

# High fat, low carb: A ketogenic diet could help patients with polycystic kidney disease

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A new study has shown that ketosis—a state in which the body primarily uses dietary fats as energy sources—may have positive effects on kidney function in people affected by hereditary polycystic kidney disease.

Autosomal dominant polycystic kidney disease, or ADPKD, is the most common hereditary kidney disease and causes about 10% of all cases of kidney failure. The Keto-ADPKD study conducted in Cologne involved 63 affected patients. The aim of the clinical trial was to demonstrate the feasibility, efficacy, and safety of ketogenic diet as a therapy for people with ADPKD.

The results have now been presented at the Kidney Week of the American Society of Nephrology held in Orlando, Florida, from 1 to 6 November 2022.

For the study, patients were divided into three groups. One group followed a ketogenic diet, which is low in carbohydrates and sugar but high in fat, for three months. The second group did three days of water fasting every month during the study period, which also leads to ketogenic metabolism. The third control group followed the common dietary recommendations that doctors usually give for ADPKD: reduce salt intake and drink more than 2–3 liters per day.

The goal—the feasibility of the dietary change—was defined as a combination of a questionnaire and a metabolic test that can detect ketosis and thus the implementation of the diet ( $\beta$ -hydroxybutyric acid in the blood, acetone in the breath). 91% of the patients on the ketogenic diet and 89% in the water fasting group rated the diet as feasible in the questionnaire.

Ketosis was shown in the measurements of 85% of the participants during all three phases of the water fasting. When examined at the three timepoints of BHB measurement during the intervention, 78% of the ketogenic diet group exhibited higher values than before its start.

Already after three months, there were positive signals regarding important parameters such as kidney size and [kidney function](#). While the

kidneys became smaller during a ketogenic diet, they increased in size in the control group. However, this result barely fell short of the statistical threshold ( $p = 0.08$ ) that is common in [clinical trials](#). This was different for the development of kidney function.

"It is noteworthy that the trial participants on a ketogenic diet showed a statistically significant positive kidney function development compared to the control group. We had not yet expected this so soon, considering the rather short treatment period of three months," said Professor Dr. Roman-Ulrich Müller, who led the study. "Despite these successes, however, the data are not yet sufficient for us to generally recommend a ketogenic diet for ADPKD patients."

To confirm the results, Müller and his team need to perform larger studies at multiple sites and with longer follow-up periods. The researchers also want to obtain more data regarding safety. In particular, Müller sees a potential risk of kidney stones, as two of the participants in the ketogenic diet group had symptomatic kidney stones during the diet. This means that a ketogenic diet in ADPKD patients should only be carried out under the advice and guidance of an experienced renal specialist who can advise on and assess this risk, and take preventive measures if necessary.

"We are very pleased with the results of the study because they confirm data from basic research with mice," Müller added. As recently as 2019, University of Cologne alumnus Professor Dr. Thomas Weimbs, now at the University of California, had published on the positive effect of a [ketogenic diet](#) on cystic kidney disease in animal models in *Cell Metabolism*.

Müller remarked, "It is extraordinary that we can now present current data from a clinical trial. The support of the participating patients was crucial for this success, and we would like to express our gratitude to

them."

## **Why is a ketogenic metabolism beneficial in ADPKD?**

In polycystic kidney disease, the functional units of the kidneys, the nephrons, are affected. They develop cysts—water-filled sacs—which can significantly limit kidney function. More than 50% of those affected will have permanently lost kidney function by the age of 50 to 60, making dialysis or a kidney transplant necessary to replace kidney function.

The goal of treatment is to preserve kidney function and to prevent the growth in kidney size associated with the disease, which often causes discomfort. By changing the diet, the body adapts and changes its metabolism from carbohydrate/sugar burning (glycolysis) to ketosis, the burning of fats. It has previously been shown in animal models that the metabolic state of ketosis is important in inhibiting the progression of cystic kidney disease because the cyst-lining cells cannot adapt to the altered metabolism.

Provided by University of Cologne

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