About THE DATA SET

The dataset used in this article is the Cleveland Heart Disease dataset. There are 14 columns in the dataset, which are described below.

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which are described below.

1. Age, in years

2. Sex, 1 = male; 0 = female

3. cp: chest pain type

– Value 0: typical angina

– Value 1: atypical angina

– Value 2: non-anginal pain

– Value 3: asymptomatic

4. trestbps: resting blood pressure (in mm Hg on admission to the hospital)

5. chol: serum cholestoral in mg/dAttribute Information:

6. fbs: (fasting blood sugar > 120 mg/dl) 1 = true; 0 =false

7. restecg: resting electrocardiographic results

– Value 0: normal

– Value 1: having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of >0.05 mV)

– Value 2: showing probable or definite left ventricu lar hypertrophy by Estes' criteria

8. thalach: maximum heart rate achieved during stress TEST

9. exang: exercise induced angina, 1 = yes; 0 = no

10. oldpeak = ST depression induced by exercise relative to rest

11. slope: the slope of the peak exercise ST segment

– Value 0: upsloping

– Value 1: flat

– Value 2: downsloping

12. ca: number of major vessels (0-4) colored by flourosopy

13. thal: thalassmia, 0 = normal; 1=mild defect; 2 = fixed defect; 3 = reversible defect

14. condition (target) : 0 = no disease, 1 = disease

(3)CP:- chest pain type (4 values) Chest pain at rest, 1=typical angina, 2= atypical angina, 3= non-anginal chest pain pain, 4=asymtomatic	Angina is the discomfort that is noted when the heart does not get enough blood or oxygen. Typically, this is caused by blockage or plaque buildup in the coronary arteries. If one or more of the coronary arteries is partially or completely clogged, the heart will not get enough oxygen. Yet most people aren't aware of the different symptoms and types of this condition for men and women. Usually, angina is a symptom that may feel like a tightness or heaviness in the central chest. It may be associated with shortness of breath and respiration.

	The location of the discomfort will vary from person to person. Some people may have it in the central part / left side/right side of chest. It may also feel like the discomfort moves or radiates to the shoulder, arms, jaw, neck, and back. It usually does not radiate past the wrist into the hand. **Men commonly have the usual kind of angina as described above.** **Typical angina and atypical angina, which one is more dangerous?** **Typical angina means that the history of the patient is classical and chance of**

	having coronary artery blockages is high. **Atypical angina means that the symptoms have some features suggesting blockages and other symptoms which are not specific and chance of blockages is lower. In the present era nothing is dangerous if diagnosed and treated properly and in time.**
The exact reason for the lower heart disease rate among women is thought to be linked to **estrogen**. **Estrogen**, the female growth hormone, affects almost every part of the	**Women may have more of a subtle presentation called atypical angina.** For example, in one study of over 500 women who suffered a heart attack, 71% had fatigue, 48% had

body to some degree. For the cardiovascular system, the effects are a mix of benefits and drawbacks.	sleep disturbances, 42% had shortness of breath, and 30% had chest discomfort in the month prior to the heart attack. At the time of their heart attack, 58% had shortness of breath, 55% had weakness, 43% had fatigue, and 43% had chest discomfort. The problem may present like an indigestion feeling and can even mimic a problem related to peptic ulcer disease or gallbladder disease. The signs of a woman having a heart attack are much less noticeable than the signs of a male. In women, heart attacks may feel uncomfortable squeezing, pressure,

	fullness, or pain in the center of the chest. It may also cause pain in one or both arms, the back, neck, jaw or stomach, shortness of breath, nausea and other symptoms. Men experience typical symptoms of heart attack, such as chest pain , discomfort, and stress. They may also experience pain in other areas, such as arms, neck , back, and jaw, and shortness of breath, sweating, and discomfort that mimics heartburn.
– Value 0: non-anginal pain	Non-cardiac chest pain is defined as recurring pain in your chest — typically, behind your breast bone and near your heart — that is not related to your

	heart. In most people, non-cardiac chest pain is actually related to a problem with their esophagus, most often gastroesophageal reflux disease (GERD).
– Value 3: asymptomatic	"silent" (asymptomatic) myocardial ischemia is the most common manifestation of coronary heart disease (CHD), accounting for more than 75 percent of ischemic episodes during daily life as assessed by electrocardiographic (ECG) monitoring. Silent myocardial ischemia is defined as the presence of objective evidence of myocardial ischemia in the absence of chest discomfort or

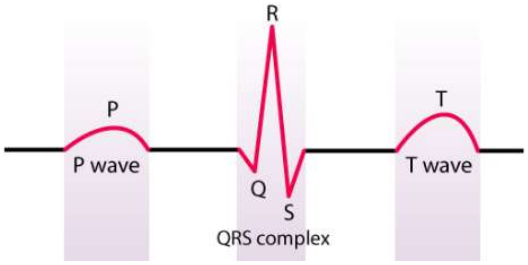
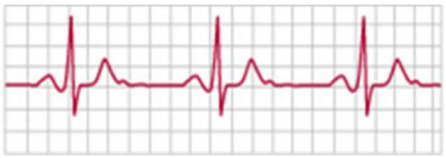
	another anginal equivalent symptom (eg, dyspnea, nausea, diaphoresis, etc). Objective evidence of silent myocardial ischemia may be obtained in several ways:
resting blood pressure (in mm Hg on admission to the hospital)	Resting blood pressure (in mm Hg on admission to the hospital)
serum cholestoral in mg/dl What is serum cholesterol? Cholesterol is a type of body fat, or lipid. A person's serum cholesterol level	**What diseases cause low cholesterol?** **What Causes Low Cholesterol?** • A rare disorder that runs in your family. • Malnutrition (not eating enough, or not

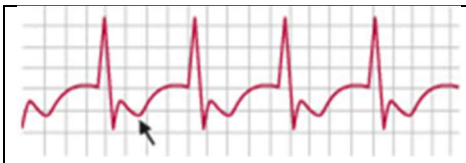
represents the amount of total cholesterol in their blood. A person's serum cholesterol level comprises the amount of high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides in the blood.	eating enough healthy foods) • Malabsorption (your body doesn't absorb enough fat) • Anemia (low red blood cell count) • Thyroid issues. • Liver disease. • Some types of infections (like hepatitis C)
(5)Fasting blood sugar. 1= >120 mg/dl, 0 = <120 mg/dl	fbs: (fasting blood sugar > 120 mg/dl) 1 = true; 0 = false
(6)resting electrocardiographic results (values 0,1,2) Resting electrocardiographic results. 0=normal, 1=ST-T wave abnormality,	ECG An electrocardiogram is a graphic record produced by an electrocardiograph that provides details about one's heart rate and rhythm and depicts if the heart has enlarged due to

2=left ventricular hypertrophy – Value 0: normal – Value 1: having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of >0.05 mV) – Value 2: showing probable or definite left ventricular hypertrophy by Estes' criteria Normal	hypertension (high blood pressure) or evidence of a myocardial infarction previously (heart attack if any). Electrocardiogram (ECG) is one of the most common and effective tests for all drugs. It is easy to perform, non-invasive, yields outcomes instantly and is useful to identify hundreds of heart conditions. Two main forms of data are given by an ECG. First, a surgeon will determine how long it takes for the electromagnetic pulse to travel through the heart by calculating time intervals on the ECG. Whether the electrical activity is natural or sluggish, fast or erratic,

In the normal ECG pattern, there is a regular pattern of The P wave, QRS complex, and T wave. They occur in a sequence. Angina When the heart muscle doesn't get enough blood with oxygen, it causes discomfort, that feels like putting pressure on the chest. This condition is termed as Angina pain. It can sometimes be misunderstood as indigestion. As you can see in the figure above (see arrow), the ST-segment dips, which normally is flat.	figuring out how long a pulse takes to travel from one part of the heart to the next. Second, a cardiologist may be able to find out if areas of the heart are too large or overworked by measuring the amount of electrical activity that flows through the heart muscle. Ten electrodes are mounted on the arms of the patient and on the top of the heart in a traditional 12-lead ECG. The average strength of the electrical potential of the heart is then calculated from 12 different angles ("leads") and reported over a period of time (usually 10 seconds). Throughout the cardiac phase, the total

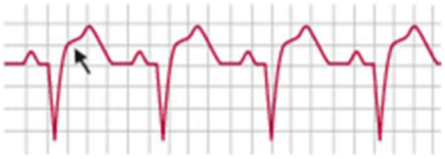
Serious heart attack The elevated ST segment of the ECG is an indication of a serious heart attack. In the medical terminology, it is referred to as “STEMI”, which needs immediate attention. Generally, the ST segment remains flat. Atrial fibrillation Atrial fibrillation is the state when the atria and the ventricles show a lack of coordination of movement. It results in rapid heartbeat, weakness and shortness of breath. On ECG, it is represented	intensity and trajectory of the electrical depolarization of the heart are observed at each moment. Evidence does not support the use of ECGs as an attempt for prevention among those without symptoms or at low risk of cardiovascular disease. This is because an ECG may incorrectly suggest a concern, leading to misdiagnosis, initiation for invasive procedures, and overtreatment. The overall objective of an ECG is to obtain information about the heart’s electrical function. For this material, clinical needs are diverse and

by jumpy baseline and the P wave disappears.  Normal  In the normal ECG pattern, there is a regular pattern of The P wave, QRS complex, and T wave. They occur in a sequence. Angina	often need to be paired with knowledge of the heart anatomy and symptoms of physical examination to be understood. Some signs for an ECG are as follows: An ECG is used to measure: any heart damage and weaknesses in various parts of the heart muscle how quickly your heart beats and whether it normally beats the effects of drugs or devices used to control your heart (such as a pacemaker) the size and position of your heart chambers To diagnose abnormal heart rhythms



When the heart muscle doesn't get enough blood with oxygen, it causes discomfort, that feels like putting pressure on the chest. This condition is termed as Angina pain. It can sometimes be misunderstood as indigestion. As you can see in the figure above (see arrow), the ST-segment dips, which normally is flat.

Serious heart attack



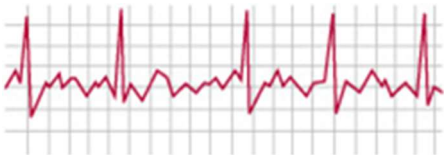
The elevated ST segment of the ECG is an indication of a

Also Check: Systole and Diastole

How is an ECG carried out? An ECG is a safe and painless test that usually takes only a few minutes.

Using adhesive patches to bind leads from an electrocardiograph system to the skin on your hands, legs, and chest. This leads to your heart reading signals and sending this information to the electrocardiograph. On a paper strip or on a monitor, the computer then prints the text.

There are three primary ECG types:

serious heart attack. In the medical terminology, it is referred to as “STEMI”, which needs immediate attention. Generally, the ST segment remains flat. Atrial fibrillation  Atrial fibrillation is the state when the atria and the ventricles show a lack of coordination of movement. It results in rapid heartbeat, weakness and shortness of breath. On ECG, it is represented by jumpy baseline and the P wave disappears.	Resting ECGIf your doctor is interested in how your heart works while you’re in rest, you’ll be asked to lie down and relax while recording your heartbeat. Exercise ECG The doctor may be interested in how the heart responds to movement and you may be asked to walk or run on a treadmill or cycle on an exercise bike when monitoring your pulse. 24-hour ECG Often checking your rhythm throughout the day may be useful, so you’ll be asked to wear a portable electrocardiographic unit. A doctor will read the notes from the device when you access the machine.

	The Electrocardiogram Wave An ECG has three main components: the P wave, which denotes depolarising atria; the QRS complex, denotes the depolarization of the ventricles; and the T wave represents repolarising ventricles. During each pulse, a healthy heart has an ordered process of depolarization that starts with pacemaker cells in the sinoatrial node, extends throughout the atrium, and moves through the atrioventricular node into its bundle and into the fibres of Purkinje,

	spreading throughout the ventricles and to the left. The electrical activity occurs in a small patch of pacemaker cells called the sinus node during a regular heartbeat. This produces a small blip called the P wave when the impulse stimulates the atria. It then activates the main pumping chambers, the ventricles, and produces the large up-and-down in the middle, the QRS complex. The last T wave is a time of regeneration as the impulse reverses over the ventricles and travels back. If the heart is beating normally, it takes about a

	second (approximately 60 heartbeats per minute) for the entire cycle.
maximum heart rate achieved **Maximum heart rate achieved. based on values, likely taken during exercise stress test**	
(8)exercise induced angina **Exercise induced angina (chest pain). 1=yes, 0=no**	exang: exercise induced angina, 1 = yes; 0 = no
(9)oldpeak = ST depression induced by exercise relative to rest	oldpeak = ST depression induced by exercise relative to rest

ST depression induced by exercise relative to rest	
(10) Slope **Slope of the peak exercise ST segment. 1=upsloping/normal, 2=flat, 3=downsloping**	slope: the slope of the peak exercise ST segment – Value 0: upsloping – Value 1: flat – Value 2: downsloping
(11)number of major vessels (0-4) colored by flourosopy **Number of major vessels colored by flourosopy**	ca: number of major vessels (0-4) colored by fluoroscopy **Fluoroscopy is an imaging modality that uses x-rays to allow real-time visualization of body structures. During fluoroscopy, x-ray beams are continually emitted and captured on a screen, producing a real-time, dynamic image. This allows for dynamic**

	assessment of anatomy and function.
(12) thal: 0 = null; 1 = normal;2=fixed defect; 3 = reversable defect	thal: A blood disorder called thalassemia any of a group of hereditary haemolytic diseases caused by faulty haemoglobin synthesis, widespread in Mediterranean, African, and Asian countries. Value 1: normal Value 2: fixed defect (no blood flow in some part of the heart) Value 3: reversible defect **: reversible defect (a blood flow is observed but it is not normal)**

	Heart failure and arrhythmias are the major cause of death in patients with b-thalassemia. Iron cardiomyopathy is reversible
exang: Exercise induced angina (1 = yes; 0 = no)	
condition (target) : 0 = no disease, 1 = disease Angiographic status of heart disease. 0= <50% diameter narrowing (no heart disease), >1= >50% diameter narrowing (heart disease present)	