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What do the kidneys do for you?

Transcript:

“Doctor, lately, I feel tired and have less energy. I have a dry itchy skin and have sleepless nights. I pass sufficient more frequent urine, but I find that it is foamy. Please advise me.”

Kidneys are given a less priority when it comes to your health, as much contemplating on cholesterol levels to prevent a heart attack, though both organs go hand in glove situation.

Relatively recent research has shown that heart failure is a significant risk factor for kidney disease. When the heart is no longer pumping efficiently, blood seem to collect in the kidney veins, leading to congestion of blood in the kidneys.

So, keeping your heart healthy is important for your kidney health function.

The life-saving functions of the kidneys are many, but its main function is to filter the blood the unwanted waste products into the urine through the glomeruli and help regulate the water and salt levels to control your blood pressure.

What are glomeruli in your kidneys. Let me explain briefly.

There are approximately 1 million glomeruli or filters in each kidney. These are attached to the opening of a small fluid collecting tube called a tubule.

Blood coming from the minute arterioles is filtered in the glomeruli and the extra fluid and waste products enter the tubule and becomes urine. You get the proximal tubule and a distal tubule.

The proximal tubule is essentially reabsorption of chemicals in accordance with the needs of homeostasis or equilibrium. They are glucose, amino acids, water, chlorides, potassium and bicarbs. These are all lost during glomerular filtration and reentering the blood from the renal tubules.

Glomerular filtration is the first step in making urine.

It is the process that your kidneys use to filter excess fluid and waste products out of the blood into the urine collecting tubules of the kidney, so they may be eliminated from your body.

You may be not drinking enough water to flush the kidneys, but you may be eating extra salt that is hidden in your food preparations.

Good examples of these salty delicacies are cheese, butter, sauces, salty nibbles, bread, potato dishes,

When the heart does not pump sufficient blood due to failure, the kidneys become impaired, and the hormone system in the kidneys tend to regulate the blood pressure, enabling the kidneys to excrete waste products.

What is this hormone system that controls the blood pressure?

The kidneys control the volume of fluid and help control of the chemical balance of the blood and regulates the body's level of sodium, potassium, and calcium.

Let us briefly talk about the nephrons, the unit of the kidney mainly responsible for the excretion of urine and its toxic waste products from the blood.

At the end of the nephron, blood enters via the afferent arteriole, passes through a network of capillaries called the glomerulus and leaves via the efferent arteriole. As this occurs the blood is filtered out into an area known as the Bowman's Capsule. The Bowman's capsule is a part of the nephron that forms a cup-like sack surrounding the glomerulus. Except for blood cells, the proteins are squeezed, water, glucose, amino-acids, sodium chloride potassium and bicarbonate, creatinine, urea are filtered into the urine.

These enter the proximal convoluted tubules.

About 65% of sodium and potassium, as well as 90% of bicarb are reabsorbed. Glucose and amino acids are absorbed.

There are specialized cells called macula densa located in a portion of the distal convoluted tubules in the nephron. These cells monitor the salt concentrations in the blood that flows through the arterioles of the glomeruli of the kidneys and cause constriction or dilation of these arterioles, while the arterial cells called juxtaglomerular cells sense the blood pressure. In short, macula densa cells are salt sensors.

Macula densa cells release chemical signals for the juxtaglomerular apparatus to control vital kidney functions, including renal blood flow, glomerular filtration of urine and the release of renin.

Now let us talk about the juxtaglomerular apparatus.

This is a structure in the kidney that regulates the function of each nephron, the functional units of the kidney.

The juxtaglomerular apparatus is named because it is next to the glomerulus.

Renin is released from juxtaglomerular apparatus.

Summarizing:

Macula densa cells check and control the salt in circulation and the granular cell of the juxtaglomerular apparatus regulates all the functions of the kidney and further releases a hormone called Renin.

Let us talk about the RAAS in the kidneys which modulates the blood pressure -God given life saving system in times of distress.

Renin activates the renin-angiotensin system, a key modulator of body fluid homeostasis.

Blood flows through the renal arteries. Renal perfusion pressure directly regulates sodium excretion, through the macula densa cells, and activates the renin-angiotensin system or the RAS, or the renin-angiotensin-aldosterone system or RAAS, a hormone system that regulates blood pressure and water balance.

So, the kidneys play a central role in the regulation of arterial extra-renal blood pressure, that is the blood pressure when recorded with your monitor.

Kidneys influence the blood pressure by:

Causing the arteries and veins to constrict.

Increasing the circulating blood volume.

Now let us talk about the RAAS i.e. The Renin-Angiotensin-Aldosterone-System.

This is a hormone system within the body that is essential for the regulation of blood pressure and fluid balance.

There are three hormones in this system-renin, angiotensin II and aldosterone.

In the first stage of the RAAS is the release of the enzyme renin.

This is released from the granular cells of the renal juxtaglomerular apparatus as described earlier.

Renin response occurs when there is reduced delivery of sodium in the distal convoluted tubule detected by macula densa cells.

Also, reduced perfusion pressure in the kidneys.

Angiotensinogen is a precursor protein produced in the liver and is converted into angiotensin I by renin.

Angiotensin I is then converted into angiotensin II by angiotensin converting enzyme ACE.

This conversion occurs in the lungs, where ACE is produced by the endothelial cells of the lung inner lining.

Angiotensin II causes narrowing or constriction of arteries. This increases the peripheral resistance and causes high blood pressure.

In addition to the low salt content in the perfused blood, reduced blood flow through the kidneys stimulates RAAS. In other words, when there is a drop in blood pressure RAAS gets activated to increase water and electrolyte reabsorption in the kidney: which compensates for the drop in blood volume, thus stepping up the blood pressure.

So, the renin-angiotensin-aldosterone system is a well-known regulator of blood pressure.

In an accident with loss of blood volume due to dehydration or hemorrhage the RAAS gets activated. This is a survival kit the body has in emergencies.

This activation also improves cardiac output through increased retention of salt, water, and peripheral arterial vasoconstriction.

Relatively recent research has shown that heart failure is a significant risk factor for kidney disease. So, keeping your heart healthy, also means that you are keeping the functions of the kidneys in trim condition, too.

If doctors suspect kidney disease, they do a routine kidney function tests such as check the creatinine level, a waste product usually excreted by the kidneys. If the kidneys are impaired, the creatinine seems to accumulate in your blood.

So, the functions of the kidneys are:

Regulation of extracellular fluid volume as already discussed.

Regulating and filtering minerals from blood

Filter waste material from food, medications, and toxic substances.

Production of hormones that help produce red blood cells, promote bone health, and regulate blood pressure.

People with kidney disease should lower the blood pressure to normal range.

Blood sugar must be controlled.

Reduce your salt intake.

Avoid NSAIDs.

Protein consumption in your food should be moderate.

Exercise regularly, Control body weight.

Hope this video talk was useful. You appreciate the part played by your kidneys in life, and it is important to look after them, for good health and longevity.

Stay safe and goodbye for now.