Polycystic Kidney Disease

Polycystic Kidney Disease — Natural Approaches in a Genetic Disease

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Part I: Diagnosis & Symptomatology of Autosomal Dominant Polycystic Kidney Disease

Polycystic kidney disease (PKD) is a genetic disease in which multiple cysts grow on the kidneys.\(^1\) As the cysts expand in size, they impinge on the normal structure of the kidney, and there is a decrease in kidney function.\(^1,\, 2\) In people with severe forms of the disease, this leads to a condition called end-stage renal disease (ESRD), which refers to such low kidney filtering function that dialysis and kidney transplantation become necessary.\(^2\) ESRD is a gradually progressing condition that may eventually lead to death unless a kidney transplant is received. Natural approaches to PKD can help preserve kidney function and delay the need for more invasive treatment.

There are two main forms of PKD based on how they are inherited: autosomal dominant PKD (ADPKD), and autosomal recessive PKD (ARPKD).\(^1,\, 2\) ADPKD is one of the most common life-threatening genetic disorders, affecting from 1 in 400 to 1 in 1000 people worldwide.\(^1,\, 2\) Recessive PKD is more rare, affecting 1 in 20,000 people.\(^1,\, 2\) The focus of this article will be on understanding the diagnosis and common symptoms of ADPKD.

Diagnosis of ADPKD

In patients with a family history of ADPKD, diagnosis requires imaging tests.\(^1\) In general, the diagnosis of ADPKD can be made in people with a family history of the disease when ultrasound shows the presence of either at least:

- Three renal cysts in one or both kidneys — for people 15–39 years old;
- Two renal cysts in each kidney — for people 40–59 years old;
- Four renal cysts in each kidney — for people 60 years old and over.\(^1\)
Symptoms of ADPKD

There are two main genes found to be responsible for the majority of ADPKD: \textit{PKD1} gene and \textit{PKD2} gene, and this may lead to slightly different symptoms.\(^{(2)}\) Common symptoms that occur in patients with ADPKD-1 \& ADPKD-2 include:

- **High blood pressure:** This is often the first symptom that occurs.\(^{(1)}\) Controlling blood pressure well is central to PKD management.\(^{(1, 2, 3)}\)

- **Enlarged kidneys:** As cysts grow, they cause the size of the kidney to enlarge, often to double the size of a normal kidney or more.\(^{(1)}\)

- **Flank and low back pain** occur due to enlarged kidneys, cyst inflammation, or infection.\(^{(1)}\)

- **Cysts in other organs:** Additional cysts may be seen in the liver, as well as the pancreas, ovaries, and other organs.\(^{(1)}\)

- **End-stage renal disease:** ESRD occurs in approximately 50\% of people with ADPKD, and can occur as early as 54.3 years of age in ADPKD-1.\(^{(1)}\)

There is a great deal of variability in symptom severity between individuals with ADPKD within the same family, as well as between families.\(^{(1, 2)}\) Thus, it is accepted that there are factors that may have a role on disease progression including diet, stress, environmental toxins, smoking, and alcohol.\(^{(1, 2, 3)}\) There is no known treatment or cure for ADPKD.\(^{(1, 2, 3)}\) However, the possibility that modifiable factors can affect disease progression provides hope that natural treatments and lifestyle changes including nutrition and stress management may slow the progression of ADPKD.

References


Due to the documented intra- and inter-familial variability in patients with ADPKD, there has been considerable interest in how nutrition affects the progression of this chronic, genetic condition.\(^{(1, 2, 3)}\) This section presents some of the research that supports specific nutritional changes for patients with ADPKD.

**Low-Protein Diet**

Polycystic kidney disease is considered one of the kidney conditions that benefit most from a low-protein diet.\(^{(3)}\) In the Modification of Diet in Renal Disease (MDRD) study, researchers concluded that while a low-protein diet was ineffective for ADPKD patients with moderate kidney insufficiency, it may be effective for ADPKD patients with more severe renal disease.\(^{(3)}\)

An important limitation of this study was that the patients enrolled were already of quite advanced stage; therefore, starting a low-protein diet at an earlier stage would have been more effective in slowing disease progression.\(^{(4)}\) Another study suggested that low-protein diets may improve complications of chronic kidney disease through a reduction in the production of metabolic waste products such as phosphorus and nitrogen, which build up when kidney filtering function declines.\(^{(6)}\)
Soy Protein
Lab studies have shown that soy-protein-based diets are beneficial in slowing the progression of PKD in animal models.\(^7\) Specifically, rats with polycystic kidneys that were fed soy protein had decreased cyst size, kidney size, and disease progression, compared with rats fed casein (milk protein).\(^7, 8\) Improvement in polyunsaturated fatty acid status from soy protein was shown to be a potential mechanism for its benefits.\(^9\)

Water Therapy
Water therapy entails increased water consumption spread out evenly throughout the day, to an amount that can decrease a measure of urine concentration called urine osmolality.\(^10\) The rationale is that this amount of water would suppress an important hormone called arginine vasopressin (AVP), which has been shown to increase cyst growth, kidney growth, and worsening of PKD in animals.\(^10, 11\) On the other hand, AVP inhibition leads to reduction of cyst growth.\(^10\) Only a licensed health care provider should decide on a case-by-case basis if water therapy is advisable for each ADPKD patient.\(^10\) Water therapy is not recommended for PKD patients with advanced disease.\(^10\)

Limit Salt and Caffeine Intake
In patients with chronic kidney disease (CKD), reduction of salt intake reduces blood pressure and protein spilling in the urine.\(^12\) In contrast, high salt intake contributes to kidney fibrosis and decreased renal function.\(^13\) It may be valid for patients with CKD, including ADPKD, to restrict salt intake.\(^12, 13\)

Evidence on caffeine is conflicting. Although animal studies show a negative effect of caffeine on ADPKD,\(^14, 15\) one human study failed to show the same effect.\(^16\) Nonetheless, caffeine does raise blood pressure,\(^14, 15, 16\) so it may be beneficial for ADPKD patients to limit caffeine intake, especially if there is already high blood pressure.

It is important to remember that the nutritional needs of any renal patient vary greatly depending on kidney function, so it is important that even the smallest nutritional change be discussed and monitored by trained health care professionals.

References
Currently there are no known treatments or cure for autosomal dominant polycystic kidney disease (ADPKD), one of the most common life-threatening genetic conditions worldwide.\(^{(1)}\) While common symptoms like hypertension are currently managed with medications, there is a need for safe and effective natural therapies to help manage symptoms and potentially slow the progression of ADPKD. This article introduces possible treatments, with the understanding that although most
of the studies presented are done on animals, they deserve consideration on a case-by-case basis while under the supervision of a licensed health care provider.

Curcumin
A study in an experimental mice model of polycystic kidney disease (PKD) showed that curcumin slowed the growth of cysts and progression of PKD, without side effects in mice. There were several mechanisms proposed, which could be beneficial considering that cyst growth in PKD is known to be multifactorial. Other proposed benefits of curcumin for PKD include antioxidant protection of stress-induced cyst growth.

Flaxseed
In experimental models of PKD, rats fed flaxseed oil had less cysts, less inflammatory changes to the kidney, lower blood levels of creatinine (a marker of kidney filtering function), and decreased kidney injury overall, compared to rats fed corn oil. Similar findings in mice showed slower progression of kidney injury, due to decreased kidney inflammation.

Fish
Studies in rats with PKD compared a high-fat to a low-fat diet, and also compared the type of fats consumed: fish oil, soybean oil, or cottonseed oil. This study showed that high fat diets were detrimental to rats, causing renal fibrosis, increased cyst size, and decreased creatinine clearance (a measure of kidney filtration). Rats fed fish oil had decreased kidney weight, cyst volume, and improved cholesterol levels. Furthermore, the rats fed fish oil had less kidney inflammation even if they were eating a high-fat diet.

A small study on the effect of eicosapentaenoic acid (EPA, from fish oil) failed to show improvements in kidney size or function in patients with PKD. The investigators proposed that this may be due to the advanced stage of disease of these patients. However, the benefits of fish oil are not limited to effects on disease progression. Fish oil has also been found to improve risk factors for cardiovascular disease, which are elevated in CKD, and benefit mood, which may be beneficial given the stress associated with this diagnosis.

In general, chronic kidney disease (CKD) is improved when cardiovascular risk factors are controlled. Known targets for reducing risk of cardiovascular disease in patients with CKD include controlling blood pressure and normalizing cholesterol. Fish oil has been shown to improve both of these parameters as well as reduce the risk of fatal and non-fatal coronary events.

With respect to mood, fish oil has been shown to be as effective as the antidepressant medication fluoxetine, and when fish oil and fluoxetine were given together, their benefits
were better than using either one alone. Considering that depression is the most common psychological condition among patients with chronic kidney disease, fish oil may represent an important supplement in improving the overall health of patients with ADPKD.

References
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Part IV: Mental-Emotional Health in Autosomal Dominant Polycystic Kidney Disease

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Research shows that depression is the first, and anxiety the second most common psychological condition in patients with chronic kidney disease (CKD).\(^1\) One study has reported that prevalence of anxiety and depression is increased among patients with ADPKD, and that feelings of concern and sudden panic are common during the first 12 months after diagnosis.\(^1\) This is important, since other research has demonstrated that the presence of anxiety/depression in early-stage CKD is predictive of higher rates of death once patients reach more advanced stages.\(^1, 4\) Reasons for this could include the fact that depression and anxiety lead to decreased adherence to the treatment plan, as well as independent physical and psychological symptoms of depression.\(^1, 4, 5\) Clearly, addressing mental-emotional health is a priority in the management of ADPKD.

Early studies on the psychological impact of ADPKD stated that the most important psychological aspect was “feeling guilty” for spreading the genetic disease to other members of their family.\(^5\) This was echoed in another study, which described another key aspect of ADPKD: that patients did not discuss the disease with others.\(^5\) An investigation into the coping mechanisms of people with genetic kidney diseases reported the following emotions as common:

- Shock at first diagnosis that caused some patients to refuse medical follow-up.\(^6\)
- Fear centred around the progression of the disease, especially if they had a close relative who had suffered from the disease.\(^6\)
• Anxiety about the health of their children, who may or may not inherit the disease.\(^{(6)}\)
• Distress about genetic testing especially while awaiting the results.\(^{(6)}\)

Several preliminary studies in patients with advanced kidney disease show promise for the following strategies to improve mental health of patients at earlier stages of chronic kidney disease:

• **Visual (guided) imagery:** Compliance and patient satisfaction were reported as “good” by hemodialysis patients.\(^{(7)}\)

• **Mindfulness-based stress reduction (MBSR):** Compared to health education alone, eight weeks of training in MBSR techniques significantly reduced anxiety, depression and poor sleep, and improved quality of life, in patients who underwent an organ transplant.\(^{(8)}\)

• **Acupuncture:** Weekly treatments over the course of six weeks improved quality of life, energy, fatigue, emotional and physical well-being, effects, and burden of kidney disease in hemodialysis patients.\(^{(9)}\)

• **Acupressure and transcutaneous electrical acupoint stimulation:** Each of these therapies equally improved mood, sleep and fatigue in hemodialysis patients compared with patients who did not receive either therapy.\(^{(10)}\)

• **Acupoint massage:** In patients with ESRD, acupoint massage significantly improved quality of life and sleep.\(^{(11)}\)

• **Exercise:** An analysis of data from over 20,000 hemodialysis patients in over 12 countries showed that regular exercise (one or more times per week) improved quality of life, quality of sleep, and improved depressive symptoms.\(^{(12)}\)

It is recommended that health professionals routinely assess for anxiety and depression in ADPKD patients, and refer to mental health professionals as necessary.\(^{(5)}\) Adequate management of these psychological factors will improve the patient’s quality of life as well as disease outcomes.\(^{(6)}\) Patients with ADPKD may consider the above therapies to help manage the important mental-emotional health concerns that accompany this condition.

**References**


