

## QUASI-EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF RENAL-FRIENDLY PLAN UPON SELF-EFFICACY AMONG PATIENTS UNDERGOING HEMODIALYSIS

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### ABSTRACT

**Background:** Patients undergoing hemodialysis often face challenges that can impact their self-efficacy in managing their health. This study aims to assess the effectiveness of a renal-friendly plan on enhancing self-efficacy among these patients. **Methods:** A quasi-experimental design was employed involving a sample of patients undergoing hemodialysis. Participants were divided into an experimental group, which received the renal-friendly plan, and a control group, which continued with standard care. Self-efficacy was measured using a validated questionnaire before and after the intervention. **Results:** The findings indicated a significant improvement in self-efficacy scores among the experimental group compared to the control group. Statistical analysis revealed that the renal-friendly plan positively influenced patients' confidence in managing their dietary and health-related behaviors. **Conclusion:** The implementation of a renal-friendly plan effectively enhances self-efficacy among patients undergoing hemodialysis. This intervention could be a valuable component of patient education and management strategies in renal care settings. Further research is recommended to explore long-term effects and potential adaptations of the plan.

**Keywords:** Renal-friendly plan; Self-efficacy; Hemodialysis; Quasi-experimental study; Patient education; Dietary management

### INTRODUCTION

Chronic kidney disease (CKD) affects more than 10% of the global population, translating to over 800 million people worldwide [1–3]. The global estimated prevalence is around 13.4% (with a range of 11.7–15.1%), making CKD a significant and growing public health concern [2]. This prevalence is increasing, fueled by higher rates of diabetes, hypertension, obesity, and population aging. The burden is especially high in low- and middle-income countries, where access to kidney care is limited and awareness is often low [1,2].

In India, CKD prevalence estimates are variable, ranging from less than 1% up to 21% depending on the region and the definitions used, with systematic reviews reporting prevalence rates between 12% to 21% in different regions [4]. Nearly one-third of all CKD patients worldwide live in India and China, underlining the major global burden in these populous countries [3]. Patients with CKD are at increased risk of progressing to end-stage kidney disease (ESKD), requiring renal replacement therapy. Globally, the number of people needing such therapy is projected to nearly double from 2.6 million in 2010 to 5.4 million by 2030 [3]. Hemodialysis is the most common kidney replacement therapy for patients with end-stage kidney disease (ESKD) worldwide, accounting for approximately 69% of all kidney replacement therapy (KRT) and 89% of all dialysis treatments [5]. By comparison, peritoneal dialysis accounts for about 11% of all dialysis globally [6]. While peritoneal dialysis has several potential advantages—such as technical simplicity, home-based treatment, and often lower costs—its use remains significantly less common than hemodialysis due to barriers like higher fluid costs,[1–3]. The global estimated prevalence is around 13.4% (with a range of 11.7–15.1%), maki. Globally, most dialysis patients receive hemodialysis, with peritoneal dialysis being the next most utilized modality, reflecting policy, economic, and logistical factors across different countries [5,6].

## **NEED FOR THE STUDY**

Patients undergoing hemodialysis face significant challenges, particularly in managing their health and dietary behaviors, which can adversely affect their self-efficacy. With chronic kidney disease (CKD) affecting over 800 million people globally and the increasing prevalence of end-stage kidney disease (ESKD), effective patient education and management strategies are crucial. The renal-friendly plan proposed in this study aims to enhance self-efficacy, empowering patients to take charge of their health. Given that hemodialysis is the most common renal replacement therapy, understanding and improving the self-efficacy of these patients is essential for better health outcomes and overall quality of life. This study addresses a critical gap in renal care by assessing the effectiveness of a structured intervention that could potentially transform patient education and management in this vulnerable population.

## **AIM OF THE STUDY**

The aim of this study is to assess the effectiveness of a renal-friendly plan in enhancing self-efficacy among patients undergoing hemodialysis, empowering them to better manage their health and dietary behaviors.

## **METHODS**

### **Research Approach and Design**

A quasi-experimental research design was used to assess the effectiveness of the Renal Friendly Plan (RFP) on self-efficacy among patients undergoing hemodialysis at Billroth Hospital,

Chennai. This study included both experimental and control groups to compare pre-test and post-test outcomes.

## **Study Setting**

The research was conducted at Billroth Hospital, Chennai, which offers specialized care for patients with chronic kidney disease (CKD) undergoing hemodialysis.

## **Population and Sample**

The target population comprised patients diagnosed with CKD and receiving hemodialysis at the selected hospital. Participants were selected based on specific inclusion and exclusion criteria, ensuring a representative sample of this patient population.

- Sample Size: 15 patients undergoing hemodialysis
- Sampling Technique: Non-probability purposive sampling method was used to recruit participants.

## **Inclusion Criteria**

- Patients diagnosed with chronic kidney disease and currently undergoing hemodialysis.
- Patients who were willing to participate and provide informed consent.

## **Exclusion Criteria**

- Patients with cognitive impairment or not able to participate in the intervention.
- Patients unwilling to provide informed consent.

## **Variables**

Independent Variable: Implementation of the Renal Friendly Plan (RFP) diet intervention.

Dependent Variable: Level of self-efficacy among patients measured using a validated questionnaire.

Demographic Variables: Age, sex, religion, location, type of family, educational status, income, diet pattern, pre-morbid disease, duration of dialysis.

## **Data Collection Tools**

A structured self-efficacy questionnaire was developed and administered in both pre-test and post-test phases. The tool consisted of 7 questions covering:

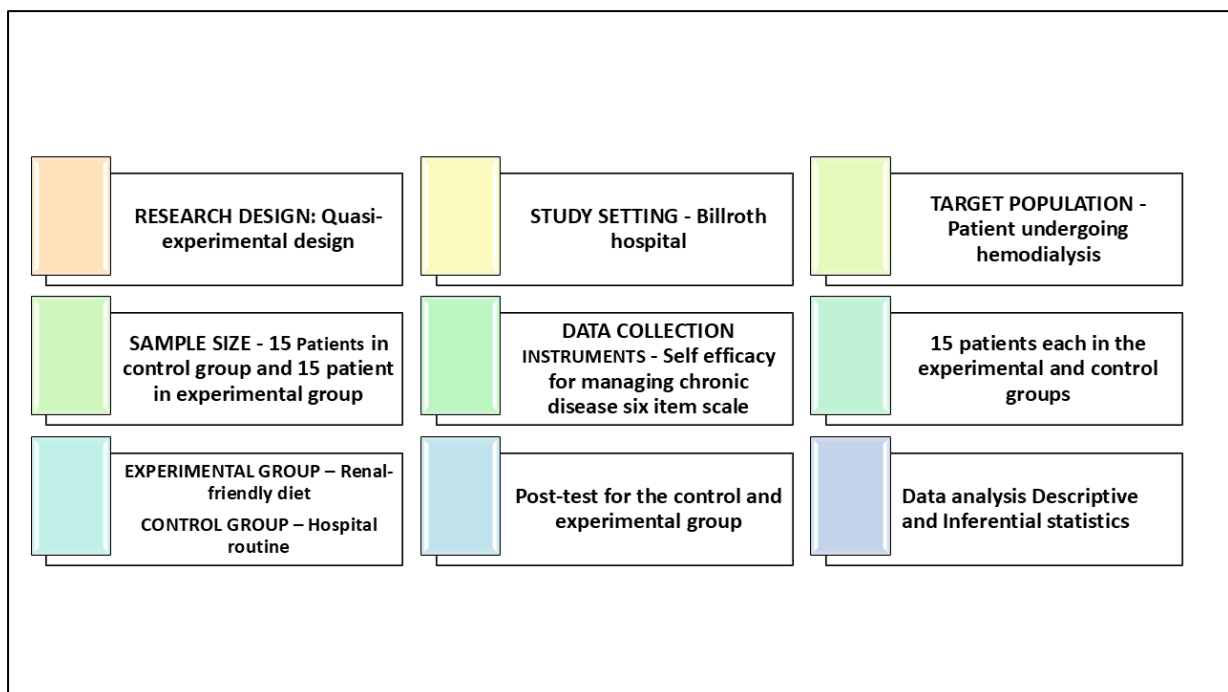
- Protein-rich diet
- Potassium-rich and potassium-low diet
- Phosphorus-rich and phosphorus-low diet
- Sodium-rich and sodium-low diet

Each question had a five-part food choice plan. The scoring ranged from 0 to 25, categorized as:

- High perceived self-efficacy: 25–35
- Medium perceived self-efficacy: 15–24
- Low perceived self-efficacy: 0–14

## RESULTS

Demographic data were also collected for each participant. The independent variable was the implementation of the renal friendly diet plan, while the dependent variable was the change in self-efficacy levels among the hemodialysis patients. The research framework included a pre-test and post-test assessment for both groups, with the intervention (RFD) applied to the experimental group only.



**Fig. 1 Schematic Representation of Research Methodology**

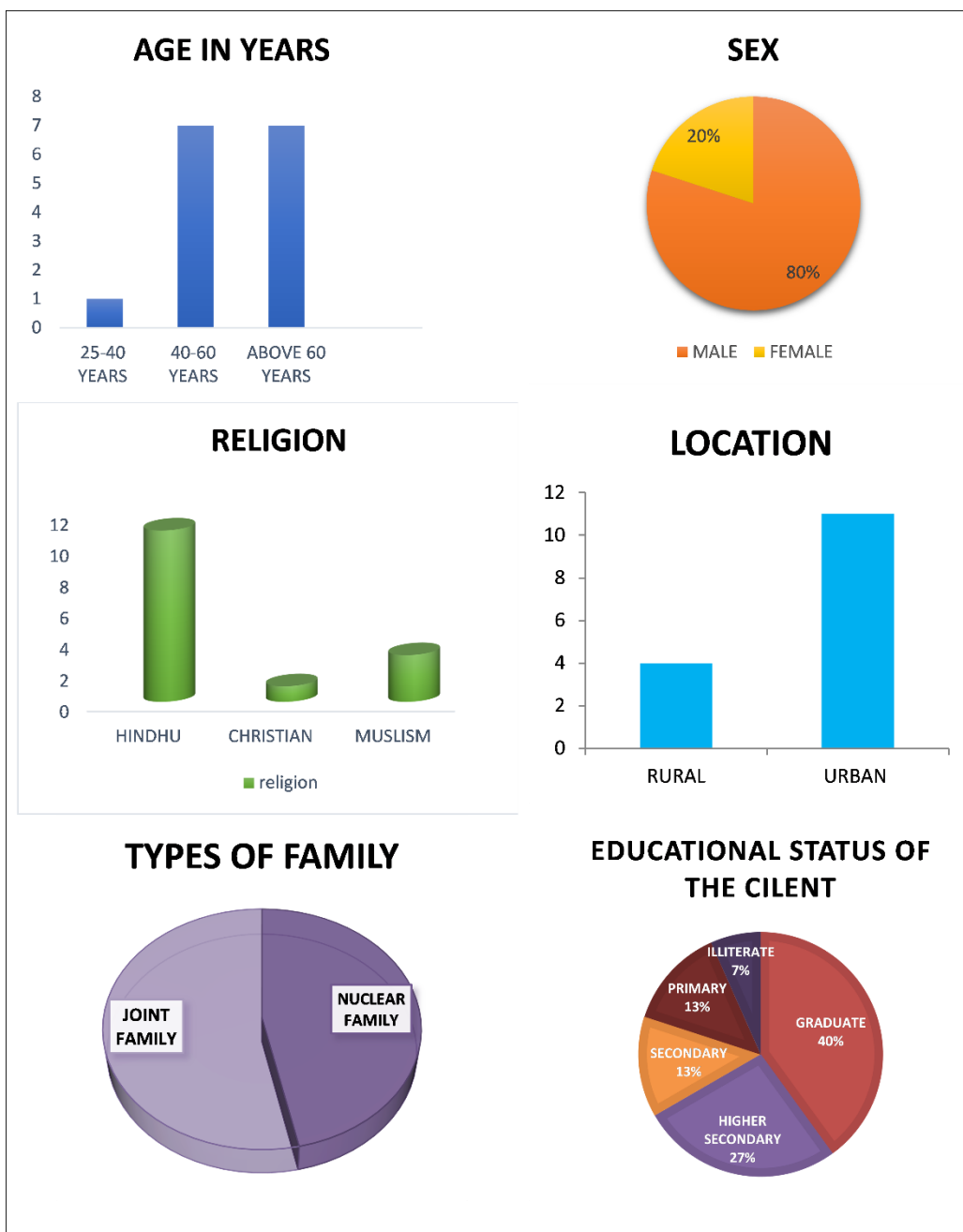
The setting for the study consisted of hemodialysis patients at Billroth Hospital who attended the unit twice a week and met specific inclusion criteria. A purposive non-probability sampling technique was employed to select a sample of 30 participants. Prior permission was obtained from the relevant authorities, and ethical clearance was secured from the hospital's ethical committee before data collection commenced to ensure adherence to ethical standards.

Data collection involved the administration of structured tools to assess pre- and post-test levels of self-efficacy among the study participants. The effectiveness of the renal-friendly diet intervention was evaluated by comparing changes in self-efficacy between the experimental

and control groups after the intervention period. This methodological approach facilitated a systematic assessment of the impact of the dietary intervention on the target patient population.

## **Demographic Variables of Chronic Kidney Disease Patients**

Figure 2 shows the demographic profile of 15 hemodialysis patients. The majority are male (80%) and urban residents (73.3%), with most identifying as Hindu (73.3%) and following a non-vegetarian diet (73.3%). Age distribution is primarily between 40-60 years (46.7%) and over 60 years (46.7%). About half belong to joint families (53.3%), and most are educated at least to graduate (40%) or higher secondary level (26.7%). The predominant income bracket is ₹15,001–25,000 (66.7%). The main pre-morbid diseases are hypertension (40%) and other conditions (46.7%), with 13.3% having diabetes mellitus. Regarding dialysis, most patients undergo it either two (33.3%) or three times a week (46.7%). Overall, the sample is predominantly urban, educated, male, and middle-aged to elderly, with hypertension as the leading co-morbidity and a high frequency of hemodialysis sessions per week.



**Fig. 2 Demographic variables of chronic kidney disease patients**

**Assessment of self-efficacy among patients undergoing hemodialysis pre-test and post-test**

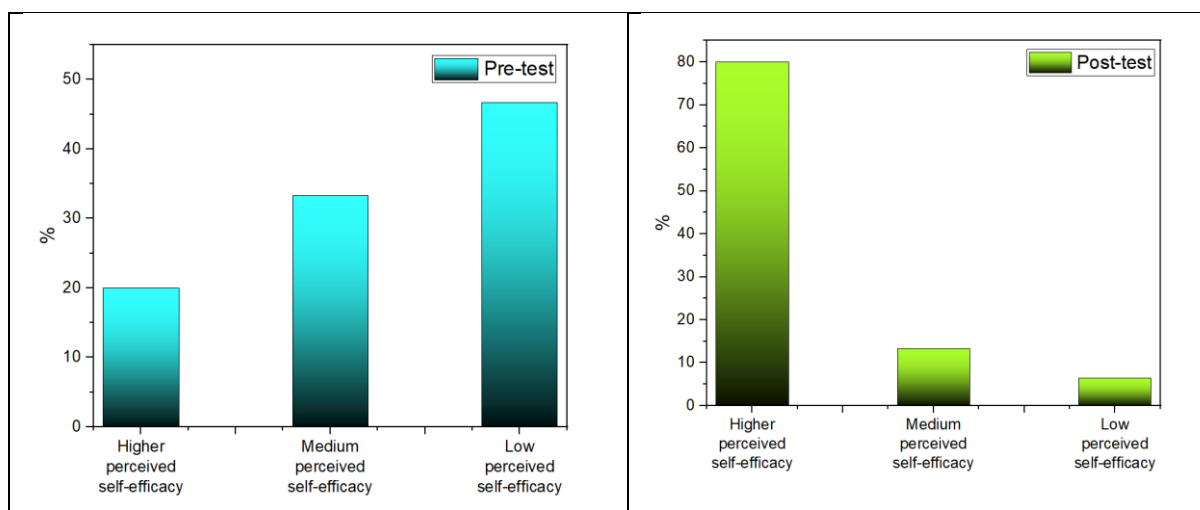
**Table 1: Self-efficacy among patients undergoing hemodialysis: pre-test and post-test**

	LEVEL OF PERCEIVED SELF-EFFICACY	NUMBER OF PARTICIPANTS	
		FREQUENCY (f)	PERCENTAGE (%)

<b>PRE-TEST</b>	Higher perceived self-efficacy	3	20
	Medium perceived self-efficacy	5	33.3
	Low perceived self-efficacy	7	46.7
<b>POST-TEST</b>	Higher perceived self-efficacy	12	80
	Medium perceived self-efficacy	2	13.3
	Low perceived self-efficacy	1	6.4

Table 1 presents the distribution of participants based on their level of perceived self-efficacy. Out of the total participants, 46.7% (7 individuals) were found to have low perceived self-efficacy, making this the most common category. Medium perceived self-efficacy was reported by 33.3% (5 individuals), while only 20% (3 individuals) exhibited high perceived self-efficacy. This suggests that a significant proportion of the group experiences lower levels of confidence in their abilities, with fewer participants perceiving themselves as highly efficacious.

The data in Table 1 reveal that, following the implementation of the renal-friendly plan, a significant proportion of patients undergoing hemodialysis exhibited high levels of perceived self-efficacy. Specifically, 12 patients (80%) demonstrated higher self-efficacy post-test, while 2 patients (13.3%) showed a medium level, and only 1 patient (6.4%) reported low self-efficacy. This distribution indicates that the majority of participants experienced an improvement in their confidence and ability to manage their condition after the intervention. The findings suggest that the renal-friendly plan was effective in enhancing self-efficacy among the studied cohort, with very few patients remaining in the low or medium categories post-intervention. Fig 3 shows the frequency and percentage distribution of pre-test and post-test levels of self-efficacy among patients undergoing hemodialysis. The frequency and percentage distribution of pre-test and post-test levels of self-efficacy among patients undergoing hemodialysis is presented in Fig. 3.



**Fig. 3 Frequency and percentage distribution of pre-test and post-test levels of self-efficacy among patients undergoing hemodialysis**

**Effect of renal-friendly diet plan on self-efficacy among patients undergoing hemodialysis**

The average outcome score increased from 1.87 (standard deviation 0.83) before the diet plan to 2.87 (standard deviation 0.43) after its adoption, indicating a mean difference of 1.00. The t-value of 5.12 suggests a statistically significant improvement in patient outcomes following the intervention with the renal-friendly diet plan, highlighting its positive effect on patient health measures.

**Association between the pre-test level of self-efficacy among the patients undergoing hemodialysis and selected demographic variables among CKD patients**

**Table 2: Pretest and post-test level of self-efficacy among patients undergoing hemodialysis**

S.No	PRE-TEST(x <sub>1</sub> )	POST-TEST (x <sub>2</sub> )	X <sub>1</sub> -X <sub>2</sub> = d	d <sup>2</sup>
1.	17	26	-9	81
2.	14	25	-11	121
3.	27	25	2	4
4.	16	26	-10	100
5.	10	25	-15	225
6.	13	26	-13	169
7.	12	13	-1	1
8.	19	27	-8	64
9.	27	25	2	4
10.	13	26	-13	169
11.	28	24	4	16
12.	12	26	-14	196
13.	19	25	-6	36
14.	21	24	-3	9
15.	9	27	-18	324

Table 2 presents data from a study comparing the results of a pre-test (x<sub>1</sub>) and a post-test (x<sub>2</sub>) for 15 patients. For each subject, the difference between the pre-test and post-test scores (d = x<sub>1</sub> - x<sub>2</sub>) is calculated, as well as the square of this difference (d<sup>2</sup>). The pre-test and post-test scores indicate the individual's performance before and after intervention. In most cases, the pre-test score is lower than the post-test score, resulting in negative values for d, which suggests an improvement after the intervention.

The  $d^2$  column provides the squared differences, which are useful for statistical analysis. The values of  $d$  range from -18 to +4, with most differences being negative, further supporting the observation that participants generally performed better on the post-test. The consistently higher post-test scores indicate that the intervention was likely effective in enhancing the self-efficacy.

## DISCUSSION

These results are consistent with prior studies indicating that patients with chronic kidney disease (CKD) often experience diminished self-efficacy due to the disease's complexity, frequent symptom burden, and lifestyle restrictions [7,8]. According to Lee et al. [9], self-efficacy is often compromised in hemodialysis patients, adversely affecting disease management and quality of life. Following the renal-friendly plan intervention, there was a significant improvement in the experimental group's self-efficacy levels; 80% achieved high self-efficacy post-intervention. This result aligns with interventions reported by Tsay et al. [10], who found that self-management programs tailored for renal patients—especially those focused on dietary restrictions and symptom management—significantly increased patients' perceived self-efficacy.

The mean self-efficacy score increased from 17.13 (SD = 18.43) to 24.66 (SD = 1188.64) after the dietary intervention, indicating a substantial positive shift. The study by Peng et al. [11] implies that Self-management interventions are a valuable adjunct for CKD patients, producing improvements in key risk factors and function, but should be combined with medical care. A 2025 study on a psychoeducational nursing program for hemodialysis patients found significant improvements in self-efficacy and psychological adjustment post-program [12]. A 2022 review on psychosocial needs of CKD patients without kidney replacement therapy emphasized that CKD-related education and supportive relationships empower patients, improving trust in healthcare providers, coping, and feelings of control—key to adaptation and self-efficacy [13].

These findings reinforce the established evidence that structured interventions, particularly those incorporating dietary education and individualized patient counselling, can effectively elevate self-efficacy and potentially improve clinical outcomes in hemodialysis patients [10]. There is growing support for the theory that self-efficacy is modifiable through educational strategies—consistent with Bandura's self-efficacy model [14] and that enhancements in self-efficacy contribute to better disease management, reduced symptomatology, and improved quality of life.

## CONCLUSION

This quasi-experimental study highlights the significant impact of a Renal-Friendly Plan (RFP) on enhancing self-efficacy among patients undergoing hemodialysis. The findings reveal that a substantial proportion of patients initially exhibited low to moderate levels of self-efficacy, which is consistent with existing literature on the challenges faced by individuals with chronic

kidney disease (CKD). However, following the implementation of the RFP, there was a marked improvement in self-efficacy levels, with 80% of participants achieving high self-efficacy post-intervention. This study underscores the importance of dietary education and structured interventions in promoting self-management behaviors among hemodialysis patients. The significant increase in self-efficacy scores, as evidenced by the statistical analysis, indicates that targeted dietary interventions can empower patients, improve their confidence in managing their condition, and potentially lead to better clinical outcomes. Furthermore, the study identified associations between self-efficacy levels and demographic factors, suggesting that educational initiatives should be tailored to consider these variables to maximize their effectiveness. Despite the limitations of a small sample size and a single-center design, the results contribute valuable insights into the role of self-efficacy in chronic disease management.

## **Author contributions**

RM and SD were involved in the conceptualization of the study. RM, SD, and SC contributed to data management and analysis for the study. RM drafted the manuscript. SC, AJ, VE, and TAM reviewed the manuscript and provided suggestions. All authors have read and approved the final manuscript.

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This research did not receive any funding from any government or private institutions.

## **Data Availability**

Data will be made available upon request made to the corresponding author.

## **Declarations**

## **Ethical statement**

The Institutional Ethics Committee (REG.No: ECR/1002/Inst/TN/2017/RR-20) of Apollo College of Nursing discussed “Effectiveness of Dialysis Nursing Intervention Package upon self-efficacy, treatment adherence and clinical outcome among patients undergoing Hemodialysis at selected hospitals in Chennai” by Mr. Raja M, Assistant Professor, Billroth College of Nursing on 28.4.2023 at 2.00 PM. The Ethics Committee approved the project and the progress will be reviewed periodically. This approval is valid for three years. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## Patient Consent for Publication

Not applicable.

## Competing Interests

All authors confirm that they do not have any conflicts of interest to disclose.

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