



Bias and Biology

How the gender gap in heart disease
is costing women's lives

British Heart Foundation briefing

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I never thought my symptoms were my heart, partly because I am a woman. When they told me I'd had a heart attack I couldn't believe it. Even though my dad died of a heart attack, I thought they'd got it wrong.

–Esther Stanhope





Inequalities in the way women with heart attacks are cared for compared to men are costing lives.

Research funded by the BHF and others has uncovered that at every stage - diagnosis, treatment and aftercare - women who have heart attacks receive poorer care than men.

Underlying all of this is a common misperception that coronary heart disease and heart attack is a man's disease. Yet 35,000 women are admitted to hospital following a heart attack in the UK each year - an average of 98 women a day, or four per hour.¹

In this briefing, we are focusing specifically on

the issue of women and heart attacks, an area where we can save more lives by improving awareness and treatment for women.

Inequalities for women are rife in many areas of heart and circulatory health beyond heart attack, and we are committed to reporting on these other issues in future statements.



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Foreword

The British Heart Foundation has produced this briefing about the women who are dying needlessly from heart attacks, or not making as good a recovery as they could, because they don't receive the same care and treatment as men.²

Decades of research have transformed the likely outcome for someone suffering a heart attack. In the 1960s, standard treatment was bed rest and pain relief, and more than seven out of ten heart attacks in the UK were fatal.

Today these numbers have been reversed so now, on average, seven out of ten people will survive a heart attack.³ We better understand the steps which need to be taken when a patient presents with symptoms suggestive of a heart attack. We are better and quicker at running the appropriate diagnostic tests, and we have better techniques available to treat the cause of the heart attack, and to prevent another from happening in the future.

Yet if you're a woman, the odds are stacked differently. The studies detailed in this briefing have revealed inequalities at every stage of a woman's medical journey and, while complex to dissect, they add up to a societal failure to provide fair care for women.

This gender gap is not just a problem in the UK. The British Heart Foundation's counterparts in the U.S. and Canada have unearthed a similar picture from the evidence and are already campaigning on the issues. Some of the studies in this briefing were conducted by

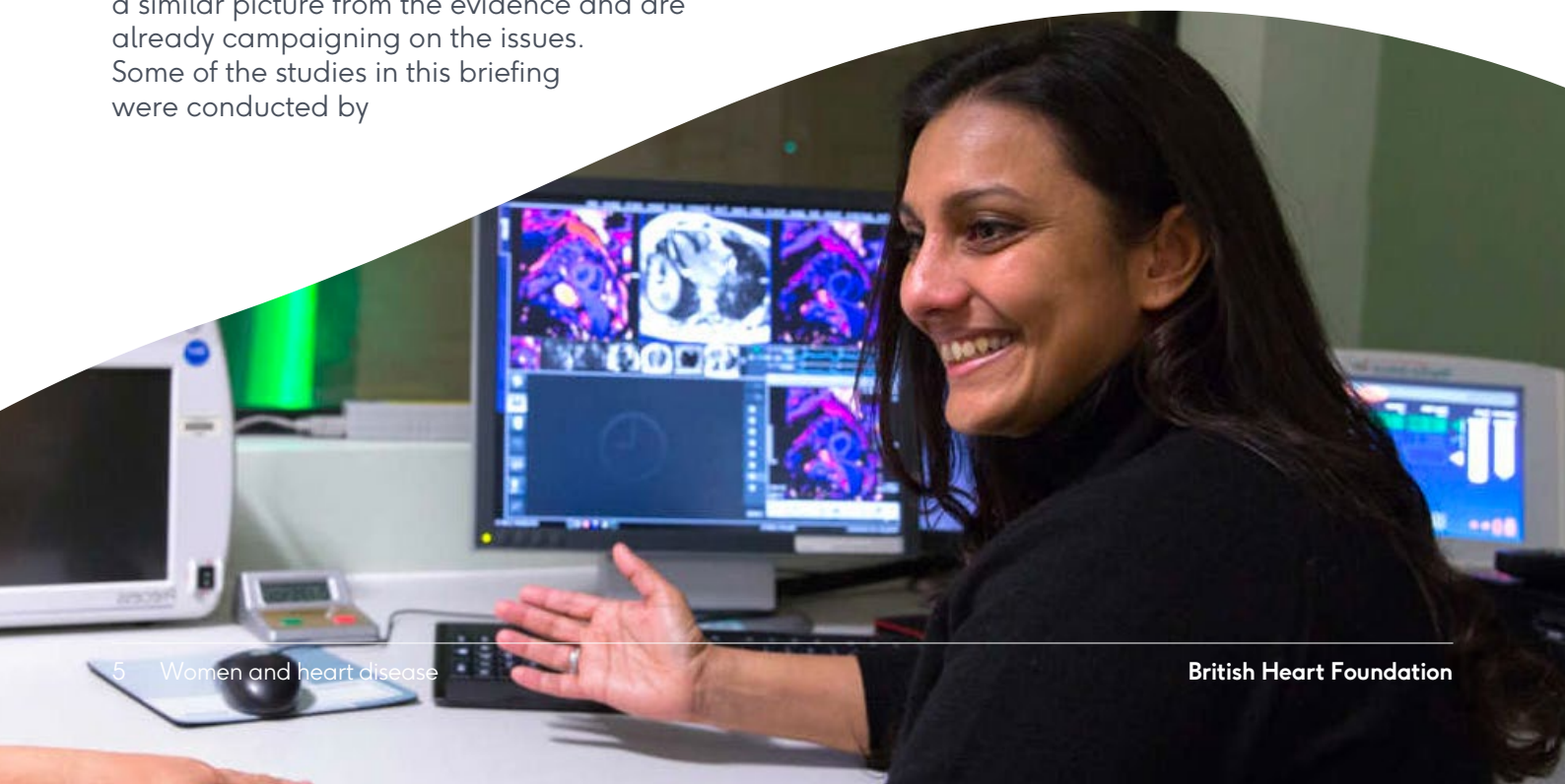
researchers studying patterns in men and women across Europe.

I'm shocked by this injustice, not least as a cardiologist. As this briefing highlights, we now know that women are often not empowered with correct information on symptoms associated with a heart attack, delay seeking medical help, receive medical care slower than their male counterparts, and are offered fewer treatment options than men.

It is important to say that this is not the fault of any single organisation or individual. This appears to be a deeply entrenched issue which manifests itself in a series of unconscious biases. While this briefing addresses the inequalities in all areas of heart attack care, it is not intended to paint a picture of blame; we want to change the whole public perception of women and heart attacks. We want to start a conversation today so that, in the future, more women's lives are saved, and women make a better recovery following a heart attack.

Dr Sonya Babu-Narayan

Associate Medical Director,
British Heart Foundation



Definitions

What is coronary heart disease?

Coronary heart disease is also known as ischaemic heart disease.

Ischaemia is when blood flow to the heart is reduced, preventing the heart muscle from receiving enough oxygen.

Coronary heart disease occurs when fatty deposits called 'atheroma' build up in the inner layer of the artery wall (the intima) to form plaques, which cause the arteries to become hard and narrow. As the coronary artery becomes narrower the blood it can supply to the heart muscle becomes more limited.

What is a heart attack?

A heart attack is a medical emergency and can be life threatening.

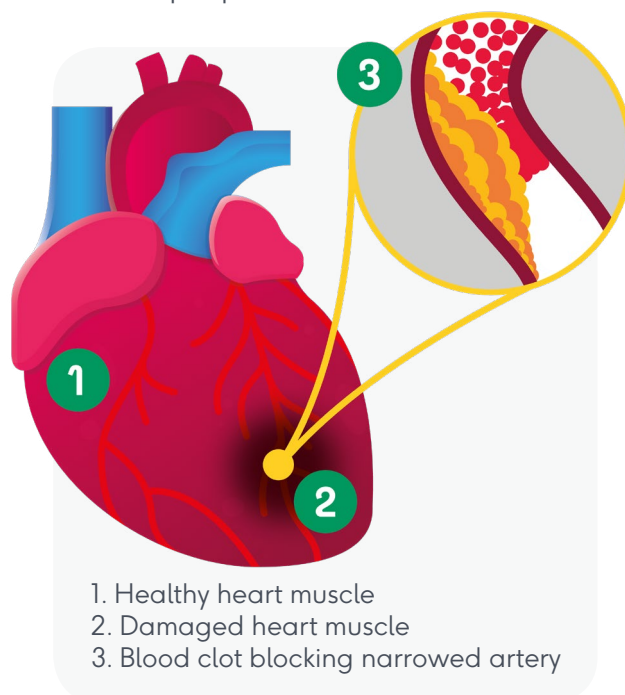
A heart attack (or myocardial infarction) occurs when a plaque ruptures. The flowing blood is exposed to the atheroma, causing a blood clot to form at the site, and leading to full or partial blockage of the artery. This blocks the flow of blood through the coronary artery to the heart muscle, causing it to be starved of oxygen, and that part of the muscle to be permanently damaged.

When someone has symptoms of a heart attack, an urgent electrocardiogram (ECG) is used to determine which type it is. The two main types of heart attack are referred to as either STEMI (ST-elevation-myocardial infarction) or NSTEMI (non-ST-elevation myocardial infarction) based on the ECG. STEMI generally occurs when there's a sudden total blockage of one or more of the coronary arteries. NSTEMI is typically caused by a partial or near complete blockage of one or more arteries.

The ECG findings help determine which type of heart attack has occurred and therefore which treatment procedure is appropriate, and how quickly it needs to be done. For this reason ECG is urgently needed for diagnosis if you have symptoms of a heart attack.

Increased blood levels of markers of heart tissue injury such as troponin are also used to diagnose heart attack.

Both types of heart attack are serious and can result in permanent damage to the heart, or death. A heart attack can lead to a cardiac arrest, where the heart stops pumping blood around the body, you stop breathing and lose consciousness. Immediate cardiopulmonary resuscitation (CPR), including defibrillation, allows some people to survive.



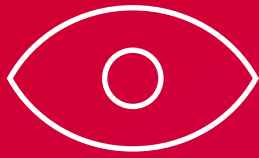
What is angina?

Coronary artery disease may also manifest as angina. Angina is experienced as short-lived pain (or discomfort, heaviness, tightness, pressure or dull ache) in your chest that may spread to your arms, neck, jaw, back or stomach, and it typically happens on exertion.

When you exercise, your heart needs a greater blood supply. The narrowing of the coronary arteries means that on exercise your heart does not get enough blood, which causes the pain and discomfort.

Angina is usually triggered by physical activity and relieved by rest, but it can also be triggered by an emotional upset, cold weather or after a meal.

An angina attack doesn't permanently damage your heart muscle, and having angina doesn't mean you'll have a heart attack. But it does increase your risk.



Awareness

- Coronary heart disease kills **twice as many women** as breast cancer in the UK. However, there is a widespread misperception that it's a man's disease.
- This lack of awareness of their risk could mean women are **less likely to recognise they are having a heart attack**, leading them to delay seeking help.
- **Women typically arrive at hospital later than men** when having a heart attack, contributing to delays in treatment. A heart attack is a medical emergency - delays in receiving treatment are putting women's lives at risk.

Public understanding of women and heart attacks is beset by misperceptions. These are dangerous when they mean a woman doesn't recognise the symptoms of her heart attack and delays seeking and receiving medical help.

That is why we need to raise awareness of heart attack among women: the longer treatment for a heart attack is delayed, the greater the chance of permanent damage to the heart.^{4,5}

Worldwide, coronary heart disease is the single biggest killer of women.⁷

Women are twice as likely to die from coronary heart disease as from breast cancer in the UK⁶

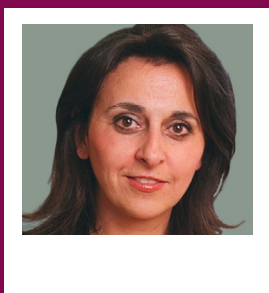
However, data from the US and other countries shows that both women and their doctors continue to underestimate their risk of heart and circulatory disease, particularly if they are young.^{8,9,10,11}

The perception that 'women don't have to worry about heart attacks' in the same way as men has dangerous real-life consequences: studies

suggest women typically arrive at hospital later than men while having a heart attack.^{4,12,13} Early treatment is critical for reducing complications and damage to the heart,^{4,5} and one trial showed that delaying treatment by 30 minutes reduced life expectancy by one year.¹⁴ A global systematic review¹³ found that the average (median) delay between the onset of symptoms and arrival at hospital for men ranges between 1 hour 24 minutes and 3 hours 30 minutes. For women the delay ranged between 1 hour 48 minutes and 7 hours 12 minutes.

One of the reasons both men and women delay seeking help is if they don't recognise they are suffering a cardiac event. Generally, when people believe they are having a heart attack, they understand that they should seek help quickly. Yet many people don't realise they are having a heart attack and are likely to self-medicate or wait to see if they improve rather than dialling 999.^{4,10,13,15}

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Dr Ghada Mikhail,
Consultant
Interventional
Cardiologist and
founder of the 'Her
at Heart' initiative

Men are much more aware of the possibility of having heart disease compared to women. If men develop symptoms of chest pain related to a heart attack, they are much more likely to call an ambulance and seek medical help. This is compared to women who can delay their presentation to hospital. They are unaware that they too could be having a heart attack. There remains still the misperception that heart disease is a man's disease.

Younger women

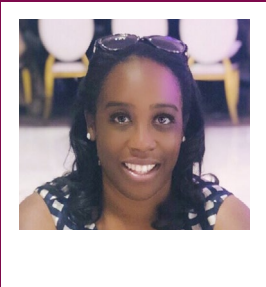
Another common misperception is that younger women don't have heart attacks. It's true that women, on average, have heart attacks seven to ten years later than men.¹⁶ Although the reasons for this gap are still under investigation, younger women are thought to be protected by oestrogen, and therefore after menopause their risk of heart attack increases.^{17,18}

Yet there are numerous reasons why a younger woman could have a heart attack, including a family history of heart disease, high blood pressure, high cholesterol or diabetes, or due to lifestyle factors, like smoking. And when women do have heart attacks younger, they can be even more disadvantaged.^{19,20,21} They might struggle to be taken seriously, may have their symptoms attributed to another cause without proper exploration, and they may receive fewer evidence-based treatments than their male counterparts.

Younger women can also experience an entirely different type of heart attack, caused by spontaneous coronary artery dissection, or SCAD. It's rare but potentially devastating, and predominantly affects young, otherwise healthy women. The average age of a person having a SCAD is around 42.²² Women make up eighty per cent of people with SCAD.²³

SCAD happens when one or more of the inner layers of a coronary artery tears away from the outer layer. As a result, blood can collect between the vessel layers, reducing the flow of blood through the artery. This can lead to a heart attack as the blood supply to the heart has been blocked. In some cases SCAD can lead to a cardiac arrest. SCAD can also be associated with pregnancy.

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Marie Frederick had a heart attack at work, caused by SCAD, when she was 35.

At work I was in tears from the pain in my chest and my arm and said to my manager he needed to call an ambulance.

The pain was getting worse and worse. Eventually the paramedics arrived and did an ECG. The ECG wasn't showing anything abnormal at that stage, but I was feeling awful and could barely walk. They said it wasn't mandatory for me to go to the hospital, but that if I wanted to, they suggested that I did. I said I really wasn't feeling well so I should go.

We went to the hospital. The flashing blue ambulance lights weren't on. I kept wondering when we were going to get there. I was in A&E sitting there upright on a chair. A few more ECGs then blood tests, then more waiting. Finally, someone said to me when I was called in to be seen that I'd had a heart attack. I was completely shocked.



Esther Stanhope

When she was 45 and on a work trip to New York, Esther experienced chest pain, and other heart attack symptoms. Despite a family history of coronary heart disease, she dismissed the idea that she could be having a heart attack because she was too young, and a woman. She delayed seeking help until she returned to the UK.

"In New York, I had three speaking engagements. I was walking back from one event where I'd been on stage for 90 minutes and I thought – I'll get a cab. I felt a little bit dizzy, my breathing wasn't that easy and I wasn't feeling great.

I had actually experienced something similar before on a work trip to Amsterdam. It felt like I couldn't catch my breath, and there was a pressure on my chest.

I went to Maine to see my brother, and I went to a cross-fit class with my sister-in-law. Within minutes I started to feel unwell – I was dizzy, I was sweating, I couldn't breathe easily. It was humid so I put it down to that. I felt embarrassed, as if I was very unfit. So I joined in the core exercises at the end.

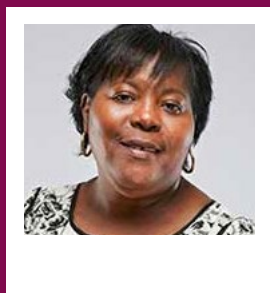
I never thought it was my heart, partly because I

am a woman. I am relatively healthy and I don't eat loads of fatty food. There was definitely a strange feeling in my left arm. But I didn't take it that seriously.

When I got back to the UK, even my eight-minute walk home from the tube was difficult. I told my husband I didn't feel well and called my GP. The receptionist advised me to go straight to A&E. Even when I was in hospital being tested I was saying to the doctors and nurses, "I have a call at 3 – do you think I'll be done by then?"

When they told me I'd had a heart attack, I couldn't believe it. I thought they'd got it wrong. My dad had died of a heart attack. So I thought if you had a heart attack you died straight away. Or you'd be clutching your chest like you see in the movies."

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Yvonne Genas

It felt like somebody had taken a sledgehammer and whacked me in the chest...I couldn't breathe, I was sweating... then I had pain down my arm.

I had all the 'classic' symptoms — sweating, breathlessness, chest pain. But as I sat slumped over my desk, my colleagues looking on in horror, it didn't occur to me I was seriously ill.

That night I took paracetamol and went to bed early. I went to work for the next three days, but the symptoms were worsening, I only went to the GP when I got a horrible cough.

A lack of awareness of heart attack symptoms also proves a barrier to women seeking help. It is a misperception that men and women experience completely different heart attack symptoms: symptoms vary from person to person, and everyone needs to know the different ways a heart attack can present.

Different studies have suggested that certain symptoms may occur more or less frequently in men or in women;^{19,24} but there are none exclusive to either men or women, and there is no distinct set of 'men's symptoms' and 'women's symptoms'.

A BHF-funded study shows that chest pain (including feelings of tightness, pressure or squeezing) is overwhelmingly the most common symptom in both men and women, questioning the myth that women tend to suffer unusual or 'atypical' heart attack symptoms.²⁵

The findings emphasise the need for women to recognise and act on the warning signs.

Amy Ferry, cardiology research nurse at the University of Edinburgh, and first author of the recent study, said:

"It's not unusual in hospital for patients' symptoms to be recorded at the time doctors are reviewing the results of diagnostic tests, and when a diagnosis of a heart attack is being made. This means what the patient describes may be influenced by what they think a heart attack may feel like. Doctors may also be influenced in the same way: they may record the symptoms which are most relevant to the diagnosis they think is most likely.

When we designed our study we did things differently, to avoid this potential bias. We asked all patients coming to A&E with a possible heart attack to tell us their symptoms, and we recorded them, before they were given a diagnosis. We found that when people described their symptoms freely, women were as likely as men to report 'typical' symptoms like chest pain, tightness or pressure."

Symptoms

Symptoms of a heart attack

It's vital to recognise the symptoms of heart attack and seek medical attention fast by dialling 999.

The symptoms of a heart attack can vary from person to person, but the most common signs of a heart attack are:

- **Central chest pain or discomfort in your chest that suddenly occurs and doesn't go away**
- **It may feel like pressure, tightness or squeezing**
- **Pain which radiates down your left arm, or both arms, or to your neck, jaw, back or stomach**
- **Feeling sick, sweaty, light-headed or short of breath**

If you experience the symptoms of a heart attack, you should call 999, rather than visiting a GP or going to A&E. Paramedics may be able to diagnose a heart attack straight away and take you to a hospital where you can be

treated as soon as possible. Going to A&E may lead to delays in your treatment or you may be at a hospital not set up to deliver you the best treatment for your type of heart attack on time.

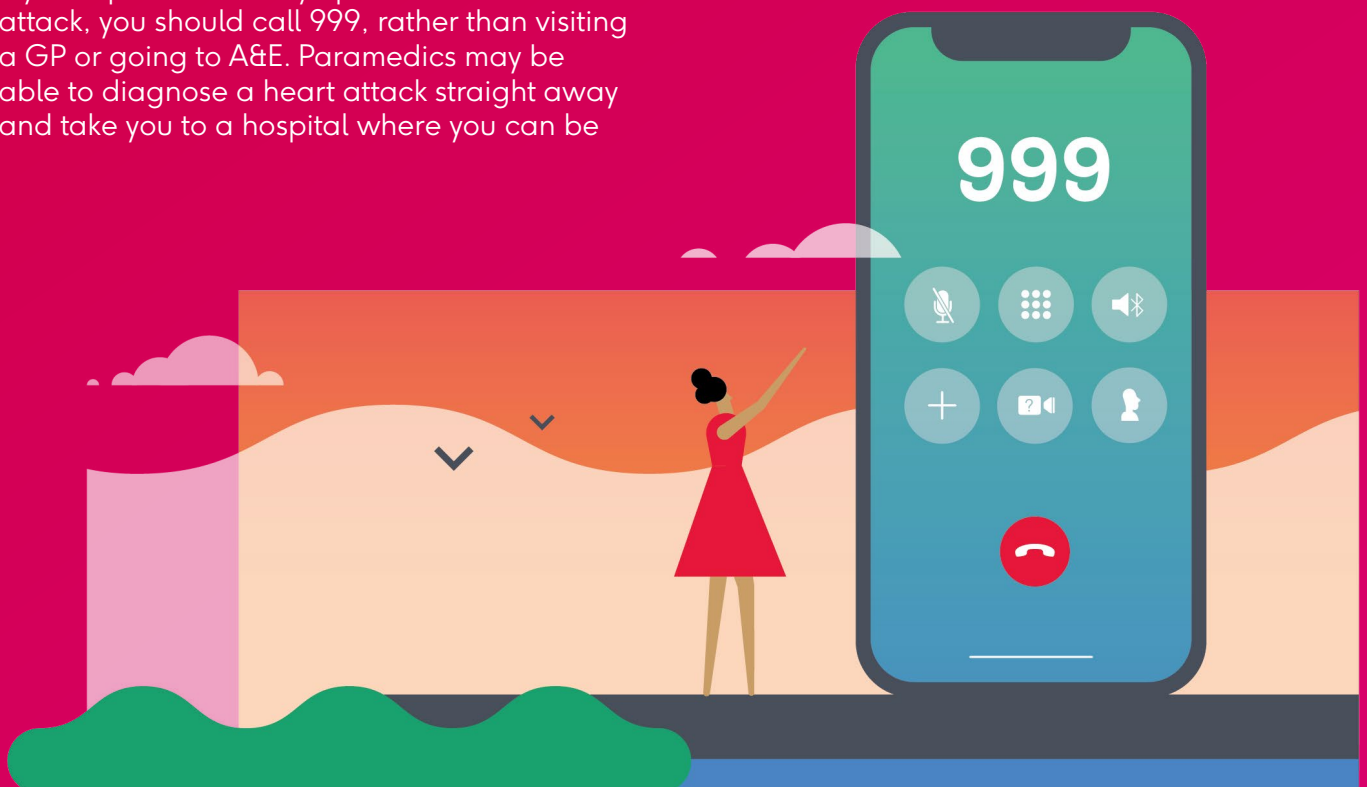
Symptoms of angina

The symptoms of angina are similar to those of a heart attack but typically occur with exertion. Angina is not the same as a heart attack, but it is a sign that you have coronary heart disease.

How are the symptoms different?

If you have angina, your symptoms will usually ease or go away after a few minutes of rest.

If you have not been diagnosed with angina and experience chest pain, call 999 immediately.





Simone Telford

Doctors thought Simone's health problems were due to asthma, and later from stress and anxiety at a time of her life when she was changing jobs, even though she had previously brought up her family history of heart disease and high blood pressure. Simone describes the heart attack she had while staying with her sister in Australia. She was 42.

"Arriving at A&E, I had shortness of breath and chest pain. I felt like I needed air and was breathing very deeply.

They [the doctors] took me into a room, where I had an ECG which revealed I was having a STEMI heart attack. Straight away I was wheeled away into a hospital bay where they gave me aspirin, got me to lay down, and were talking to me about my medical history. I was telling them all about the shortness of breath, my asthma – and the doctors were saying 'you've probably had angina for a couple of years, and it's not been picked up because you're female, because you're young, it's not even been looked at at all'.

They took me for an angiogram, which revealed I had critical triple coronary artery disease. There were two blockages in the left arteries of 90 per cent and 70 per cent, my right coronary

artery had two blockages of 100 per cent, and there were two more blockages of 90 per cent elsewhere – so six critical blockages in total. I felt the doctors were looking at me as if to say – we don't know how you're even still here.

They had to take me down to bypass surgery. They kept me stable through the night, until I was taken down early the next morning for the operation.

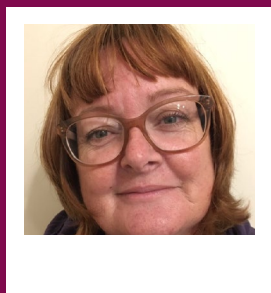
I was coming to the end of my holiday and suddenly – to be told you're having a massive heart attack – it was scary for us all. My brother and sister live in Australia but my dad was in the UK, and I was saying they had to let Dad know. Hearing the risks and pros and cons involved with the bypass surgery was terrifying. I was 42 years old, and I had to make phone calls to my dad saying, I love you - I hope it all works out."



Diagnosis

- Someone who has an incorrect initial diagnosis of heart attack has a **70% higher risk** of death after 30 days compared to someone who receives the correct diagnosis straightaway.
- A woman is 50% more likely than a man to receive the **wrong initial diagnosis** for a heart attack.
- This picture shows that women are **disadvantaged compared to men** at the outset of their treatment.

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Lorraine Kinzel, who was 44 when she had a heart attack

The idea it was a heart attack didn't even enter my head. A paramedic car came out, and he examined me. My blood pressure was very high but he said that was probably because I was in pain. He thought I had a hiatus hernia. He said because you're in so much pain and your blood pressure is high, I'll call for an ambulance.

So the paramedics came, they gave me a dose of morphine. They kept saying it was a hiatus hernia. They didn't do an ECG test until I got to A&E.

A quick diagnosis after a heart attack, leading to the correct treatment, is essential to ensure the best possible recovery.

A BHF-funded study showed that women who have an NSTEMI heart attack are 34 per cent less likely to receive coronary angiography within 72 hours of their first symptoms compared to men.² This 72-hour window is recommended by European Society of Cardiology guidelines.²⁶

Coronary angiography is an invasive procedure where a dye is used to create video images that reveal narrowings or blockages in the coronary arteries. It is a critical step in heart attack diagnosis, helping doctors to decide what to do next, and paves the way for timely treatments which are used to restore blood flow to the heart.

A woman in the UK is 50 per cent more likely than a man to receive an initial wrong diagnosis following a heart attack, according to a study carried out between 2002 and 2013.²⁷

In the study, both men and women who received a wrong initial diagnosis had a 70 per cent higher risk of death after 30 days, compared

with those who received a consistent diagnosis. However, women were more likely to receive the wrong initial diagnosis.

These studies demonstrate that women who have heart attacks are at a disadvantage from the point of diagnosis and at the very start of their treatment.

50%
♀

In a study women were 50% more likely than men to get the wrong initial diagnosis after a heart attack

BHF research, improving diagnosis

BHF-funded research has improved methods of diagnosing heart attacks in women.

A simple blood test could help doctors spot twice as many heart attacks in women, a BHF-funded study has shown.²⁸

A protein called troponin is released from the heart when it is damaged, and taking a blood test to measure troponin levels helps doctors to diagnose or rule out a heart attack in people experiencing warning symptoms. When women come to hospital with a heart attack, the levels of troponin in the blood tend to be on average lower than those in men. A powerful new high-sensitivity troponin test detects even lower levels of troponin and has helped to set different thresholds for men and women.

Anoop Shah, a senior lecturer in cardiology who worked on the study, said: “We wanted to know if women are less likely to be diagnosed with a heart attack. Our findings told us that we, as doctors, may have been using a threshold for troponin levels that are too high in women.”

Research by the BHF shows that using this high-sensitivity troponin test can double the number of women diagnosed with a heart attack, who otherwise would have been told their hearts were fine.





Treatment

- BHF-funded research suggested that between 2002 and 2013, **8,243 women's lives were needlessly lost in England and Wales** because they didn't receive the same standard of care as men.
- Small differences across their pathway of care added up to create **significant gender gaps** in the treatment of heart attack.
- Understanding the root causes of these disparities will be a vital way to **improve heart attack care** for women.

Over a decade, the lives of more than 8,000 women in England and Wales who died as a result of a heart attack could potentially have been saved if they had received the same standards of care as men, a BHF-funded study at the University of Leeds has shown.¹

If this remains true, it means that two women a day are dying needlessly because they are receiving poorer care than men.

The senior author of the study, Chris Gale, Professor of Cardiovascular Medicine and Co-Director of the Leeds Institute for Data Analytics at the University of Leeds, said:

"Our study didn't take into account all of the heart attacks across England and Wales in this ten-year period – so it's likely that the number is an underestimate.

We know women receive unequal heart care – and we have identified which vital treatments they are missing. Understanding why these shortfalls exist and tackling them head on could save lives.

Health professionals have the best interests of their patients at heart – it's not that they don't care about women or wish to treat them differently. It's likely to be a combination of biology and bias. We need to understand more about why this is happening, and the way health systems make it more likely to happen."

One study looked at 'quality indicators' recommended by the European Society of

Cardiology. These are the endorsed lifesaving treatments for people who have a heart attack, and should be considered for every patient presenting to hospital with a suspected heart attack.

The study assessed the quality of care received by men and women following their heart attack against 16 of these treatments and found that women were less likely to receive 13 of the 16, including:

- Women who have a heart attack where the coronary artery is completely blocked acutely (known as a STEMI) were **around 3 per cent less likely to receive timely reperfusion** (restoration of blood flow, using procedures such as drugs or stents) than men.
- Women who have a heart attack caused by a partially blocked coronary artery (an NSTEMI) were **34 per cent less likely to receive a coronary angiography imaging test within 72 hours** of their hospital admission. Coronary angiography is used to reveal presence and extent of disease in the coronary arteries and is a vital step in treatment because it helps doctors decide on next treatment steps. Research shows that people who receive timely angiography for an NSTEMI have better outcomes as a result.
- Women were less likely to be prescribed drugs that helped to reduce the chance of having a second heart attack; they were **4.2 per cent less likely to receive dual antiplatelet therapy** – this involves taking two antiplatelet drugs, often aspirin and an antiplatelet agent.

More recently, data from Scotland showed a similar trend with women being less likely to undergo angiography, less likely to receive revascularisation therapies such as stents, and less likely to receive potentially lifesaving medications when they leave hospital.²⁹

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In isolation the differences may appear small, but even in a high-performing health system like the UK, small deficits in care across a population add up to reveal a much larger problem and a significant loss of life."

– Professor Chris Gale



Risk factors

- Women who have similar risk factors to men may have a **greater chance** of developing coronary heart disease.
- Women's lack of awareness of this so-called 'excess risk', combined with a low uptake of health checks, means that women may be dramatically **underestimating their personal risk** of heart attack.
- Women who have established coronary heart disease are **less likely than men** to reduce the chances of a second heart attack by managing their risk factors.

Prevention

The risk factors for heart attack are well established: high blood pressure, high cholesterol levels, a family history of coronary heart disease, smoking, obesity and diabetes.

Women may need to be extra vigilant with these risk factors. A UK study suggests that smoking, diabetes and high blood pressure increase the chance of a heart attack more in women than in men.³⁰

The study showed that while male smokers have more than double the heart attack risk of men who have never smoked, female smokers were found to have over three times the risk of women who have never smoked, giving them a so-called 'excess risk' when compared to men. An excess risk was also found among women with high blood pressure, and diabetes.

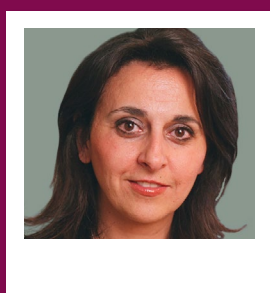
Even if they are aware of the risk factors for a heart attack, women may be unaware that these risk factors add up to an 'excess risk' compared to men. Combined with a low uptake of health checks, which measure cholesterol and blood pressure – as of early 2019, fewer than

50 per cent of eligible people had their NHS health check³¹ – women may be dramatically underestimating their personal risk of heart attack.

The NHS is working to make it as easy as possible for people to find out their risk, including recent moves in England to offer a pilot scheme for testing blood pressure and cholesterol at high street pharmacies.

It's estimated that in the UK, nearly 7 million women have high blood pressure. Of these, as many as 2.5 million may be undiagnosed. It's estimated that nearly 2 million women in the UK are living with diabetes, and nearly half of all women in the UK have cholesterol levels above national guidelines.³²

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Dr Ghada Mikhail,
Consultant
Interventional
Cardiologist and
founder of the 'Her
at Heart' initiative

As a cardiologist, I see women who are surprised to be diagnosed with a heart attack despite having risk factors such as a family history of heart disease. They may also be unaware that they have other risk factors such as high blood pressure, a high cholesterol level or diabetes.

Apart from family history, most other risk factors are modifiable. It is important therefore that women address their risk profile when they are younger with action such as not smoking, watching their weight, exercising regularly and treating high blood pressure, high cholesterol and diabetes in order to reduce their risk of developing heart disease when they are older.



Shernaz Engineer

Shernaz had a heart attack when she was 55 years old, and hadn't previously been aware of her blood pressure reading, cholesterol level or the symptoms of a heart attack.

"I never had my over-40s health check – I just wasn't aware of it. I was rarely ill and never went to the GP, so I think I slipped through the net. When I was told I was having a heart attack and they checked my cholesterol it was really high – so at the back of my mind I keep thinking it could have been avoided.

The day before my heart attack, I'd gone to bed, but when I tried to sleep, I couldn't – I was in pain that radiated all around my chest, back and arm. By 8am the pain was so excruciating it woke me up. It felt like someone

was pressing on my chest. I got myself to A&E and the doctor told me he thought I was having a heart attack. I told him he was being ridiculous.

I was taken by ambulance to another hospital, where I had a lot of tests. It was the troponin test which confirmed I was having a heart attack. I was whisked into the cath lab for a stent.

I would strongly impress on women over 40 to get their numbers checked – blood pressure and cholesterol – and to be aware of heart attack symptoms.'

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Mamas A. Mamas,
Professor of
Cardiology at
Keele University

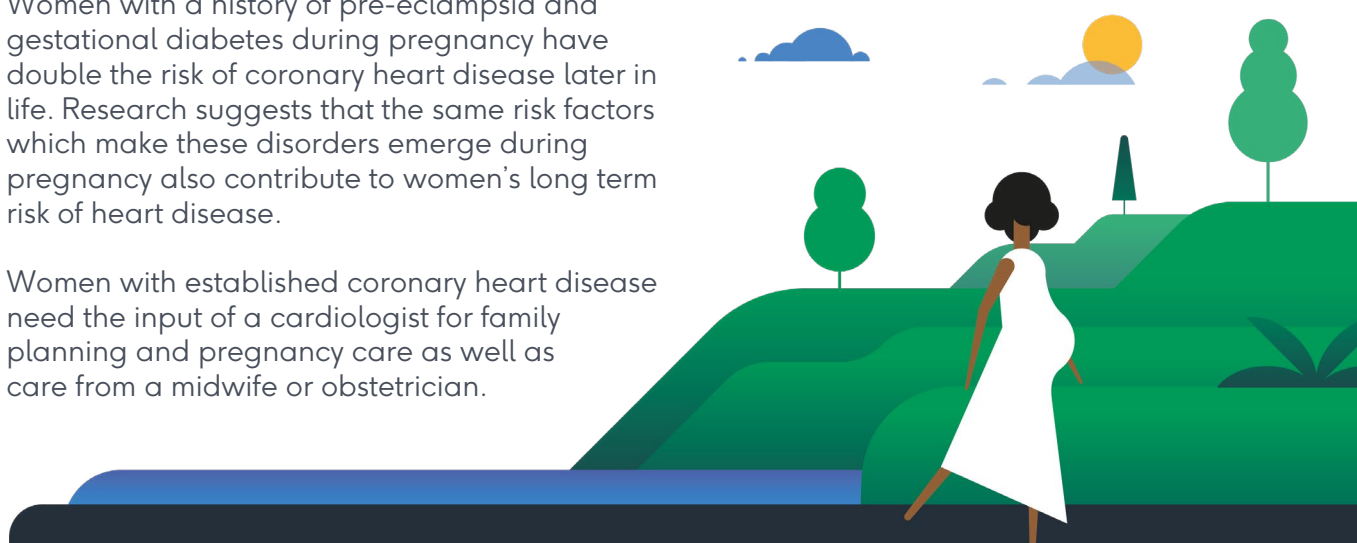
Women with pregnancy complications such as pre-eclampsia, gestational diabetes, pre-term delivery, multiple pregnancies or miscarriage are at higher risk of developing heart and circulatory diseases later in life. It's therefore very important that these women are screened for their heart disease risk factors during their pregnancy and after birth.

However, it shouldn't stop there. It is especially important that women who experienced these complications receive close, regular monitoring of their risk factors in the decades following the birth of their child. Managing these risk factors in the long term will help women to lower their future risk of heart and circulatory disease, to help to ensure they can live a long and healthy life.

Pregnancy can bring about a set of risk factors that are unique to women. It puts unique stresses on the heart and circulation – the amount of blood circulating increases by 50 per cent, and the way the body processes fat and sugar changes. Cardiologists have described pregnancy as a heart and circulatory ‘stress test’.

Women with a history of pre-eclampsia and gestational diabetes during pregnancy have double the risk of coronary heart disease later in life. Research suggests that the same risk factors which make these disorders emerge during pregnancy also contribute to women's long term risk of heart disease.

Women with established coronary heart disease need the input of a cardiologist for family planning and pregnancy care as well as care from a midwife or obstetrician.



A close-up portrait of Hina Shah, a woman with dark hair, looking slightly to the right with a gentle smile. She is wearing a red and black patterned top. The background is softly blurred, showing what appears to be a window or a railing.

Hina Shah

Hina had a heart attack when she was just 34. It came completely out of the blue, and she only later found out that her South Asian heritage may have put her at an increased risk. She is now particularly careful with her lifestyle to avoid another heart attack.

“When I first started feeling strange, I didn’t think anything like ‘this is likely to be a heart symptom’, because I was so young.

I had been preparing for Diwali with my daughter, Hiral. I remember we were making rice krispie chocolate balls together. She was five at the time, and we were chatting away and all of a sudden I felt like I was choking.

I went upstairs and thought that if I lay down for a bit then maybe it’d go away. My husband went out to pick up our son, and I hadn’t told anyone else. Luckily, Hiral came looking for me and could see that I’d really deteriorated – I was barely able to speak. I told her to go and get her grandad because I was really unwell. He came up and was shocked to see me. I whispered ‘you need to call 999, I am really unwell’.

The paramedics were a bit baffled that I was 30-something years old, yet everything was suggesting that I was having some sort of heart issue. They carried me down to the ambulance to do an ECG, and they took me straight to

Harefield Hospital rather than our local hospital. At hospital I was told that I’d had a heart attack and that they were going to treat me. They told me I had a blocked artery and I needed stents – I had no idea what a stent was.

The care was fantastic. The difficulty is when you have questions later on – after the consultants move on, the nurses go away, and you have a thousand questions: why did this happen? What does this mean for me? Am I going to live? Is my life going to be the same?

To start with I couldn’t walk from my house to the end of the street, as it would tire me out completely. I was 34. You think you have your whole life ahead of you: I do, and I did. But there are times when you just think – wow.”

Ethnic background can increase someone’s risk of developing heart and circulatory diseases: for people with South Asian or African Caribbean heritage, the risk of developing some heart and circulatory diseases may be higher.

After a heart attack

Women typically do not meet targets for care following a heart attack,³³ and are less likely to be prescribed certain drugs to help prevent a further heart attack.²

When someone has been treated for a heart attack, they may often need a source of support afterwards to answer their questions and to manage heart attack risk factors, to avoid having another one.

This usually means monitoring blood pressure and cholesterol levels, and taking medication such as statins and beta blockers. These measures may be accompanied with changes to diet and levels of physical activity, and stopping smoking.

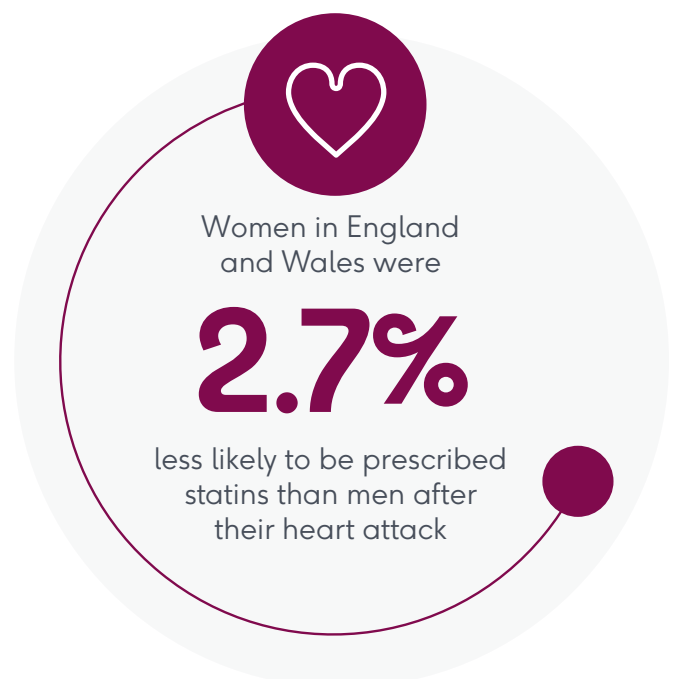
According to a European study, women with established heart disease are less likely than men to meet risk management targets in order to prevent a second heart attack. Only blood pressure control is better in women: they fare worse on targets for lipid and glucose levels, physical activity, obesity and cardiac rehabilitation.³³

Additionally, fewer women are prescribed medication than men. Statins are proven to be effective in the prevention of a second heart attack and are equally effective in men and women.³⁴ Yet a BHF-funded study showed that women in England and Wales were 2.7 per cent less likely to be prescribed statins and 7.4 per cent less likely to be prescribed beta blockers when leaving hospital following a heart attack.² More research will be needed to work out why and to test how best to redress these inequalities.

The NHS offers structured cardiac rehabilitation services for people who have suffered a heart attack. Cardiac rehabilitation programmes can help people to understand their condition, support their recovery and encourage and support them to make lifestyle changes to improve their heart health.

Across the UK, fewer eligible women than men are offered and take up cardiac rehabilitation services. Women from certain ethnic backgrounds are also less likely to attend, and when women do attend they do not gain the same level of benefit as men.³⁵

Once referred, the reasons women and men may not attend cardiac rehabilitation include that they have differing views on their rehabilitation needs and preferences for how physical activity, group interaction and emotional support aspects of these programmes are delivered. Other factors include old age, obesity, and severity of the disease, other long-term conditions and family obligations.³⁵





Research

- Women have been historically **under-represented** in clinical research, including cardiovascular trials.
- As a result, many diagnostic tests and treatments have been based on **data gathered from men**.
- Women are still **not taking part in clinical trials** to the same level as men. We need to understand the barriers that prevent women from taking part in clinical trials.

Historically, two thirds of all clinical research has been carried out on men,³⁶ and women have been under-represented in cardiovascular clinical trials.

As a result, diagnostic techniques and treatments have been based upon research conducted predominantly on men. This leaves open the possibility that if treatments that come about as a result of research are less effective in women than men we would not know.

A study published in the American Journal of Cardiology in 2018 looked into the representation of women in cardiovascular clinical trials between 2005 and 2015.³⁷ It concluded that women were under-represented in clinical trials for heart failure, coronary artery disease and acute coronary syndrome.

The researchers concluded that there were not obvious eligibility issues. Women could fit the inclusion criteria the investigators had. However, there appeared to be a lack of women being put forward (or possibly putting themselves forward) to be considered.

It is important that we seek to understand the barriers that might prevent women from being invited to take part or being able to take part in clinical trials to try to address them in case the best treatments for women turn out to be different from men.

With the inclusion of more women in trials,

and analysing results by gender, we can redress some of the historical gender disparity in research.

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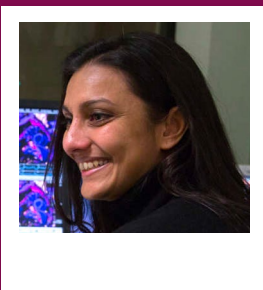
If we only study a select group of the population, our evidence base will not be representative of the real world for all patients. Moreover, we may fail to collect data that could be important for improving women's health.

There are numerous reasons why a person may find it difficult to take part in a clinical trial. Trials typically last many months, and sometimes years, and can involve multiple additional hospital appointments or surveys. There may also be a misperception that women are less likely to have heart disease, and therefore that they don't need to participate in research about heart disease.

Clearly, we must recognise that women are often under-represented in cardiovascular research studies, and that greater inclusiveness will provide improved insights as to how we may tackle heart disease in women."

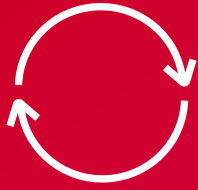
– Professor Chris Gale

“



Dr Sonya Babu-Narayan
Associate Medical
Director, British Heart
Foundation

Women are a minority amongst UK cardiologists. Despite making up over half of medical students in the UK, recent data shows that women represent 28 per cent of cardiology trainees and only 13 per cent of cardiology consultants. The factors influencing this need to be addressed urgently, if we want cardiovascular patients to benefit from cardiologists drawn from the widest pool of talent, regardless of gender.



The change we want to see

The reasons for the gender gap in heart attack care that disadvantages women are numerous and complex. They won't be fixed overnight, and they will require changes in public awareness and perceptions, as well as changes in heart attack treatment and care.

The BHF has identified three main areas of change:

Raise awareness

We need to change the perception of coronary heart disease and heart attack as a man's disease, and we're committed to raising public awareness so that women know their risk and take action to look after their heart health.

Understand and tackle inequality

We want to work with the NHS and healthcare professionals to discover the barriers that prevent women receiving the same quality of cardiovascular diagnosis, treatment and aftercare as men so that we find ways to surmount them.

Fund more research

We need increased support for research into heart and circulatory diseases in women. To make sure that research is as effective as possible we need to ensure participants are representative, including by encouraging better representation of women in clinical trials.

References

1. UK hospital statistics, 2017-18; NHS Digital/ISD Scotland/NHS Wales/DH Northern Ireland
2. Wilkinson C, Bebb O, Dondo TB et al. Sex differences in quality indicator attainment for myocardial infarction; a nationwide cohort study. *Heart*. 2018;105(7): 516-523. doi: 10.1136/heartjnl-2018-313959. Epub 2018 Nov 23.
3. Smolina K, Wright LF, Rayner M, Goldacre MJ. Determinants of the decline in mortality from acute myocardial infarction in England between 2002 and 2010: linked national database study. *BMJ*. 2012; 344. doi: 10.1136/bmj.d8059
4. Moser DK, Kimble LP, Alberts MJ, et al. Reducing delay in seeking treatment by patients with acute coronary syndrome and stroke: a scientific statement from the American Heart Association Council on cardiovascular nursing and stroke council. *Circulation*. 2006;114(2):168-82. 10.1161/CIRCULATIONAHA.106.176040 Epub 2006 Jun 26.
5. Berger PB, Ellis SG, Holmes DR Jr, et al. Relationship between delay in performing direct coronary angioplasty and early clinical outcome in patients with acute myocardial infarction: results from the global use of strategies to open occluded arteries in Acute Coronary Syndromes (GUSTO-IIb) trial. *Circulation*. 1999; 100(1): 14-20. DOI:10.1161/01.cir.100.1.14
6. BHF analysis of latest UK mortality statistics: ONS/NRS/NISRA (2017 data)
7. Institute for Health Metrics and Evaluation (IHME). Findings from the Global Burden of Disease Study 2017. Seattle, WA: IHME, 2018.
8. Mosca L, Benjamin EJ, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: a guideline from the American Heart Association [published correction appears in *J Am Coll Cardiol* 2012;59:1663]. *J Am Coll Cardiol*. 2011;123(11):1243-62. doi: 10.1161/CIR.0b013e31820faaf8. Epub 2011 Feb 14.
9. Mosca L, Linfante AH, Benjamin EJ, et al. National study of physician awareness and adherence to cardiovascular disease prevention guidelines. *Circulation*. 2005;111(4):499-510. DOI:10.1161/01.CIR.0000154568.43333.82
10. Leifheit-Limson EC, D'Onofrio G, Daneshvar M, et al. Sex Differences in Cardiac Risk Factors, Perceived Risk, and Health Care Provider Discussion of Risk and Risk Modification Among Young Patients With Acute Myocardial Infarction: The VIRGO Study. *JACC*. 2015;66(18):1949-1957. doi: 10.1016/j.jacc.2015.08.859
11. Lehto HR, Lehto S, Havulinna AS, Jousilahti P, Salomaa V. Gender differences in the prevalence, causes and treatment of high cardiovascular risk: findings from the FINRISK Survey. *Eur J Prev Cardiol*. 2012;19(5):1153-60. doi: 10.1177/17418267114222454. Epub 2011 Sep 2
12. Bugiardini R, Ricci B, Cenko E, et al. Delayed Care and Mortality Among Women and Men With Myocardial Infarction. *J Am Heart Assoc*. 2017;21;6(8)
13. Nguyen HL1, Saczynski JS, Gore JM, Goldberg RJ. Age and sex differences in duration of prehospital delay in patients with acute myocardial infarction: a systematic review *Circ Cardiovasc Qual Outcomes* (2010) Jan;3(1):82-92. pii: e005968. doi: 10.1161/JAHA.117.005968
14. Rawles JM, Quantification of the Benefit of Earlier Thrombolytic Therapy: Five-Year Results of the Grampian Region Early Anistreplase Trial (GREAT). *J Am Coll Cardiol*. 1997;30(5):1181-6. DOI:10.1016/s0735-1097(97)00299-4

References

15. Lichtman JH, Leifheit-Limson EC, Watanabe E, et al. Symptom recognition and healthcare experiences of young women with acute myocardial infarction. *Circ. Cardiovasc. Qual. Outcomes*. 2015 8(2 Suppl 1):S31-8. doi: 10.1161/CIRCOUTCOMES.114.001612. Epub 2015 Feb 24.
16. MINAP (2016 –2017) Males with heart attack tend to be younger than females – a difference in median age for STEMI of 10 years and for NSTEMI of 7 years.
17. Chakrabarti S, Morton JS, Davidge ST. Mechanisms of estrogen effects on the endothelium: an overview. *Can. J. Cardiol*. 2014;30(7):705-12. doi: 10.1016/j.cjca.2013.08.006. Epub 2013 Nov 16.
18. Mehta LS, Beckie TM, DeVon HA, et al. Acute myocardial infarction in women: a scientific statement from the American Heart Association. *Circulation*. 2016;133(9):916-47. doi: 10.1161/CIR.0000000000000351. Epub 2016 Jan 25.
19. Lichtman JH, Leifheit EC, Safdar B, et al. Sex differences in the presentation and perception of symptoms among young patients with myocardial infarction: evidence from the VIRGO Study (Variation in Recovery: role of Gender on Outcomes of Young AMI Patients). *Circulation*. 2018; 137(8):781–790. doi: 10.1161/CIRCULATIONAHA.117.031650.
20. Arora S, Stouffer GA, Kucharska-Newton AM, et al. Twenty year trends and sex differences in young adults hospitalized with acute myocardial infarction: the ARIC Community Surveillance Study. *Circulation*. 2019; 139(8):1047–1056. doi: 10.1161/CIRCULATIONAHA.118.037137
21. Cenko E, Yoon J, Kedev S, Stankovic G, et al. Sex differences in outcomes after STEMI: effect modification by treatment strategy and age. *JAMA Intern Med*. 2018; 178(5):632-639. doi: 10.1001/jamainternmed.2018.0514.
22. Hayes SN. Spontaneous coronary artery dissection (SCAD): new insights into this not-so-rare condition. *Tex Heart Inst J*. 2014;41(3):295–298. Published 2014 Jun 1. doi:10.14503/THIJ-14-4089
23. Wagers TP, Stevens CJ, Ross KV, Leon KK, Masters KS. Spontaneous Coronary Artery Dissection (SCAD): FEMALE SURVIVORS' EXPERIENCES OF STRESS AND SUPPORT. *J Cardiopulm Rehabil Prev*. 2018;38(6):374–379. doi:10.1097/HCR.0000000000000330
24. Rubini GM, Reiter M, Twerenbold R, et al Sex-Specific Chest Pain Characteristics in the Early Diagnosis of Acute Myocardial Infarction. *JAMA Internal Medicine*. 2014. 174(2):241-9. doi: 10.1001/jamainternmed.2013.12199.
25. Ferry AV, Anand A, Strachan FE, Mooney L, Stewart SD, Marshall L, Chapman AR, Lee KK, Jones S, Orme K, Shah ASV, Mills NL. Presenting symptoms in men and women diagnosed with myocardial infarction using sexspecific criteria. *J Am Heart Assoc*. 2019;8(17):e012307. doi: 10.1161/JAHA.119.012307. Epub 2019 Aug 20.
26. Roffi M, Patrono C, Collet JP, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). *Eur Heart J*. 2016;37:267-315. 10.1093/eurheartj/ehv320
27. Wu, J, Gale CP, Hall M, et al. Impact of initial hospital diagnosis on mortality for acute myocardial infarction: A national cohort study. *Eur Heart J Acute Cardiovasc Care*. 2018;7(2):139-148 doi: 10.1177/2048872616661693. Epub 2016 Aug29.

References

28. Shah ASV, Griffiths M, Lee KK, McAllister DA, et al. High sensitivity cardiac troponin and the under-diagnosis of myocardial infarction in women: prospective cohort study. *BMJ*. 2015; 350:g7873. doi: 10.1136/bmj.g7873.
29. Jackson AM, Zhang R, Findlay I, et al. Healthcare disparities for women hospitalized with myocardial infarction and angina. *Eur Heart J - Quality of Care and Clinical Outcomes*. 2019. 0. 1–10. doi:10.1093/ehjqcco/qcz040
30. Millett ERC, Peters SAE, Woodward M, Sex differences in risk factors for myocardial infarction: cohort study of UK Biobank participants, *BMJ*, 2018;363:k4247. doi: 10.1136/bmj.k4247.
31. NHS England health check data, Public Health England, <https://fingertips.phe.org.uk/profile/nhs-health-check-detailed/data#>. Accessed 23.09.2019
32. BHF estimates based on latest UK health survey data (NHS Digital & Scottish Government)
33. Zhao M, Vaartjes I, Graham I, et al. Sex differences in risk factor management of coronary heart disease across three regions. *Heart* 2017; 103(20):1587-1594. doi: 10.1136/heartjnl-2017-311429. Epub 2017 Sep 20
34. Kostis WJ, Cheng JQ, Dobrzynski JM, Cabrera J, Kostis JB, Meta-Analysis of Statin Effects in Women Versus Men. *JACC*. 2012; 59(6):572-82. doi: 10.1016/j.jacc.2011.09.067.
35. National Audit of Cardiac Rehabilitation (NACR) Quality and Outcomes Report 2018, <https://www.bhf.org.uk/informationsupport/publications/statistics/national-audit-of-cardiac-rehabilitation-quality-and-outcomes-report-2018>
36. Nguyen QD, Peters E, Wassef A, Desmarais P, Rémillard-Labrosse D, Tremblay-Gravel M. Evolution of Age and Female Representation in the Most-Cited Randomized Controlled Trials of Cardiology of the Last 20 Years. *Circ Cardiovasc Qual Outcomes*. 2018;11(6):e004713. doi:10.1161/CIRCOUTCOMES.118.004713.
37. Scott PE, Unger EF, Jenkins MR, Southworth MR, McDowell TY, Geller RJ, Elahi M, Temple RJ, Woodcock J. Participation of Women in Clinical Trials Supporting FDA Approval of Cardiovascular Drugs. *J Am Coll*. 2018;71(18):1960-1969. doi: 10.1016/j.jacc.2018.02.070.

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