Research Article

www.ijrap.net

(ISSN Online:2229–3566, ISSN Print:2277–4343)

EVALUATING THE CORRELATION BETWEEN TAILA BINDU PARIKSHA AND GLOMERULAR FILTRATION RATE (GFR) IN THE PROGNOSIS OF CHRONIC KIDNEY DISEASE (CKD): A CROSS-SECTIONAL PILOT STUDY

Sagarika Purohit [1]*, Pavneet Kaur [1], Monika [1], Dolly Thakur [2], Sumit Srivastava [3]

[1] PG Scholar, Department of Roga Nidana evum Vikriti Vigyana, Shri Dhanwantry Ayurvedic College and Hospital Chandigarh, India

[2] Professor, Department of Roga Nidana evum Vikriti Vigyana, Shri Dhanwantry Ayurvedic College and Hospital, Chandigarh, India

[3] Professor and HOD, Department of Roga Nidana evum Vikriti Vigyana, Shri Dhanwantry Ayurvedic College and Hospital, Chandigarh, India

Received on: 06/8/25 Accepted on: 12/10/25

***Corresponding author**
E-mail: sagarikapurohit12@gmail.com

DOI: 10.7897/2277-4343.165172

ABSTRACT

Introduction: In Ayurveda, Roga Rogi Pariksha (examination of disease and patient) forms the foundation for diagnosis and treatment planning. Among the eight classical diagnostic methods, Astavidha Pariksha, Mutra Pariksha (urine examination) holds special importance. Taila Bindu Pariksha (TBP), a traditional urinary test, involves placing an oil drop on urine and observing its spread and pattern to infer disease prognosis. In modern nephrology, Glomerular Filtration Rate (GFR) is considered the gold standard for assessing renal function. This study aimed to evaluate the correlation between TBP findings and GFR values to explore the prognostic potential of this traditional test in Chronic Kidney Disease(CKD). Materials and Methods: A cross-sectional pilot study was conducted on 35 diagnosed CKD patients. Early morning midstream urine samples were collected and examined using Taila Bindu Pariksha under controlled conditions. The rate of spread and the shape of the oil drop were recorded. Corresponding GFR values were obtained from patient records. Statistical analysis was performed to assess the correlation between TBP findings and GFR. Results: A significant correlation was observed between the rate of spread in TBP and GFR values, suggesting that faster or wider spreading patterns were associated with reduced kidney function. However, no significant correlation was found between the oil drop shape and GFR. Conclusion: Taila Bindu Pariksha shows promise as a simple, non-invasive, and cost-effective complementary tool for assessing CKD progression. Larger studies with standardized methods and inclusion of additional biochemical markers are needed to validate its diagnostic and prognostic utility.

Keywords: GFR, Sadhyaasadhyata, Taila Bindu Pariksha

INTRODUCTION

Background

Chronic Kidney Disease (CKD) is one of the most fatal diseases all over world. In India, the approximate prevalence rate of CKD is 800 per million population, and the incidence of end stage renal disease is 150-200 per million population. The number of CKD related deaths has increased by 75% since 2000 (10,200 deaths) .[1] CKD is a syndrome marked by a slow decline in renal function caused by the gradual degradation of the renal parenchyma, which finally results in mortality when enough nephrons are damaged.[2] CKD is typically defined as Glomerular Filtration Rate (GFR) <60 mL/min/1.73 m2 or the presence of other markers of kidney deterioration such as albuminuria.[3] Each kidney contains millions of functional units known as nephrons. Within every nephron, the glomerulus filters blood, permitting water and small molecules to pass through while preventing the loss of larger molecules, blood cells, and proteins like albumin. The most reliable measure of glomerular function is the Glomerular Filtration Rate (GFR), defined as the volume of fluid filtered by the glomeruli per minute, expressed in millilitres. The normal GFR for an adult male is 90 to 120 mL per minute.[4] The Glomerular filtration rate is a measure of how much the kidneys is functioning properly. The GFR is the sum of the ultrafiltration rates from plasma into the Bowman's space in each nephron, and it measures the renal excretory function.[5] Based on the level of GFR and severity of the disease CKD has been subdivided into 5 stages. To understand the stage of CKD, it is necessary to estimate the GFR rather than relying on serum creatinine concentration. GFR is widely accepted as the best measure of kidney function in health and disease.[6] These scales and criteria are used by doctors and researchers to assess how a patient's disease is progressing, and determine appropriate treatment and prognosis. For most adults, a GFR of over 90 ml/min/1.73 m² is considered normal. However, a GFR of 60 ml/min/1.73 m² or higher is also considered within the normal range if you do not have other signs of kidney disease. A GFR lower than 60 ml/min/1.73 m² may be an indication that you have kidney disease. When GFR falls to 15 ml/min/1.73 m² or lower, it can be a sign that you have kidney failure.[7]

If one looks into Ayurvedic texts then one can find the art of prognosis was well developed in the ancient times. In 16th century AD, Taila Bindu Pariksha a urine test for knowing prognosis was popular.[8,9,10] Taila Bindu Pariksha can be used to assess prognosis in any disease based on the rate of spread, direction of the oil drop, and the shape that appears after the examination. It was a popular prognostic tool in the past, but now a days it is not specifically used; hence, there is a need to re-establish its utility so that it can be effectively applied in the future. The aim of the study is to correlate the findings in Taila Bindu Pariksha and compare them with GFR in the prognosis of CKD. The objectives of the study are: to study the rate of spread of the oil drop in CKD

patients through Taila Bindu Pariksha, and to observe any specific shape pattern found in the urine of CKD patients after performing Taila Bindu Pariksha. The hypothesis for the study includes: H_1 (Alternative Hypothesis): There is a significant correlation between the findings of Taila Bindu Pariksha and the GFR in the prognosis of CKD. H_0 (Null Hypothesis): There is no significant correlation between the findings of Taila Bindu Pariksha and the GFR in the prognosis of CKD.

MATERIALS AND METHODS

Study design: Observational study.

Setting and participants: For this pilot study, 35 CKD patients were enrolled from the institution. A comprehensive clinical history and examination were conducted and documented using a pre-designed proforma. GFR scoring was employed to assess prognosis. Early morning urine samples were collected from all patients, and Taila Bindu Pariksha was conducted.

Inclusion Criteria and Exclusion criteria: Patients diagnosed with CKD, able to provide a urine sample minimum 50 ml, regardless of age or gender, and willing to participate were included. Unconscious patients, menstruating women, and those under catheterization were excluded.

Ethical consideration: Informed consent was obtained from all participants. They were informed about the purpose of this pilot study and assured that their responses would remain confidential and their identities would be kept anonymous.

Data Sources

Taila Bindu Pariksha: We standardized all parameters using a previously established Standard Operating Procedure (SOP). Adhering to this SOP ensured consistency and accuracy throughout the sample collection and analysis process.[11]

Use of Specific Container and Oil Type: A 4-inch glass Petri dish was selected for its availability and optimal shape, making it suitable for consistent observation of oil behaviour. As described by Acharya Basavarajeeyam, black sesame (Til) oil was chosen due to its higher viscosity and specific gravity,[11] both of which are essential for achieving accurate and reproducible results.

Sample Requirements and Data Collection: For each analysis, a minimum of 50 ml of urine was collected. The interaction between the oil droplets and the urine was observed for a fixed duration of 2 minutes, as preliminary observations indicated that most significant pattern changes occurred within this time frame.

Cleaning and Preparation: The container used for testing, often a Petri dish, underwent thorough cleaning to ensure reliability. The cleaning procedure involved immersing the dish in chromic acid for 24 hours, followed by washing with tap water, rinsing with distilled water, and drying in an oven. This meticulous preparation was essential to maintain the reproducibility and accuracy of the tests.[12]

As describe in the Literature the prognosis of the disease by the examination of urine (Taila Bindu Pariksha), Yogaratnakar and Vangasena have mentioned that Sadhya (curable), Kashtasadhya (difficult to cure), and Asadhyata (incurable) can be assessed from Rate of Spread. If drop of oil spreads fast: Disease is easily curable, if drop of oil spreads slowly: Disease is difficult to treat, if drop of oil sinks: Disease is incurable.[13] Variation of shape is sadhya (curable) if the oil drop assumes shapes like Hansa, lotus, Chamara, Torana, Parvata, elephant, camel, tree, umbrella, or house. Shapes such as Valli, Mrdanga, Manushya, Bhanda, Chakra, or Mriga indicate Kashtasadhya (difficult to cure). Shapes resembling tortoise, buffalo, honey-bee, bird, headless human body, Astra, or Khanda suggest an Asadhya (incurable condition).[14]

Measurement

Observations were conducted in a cabinet (square-shaped setup) that was enclosed on all sides to eliminate external air disturbances, which could otherwise affect oil pattern formation. A fixed volume of 12µl of sesame oil was dispensed using a micropipette to ensure precision. The micropipette socket was securely positioned at the centre of the cabinet, close to the camera, to maintain consistency in droplet placement. To minimize surface wave interference, oil droplets were released from a height of 1 cm above the urine surface, ensuring the fluid remained calm and undisturbed during the test.

A fixed directional orientation was maintained using a compass, and the direction of oil spread was marked accordingly for accurate interpretation. A centrally positioned 5-megapixel fixed camera was used to capture both videos and still images of the evolving oil patterns, which were later analysed using computer software. The entire procedure was carried out under controlled environmental conditions with standardized parameters to eliminate variability caused by air currents, thereby ensuring accuracy, consistency, and reproducibility of the results.

Criteria of Assessment

The present analysis investigates the relationship between GFR values and the behaviour of oil drop, focusing on two key parameters: the rate of spread and shape. The rate of oil drop spread was categorized based on video observations. An oil spread occurring in less than 10 seconds was classified as a fast spread and interpreted as Sadhya (curable) [Figures 1-3]. Spreads taking more than 10 seconds were considered slow spreads, indicating Kashtasadhya (difficult to cure) [Figures 4 and 5]. If the oil drops no spread or sinks to the bottom, irrespective of the spread time, it was categorized as sink, [Figures 6-8] suggestive of an Asadhya (incurable) prognosis. The shape of the spread was recorded as either regular, with smooth outlines and no projections, indicating a Sadhya (curable) condition, or dot, irregular with protrusions or uneven borders, suggestive of an Asadhya (incurable) condition.[15]

Bias in the Study

The study presents several potential biases that may affect the validity and generalizability of its findings. Selection bias is evident as the study included only 35 CKD patients from a single institution, limiting the sample size and geographic diversity, and thus may not represent the broader CKD population. Observer bias may have influenced results, as the interpretation of Taila Bindu Pariksha parameters such as rate, direction, and shape of oil drop spread is inherently subjective and may vary between observers, leading to inconsistencies. Measurement bias is also a concern, as urine composition factors like pH and protein content, which can affect the oil drop's behaviour, were not standardized or controlled. Additionally, confounding bias arises from unaccounted variables such as hydration status, dietary habits, medication use, and comorbidities like diabetes and hypertension, which could influence both GFR and urine characteristics. The absence of additional biomarkers, such as serum creatinine, blood urea nitrogen, and albuminuria, further weakens the ability to establish a robust correlation between Taila Bindu Pariksha and CKD prognosis. Lastly, the small sample size introduces a bias

that limits statistical power and generalizability, underscoring the need for larger, multi-centered studies to validate and refine these preliminary observations.

RESULT

Participants: A total of 35 participants diagnosed with CKD, as per the inclusion criteria, were enrolled in the study. All participants were advised to follow a similar diet 24 hours prior to sample collection, maintain proper sleep, and provide their early morning midstream urine samples, collected as the first void of the day. The urine samples were collected and analysed within two hours of collection using a standardised cabinet. Based on the rate of oil spread observed during the test, fast spread (more than 10 seconds) was seen in 21 participants, a slow spread (less than 10 seconds) was noted in 8 participants, and in 6 participants, the oil drop sinks down.

Rate of Spread and Renal Function: The descriptive data reveal that the rate of spread significantly correlates with GFR values. Fast spreading conditions are associated with the highest average GFR (41.22 ml/min/1.73 m²), suggesting that in cases where the disease progresses rapidly, patients may still have relatively better kidney function. On the other hand, slow spreading with average GFR (28.50 ml/min/1.73 m²) and sink conditions average GFR (22.83 ml/min/1.73 m²) show progressively lower average GFR, these findings imply that slower disease progression might be associated with more significant and sustained renal damage [Table 1]. The statistical analysis confirms significant differences in GFR across these groups (ANOVA, $p < 0.09$), validating the impact of the rate of spread on kidney function [Table 2]. Furthermore, a homogeneity of variances test ($p > 0.05$) indicates that the variance between groups is consistent, reinforcing the reliability of these results [Table 3].

Shape of oil drop and Renal Function: Based on the observation, the shape of the oil drop seems insignificant as confirmed by Chi-square test ($p > 0.05$) [Table-4]. However, the small sample size limits the ability to draw definitive conclusions about whether the Shape of the oil drop follows a regular or irregular pattern. While the data suggest potential trends in disease progression such as variations in GFR based on directional spread and rates of progression the limited number of patients makes it difficult to generalize these findings to a larger population.

Table 1: Descriptive Statistics rate of Spread

Descriptive Statistics					
GFR	Rate of Spread	N	Mean	SD	SE
	Fast spread(>10sec)	21	41.2	26.4	5.76
	Slow Spread(<10sec)	8	28.5	17.0	6.01
	Sink down	6	22.8	12.4	5.04

Table 2: One-Way ANOVA (Welch's) test

One-Way ANOVA (Welch's)				
GFR	F	df1	df2	p
	2.82	2	15.9	0.089

Table 3: Homogeneity of Variances test

Homogeneity of Variances test (Levene's test)				
GFR	F	df1	df2	p
	o.459	2	32	0.636

Table 4: Chi-Square ($\chi 2$) Tests On Shape of the Oil Drop

Chi-Square ($\chi 2$) Tests (On Shape of the Oil Drop)			
	Value	df	P
$\chi 2$	2.33	2	0.311
N	35		

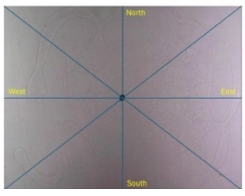

Figure 1: Fast Spread and Irregular Shape

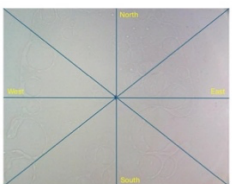

Figure 2: Fast spread and Irregular Shape

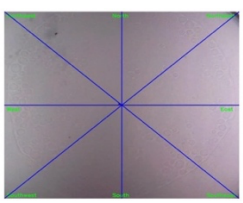

Figure 3: Fast spread and Irregular Shape

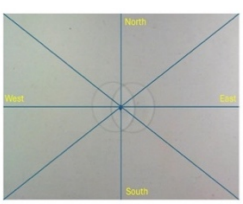

Figure 4: Slow Spread and Regular Shape

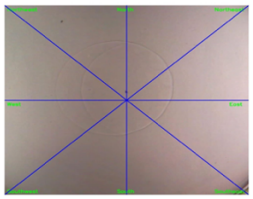

Figure 5: Slow Spread and Regular Shape

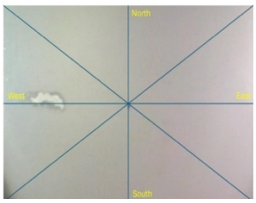

Figure 6: Direction of the oil drop spread and sink

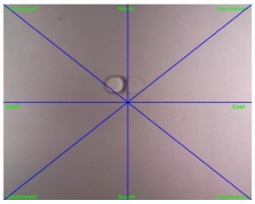

Figure 7: No Spread dot Shape

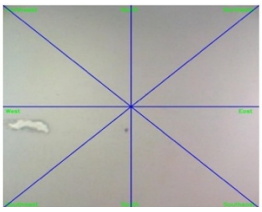

Figure 8: Direction of the oil drop spread and sink

DISCUSSIONS

Key Result: The study found a significant correlation between Taila Bindu Pariksha and GFR in assessing CKD prognosis. Fast spreading was associated with higher GFR (41.22 ml/min/1.73 m²), indicating better kidney function, whereas slower spreading (28.50 ml/min/1.73 m²) and sinking of oil drops (22.83 ml/min/1.73 m²) correlated with worsening renal function. However, the shape of the oil drop did not show a significant correlation ($p > 0.05$), which may be due to the small sample size. These results suggest that Taila Bindu Pariksha could serve as a non-invasive, complementary diagnostic tool for CKD prognosis, though further research with larger sample sizes and additional biomarkers is needed for validation.

Interpretation: Each kidney contains approximately one million filtering units called glomeruli. These glomeruli are composed of microscopic clusters of capillaries with small pores that allow selective filtration of blood. This filtration system is designed to permit the passage of fluid and small molecules into the renal tubules while restricting the passage of larger molecules such as proteins and blood cells. The filtrate is then modified by the tubules through processes of secretion and reabsorption, eventually forming urine, which drains through progressively larger ducts to exit the kidney. Under normal physiological conditions, this system does not permit significant leakage of proteins or blood cells into the urine. However, in pathological conditions such as CKD, this selective permeability is often compromised. For instance, in glomerulonephritis (or nephritic syndrome), inflammation of the glomeruli leads to the escape of proteins and blood cells into the urine due to damaged capillary walls. In nephrotic syndrome, extensive damage to the glomerular capillaries results in marked proteinuria. Additionally, urinary tract infections (UTIs) may cause the presence of pus cells or other contaminants in the urine, further altering its composition.[16] The Taila Bindu Pariksha involving the behaviour of oil droplets in urine, may be influenced by these altered urinary constituents. Although the exact nature of the minor constituents responsible for the spread of oil remains unknown, some studies suggest that surface-active molecules and other trace metabolites, undetectable by conventional methods, play a critical role in determining the pattern of oil dispersion.[17] These molecules may be involved in modifying surface tension or local micro-environmental factors in the urine. Hence, understanding the biochemical nature and behaviour of these minor urinary constituents is essential for standardising and interpreting Taila Bindu Pariksha findings, especially in conditions like CKD where urinary composition is significantly altered.

Limitations of the Study: This study had several notable limitations. The most significant is the small sample size ($n = 35$), which limits the statistical power and generalizability of the findings to the broader CKD population. Additionally, the study did not incorporate other critical renal biomarkers such as serum creatinine, blood urea nitrogen (BUN), or albuminuria, which would have enhanced the depth and reliability of clinical correlations. The visual interpretation of oil drop characteristics in Taila Bindu Pariksha such as rate, direction, and shape introduce a degree of observer bias, despite efforts to standardize procedures. Furthermore, the cross-sectional nature of the study restricts its ability to assess the prognostic utility of Taila Bindu Pariksha over time.

The direction of oil spread could not be accurately assessed in all samples due to the presence of only minute changes, making it difficult to determine a clear direction. This limitation may be addressed in future studies with a smaller and more controlled sample size. Finally, as the study was conducted in a single tertiary care Ayurvedic hospital, the results may be influenced by selection bias, thereby limiting their external validity and applicability to other clinical settings.

Generalisability: The study's generalizability is limited due to its small sample size (35 patients), single-centre setting, and lack of diverse representation. The findings may not apply to broader CKD populations with varying genetic, environmental, and lifestyle factors. A larger, multi-centre study with diverse participants is needed for broader applicability.

CONCLUSION

As this is a pilot study aimed at exploring the potential correlation between Taila Bindu Pariksha and CKD progression, the findings are preliminary but promising. A significant association was observed between the rate of oil spread and GFR, indicating a potential link with renal function. However, the shape of the oil drop did not yield significant results, possibly due to the limited sample size. Despite these limitations, Taila Bindu Pariksha may serve as a complementary, non-invasive tool for assessing progression of a disease, offering a traditional yet scientifically relevant method to aid in early detection and prognosis. To establish its clinical applicability, further research involving larger sample sizes, longitudinal follow-up, and integration of additional renal biomarkers is essential.

REFERENCES

1. Agarwal SK, Srivastava RK. CKD in India: challenges and solutions. Nephron Clin Pract. 2009;111(3):c197-203; discussion c203. doi: 10.1159/000199460. Epub 2009 Feb 5. PMID: 19194110.
2. Mohan H, Damjanov I. Textbook of Pathology. 8th ed. New Delhi: Jaypee Brothers Medical Publishers; 2019. p. 683.
3. Coresh J, Astor BC, Greene T, Eknoyan G, Levey AS. Prevalence of CKD and decreased kidney function in the adult US population: Third National Health and Nutrition Examination Survey. Am J Kidney Dis. 2003;41(1):1–12. doi:10.1053/ajkd.2003.50007. PMID: 12500213.
4. Physiopedia. Renal Function Test (RFT) [Internet]. Physiopedia; [cited 2025 May 2]. Available from: https://www.physio-pedia.com/Renal_Function_Test_(RFT) [Last assessed on 2025- JUL-25]
5. Ralston S, Penman ID. Davidson's Principles and Practice of Medicine. 23rd ed. Elsevier; 2018. p. 386.
6. Loscalzo J, Kasper DL, Longo DL, Fauci AS, Hauser SL, Jameson JL. Harrison's Principles of Internal Medicine. 21st international ed. Vol. 2. McGraw Hill; 2022. p. 2309.
7. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Explaining kidney test results [Internet]. Bethesda (MD): NIDDK; [updated 2017 Dec; cited 2025 May 2]. Available from: https://www.niddk.nih.gov/health-information/professionals/advanced-search/explain-kidney-test-results[Last assessed on 2025- JUL-25]
8. Shastri L. Yogaratnakara, Purvardha, Mutra Pariksha, Ver. 2–22. 7th ed. Varanasi: Chaukhamba Sanskrit Bhawan; 1993. p. 10–2.
9. Nirmal. Vangasena Samhita of Vangasena, Aristadhikar. 1st ed. Varanasi: Chaukhamba Sanskrit Series; 2009. p. 997–9.
10. Sharma G. Vasavarajiyam of Vasavaraja. Reprint ed. Varanasi: Chaukhamba Sanskrit Pratisthan; 2005. Chapter 3, p. 69–71.
11. Vasavaraja. Vasavrajiyam. Goverdhana Sharma, editor. 1st ed. Gorakhpur: Gorakshana Yantralaya; 1930.
12. Kar AC, Sharma R, Panda BK, Singh VP. A study on the method of Taila Bindu Pariksha (oil drop test). Ayu. 2012;33(3):396–401. doi:10.4103/0974-8520.108851. PMID: 23723648; PMCID: PMC3665087.
13. Shastri L. Yogaratnakara Vaidyotini. Varanasi: Chaukhamba Prakashan; 2010. Mutrapariksha 1/6. p. 11.
14. Shastri L. Yogaratnakara Vaidyotini. Varanasi: Chaukhamba Prakashan; 2010. Mutrapariksha 1/15-19. p. 13.
15. Rana D, Priya M, Bhuyan SS, Kar AC. Comparative study of features of Taila Bindu Pareeksha in rheumatic heart disease patients before and after treatment. Pharmacognosy and Natural Remedies. 2022;13(Suppl 10):710. doi:10.47750/pnr.2022.13.S10.710.
16. Merck Manuals. Overview of Kidney Filtering Disorders. Merck Manuals Consumer Version, Available from: https://www.merckmanuals.com/home/kidney-and-urinary-tract-disorders/kidney-filtering-disorders/overview-of-kidney-filtering-disorders. [Last assessed on 2025- JUL-25]
17. Sharma R, Kar AC, Panda BK. Study of Taila bindu pariksha on artificial urine. Int J Res Ayurveda Pharm. 2015;6(1):15–17. doi:10.7897/2277-4343.0614

Cite this article as:

Sagarika Purohit, Pavneet Kaur, Monika, Dolly Thakur and Sumit Srivastava. Evaluating the correlation between Taila Bindu Pariksha and Glomerular Filtration Rate (GFR) in the prognosis of Chronic Kidney Disease (CKD): A cross-sectional pilot study. Int. J. Res. Ayurveda Pharm. 2025;16(5):67-71
DOI: http://dx.doi.org/10.7897/2277-4343.165172

Source of support: Nil, Conflict of interest: None Declared