

## Water Drinking Practices in ADPKD Patients: A Questionnaire Based Study

### Abstract

**Introduction:** Patients with autosomal dominant polycystic kidney disease (ADPKD) who have normal renal function (creatinine clearance, >90 ml per minute per 1.73 m<sup>2</sup> of body-surface area) might potentially benefit from frequent water intake that would be sufficient to reduce plasma AVP levels and decrease the average urine osmolality, bringing it closer to that of plasma. **Materials and Methods:** In this cross-sectional study, the patients of ADPKD, chronic kidney disease stages 1–5 were included. We formed a questionnaire on the dietary recommendation to the patients. The questions enquired whether the patients received the recommendation from the faculty and the postgraduates of the nephrology department that (a) they should consume at least 3000 mL of water per day, (b) that they should not consume coffee and tea, (c) adherence of patients to the advice of the nephrologists. **Results:** Of 294 patients, 142 (48.2%) did not receive any dietary recommendation. The rest 152 (51.7%) were given the appropriate dietary recommendation. Majority of the patients mentioned that they lacked the access to the water when they intend to consume. Despite the advice from the nephrologists, 95 (32.3%) failed to observe the abstinence from coffee and tea. The reason expressed for not quitting coffee and tea was the force of the habit. **Conclusion:** Treating doctors failed to inform 48% of patients the proper diet. Only 20.3% of patients consumed >3.0 litre of water per day. The demand of the agricultural work at a place away from home deprived majority of the participants of the study from the potable water.

**Keywords:** Adherence, ADPKD, coffee, cyclic AMP, plasma arginine vasopressin, tea, water drinking

### Introduction

In humans, the osmolality of urine most of the time far exceeds that of plasma (~285 mOsm per kilogram), reflecting the sustained action of plasma arginine vasopressin (AVP).<sup>[1]</sup> Although data from randomized trials are lacking, patients with autosomal dominant polycystic kidney disease (ADPKD) who have normal renal function might potentially benefit from frequent water intake that would be sufficient to reduce plasma AVP levels and decrease the average urine osmolality, bringing it closer to that of plasma. For persons with an average output of urine (~1500 ml per day) and solute (~600 mOsm per day), ~3000 ml of water consumed throughout waking hours would reduce average plasma AVP levels by about one half. This amount of fluid is widely recommended for persons with kidney stones but must be prescribed

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cautiously. Hyponatremia is a concern in patients who are following low salt diets or taking diuretics,<sup>[2]</sup> as do many patients with ADPKD and monitoring of the sodium level is prudent in such patients. Sagar and associates had proven that water ad libitum given to the experimental rat models showed attenuation of renal cystic disease.<sup>[3]</sup>

We conducted a survey of patients with ADPKD to identify the following (a) to study the diet recommendation offered to the patients of ADPKD and (b) to know the adherence to the diet recommendation by the patients of ADPKD.

### Materials and Methods

We received the approval of the institutional ethics committee. In this cross-sectional study, the patients of ADPKD, chronic kidney disease (CKD) stages 1-5 who received consultations from the department of Nephrology, SVIMS, Tirupathi were included. We formed a questionnaire containing dietary recommendation to the

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patients. The questions enquired whether the patients received the recommendation from the faculty and the postgraduates of the nephrology department that (a) they should consume at least 3000 mL of water per day, (b) that they should not consume coffee and tea (c) adherence of patients to the advice of the nephrologists. We administered the questionnaire to the patients of ADPKD either on a telephone or when some of them attended nephrology OPD. The questionnaire is appended as a supplementary file. We collected the telephone numbers of all ADPKD patients who received consultations at our OPD from the medical records. We collected the data of patients from January 2013 to June 2019. Authors 1, 4, 5, and 6 collected the responses from the patients over telephone.

We expressed the variables as mean and percentages. The sample size calculated with an acceptable margin of error of 5%, desired confidence of interval of 95%, and expected response distribution of 50% and with a population of 234 patients of ADPKD. We arrived at this population number of patients of ADPKD with a calculation, one new patient per one out patient day (OPD), like that three OPDs for 78 weeks (from January 2013 to June 2019). The sample size calculated is 146.

## Results

From January 2013 to June 2019, 354 ADPKD patients received consultations at Nephrology, SVIMS. Out of them 294 patients of ADPKD, CKD stages 1-5 could be contacted. We administered the questionnaire on telephone for 195 patients and for 99 patients when they attended nephrology OPD. The mean age of participants was 48.7 years and mean age 39.5 years at diagnosis. The leading 3 occupations of our male patients were, agriculture labourers (134 (45.5%)), agriculturists (35 (11.9%)) and self-employed (28 (9.5%)). The majority of female patients were agriculture labourers (51 (17.3%)), and home makers (12 (4.0%)) [Table 2]. Of these 225 (76.5%) were males. In total 142 (48.2%) of the patients did not receive any dietary recommendation. The rest 152 (51.7%) were given the appropriate dietary recommendation. These patients were specifically informed the two recommendations, that they should consume at least 3000 mL of water per day and that they should not consume coffee and tea. There was a wide variation in daily water consumption, the majority (79%) reported intake of <3 litres/day. Only 4% were consuming >4 litres/day. Table 1 depicts the adherence to these two recommendations by the patients. Majority of the patients told us that they lacked the access to the water when they intend to consume. Despite the advice from the nephrologists, 95 (32.3%) failed to observe the abstinence from coffee and tea. The reason expressed behind not quitting coffee and tea was being habitual to it.

## Discussion

The advice on the diet should be integral to the renal patients. The dietary advice given to ADPKD patients has

a basis to the pathogenesis of ADPKD. The molecular pathogenesis of ADPKD has an interplay of several pathways.

The expression of V2 receptors (vasopressin) is strong in the medullary thick ascending limb, macula densa, and medullary collecting duct, intermediate in connecting tubule and cortical collecting duct, and low in cortical thick ascending limb and distal convoluted tubule.<sup>[4]</sup> The circulating levels of AVP are increased in human ADPKD and in all animal models in which it has been ascertained.<sup>[5]</sup> This may be the result of a central defect<sup>[6-8]</sup> or, more likely, to compensate for the reduced concentrating capacity of the polycystic kidneys. This concentrating defect may be owing to the disruption of the corticomedullary architecture by the cysts, early development of tubulointerstitial disease, or directly linked to the PKD cellular phenotype.<sup>[9]</sup>

This study is an eye opener to us. We failed to inform 48% of our patients the proper diet. Even with the understanding, that between 2013 and 2019, many and diverse quality of residents and faculty served the patients of our institute, the leadership in the department, which remained the same, failed to impart a uniform standard of education to the residents and the junior faculty for them to transmit to the patients.

We also explored the reasons for not following the advice of consumption of at least 3000 mL of water per day. We found out that more than the scarcity of water, it is the unavailability of water (151 out of 294, 51.3%) when they wish to consume. The demand of the agricultural work at a place away from home deprived majority of the participants of the study from the potable water.

There is an urgent need for trials to evaluate the optimal hydration strategy in patients with ADPKD. El-Damanawi and associates planned a survey of patients with ADPKD to inform the design of a randomized feasibility trial of high versus standard water intake. As a prelude to that study, patients were asked their current water drinking practices. The authors found a wide variation in self-reported fluid intake among participants (ranging <1.0 to >4.0L/day): 54 participants (61%) reported drinking >2L/day. However, 65 patients (74%) reported drinking beyond thirst, yet

**Table 1: Water drinking practice**

Number of liters of water consumed per day	Numbers of patients (percent)
<1.0	3 (1.0%)
1.01.5	38 (12.9%)
1.52.0	73 (24.8%)
2.02.5	50 (17%)
2.5 3.0	70 (23.8%)
3.03.5	29 (9.8%)
3.54.0	20 (6.8%)
>4.0	11 (3.7%)

**Table 2: Reasons for not consuming at least 3.0 liter water per day**

Reason	Occupation of the patients, n=294						Total
	Agriculture labourers n=185 (62.9%)	Agriculturist n=35 (11.9%)	Self employed n=28 (9.5%)	Teachers n=19 (6.4%)	Students/unemployed/ retired n=15 (5.1%)	Homemakers n=12 (4.0%)	
Scarcity of water	37 (20%)	5 (14.2%)	2 (7.1%)	3 (15.7%)	1 (6.6%)	5 (41.6%)	53
Lack of access to water	115 (62.1%)	11 (31.4%)	12 (42.8%)	5 (26.3%)	6 (40%)	2 (16.6%)	151
Forgetfulness to consume	33 (17.9%)	19 (54.2%)	14 (50%)	11 (57.8%)	8 (53.3%)	5 (41.6%)	90
						Total	294

18 (28%) of these estimated their fluid intake at <2.0 L daily. The other questions, similar to the present one were not asked in that study.

To conclude, we realized that doctors failed to inform 48% of patients the proper diet. Only 20.3% of our patients consumed >3.0 liter of water per day. The demand of the agricultural work at a place away from home deprived majority of the participants of the study from the potable water.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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## Questionnaire

Have you been instructed any special diet to reduce the worsening of these cysts: yes/no

Have you been instructed to consume at least 3.0 L of water per day: yes/no

How much of water do you consume in a day—< 1.0, 1.01.5, 1.52.0, 2.02.5, 2.53.0  
03.5, 3.54.0, >4.0L

Have you been instructed not to consume coffee and tea: yes/no

Have you been informed these two measures reduce the worsening of these cysts: yes/no