RESEARCH PAPER

Impact of Plasma Uric Acid and Albumin Levels with Severity of Parkinson's Disease in a Tertiary Coastal Hospital: An Observational study..

Dr. Prabakaran Vaithinathan[1]*, Dr. Nitesh Bholanath Yadav[2], Dr. Sakthivel Vaithiyanathan[3]
Dr. C.Ganesan[4]

*[1]*Assistant Professor, Department of General Medicine, Vinayaka Mission's Medical College and Hospital, Vinayaka Mission's Research Foundation (Deemed to be University), Karaikal, Puducherry, India*
[2]Post graduate, Department of General Medicine, Vinayaka Mission's Medical College and Hospital, Vinayaka Mission's Research Foundation (Deemed to be University), Karaikal, Puducherry, India
[3]Professor and Head of the Department, Department of General Medicine, Vinayaka Mission's Medical College and Hospital, Vinayaka Mission's Research Foundation (Deemed to be University), Karaikal, Puducherry, India
[4]Professor, Department of General Medicine, Vinayaka Mission's Medical College and Hospital, Vinayaka Mission's Research Foundation (Deemed to be University), Karaikal, Puducherry, India,

ABSTRACT
In recent years impact of Plasma Uric acid and albumin with the Severity of Parkinson's Disease has been studied but no Study has been done in this remote Coastal region of India. To find if plasma uric acid and albumin are independent risk factors for the progression of the severity of Parkinson's Disease in the coastal area of Karaikal A total of 44 cases over 14 months were recruited at Department of General Medicine, Vinayaka Mission's Medical college & Hospital, Karaikal. General data including age, sex, severity by Hoehn and Yahr Scale (H&Y scale) and Webster rating scale (WRS), Plasma uric acid and Albumin levels were assessed. As the Severity of Parkinson's Disease Increased the Plasma levels of uric acid and albumin were significantly decreasing. The P-value of serum Uric acid and Albumin with H&Y scale is <0.001 and with WRS is <0.001 which is statistically significant. Both plasma Uric acid and Albumin can be considered independent risk factor for Parkinson's Disease in the coastal region of Karaikal..

Keywords: Parkinson's disease, Serum Uric Acid, Serum Albumin, Interaction, Oxidative stress, Pathophysiology of Parkinson's..
How to cite this article: Vaithinathan P, Yadav NB, Vaithiyanathan S, Ganesan C , Impact of Plasma Uric Acid and Albumin Levels with Severity of Parkinson's Disease in a Tertiary Coastal Hospital: An Observational study..Int J Drug Deliv Technol. 2026;16 (2s): 719-723; DOI: 10.25258/ijddt.16. 719-723
Source of support:. None
Conflict of interest: None

INTRODUCTION

The incidence of Parkinson's disease among the neurodegenerative diseases is second only to Alzheimer's disease. The prevalence of PD differs throughout the world. The global prevalence of Parkinson's disease doubled over 26 years between 1990 to 2016 with an increase in all socio-demographic regions of the world, mainly related to aging population and longer disease duration. The overall incidence of PD in India is 70/100 000. However, 328/100 000 cases were identified among a Parsi community in Mumbai. PD is diagnosed clinically by cardinal features of bradykinesia, rigidity, and resting tremors with asymmetry of motor impairment and a good response to Levodopa, this predicted PD with more sensitivity known as U.K Brain Bank Criteria.[1-2] The characteristic pathological features of Parkinson's disease include the degeneration of dopamine-producing neurons in the substantia nigra pars compacta (SNc), decreased levels of striatal dopamine, and the presence of intraneuronal proteinaceous inclusions in cell bodies and axons that are positive for alpha-synuclein staining, known as Lewy bodies and Lewy neurites
collectively referred to as Lewy pathology. Research has also indicated that neuronal degeneration accompanied by Lewy pathology extends to cholinergic neurons in the nucleus basalis of Meynert (NBM), norepinephrine-producing neurons in the locus coeruleus (LC), serotonin-producing neurons in the brainstem's raphe nuclei, and neurons in the olfactory system, cerebral cortex, spinal cord, and peripheral autonomic nervous system.3 Oxidative stress is recognized as a key pathophysiological factor in Parkinson's disease (PD), with the harmful byproducts of oxidative stress—reactive oxygen species (ROS) and reactive nitrogen species (RNS)—playing a role in the degeneration of dopaminergic neurons in PD.[4-5] We propose that individuals in the later stages of PD commonly face challenges with swallowing, referred to as dysphagia, which can impact their ability to intake essential nutrients and ultimately result in poor nutritional health. Plasma albumin serves as a widely used marker in assessing nutritional status, with research indicating that PD individuals tend to have lower plasma albumin levels than

**Author for Correspondence: vpkn0304@gmail.com*

controls. Uric acid is proposed to have a biological Anti-oxidant property and can successfully neutralize reactive oxygen and nitrogen free radicals. Therefore, we studied the correlation of Plasma uric acid and albumin with the severity of Parkinson's disease in the coastal region of Karaikal.

MATERIAL AND METHODS

Study design: An observational study was undertaken to assess the association between plasma Uric acid and Albumin with severity of Parkinson's disease. The study was performed after getting appropriate institutional ethical committee approval and good clinical practice guidelines were followed. A total of 44 participants who presented to Department of General Medicine, VMMC, Karaikal from March 2023 to April 2024 after considering the inclusion and exclusion criteria were selected in the study. All subjects signed informed & written consent prior to the study. All PD patients were diagnosed after detailed history and Physical examination and the U.K Brain bank criteria was satisfied from diagnosing PD.

Hoehn and Yahr scale(H&Y) and Webster rating scale (WRS) were used to evaluate Disease stage or severity. Patients with CAD, malignancy, Gout, chronic liver disease or CKD, other neurodegenerative conditions, were excluded from the study. At the first initial visit all the clinical and lab parameters were collected.

Laboratory assessments: All blood samples were collected in the early morning. Immediate biochemical analysis was done after plasma separation. Plasma uric acid and Plasma Albumin are measured using a semi-autoanalyzer with Agappe made in India kit.

Statistical analysis: Descriptive Data from the study like age, H&Y stage, Webster rating scale, plasma Uric Acid and Albumin are predicted as mean ± standard deviation or median, while gender was presented as percentage correlation between variables was measured using Spearman correlation coefficient in SPSS software. P-value of <0.05 is considered statistically significant.

Results: Out of 44 participants 29(65.9%) were male and 15(34.1%) were female.

Majority of the participants n=15 (34.1%) belonged to age group of 71-80 years old. Mean age was 73.16±8.80 years. Range was 57-88 years. Majority of PD cases belonged to grade 3(38.6%) severity by H&Y scale, with minimum belonging to H&Y grade 5(6.8%). Similarly, with WRS majority of cases belonged to Moderate disability

29(65.9%) and least belonged to severe or advanced disability (5, 11.4.%).

Fig. 1: Age-wise distribution of study subjects.

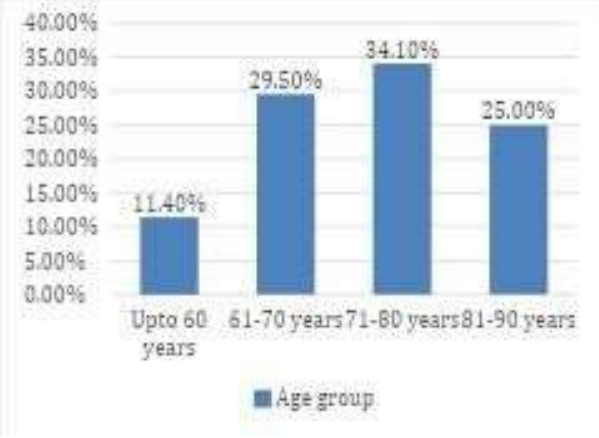
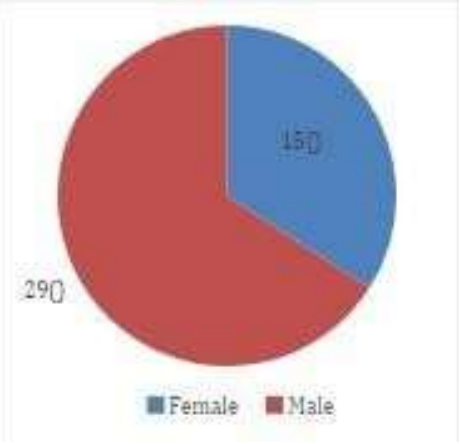
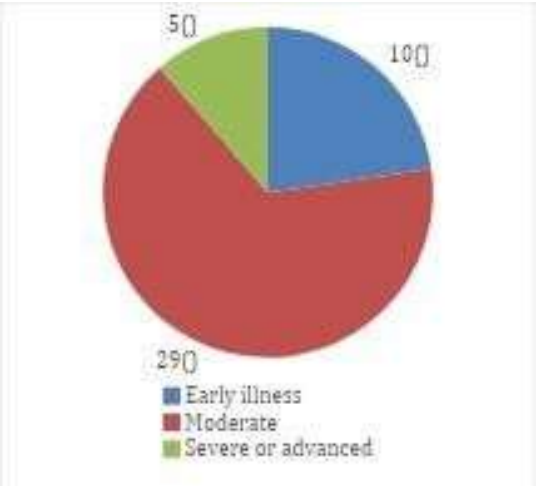


Fig. 2:Gender-wise Distribution of Study Subjects





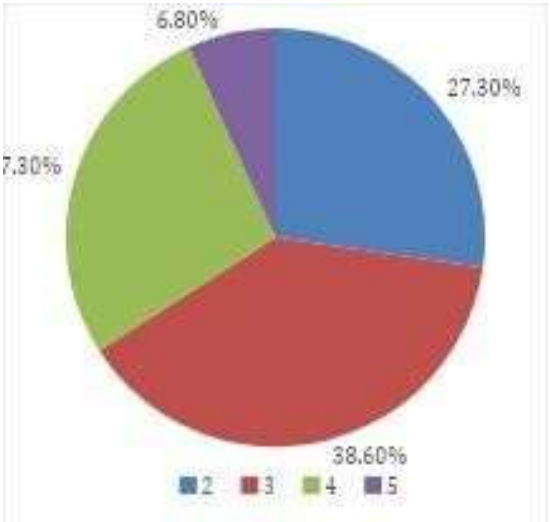


Fig. 3: Symptoms of Severity of parkinsonism as per WRS score in study subjects (n=44).
Fig. 4: Symptoms of Severity of parkinsonism as per H&Y in study subjects (n=44)

Table 1 shows that mean S. Albumin is 3.62 with ± 048 and Median of 3.65. The mean S. Uric acid value is 3.5 with ± 1.03 and Median of 3.3Table 2-3 shows the correlation between mean, median and standard deviation of S. Uric acid with H&Y scale and WRS. We found that as severity of PD
increases the Serum value of uric acid decreased. The UA level was maximum in H&Y scale 2 of 4.5 and least in H&Y scale 5 of 2.5. similar results were found when correlated with WRS. Table 6 **shows P-Value is <0.001 which is statistically significant for UA with severity of PD**

Table 1: Serum. albumin and Uric acid Values

	Albumin (gm/dl)	**Uric acid level (mg/dl)**
Mean	3.62	3.5
Std. Deviation	0.48	1.03
Median	3.65	3.3
IQR	3.2-4.0	2.92-3.97

Table 2. Correlation of S. Uric Acid with H&Y scale

H&Y Scale	Mean Uric acid	Median uric acid	Standard deviation
2	4.5	4.3	1.10901
3	3.4	3.3	0.74077
4	2.88	2.8	0.57064
5	2.5	2.4	0.36055

Table 3: Correlation of S. Uric Acid with WRS

WRS	Mean Uric acid	Median uric acid	Standard deviation
Early illness	4.31	4.05	1.18738
Moderate	3.41	3.3	0.83097
Severe or advanced	2.38	2.4	0.41419

Similarly, table 4-6 shows the correlation of S. Albumin with the severity of PD. As the severity of the disease increased the serum level of Albumin decreased. P-value

is <0.001 which is statistically significant. Our study also
revealed that Mean S. Uric acid in male cases is 3.48 and females is 3.52, while Mean S. Albumin in Male is 3.57 and females is 3.71

Table 4: Correlation of S. Albumin with H&Y scale

H&Y Scale.	Mean Albumin	Median Albumin	Standard deviation
2	3.95	4	0.31766
3	3.80	3.9	0.37495
4	3.25	3.2	0.30289
5	2.7	2.8	0.15275

Table5: correlation of S. Albumin with WRS

WRS	Mean albumin	Median albumin	Standard deviation
Early illness	4.02	4	0.21499
Moderate	3.62	3.6	0.40523
Severe or advanced	2.82	2.8	024899

Table 6: Statistical analysis using Spearman coefficient

		Uric acid	**Albumin**
WRS	r value	-0.74	-0.66
	p value	**<0.001**	**<0.001**
H & Y scale	r value	-0.73	-0.67
	p value	**<0.001**	**<0.001**

DISCUSSION

In our study, as the severity of PD increased (H&Y Scale IV & V and severe or advanced disability by WRS) the plasma UA and Albumin were on decreasing trend. Interestingly, uric acid (UA), a natural antioxidant, has the ability to counteract ROS and RNS. Data from Previous research has demonstrated that UA can eliminate superoxide., the hydroxyl. radical,and singlet.oxygen while reducing the consumption of other antioxidants like glutathione.(GSH) and superoxide.dismutase (SOD)[6-7]. Furthermore, various case-control studies have revealed that PD patients exhibit significantly lower levels of plasma uric acid compared to healthy subjects. Additionally, several prospective epidemiological studies have shown a correlation between high plasma uric acid levels and a reduced risk of PD[8-9]. Based on these findings, it is suggested that UA may offer neuroprotective benefits in PD. The results in our study were similar to previous studies.[7-10].

In a retrospective study by Sun, Shujuna al., concluded that an increase in plasma albumin level to more than 3.9mg/dl had better cognitive function and an independent association between less motor impairment and PD-related death to elevated plasma albumin levels was associated. We propose that individuals in the later stages of PD commonly face challenges with swallowing, referred to as dysphagia, which can impact their ability to intake essential nutrients and ultimately result in poor nutritional health. This discrepancy could potentially explain the lower levels of serum albumin observed in our study in patients classified in stage group IV-V on the H&Y scale and severe or advanced disability on WRS.

PD and Alzheimer's are both neurodegenerative disorders. Previous studies have shown lower albumin levels in Alzheimer's cases and its association with dementia severity.[11-12] Serum albumin serves as a widely used marker in assessing nutritional status, with research indicating that malnourished PD individuals with lower serum albumin levels tends to have lower cognitive score, higher H&Y score, longer course of disease than those with adequate nutrition. [13] A protein called Alpha-synuclein(aS) plays a key role in pathogenesis of PD, which causes oxidative stress and inflammation in brain. Albumin is a major component of CSF and blood plasma.

Studies have shown that human serum albumin (HSA) can stop the cycle that leads to aS proteins sticking together. It can change aS clumps into less harmful forms that don't interact with cell membranes as much, reducing their toxicity. HSA can also prevent aS from forming harmful fibrils and protect cell membranes from damage. Additionally, HSA can significantly reduce the aggregation of aS at levels found in human blood. HSA's antioxidant and anti-inflammatory properties have been noted in research, and it has been shown to protect the brain in other neuroinflammatory conditions like stroke and Alzheimer's disease.[14-17]

CONCLUSION

This study explains the association between lower Serum Uric and Albumin with severity of Parkinson's disease using the H&Y scale and WRS. The association was more significant in men than women. Both plasma uric acid and albumin is independent risk factor for Parkinson's Disease. To the best of our knowledge, our study is first to correlate this interaction in the coastal region of Pondicherry. No previous studies have correlated the severity of PD using Webster rating scale. There are limitations to our study. Both plasma Uric acid Albumin are affected by local dietary practices, local nutritional culture and tradition, physical activity, regions, etc., which were not considered. A cross-sectional prospective/longitudinal study should be done for further evaluation. As all sample were collected from a single hospital which might cause selection bias. A multicentered study should be done where serial analysis of plasma uric acid and albumin are done as patient's severity worsens...

REFERENCE

1. Harrison's Principles of Internal Medicine 21st edition.
2. Davidson's Principles and Practice of Medicine 24th edition.
3. Dopaminergic innervation of the human striatum in Parkinson's disease. Porritt M al., Mov Disord. 2005;20(7):810.
4. Challenging conventional wisdom: the etiologic role of dopamine oxidative stress in Parkinson's disease. Ahlskog JE al., Mov Disord. 2005;20(3):271.
5. Oxidative stress in PD. /doi.org/10.1002/ana.10483.
6. Protective effects of urate against 6-OHDA-induced cell injury in PC12 cells through antioxidant action. Neurosci Lett 506(2):175–179. doi:10.1016/j.neulet.2011.10.075
7. Shen L, Ji H-F. Low uric acid levels in patients with Parkinson's disease: evidence from meta-analysis. BMJ Open 2013;3: e003620. doi:10.1136/bmjopen-2013-003620
8. Serum uric acid level in Parkinson's disease and related disorders DOI: 10.1002/brb3.598
9. Impact of serum uric acid, albumin and their interaction on Parkinson's disease • DOI: 10.1007/s10072-016-2738-z
10. Serum albumin, cognitive function, motor impairment, and survival prognosis in Parkinson disease. doi: 10.1097/MD.0000000000030324
11. Elovaara I, Maury CP, Palo J. Serum amyloid A protein, albumin and prealbumin in Alzheimer's disease and in demented patients with Down's syndrome. Acta Neurol Scand.1986;74:245–50.
12. Kim TS, Pae CU, Yoon SJ, et al. Decreased plasma antioxidants in patients with Alzheimer's disease. Int J Geriatr Psychiatry. 2006;21:344–8.
13. Prevalence and risk factors for malnutrition in patients with Parkinson's disease. Front Neurol. 2020;11:533731.
14. Ouchi Y, Yoshikawa E, Sekine Y, et al. Microglial activation and dopamine terminal loss in early Parkinson's disease. Ann Neurol. 2005;57:168–75.
15. Rocha EM, De Miranda B, Sanders LH. Alpha-synuclein: pathology, mitochondrial dysfunction and neuroinflammation in Parkinson's disease. Neurobiol Dis.2018;109(PtB):249–57.
16. Niranjan R. The role of inflammatory and oxidative stress mechanisms in the pathogenesis of Parkinson's disease: focus on astrocytes. Mol Neurobiol. 2014;49:28–38.
17. Serum albumin impedes the amyloid aggregation and hemolysis of human islet amyloid polypeptide and alpha synuclein. Biochim Biophys Acta Biomembr. 2018;1860:1803-9