

Understanding Chronic Kidney Disease (CKD)

FUNCTIONS OF KIDNEY

To maintain the composition of the blood at a constant level

To filter the blood and remove waste products and water

To help in controlling blood pressure

To help you in preventing from becoming anemic

To maintain the strength of your bones

What is CKD?

CHRONIC KIDNEY DISEASE (CKD) is a condition characterized by a gradual loss of kidney function over a long period of time.

Glomerular Filtration Rate (GFR) < 60 mL/min per 1.73 m²

GFR estimates how much blood passes through the glomeruli each minute. Glomeruli are the tiny filters in the kidneys that filter waste from the blood

Main Causes of CKD

DIABETES

Diabetic patient with high glucose level in their blood can damage kidney's filters so that the kidney cannot function well to remove waste.

HIGH BLOOD PRESSURE

High Blood Pressure can gradually damage blood vessels in the kidney. So your kidney may not filter well to remove waste and extra fluids from your body.

Other Causes of CKD

CARDIOVASCULAR DISEASE

SYSTEMIC DISEASE

GENETIC DISORDER

OBESITY

POISONING

INFECTION

Facts of CKD



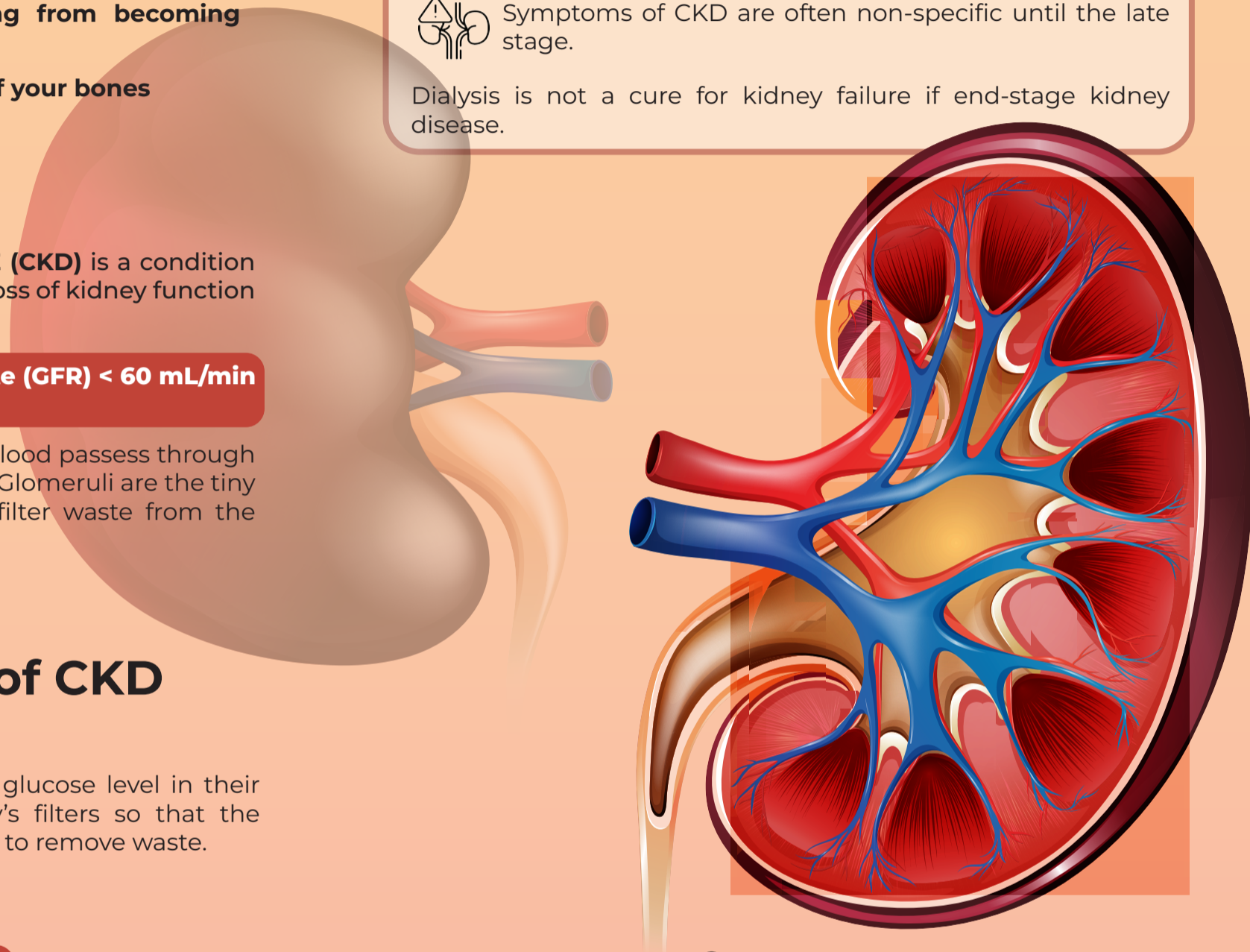
1 out of 10 adult people worldwide have it, and if left untreated it can be deadly.

Diabetes and Hypertension are the main causes of CKD. Diabetes accounts for 30-50% of all CKD and affects 285 millions (6.4%) adults worldwide.



Symptoms of CKD are often non-specific until the late stage.

Dialysis is not a cure for kidney failure if end-stage kidney disease.



Symptoms of CKD

Many people do not show specific symptoms until the late stage of CKD. Hence, CKD is one of the top 'silent killer'.

SHORTNESS OF BREATH

TROUBLE SLEEPING

NAUSEA & VOMITTING

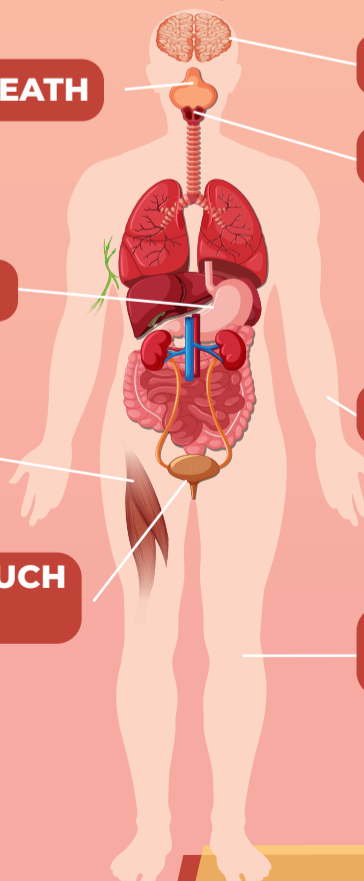
LOSS OF APPETITE

DRY, ITCHY SKIN

MUSCLE CRAMPS

URINATING TOO MUCH OR TOO LITTLE

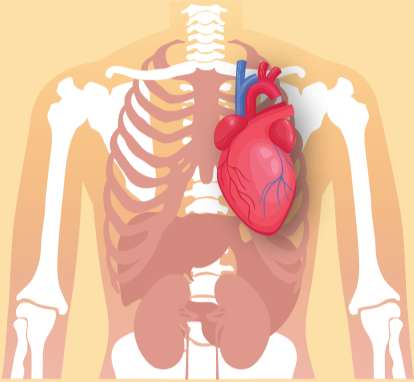
SWELLING OF YOUR FEET & ANKLES



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Chronic Kidney Disease (CKD) & Its Complications

CARDIOVASCULAR DISEASE & CKD

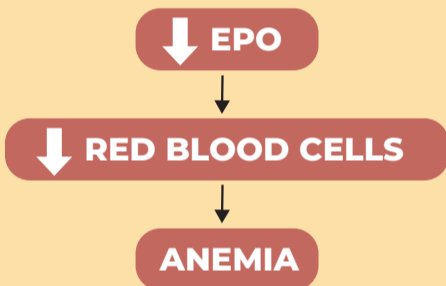


Cardiovascular disease is the leading cause of death among patients with chronic kidney disease. Its mortality is estimated to be 57% higher in people with a GFR less than 60 mL/min per 1.73 m². GFR decline could increase **the risks of myocardial infarction, stroke and cardiovascular death.**

ANEMIA & CKD

Anemia is a condition in which your blood has a lower-than-normal amount of red blood cells or haemoglobins to carry oxygen.

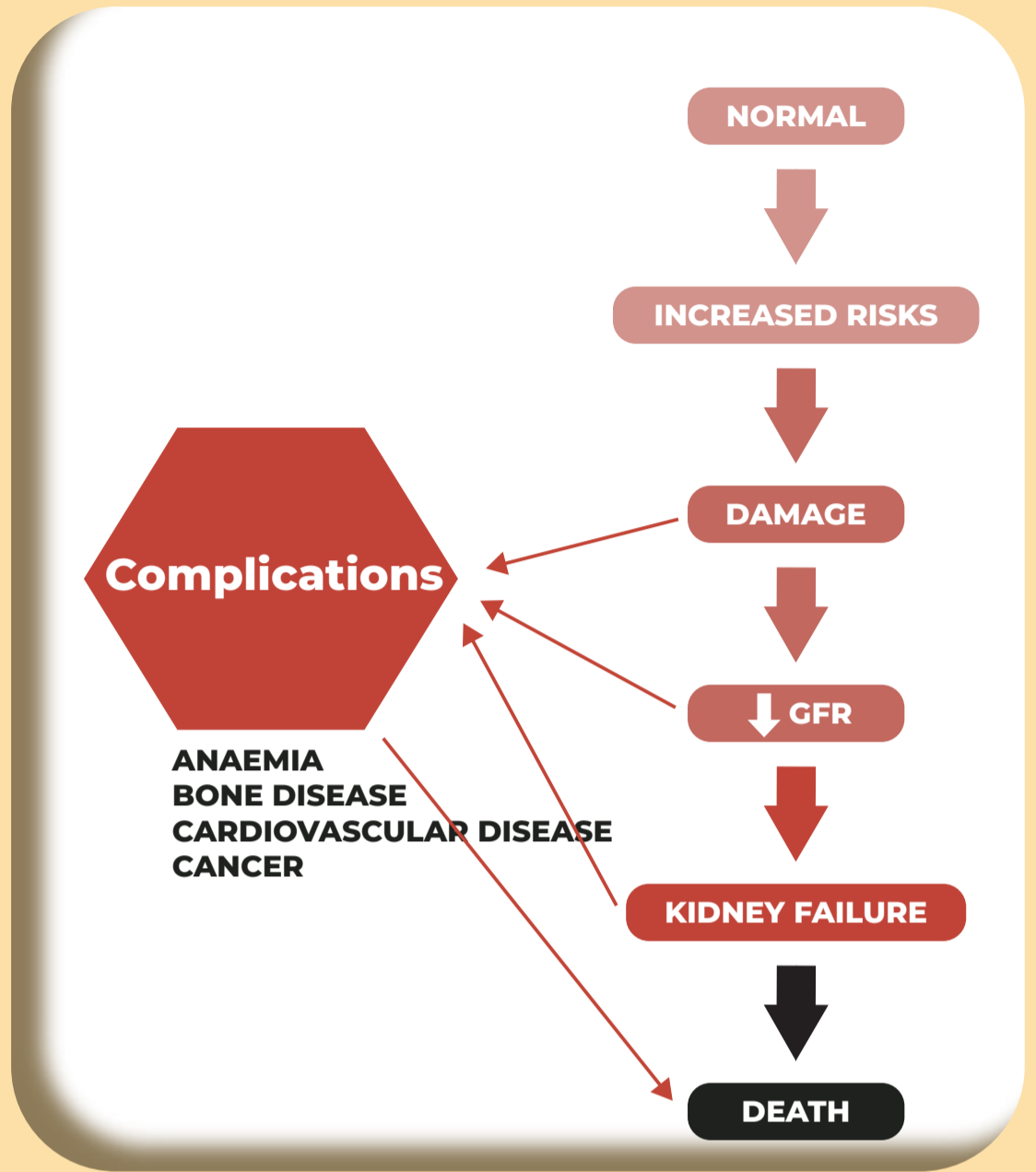
The deterioration of kidney function leads to the lesser production of erythropoietin (EPO), an hormone that send signals to the body to make red blood cells.



In U.S., approximately 15% of CKD patients presented anemia, and anemia is more frequent at higher stages of CKD (up to 53% at stage 5).

RISK OF DYING

Premature death from both heart disease and from all causes is higher in adults with CKD compared with adults without CKD.



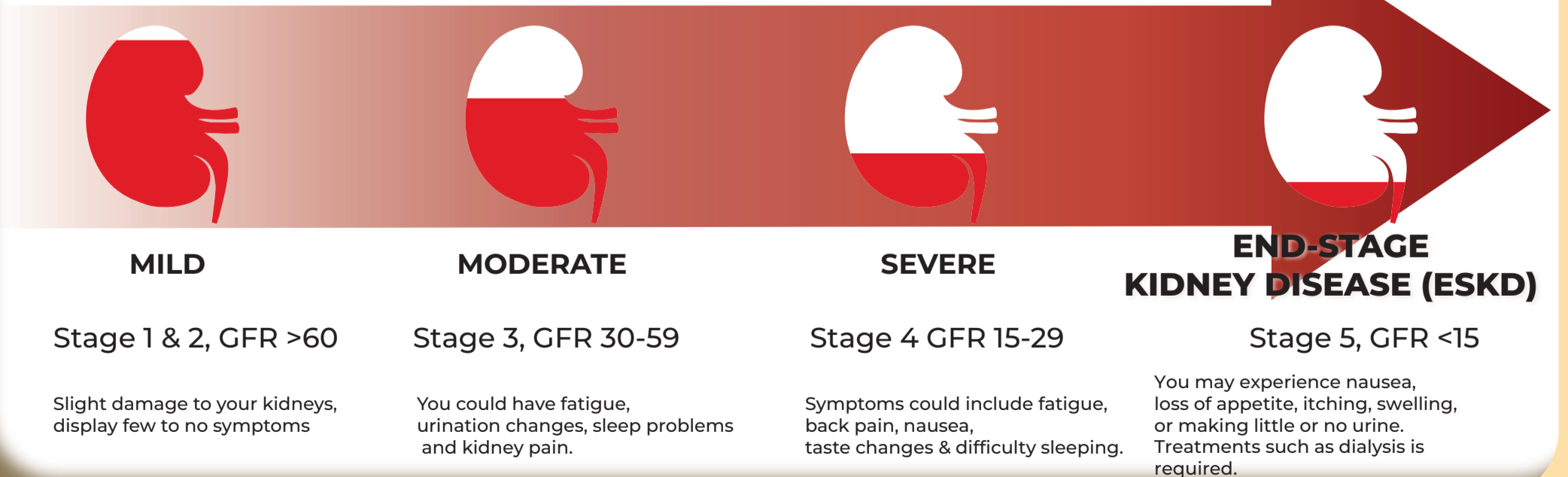
BONE DISEASE & CKD

Mineral bone disease (MBD) is a common complication of CKD caused by low calcium levels and high phosphorus levels in the blood.

The complications of bone disease caused by CKD include **slowed bone growth and bone deformities, bone fractures, and heart and blood vessels problems.**



STAGES OF CKD



Prevention & Screening For Chronic Kidney Disease



SCREENING

		Persistent albuminuria categories		
		A1 Normal to mildly increased <30mg/g	A2 Moderately increased 30-300mg/g	A3 Severely increased >300mg/g
GFR categories (ml/min/1.73m ²)	G1 Normal to high	>90	Low risk	Moderately increased risk
	G2 Mildly decreased	60-89	Low risk	Moderately increased risk
	G3a Mildly to moderately decreased	45-59	Moderately increased risk	High risk
	G3b Moderately to severely decreased	30-44	High risk	Very high risk
	G4 Severely decreased	15-29	Very high risk	Very high risk
G5 Kidney failure	<15	Very high risk	Very high risk	Very high risk

■ Low risk ■ High risk
■ Moderately increased risk ■ Very high risk

GFR (Glomerular Filtration Rate): the level of kidney function; **Albuminuria**: high level of albumin indicates the sign of kidney disease

Given that most patients with CKD are asymptomatic, screening may be important to early detection of disease. This Kidney Disease Improving Global Outcomes (KDIGO) 2D matrix was developed to classify CKD.

Screening of clinical risk factors in those > 60 years old or with a history of diabetes or hypertension is also recommended by many clinical practice guidelines.

PREVENTION

Prevention is always more preferable than after-the-fact treatment with renal replacement [e.g. dialysis, kidney transplant]

→ Lifestyle Management

CKD shares common risks factors with cardiovascular disease and diabetes, lifestyle modifications are important to prevent more kidney damage.

Smoking Cessation

Alcohol Intake

Weight Reduction

Exercise

Dietary Protein Control

Dietary Salt Intake

→ Managing Other Medical Conditions

Attention to cardiovascular risk factors remains the cornerstone of care to delay progression of chronic kidney disease and prevent cardiovascular events. Besides, a prescribed management to the risk factors [cardiovascular, diabetes, hypertension] and its complications [anemia, bone disease, etc.] are important to reduce the kidney damage.

→ Avoiding Medications That Can Hurt Your Kidneys

Be careful about the daily use of over-the-counter pain medications. Regular use of nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen and naproxen, can damage your kidneys.

QUALITY OF LIFE

If You are In the late stage of CKD

CKD-related symptoms can be the main cause of poor QOL in patients with CKD and End-Stage Kidney Disease.

Patients with **Dialysis** show obvious symptoms, such as fatigue, nausea, dyspnoea, anorexia, pruritus, restless legs and cramps.

→ Pain is common

Reports showed that 25% of patients with **Haemodialysis** have severe pain, and another 12% with moderate pain

→ Complications of CKD

Treatment of CKD complications for some patients shows major limitations or can cause additional symptoms and morbidity.

→ The Risk of Cognitive Impairments

Cognitive impairment is when a person has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life. People with CKD have an increased risk of cognitive impairment.

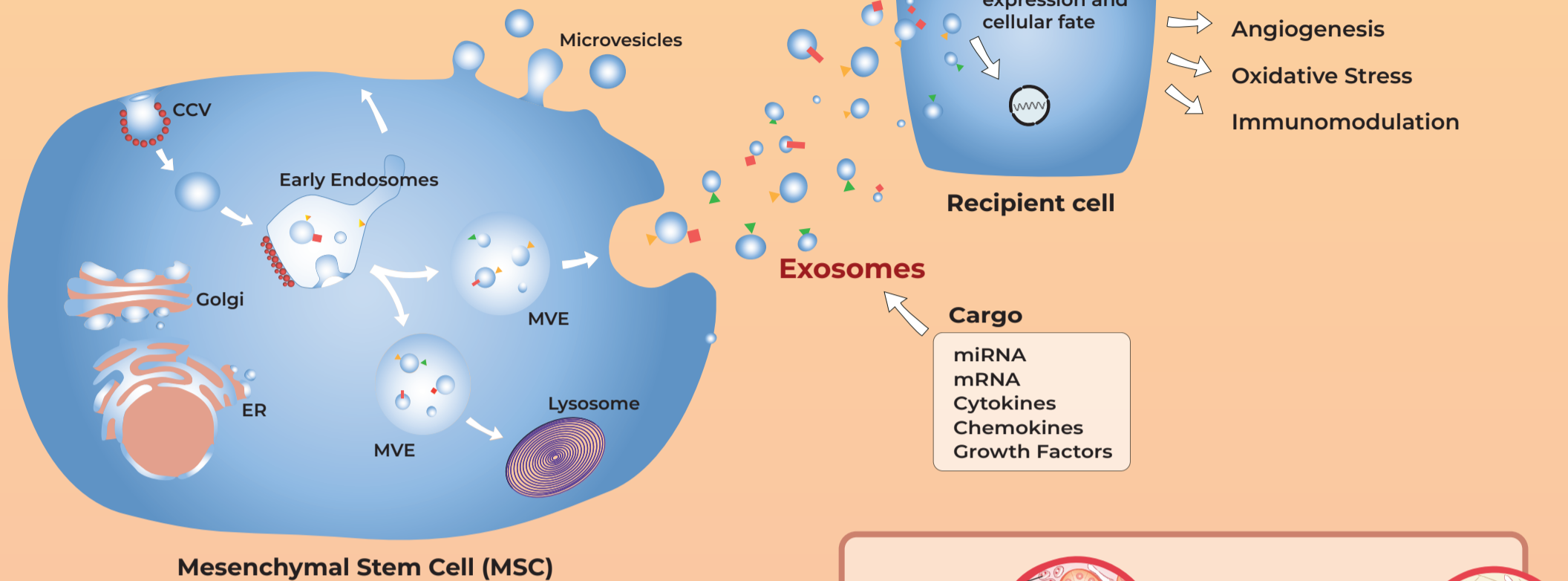
→ Weakened Immune System

Patients with dialysis or kidney transplant who have weakened immune system are more prevalent to infection and relevant complications.

Chronic Kidney Disease & Exosome Therapy

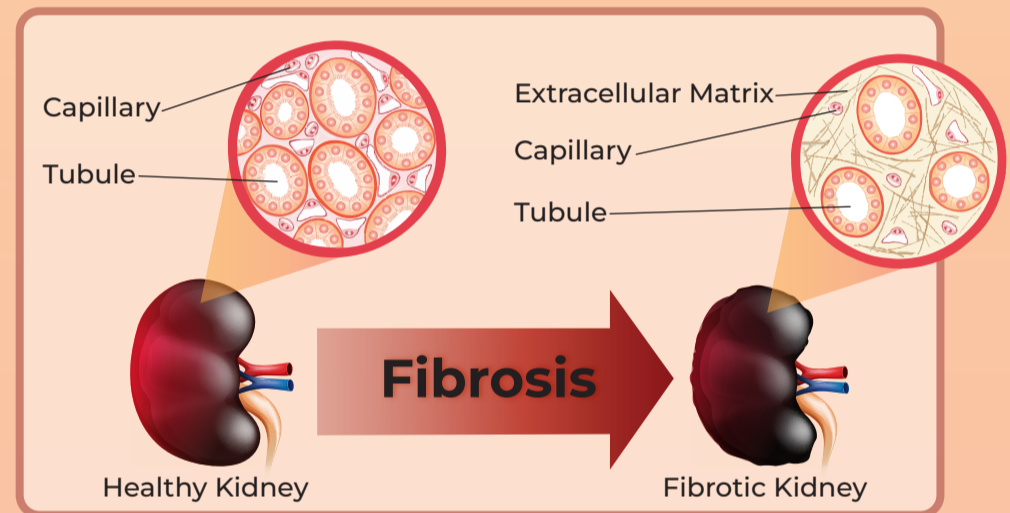
Exosomes

Exosome, the nano-sized cell-to-cell messenger, is secreted from mesenchymal stem cell (MSC) to transfer the messages to the recipient cells. It delivers biomolecules to alter the gene expression and cellular fate of the recipient cells.



Anti-Fibrotic Effects of Exosomes

Fibrosis is the hallmark of permanent damage in CKD, it is the formation and accumulation of extracellular matrix [a complex network of proteins and other molecules] caused by prolonged tissue injuries. Kidney fibrosis can eventually lead to kidney dysfunction/failure.



MSC-exosomes promote tissue regeneration by targeting kidney fibrosis in several ways. It delivers various biomolecules to the injured cells, to reprogram the cellular pathways, such as proliferation, apoptosis, angiogenesis, oxidative stress, and immunomodulation.

- ➔ **Suppress the expression of fibrotic genes [genes that promote fibrosis]**
Exosomes showed the suppression to various miRNAs that mediate fibrosis, inflammation & apoptosis.
- ➔ **Reduce tubular atrophy**
Tubular atrophy is the chronic injury happened at the tubules of kidney [tubules: the channels at kidney for filtration]. The tubules undergo thickening of membrane, and contraction of tubular lumen decrease the rate of filtration, resulting in reduced kidney functions. Exosomes can reduce tubular atrophy, ECM and improve kidney function.
- ➔ **Vascular Regeneration**
Exosomes could improve the density of blood vessels that carry blood flow into the kidneys, resulting in an increase of kidney blood flow and GFR.
- ➔ **Anti-inflammatory**
Harmful inflammation attacks our own cells and cause tissue damage. Exosomes could reduce the expression of glycoprotein that used to recruit inflammatory cells into injured kidney, reduce the recruitment of immune cells and help in the inhibition of apoptosis [programmed cell death].

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