

# Chronic Kidney Disease

## What is Chronic Kidney Disease?



Chronic kidney disease (CKD) is characterised by **progressive irreversible loss** of kidney function over time.<sup>1</sup>



Kidneys carry out a number of essential functions, including filtering blood to remove waste and excess water from the body.<sup>2</sup> Half a cup of blood is filtered every minute to make urine.<sup>2</sup>

## Classification of CKD



CKD is classified based on cause and a combination of the degree of both kidney function (measured by estimated glomerular filtration rate [eGFR]) and kidney damage (measured by urine albumin-to-creatinine ratio [UACR]) present.<sup>3</sup>

**eGFR** = numerical estimate of kidney function based on the amount of creatinine (waste product created by muscles) in the blood.<sup>4</sup>

**UACR** = measures elevated protein levels in urine to detect kidney damage.<sup>5</sup>

## Prognosis of CKD outcomes by eGFR and UACR categories<sup>3</sup>

Normal to mildly increased kidney damage

Moderately increased kidney damage

Severely increased kidney damage

1

UACR <30 mg/g

2

UACR 30-300 mg/g

3

UACR >300 mg/g

|   | 1<br>UACR <30 mg/g        | 2<br>UACR 30-300 mg/g     | 3<br>UACR >300 mg/g |
|---|---------------------------|---------------------------|---------------------|
| 1<br>Kidney damage with <b>normal</b> kidney function<br>eGFR 90-100      | low risk                  | moderately increased risk | high risk           |
| 2<br>Kidney damage with <b>mild loss</b> of kidney function<br>eGFR 60-89 | low risk                  | moderately increased risk | high risk           |
| 3A<br><b>Mild to moderate</b> loss of kidney function<br>eGFR 45-59       | moderately increased risk | high risk                 | very high risk      |
| 3B<br><b>Moderate to severe</b> loss of kidney function<br>eGFR 30-44     | high risk                 | very high risk            | very high risk      |
| 4<br><b>Severe</b> loss of kidney function<br>eGFR 15-29                  | very high risk            | very high risk            | very high risk      |
| 5<br>Kidney <b>failure</b><br>eGFR less than 15                           | very high risk            | very high risk            | very high risk      |



End-stage kidney disease (ESKD) occurs when kidney function is so low that the kidneys can no longer support the body's functions and chronic dialysis or a kidney transplant is needed for survival.<sup>6</sup>

# A deadly disease that is on the rise



Nearly

**700 million people**

are affected by CKD globally, with the majority of patients in stage 3.<sup>7,8</sup>



CKD is a serious under-recognised public health emergency - for instance,

**90%**

of affected patients in the US do not even know they have it.<sup>6</sup>

**44%**

In the UK, it is estimated that about 44% of the CKD population aged 60 and older are undiagnosed.<sup>9</sup>



In advanced countries across the world,

**2-3% of the annual healthcare budget**

is spent on ESKD treatment, reaching to about 7% in the US.<sup>11,12</sup>



CKD continues to rise in the ranks among leading causes of death,<sup>8</sup> with global deaths nearly doubling

**from 0.6 million in 1990 to 1.2 million in 2016.**<sup>10</sup>



The societal direct and indirect costs of CKD and ESKD are substantial and increase throughout disease progression.<sup>13</sup> In the US, treating Medicare beneficiaries with

**CKD costs \$84 billion**, and treating people with **ESKD costs \$36 billion.**<sup>14</sup>

## What causes CKD?



CKD often occurs in the context of other comorbidities.<sup>15</sup> Knowing the causes of CKD can increase the chance of prevention and earlier detection and treatment.



The **main causes** of CKD are **diabetes**, **high blood pressure** and **glomerulonephritis.**<sup>6</sup>

## Prevention and testing



Patients may not realise they have CKD until it has advanced,<sup>6</sup> as there are typically no symptoms in the early stages of kidney disease.<sup>15</sup> In later stages, symptoms include tiredness, swelling of the feet and ankles, muscle cramps and poor appetite.<sup>16</sup>



Specific blood and urine tests can measure levels of creatinine in the blood and albumin in the urine to determine the presence and severity of CKD.<sup>6</sup> The amount of the protein albumin in the blood is one of the strongest indicators of a patient's risk for progressing to ESKD and having a cardiovascular (CV) event.<sup>17,18</sup>



Some risk factors for CKD progression can be addressed through lifestyle changes, including adopting a healthier diet and exercising regularly.<sup>6</sup> Specific medicines can help manage additional risk factors for the development and progression of CKD, such as those that help control blood pressure and blood sugar.<sup>19</sup>

# Complications from CKD



Patients with CKD frequently develop complications like anaemia (low blood count), hyperkalaemia, weak bones, fluid overload and nerve damage.<sup>19-21</sup> People with CKD are also at high risk of having heart and blood vessel disease,<sup>15</sup> and are more likely to experience a CV event than progress to ESKD.<sup>3</sup>

## Cardiovascular disease



**Cardiovascular disease** (e.g. heart failure, heart attack, stroke, arrhythmias, peripheral vascular disease) and CKD are closely interlinked; as a person's kidney function declines and the amount of protein in their urine increases, they are at increased risk of a CV event and dying prematurely.<sup>22,23</sup>

Patients with stage 5 CKD have been estimated to have 3.4x higher risk of CV events than patients with stage 1 or 2.<sup>24</sup>

About 1 in 5 (25.9%) patients with CKD aged 66 and older in the US has heart failure, compared to less than 1 in 16 (6.1%) among patients without CKD.<sup>25</sup>

Patients with CKD stages 3a to 4 have approximately 2x to 3x increased risk of CV mortality, respectively, relative to patients without CKD.<sup>26</sup>

## Hyperuricaemia



**Hyperuricaemia**, or **high levels of uric acid** in the blood, occur in more than 60% of patients with advanced CKD.<sup>27</sup>

This condition is associated with a small increase in morbidity and mortality.<sup>28</sup>

## Hyperkalaemia



**Hyperkalaemia** is characterised by **high levels of potassium** (>5mmol/L) in the blood. As kidney function declines, the kidneys are less able to remove excess potassium.<sup>29</sup>

Elevated potassium is associated with increased risk of CV events and death.<sup>30</sup>

## Anaemia



**Anaemia** is a condition in which the body has **fewer healthy red blood cells** (RBCs) than normal.<sup>31</sup> RBCs contain the protein haemoglobin (Hb), which carries oxygen to tissues and organs throughout the body.<sup>32</sup>

Anaemia in CKD is associated with cardiovascular disease, hospitalisation and progression to ESKD and death.<sup>33,34</sup>

## Treatment

While there are medications that can address some of the risk factors for CKD, few can work directly to slow renal disease progression. **No cure currently exists for CKD, generating a significant medical need for new therapy options.**<sup>19</sup> The main treatments include:<sup>19</sup>



Lifestyle adjustments such as healthy eating, exercise and smoking cessation.



Medicine to help control risk factors for disease progression such as high blood glucose and blood pressure.



In appropriate patients, Renin Angiotensin Aldosterone System (RAAS) inhibitors can help to slow disease progression.<sup>35</sup>

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