, Vijayawada involving 204 subjects who were selected based on predefined eligibility criteria. The procedure was explained in detail to all participants, and their voluntary consent was obtained. After answering a set of questions, the participants were classified into groups that ranged from normal to severe based on the scores they acquired during the study.

Study design:

A cross sectional observational hospital-based study.

Study criteria:

Inclusion criteria:

- Those with CKD who are on dialysis and are willing to participate in our study.
- Patients diagnosed with CKD and undergoing Hemodialysis
- All age groups >21 years of age
- Both the gender

Exclusion criteria:

- Those who are not willing to participate in our study
- People above 80 years of age
- People below 20 years of age
- People diagnosed with neurological problems
- People with Cerebrovascular diseases
- Pregnant women

Statistical analysis:

Graph Pad Prism 9 was used to input data and variables were added to the software. The ANOVA and Kruskal-Wallis tests were utilized as a statistical method.Each cognitive parameter was taken into account when calculating the means for all variables. $P < 0.05$ was considered statistically significant. Cognitive Impairment served as the outcome variable.

Plan of the work:

PHASE-1

- Literature review
- Protocol presentation
- Preparation of patient consent form
- Institutional Ethical committee approval

PHASE-2

- Designing of Data collection form
- Data collection form validation
- Obtained permission for usage of questionnaire [MMSE & MoCA]

PHASE-3

- Selection of subjects based on inclusion and exclusion criteria
- Taking informed consents
- Data collection
- Patient interviewed using questionnaire

PHASE-4

- Evaluation of results using statistical analysis

RESULTS AND DISCUSSION:

The study included 204 participants who were going through Hemodialysis for Chronic Kidney Disease. The findings show that the prevalence of mild cognitive impairment is greater than that of moderate and severe cognitive impairment among hemodialysis patients.The data was presented using descriptive statistics such as frequencies, mean, and standard deviation. At $p<0.05$, statistical significance was determined, and there was a 95% confidence interval.In this study, we systematically examined a range of variables including age, sex, co morbidities, uric acid levels, habits, and duration of dialysis, aiming to elucidate potential interrelationships with cognitive impairment in chronic kidney disease (CKD) patients on hemodialysis.

In this study, using the Montreal Cognitive Assessment (MoCA) scale, it was revealed that a significant number of chronic kidney disease (CKD) patients undergoing hemodialysis exhibit mild cognitive impairment. This cognitive decline is particularly pronounced in the middle-age demographic, ranging from 40 to 60 years with 69%, with a later onset observed in younger individuals aged 20 to 30 years with 61.6%. Our primary objective is to assess mild cognitive impairment, and our observations indicate a higher prevalence of this condition among males than females. Our study found a significant correlation between mild cognitive impairment and the stage of dialysis when analyzing the duration of dialysis as a variable. Cognitive impairment is more likely to occur among individuals in the early phase of dialysis (0-3 years) with 64.7% and those in the later stages (7-11 years) with 63.6%. While habits themselves may not emerge as significant contributors, our findings indicate that individuals with sociable habits are at a higher risk of experiencing cognitive impairment compared to patients with no social habits.Co morbidities indeed play a crucial role in cognitive impairment, as evidenced by our study. Specifically, individuals with comorbid conditions such as diabetes mellitus show a notable impact on cognition, and there is a heightened effect observed in those with a combination of hypertension and diabetes.The significant role of urea levels in cognitive decline in chronic kidney disease (CKD) patients undergoing hemodialysis is highlighted in our study.Individuals who have moderate-range urea levels are at a higher risk of experiencing cognitive decline. Our findings show that urea may be the primary factor in neurodegenerative processes associated with this population.

CONCLUSION:

Our study highlights the crucial role of the associative factors including habits, duration of dialysis, age, and uric acid levels in influencing cognitive functioning among chronic kidney disease (CKD) patients undergoing hemodialysis, as evaluated through the MoCA scale.Notably, our findings indicate that early stages of dialysis may exacerbate cognitive decline. Regular cognitive examinations, along with comprehensive CBC and electrolyte level assessments, are recommended for individuals on dialysis. The integrated approach has the potential to diagnose early and implement preventive interventions to mitigate cognitive impairment in this patient population.

Clinical significance:

Based on our study, it is unequivocal that cognitive impairment is a prevalent issue among chronic kidney disease (CKD) patients undergoing hemodialysis. Early assessment and proactive intervention in the form of routine cognitive assessments during regular check-ups not only enhance the quality of life for these patients but also contribute significantly to slowing down the progression of the disease. This interventional approach recommends the inclusion of cognitive assessments as an integral component of the standard care protocol for CKD patients on hemodialysis, emphasizing the importance of addressing cognitive health alongside traditional medical evaluations.

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REFERENCES:

1. Pépin M, Ferreira AC, Arici M, et al. Cognitive disorders in patients with chronic

kidney disease: specificities of clinical assessment. Nephrol Dial Transplant. 2022 Jul 26;37(8):1589doi:10.1093/ndt/gfab262

2. Levey, A. S., & Coresh, J. (2012). Chronic kidney disease. The Lancet, 379(9811), 165-180. https://doi.org/10.1016/S0140-6736(11)60178-5
3. Condé SA, Fernandes N, Santos FR, Chouab A, Mota MM, Bastos MG. Cognitive decline, depression and quality of life in patients at different stages of chronic kidney disease. J Bras Nefrol. 2010 Jul-Sep;32(3):242-8.
4. Murray AM. Cognitive impairment in the aging dialysis and chronic kidney disease populations: an occult burden. Adv Chronic Kidney Dis. 2008 Apr;15(2):123-32. doi: 10.1053/j.ackd.2008.01.010.
5. Bronas UG, Puzantian H, Hannan M. Cognitive Impairment in Chronic Kidney Disease: Vascular Milieu and the Potential Therapeutic Role of Exercise. Biomed Res Int. 2017;2017:2726369. doi: 10.1155/2017/2726369.
6. Bossola M, Antocicco M, Di Stasio E, Ciciarelli C, Luciani G, Tazza L, Rosa F, Onder G. Mini Mental State Examination over time in chronic hemodialysis patients. J Psychosom Res. 2011 Jul;71(1):50-4. doi: 10.1016/j.jpsychores.2011.01.001.
7. Paraizo Mde A, Almeida AL, Pires LA, Abrita RS, Crivellari MH, Pereira Bdos S, Fernandes NM, Bastos MG. Montreal Cognitive Assessment (MoCA) screening mild cognitive impairment in patients with chronic kidney disease (CKD) pre-dialysis. J Bras Nefrol. 2016 Mar;38(1):31-41. English, Portuguese. doi: 10.5935/0101-2800.20160006.
8. Dautzenberg G, Lijmer J, Beekman A. Diagnostic accuracy of the Montreal Cognitive Assessment (MoCA) for cognitive screening in old age psychiatry: Determining cutoff scores in clinical practice. Avoiding spectrum bias caused by healthy controls. Int J Geriatr Psychiatry. 2020 Mar;35(3):261-269. doi: 10.1002/gps.5227.
9. Xie Z, Tong S, Chu X, Feng T, Geng M. Chronic Kidney Disease and Cognitive Impairment: The Kidney-Brain Axis. Kidney Dis (Basel). 2022 May 3;8(4):275-285. doi: 10.1159/000524475.
10. Kumar VS, Rahaman SK, Deepika T, Manoj CH. Evaluation of Antibiotics and APACHE-II Score Correlation with Mortality in An Intensive Care Unit of Hepatic Impairment Patients at Tertiary Care Hospital Int. J. Pharm. Sci. Rev. Res., 59(1), 2019, 34-41.
11. Kumar VS, Bhavana P, Supriya CH, Rahaman SK A. Prevalence and Drug Utilization Pattern in Hepatic Impairment Patients at a Tertiary Care Hospital. Inter J Science Res, July 2017; 6[7]:1878 1883: https://www.ijsr.net/archive/v6i7/v6i7.
12. Kumar VS, Monika D, Malleswari K, Swapna TS, Shanmukha Rao N V, Ajay U, Srikanth P. Prevalence and assessment of prescription pattern analysis of acute febrile illness patients in tertiary care hospital: a prospective observational study. Int. J. Adv. Res. 11(01), 456-461 DOI: 10.21474/IJAR01/16037
13. Bhavana P, Kumar VS, Divya N, Pratheek KP, and Rao GE. Assessment of the prescription pattern of oral hypoglycemic drugs in uncomplicated diabetes mellitus patients at a tertiary care hospital. Int J Pharm Sci & Res 2018; 9(8): 3487-92. doi: 10.13040/IJPSR.0975- 8232.9(8).3487-92.
14. Kumar VS, Kumar NDP, Ajay U, Jyothi PD, Rahaman SK A. Impact of Patient Counseling and Drug Utilization Pattern on Asthma

Patients at Tertiary Care Hospital Int J Adv Pha Sci 2018;1[4]: 55-65.

15. Kumar VS, Manjula K, Ramyasri A, Nikitha D, Jyothi PD. Evaluation of Adherence to Therapy In Patients of Hypertension At Tertiary Care Hospital. Br J Bio Med Res, July-Aug 2018; 2[4]:459-465; DOI: https://doi.org/10.24942/bjbmr.2018.285
16. Kumar VS, Ajay U, Bhargavi N, Nikitha D, Jyothi PD. Assessment and Drug Utilization Pattern on Antiplatelet Agents in cardiovascular patients - A Prospective Study in Tertiary Care Hospital. Int J Pham Pha Res, 2019; Vol 14[2]: 109-119.
17. Kumar VS, Rahaman SK, Deepika T, Manoj CH. Evaluation of Antibiotics and APACHE-II Score Correlation with Mortality in An Intensive Care Unit of Hepatic Impairment Patients at Tertiary Care Hospital Int. J. Pharm. Sci. Rev. Res., 59(1), 2019, 34-41
18. Prasanth CH, Sathish Kumar V, Akhila M, Swathi V. Prescribing Pattern and Pharmacoeconomic Evaluation of Antihypertensive Drugs at a Tertiary Care Hospital. J Basic Clin Pharma 2018;9:308-310.
19. V. Sathish Kumar, N. Venkata Shanmukharao, M. Saianjani Reddy, M. Amar Teja and T. Uma Shankar , An Assessment of COVID-19 Mortality Risk with A Novel Scoring Method in A Tertiary Care Hospital in Andhra Pradesh: A Prospective Study.(2023).Int J Pharm Sci.14(2), p21-28 http://dx.doi.org/10.22376/ijpbs.2023.14.2.p21-28
20. Kumar VS, Kumar K H , Swapna TS, Vaishnavi BD, Pooja, Sumalatha G. Evaluation of Clinical Manifestations and Need of Antibiotics Use in Dengue Patients: A Therapeutic Challenge at a Tertiary Care Hospital. Int J of All Re Edu and Sci Met, 12(5), 2024, 3264 – 3272 DOI: https://doi.org/10.56025/IJARESM.2023.1205243264

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Table 1:Age wise Montreal Cognitive Assessment [MoCA] score.

Age(years)	Normal	Mild	Moderate	Severe
20-40	11(18.3)	37(61.6)	12(20)	0(0)
40-60	6(5.4)	76(69)	24(21.8)	4(3.6)
60-80	0(0)	15(44.1)	16(47)	3(8.8)

Table 2:Dialysis duration wise Montreal Cognitive Assessment [MOCA] score

Duration of dialysis (years)	Normal	Mild	Moderate	Severe
0 to 3	15(9.6)	101(64.7)	36(23.07)	4(2.5)
4 to 6	2(5.4)	20(54.0)	14(37.8)	1(2.7)
7 to 11	0(0)	7(63.6)	2(18.1)	2(18.1)

Table 3: Co-morbidities wise Montreal Cognitive Assessment [MoCA] score

Comorbidities	Normal	Mild	Moderate	Severe
NO	1(8.3)	8 (66.6)	3 (25)	10 (83.3)
HTN	8(8.08)	63 (63.6)	24 (24.2)	4 (4.04)
DM	0(0)	2 (100)	0 (0)	0 (0)
HTN & DM	6 (8.6)	46 (66.6)	15 (21.7)	2 (2.8)
HTN & CVS	0 (0)	7 (63.6)	4 (36.3)	0 (0)
OTHERS	5 (20)	13 (52)	5 (20)	2 (8)

Table 4:Urea levels wise Montreal Cognitive Assessment [MoCA] score

Urea levels (mg/dl)	Normal	Mild	Moderate	Severe
50-80	8(15.0)	25(47.1)	17(32.0)	2(3.7)
80-110	7(7.8)	50(56.1)	30(33.7)	2(2.24)
110-140	7(14.2)	29(59.1)	1122.4)	2(4.0)
140-170	1(7.6)	5(38.4)	6(46.1)	0(0)

Table 5:Habits wise Montreal Cognitive Assessment [MoCA] score

Habits	Normal	Mild	Moderate	Severe
No	13(8.9)	89(60.9)	40(27.3)	4(2.7)
Smoking	3(13.6)	15(68.1)	2(9.0)	2(9.0)
Alcohol	0(0)	5(62.5)	3(37.5)	0(0)
Smoking & Alcohol	1(3.5)	19(67.8)	7(25)	1(3.5)

Table 6: Gender wise Montreal Cognitive Assessment [MoCA] score

Gender	Normal	Mild	Moderate	Severe
Male	13(9.42)	91(65.9)	30(21.7)	4(2.8)
Female	4(5.8)	39(57.3)	22(32.3)	3(4.4)

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Table 7: P value table

Variables	P Value	Significance
AGE		
20 - 40	0.0001	Significant
41 - 60	0.0023	Significant
61 - 80	0.0028	Significant
GENDER		
MALE	0.0001	Not Significant
FEMALE	0.0001	Not Significant
DURATION OF DIALYSIS		
1 – 3	0.001	Significant
4 – 6	0.0021	Significant
7 -11	0.0024	Significant
COMORBIDITIES		
HTN	0.0022	Significant
DM	0.0021	Significant
HTN + DM	0.0028	Significant
HTN + CVS	0.0024	Significant
OTHERS	0.0023	Significant
HABITS		
ALCOHOL	0.001	Not Significant
SMOKING	0.0002	Not Significant
ALCOHOL + SMOKING	0.0014	Significant
UREA LEVELS		
50 – 80	0.002	Significant
81 – 110	0.0021	Significant
111 – 140	0.0021	Significant
141 – 170	0.0024	Significant

The P value for all the variables except gender and habits was significant (p<0.05*, p<0.001**).

Figure 1: AGE wise distribution of mean scores of different parameters

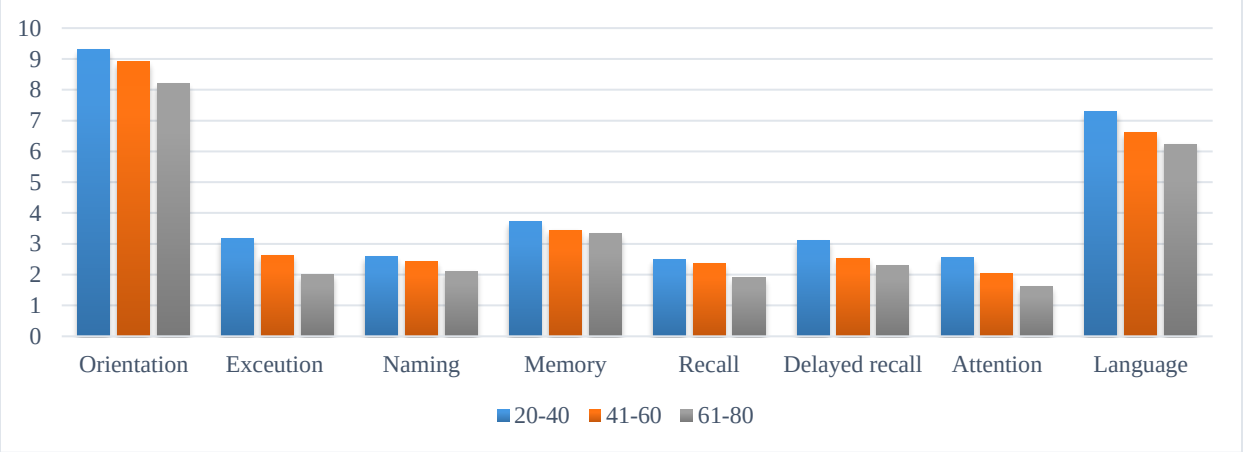

Figure 2:Gender wise distribution of mean scores of different cognitive parameters

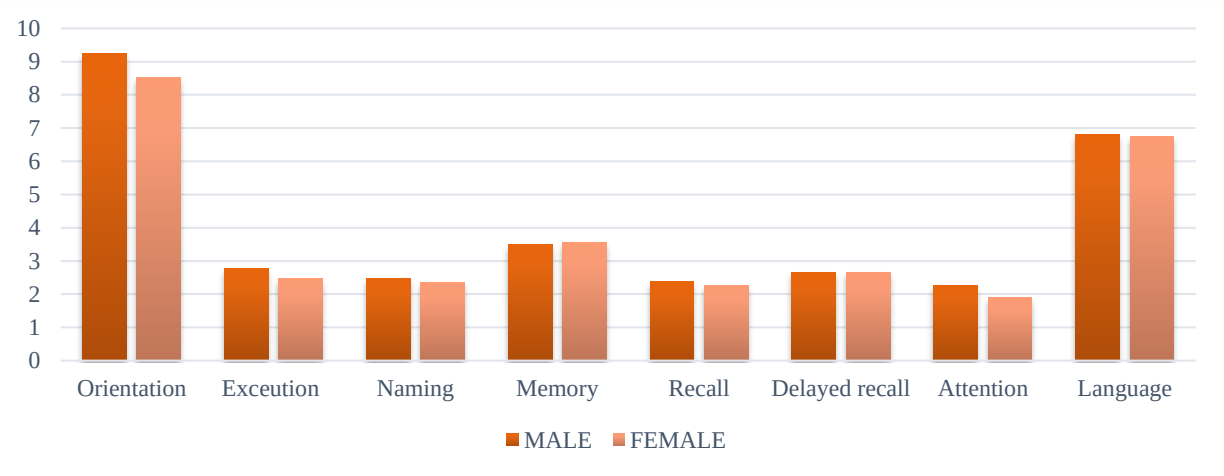

Figure 3:Dialysis duration wise distribution of mean scores of different cognitive parameters

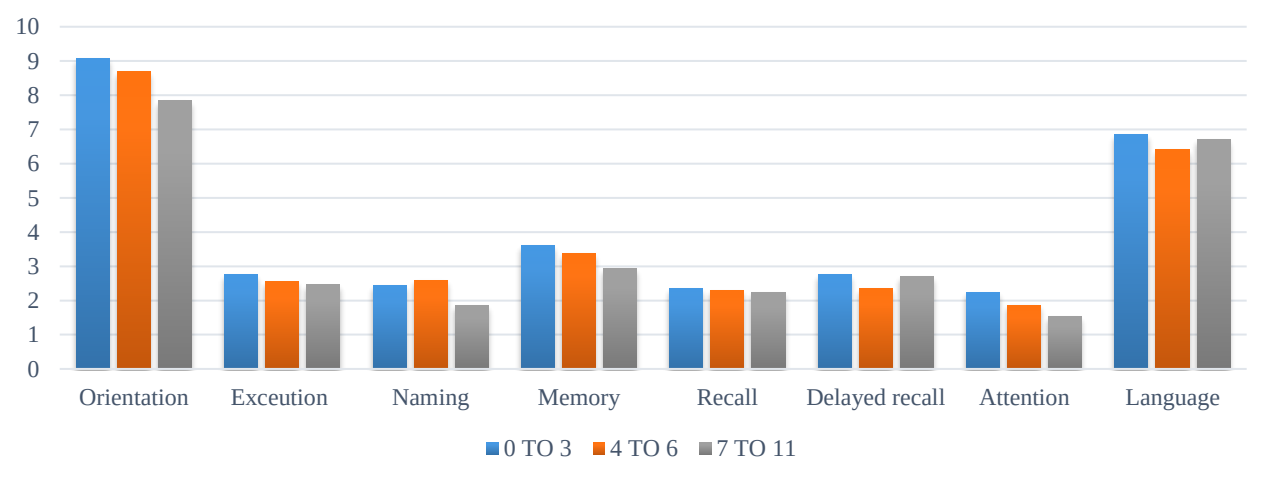

Figure 4:Co morbidities wise distribution of mean scores

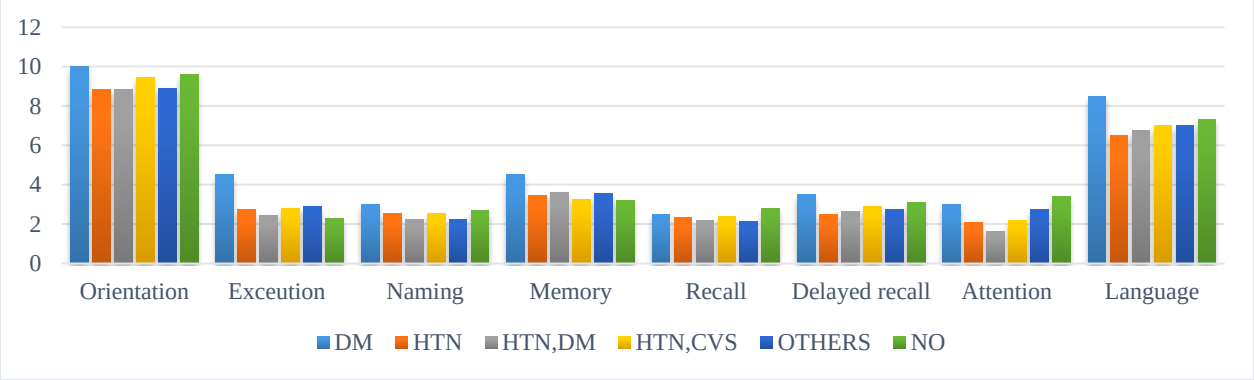

Figure 5: Habits wise mean scores of different cognitive parameters

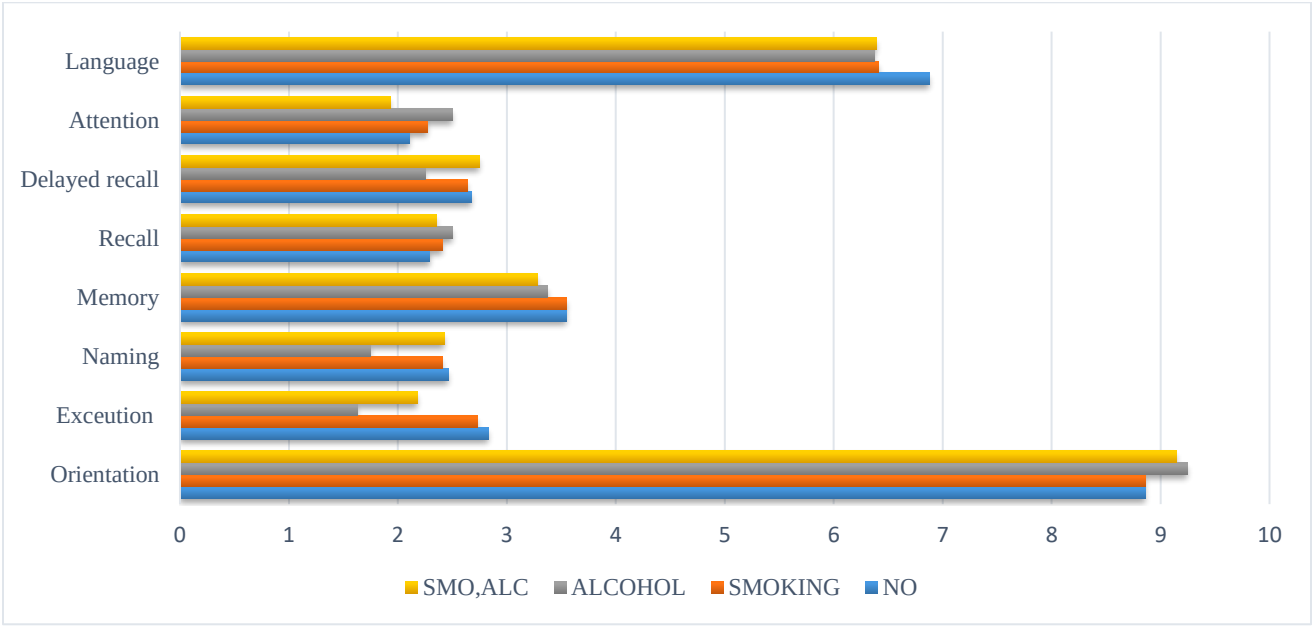

Figure 6: Uric acid wise mean scores of cognitive parameters