



LEVEL 3 CERTIFICATE / DIPLOMA

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MEDICAL SCIENCE

Unit 1: Human Health and Disease

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Level 3 Diploma in Medical Science

Level 3 Certificate in Medical Science

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One million people have kidney disease but don't know it.

- **The chronic condition costs the NHS in England more than £1.4bn each year.**
- **This is more than the amount spent on breast, lung, colon and skin cancer combined.**

Article adapted from the *Daily Mail*, 6/8/12

A recent study revealed that kidney disease costs the NHS in England more than £1.4billion each year – more than breast, lung, colon and skin cancer combined. Despite this, an estimated one million cases remain undiagnosed and untreated, according to a report published by NHS Kidney Care.

Around 1.8 million people in England have been diagnosed with Chronic Kidney Disease (CKD), which is where the kidneys become less effective at filtering waste products from blood.

The number of people receiving dialysis or kidney transplants increased by 29% between 2002 and 2008. Total prevalence of CKD (diagnosed and undiagnosed) is also believed to be increasing.

The study found that half a million people with CKD were not tested in 2009-10 to see if they would benefit from certain kidney drugs.

It is estimated that around 29000 would have been prescribed the medication as a result, ultimately saving the NHS £13 million a year.

NHS Kidney Care is urging GPs to improve the detection and early treatment of CKD, and has developed a range of professional resources to help them do this.

The Director of NHS Kidney Care said: 'Chronic Kidney Disease, if unchecked, can have a devastating impact on people's lives and as this study shows, it is also a major drain on NHS resources.'

The study 'Chronic Kidney Disease in England: The Human and Financial Cost', has been published in the journal *Nephrology Dialysis Transplantation*.

1. Introduction

Chronic Kidney Disease (CKD) is a condition where the kidneys do not work effectively. It is a long-term condition and is usually undetected until it reaches advanced stages as it does not usually cause symptoms.

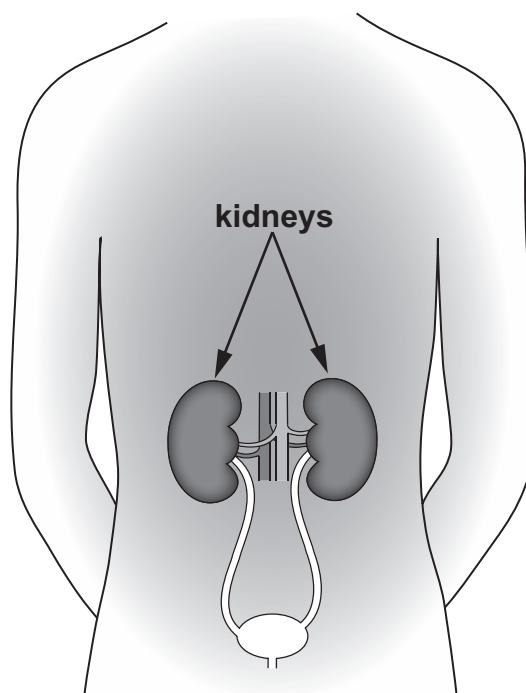


Figure 1: Position of human kidneys.

When a person suffers from CKD, the ability of the kidneys to carry out their functions is reduced. This happens over a long period of time and is therefore a chronic condition.

CKD is more common in people aged over 75 years of age with approximately 1 in 2 people suffering from it. This is caused by natural ageing of their kidneys and does not mean that they have abnormal or diseased kidneys. It is less common in young adults with approximately 1 in 50 people suffering from CKD.

Someone with CKD has an increased risk of stroke or heart attack; this is increased further if they are overweight or a smoker.

CKD is incredibly common but very few people (less than 1 in 1000) will need to be given dialysis or a kidney transplant.

People with CKD should be treated if their blood pressure is above 140/85 and they should have their kidney function checked regularly.

2. Symptoms of CKD

Early stages of CKD can remain undetected as the body is able to tolerate reductions in kidney function. In reality, the body is able to function normally with only one working kidney so people with CKD will only experience symptoms when the condition progresses.

Most people will become aware of the condition through a blood or urine test. Regular checks will be made on the person and as the condition approaches kidney failure the following symptoms could be experienced:

- weight loss and poor appetite
- shortness of breath
- swollen ankles, feet or hands (oedema)
- an increased need to urinate, particularly at night
- blood or protein in the urine
- itchy skin
- muscle cramps
- hypertension
- insomnia
- nausea

Early stage treatment can prevent many of these symptoms from developing.

3. Causes of CKD

- 3.1 **Hypertension** causes over a quarter of all cases of kidney failure. Blood pressure is the pressure exerted on the arteries by the heart during each pulse. When the pressure is too high it can damage the body's organs, which can lead to heart disease, stroke and can cause kidney function to worsen.

Hypertension puts strain on the small blood vessels in the kidney causing damage. As a result of this damage, the kidney is unable to filter the blood properly.

- 3.2 **Diabetes** is the second biggest cause of CKD with around a quarter of all kidney failure cases caused by diabetes.

When there is an increase in the glucose level in the blood, due to poorly controlled diabetes, the filters in the kidney can become damaged. This will then affect the ability of the kidney to filter out waste products and fluids.

The first sign of diabetic kidney disease is the presence of low levels of protein in urine.

- 3.3 **Other less common causes of CKD.**

- **Polycystic kidney disease** – this is an inherited condition where both kidneys are larger than normal due to the presence of cysts.
- **Regular and long-term use of certain medicines** e.g. non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen and also the use of lithium.
- **Blockages** caused by kidney stones or prostate disease.
- **Glomerulonephritis** – inflammation of the kidney.
- **Pyelonephritis** – infection in the kidney.
- **Systemic lupus erythematosus** – this is when the body's immune system will attack the kidney as if it were foreign tissue.

4. Diagnosing CKD

4.1 Blood and urine tests.

Blood and urine tests are the most common way of diagnosing CKD. These can be carried out at the GP surgery or the hospital.

4.2 Glomerular filtration rate (GFR)

The glomerular filtration rate (GFR) is used to assess how well the kidneys are working. It measures the volume (ml) of waste fluid filtered from the kidneys in a minute. A healthy pair of kidneys should filter in excess of 90 ml/min.

A formula is used to estimate the GFR as it is difficult to measure directly.

A blood sample is taken and the level of a waste product, creatinine, is measured. The person's age, gender and ethnic group will be taken into consideration at this stage. The result is compared to normal kidney function.

4.3 Urine tests.

Two tests can be used:

- Detecting the presence of protein or blood in urine.
- Measuring the levels of albumin and creatinine (the ratio of the two is used with the eGFR (estimated glomerular filtration rate) to give doctors an idea of how the kidneys are functioning).

4.4 Other tests

- **Kidney biopsy:** kidney tissue can be examined under a microscope to look for abnormalities.
- **Kidney scans:** these could be ultrasound, MRI, gamma camera or CT scans. Kidneys will appear shrunken and uneven in shape with advanced kidney disease.

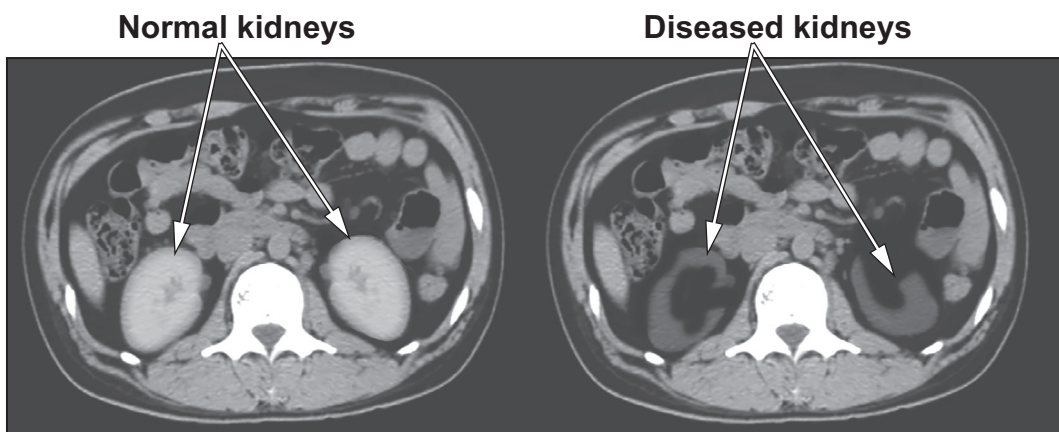


Figure 2: CT scans of normal and diseased kidneys.

4.5 Screening

A GP will recommend if a person should be screened. Annual screening is confined to certain high-risk conditions:

- diabetes
- hypertension
- acute kidney injury caused by medications, kidney stones or enlarged prostate
- cardiovascular disease
- family history of CKD stage five or inherited kidney disease
- systemic lupus erythematosus
- blood or protein in the urine without a known cause

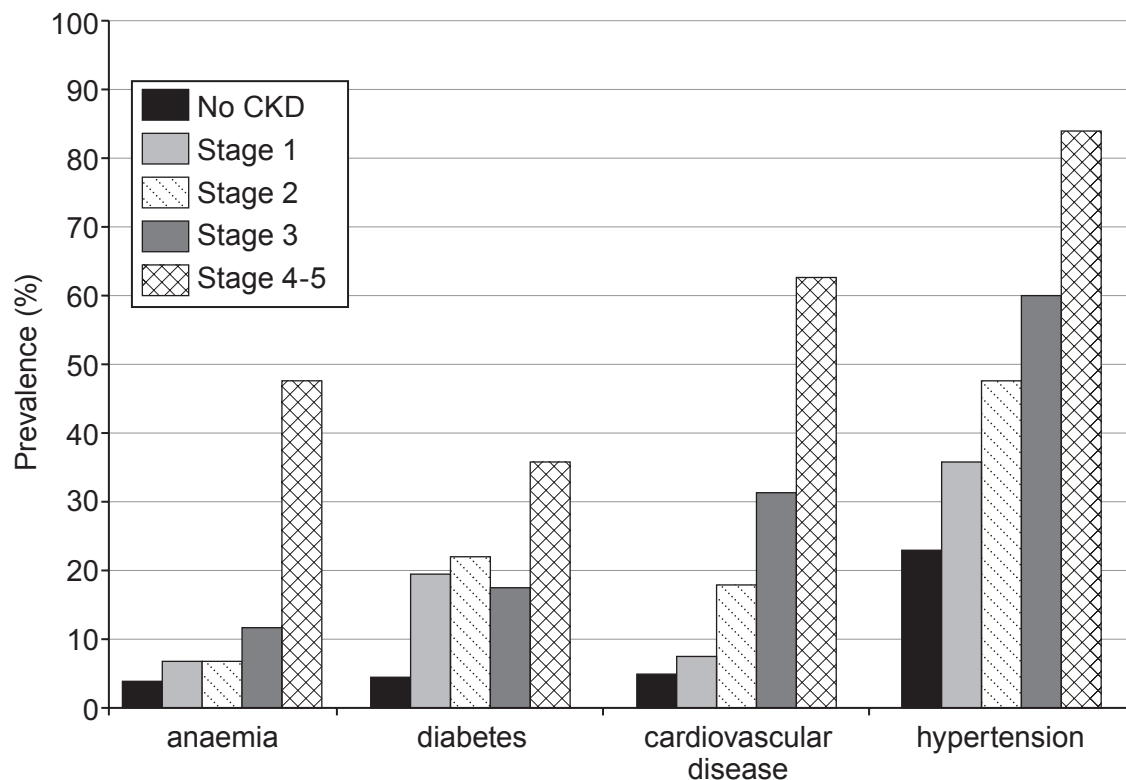
5. Stages of CKD

Chronic kidney disease is classified into stages based on the eGFR level. The higher the stage, the more severe the CKD.

There are six stages of CKD.

- **Stage 1:** eGFR is normal (above 90 ml/min), other testing shows evidence of kidney damage.
- **Stage 2:** eGFR is lower (60-89 ml/min), this is still considered in the normal range for young adults.
- **Stage 3a:** eGFR has decreased mildly (45-59 ml/min), this is called mild to moderate decrease in kidney function.
- **Stage 3b:** eGFR has decreased moderately (30-44 ml/min), this is called moderate to severe reduction in kidney function.
- **Stage 4:** eGFR has decreased severely (15-29 ml/min). Symptoms of CKD could now be present in the person.
- **Stage 5:** eGFR is very low (below 15 ml/min). There is almost no function in the kidneys. This is now known as renal failure.

Graph 1: Prevalence of CKD in coexistence with other medical conditions.



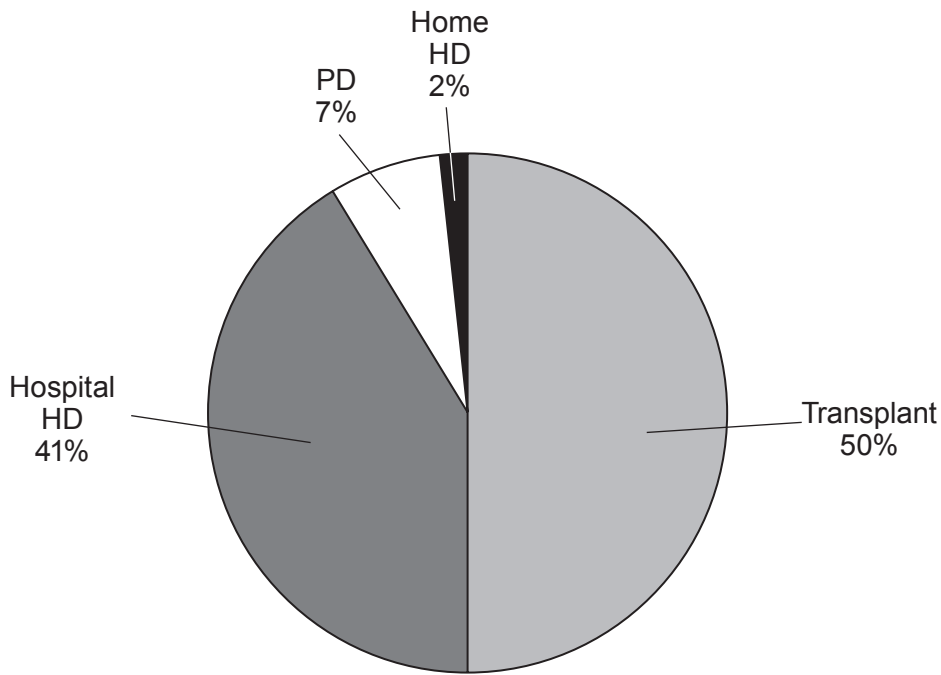
6. Treating CKD

There is no cure for CKD. Treatments are given to prevent progression of the condition, reduce the risk of developing related problems and to relieve the symptoms. Treatments will vary depending on the stage of CKD that is present.

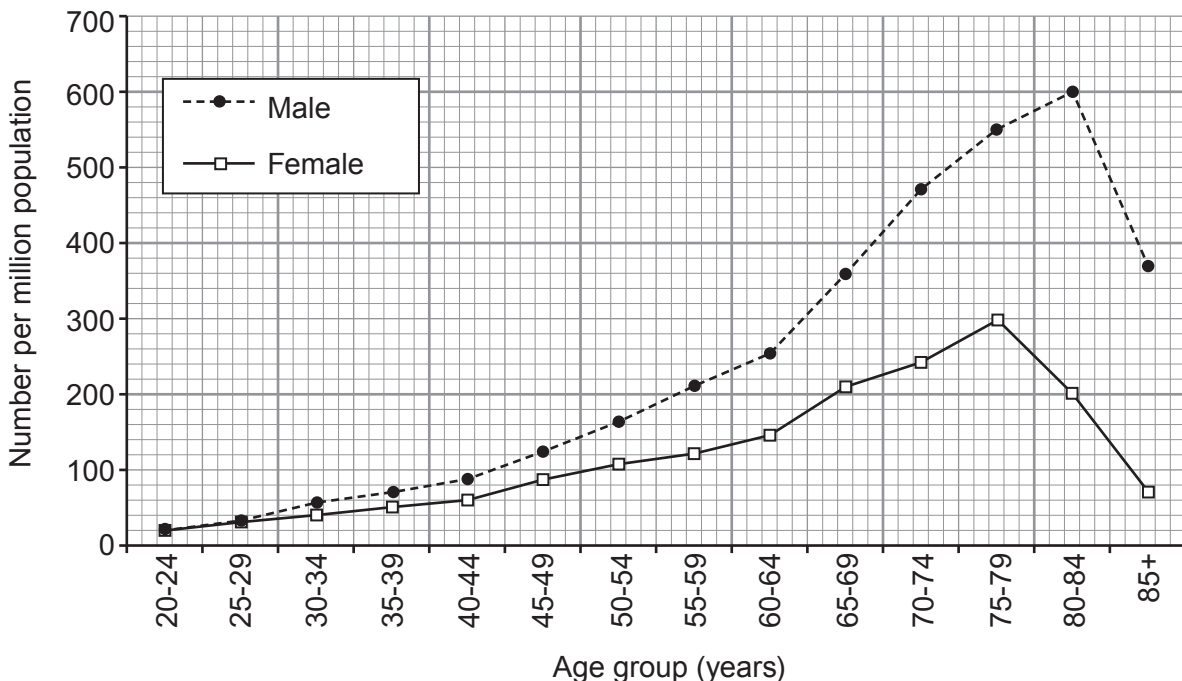
6.1 Dialysis and transplantation

As of December 2012 there were approximately 55000 adults in the UK undergoing dialysis or had a functioning transplant. 50% of these had a working kidney transplant, 41% were receiving haemodialysis (HD) at a hospital, 7% were on peritoneal dialysis (PD) and 2% were on HD at home.

Chart 1: Percentage of patients undergoing dialysis or transplant in the UK in 2012.



Graph 2: Number of people starting treatment for CKD in 2012 by age and gender.



7. Preventing CKD

Chronic kidney disease cannot be completely prevented. Steps can be taken to reduce the chances of the condition developing.

These steps include:

- managing any existing conditions
- stopping smoking
- eating a diet low in salt and cholesterol
- not exceeding the recommended limit for alcohol consumption
- exercising regularly
- limiting the use of certain painkillers
- losing weight if overweight
- drinking a minimum of 2 litres of fluid a day

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