Coronary Artery Disease in Kerala: How can we improve Public Awareness for better Patient Outcome?

CG Bahuleyan[a,b], A Jinbert Lordson[b,c]

a. Department of Cardiology, Ananthapuri Hospitals and Research Institute, Thiruvananthapuram, Kerala, India;
b. Global Institute of Public Health, Thiruvananthapuram, Kerala, India;
c. Ananthapuri Hospitals and Research Institute, Thiruvananthapuram, Kerala, India*

ABSTRACT

Published online on 30th December 2015

Coronary artery disease (CAD) is the leading cause of mortality and morbidity globally and the number one cause of death in India. The prevalence of CAD has been declining in the developed world, but in the last two decades, there has been an alarming increase in the prevalence of CAD in India. Kerala has the highest burden of CAD in India. The high rates of heart disease at relatively young age incur huge economic burden on the state. High rate of heart disease in Kerala could be attributed to correspondingly high modifiable lifestyle risk factors such as hypertension, diabetes, obesity, high cholesterol levels and smoking. In this review, we explore ways to provide better care for CAD patients in Kerala.

Keywords: Coronary artery diseases, Kerala, Risk factors, Heart diseases, Lifestyle diseases

*See End Note for complete author details

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of mortality and morbidity in India.[1] The health indices of Kerala is highest in India and comparable with that of the developed world and one would naturally expect lower incidence of CAD and other lifestyle diseases in Kerala, but ironically, it is highest in Kerala than the rest of India. The age adjusted mortality from CAD in Kerala is higher than that of the industrialized countries and 3 to 6 times higher than that of Japan or Rural China.[2] CAD occurs when the arteries that supply to heart muscles become hardened and narrowed due to the deposition of fatty substance such as cholesterol along with other cellular elements and form a buildup called plaques on the inner walls of arteries.

The prevalence of CAD in India has increased by a factor of 4 within the last 40 years. It has been observed that Indians develop CAD at an younger age.[3,4,5,6,7] The incidence of CAD in Kerala is 14 %, while the national average is 10%. In 1960s and 70s, heart attack before the age of 40 was extremely uncommon and by 1990s it increased by 40 fold with at least 20% heart attack occurring before the age of 40 and 50% of heart attack occur before the age of 50 years.[8,9,10] A study involving 100 patients below 45 years belonging to a South Indian population suffering from their first Myocardial Infarction, tried to identify the risk factors involved.[6,7] The average age of a first heart attack decreased by at least 10 years in Kerala, while in many western countries it increased by 20 years.[11,12] This phenomenon is noticed in young women too. People of Kerala exhibited special features of CAD.[13] The urban- village difference of the disease prevalence is much lower in Kerala compared to northern parts of India.[3] Many studies have shown high prevalence of CAD risk factors in urban, rural and slum settings.[4,14,15] This is largely due to the higher prevalence of major risk factors like hypertension (42%), diabetes mellitus (20%) hypercholesterolemia (72%) and smoking (42%), obesity (40%), physical inactivity (41%) and unhealthy alcohol consumption (13%) among population of Kerala.[15,16]

The disease can be observed in the following three forms

1. Asymptomatic Individuals
2. Symptomatic only on physical exertion or mental stress
3. Acute Coronary Syndrome

Some people who have CAD have no signs or symptoms, a condition called silent CAD. The disease may not be diagnosed until the person develops sudden

Corresponding Author:
Prof. Dr. CG Bahuleyan, Chairman and Chief Interventional Cardiologist, Cardiovascular Centre, Ananthapuri Hospitals and Research Institute, Thiruvananthapuram, Kerala, India - 695024. Email: bahuleyan2001@yahoo.co.uk

heart-attack. Majority of patients are in the stable form of the disease and develop cardiac symptoms only on exertion (stable ischemic heart disease – SIHD). The former two are the chronic form of the disease where flow-limiting narrowing or 'blocks' are seen in the coronary arteries supplying the heart muscles. The acute coronary syndrome (ACS) is commonly referred as 'heart attack' which may result in death of patient if proper care is not given on an urgent basis.

Acute Coronary Syndrome

Acute coronary syndrome is a medical emergency that requires immediate hospital admission. Even with 70-90% narrowing of the coronary artery, patients need not develop symptoms. However, sudden morphological change like rupture of plaque can happen in the lesions (the constricted part of the artery due to the deposition of fatty substances) even if the narrowing is not severe (< 50%). Rupture of plaque cause blockage of the artery due to the super added thrombus causing total or subtotal cessation of blood flow to the heart muscles resulting in ACS, which can lead to sudden cardiac death, most of which happen outside the hospital. Those who survive, present to the hospital with a clinical picture of one of the following

1. Unstable angina (UA)
2. Non-ST elevation Myocardial Infarction (N-STEMI)
3. ST elevation Myocardial Infarction (STEMI)

The most common symptoms of ACS is chest pain which often occurs at the central part of chest radiating to the arms, front of neck, jaws or back of chest. There will be often associated symptoms such as sweating, shortness of breath, palpitation, nausea or vomiting. Seeking urgent medical attention is the only step that can help the patient in this emergency situation. One recent study showed that majority of ACS patients in Kerala presented with STEMI (37%) followed by UA (32%) and N-STEMI (31%).[17]

Troubles in reaching a cardiac care centre

Time taken to avail proper treatment is the most critical element for an acute cardiac patient. Total ischemic time is the time duration which decides survival and recovery of the individual with ACS. It is the time from the start of symptoms to the definitive treatment. The outcome will be better if it is kept below 2 hours. In our place more than 60 % of patients reach hospital after 5 hours of onset of symptom.

The main pre-hospital issues noticed are

1. Delay in recognizing the symptoms of ACS by the patients and relatives. Often patients are in a state of denial, they sit at home thinking that 'it cannot be a cardiac chest pain, I am healthy, it cannot happen to me' We need to remember that once a patient experience a chest pain, the first thing to consider is - some thing is not right with my heart, better get it checked by a cardiologist.
2. Administration of inadvertent medication (eg. 'gas medication', herbal medicines) either indigenous or other irrelevant medicines by the family members and waiting to see the effect of it.
3. Not knowing which hospital to be approached first. Many people go to the nearby clinic or even medical labs, where no facility for treating such conditions exists and this again is a waste of time.
4. Electrocardiogram (ECG), the most important diagnostic tool may be obtained at the centre of First medical contact (FMC), but often not interpreted correctly. Misdiagnosis leads to wrong advice to the patients even to return home with symptomatic medication. Up to 25 % of patients with ACS are asked to go home from the FMC.
5. Sometimes, the diagnosis of ACS may be made from the first ECG, but the centre may not be capable of giving comprehensive treatment for the patients. Even then, they may not give the correct directions to the patients or refer them to a centre with such facility. All these lead to waste of precious time during which effective treatment could have been given to the patients.
6. Another important drawback is in the transport of patients to the hospital. Majority of patients in our country reach hospital by taxi or hired auto-rickshaws. Patients are taken to hospital even in motor bikes. Some reach hospital in their own car, sometimes driven by the patients themselves. This is mainly because of the lack of readily available Ambulance System for this purpose.
7. The most effective treatment to be offered to patients with heart-attack (ST-Elevation MI) is reperfusion therapy. This essentially means opening up the clogged artery and establish blood flow to the heart muscle. This could be achieved by drugs- thrombolytic therapy; or could be done by mechanical removal of thrombus and placement of stent in the artery at the site of block (primary angioplasty). The facility for primary angioplasty is available only in tertiary care hospitals (Percutaneous Coronary Intervention (PCI) centers). The

thrombolytic therapy is possible in many hospitals where Coronary Care Unit (CCU) facility is available and drugs like Streptokinase, Alteplase, Reteplase or Tenectelase could be used for this purpose. The key fact is that the drug could be effective only in 30-50% of cases and even if it is successful, thrombolytic therapy per se is not a complete treatment. It often requires follow-up angiography and angioplasty within the next 24 hours. Hence patients treated (thrombolysis) in a non-PCI centre should be transferred to a PCI centre. This often does not happen and the patients are released only after 5-7 days from non-PCI center, denying the patients the benefit of comprehensive treatment.

Troubles after reaching a Medical facility

Non-PCI Centre: Delay in diagnosis often happens at the Emergency Room. Ideally, the ECG should be taken within 10 minutes of arrival. Often, ECG is obtained with considerable time delay and the interpretation of ECG is also delayed due to the lack of expert personnel. The thrombolytic treatment which is possible in the non-PCI centers is mostly done in CCU and shifting of patients from emergency room to CCU also causes delay. If the consulting doctor at the first medical contact decides to refer the patient to a tertiary care, every effort must be made to stabilize the patient and if the transportation time is less than 1 hour, the patient should be transported to the PCI centre. In other situations, thrombolytic therapy can be initiated within 30 minutes of arrival of the patient. Good judgment is required about the time required to reach the tertiary cardiac centre and the patient's medical condition.

PCI Centre: Once the patient with heart-attack is received in PCI Centre, primary angioplasty should be done as early as possible with a maximum delay of 90- 120 minutes. Every PCI centre should keep this timeframe round the clock. A well coordinated team effort is necessary between the emergency department and the cardiac care unit so that the patient gets expert cardiac care soon after arrival.

How can we improve the system efficiency and reduce the time delay

Health education, creating public awareness of the heart-attack symptoms, factors leading to ACS, preliminary care of the suspected victim soon after the onset of symptoms, and seeking urgent medical help are all important steps to be improved. Once an individual develops symptoms, he/she should be advised to take rest and transported immediately to a medical facility where definitive care could be given. Shifting the patient to any nearby clinic or hospital without proper cardiac facility should be discouraged as it will cause unnecessary delay in getting proper treatment. Ideally, the transport should be made in an equipped ambulance. ECG(s) should be taken in the ambulance which needs to be transmitted to the hospital and advice sought on patient's medical management while the patient is on the way to the hospital. Once the diagnosis is confirmed, the patient could be transferred straight to the Cath-Laboratory for primary PCI and the potential delay in the emergency room can be avoided. Anti-clotting medications such as Aspirin, Clopidogrel and high dose of cholesterol lowering drug Atorvastatin administered at the onset of ACS may reduce the mortality from heart-attack.

Successful heart-attack care programs like STEMI-System of care[18] has been very effectively implemented in countries like US and many parts of Europe. In India, under the leadership of STEMI-India programme,[19] this is being tried in the state of Tamil Nadu. In a developing country like India, majority of patients are treated by thrombolytic therapy, and this should be done within 30 minutes of arrival at the hospital. If the patient could be transferred to the PCI centre, and the transport time is less than 1 hour, he/she may be shifted to PCI centre for primary PCI. If this is not the situation, the patient should undergo thrombolytic treatment and then transported to the PCI centre so that PCI could be done within 3- 24 hours of thrombolysis.

In a place like ours, where the road traffic is so busy and confined, the proportion of patients with heart-attack reaching the PCI centre in the stipulated time, will be less. Initial thrombolysis in the peripheral centers will allow a much longer time window for the subsequent transferring of patient to a PCI centre for angioplasty. This is the pharmaco-invasive approach of treatment.

A STEMI-System of care in a hub and spoke pattern incorporating peripheral hospitals (non-PCI centers), PCI centers either with the private or Government sector should be planned and implemented in a region-wise fashion. Such a system of care will require an effective and safe transport system which could be provided by the Governmental and non-Governmental organizations. A greater involvement of the State Government is essential for building up of such a system of care. Kerala Chapter of Cardiac Society of India (CSI) has taken some initiative in studying the

burden of ACS in the state and planning to identify the pre-hospital and hospital pattern of care of patients with ACS.

Post-hospital care and Rehabilitations

Most heart-attack patients, if successfully undergone reperfusion treatments using either thrombolytic therapy or primary angioplasty, can be discharged from the hospital in 3 to 5 days. They can resume their normal duties in 1 to 3 months depending on the severity of heart-attack and the residual heart function. Resentments and depressions are not uncommon. Irritability and being concerned about minor chest pain and other symptoms may be disturbing. Sleep disturbances are also common. Most of these disturbances can be managed by support from family members and health care professionals. Once recovered from acute heart-attack, the individual can aspire for a healthy and productive life. Most people can have their sexual life in the same pattern as they were having before heart-attack. Certainly they require medications and life style changes.

Entering into a comprehensive rehabilitation program which will give training and support for adherence to new life style with the help of doctor, nurse, physical trainer, dietitian and health care professional is always advisable. These programs help heart-attack patient to increase physical fitness, reduce cardiac symptoms, improve health and reduce chance for future heart-attack. Many rehabilitation programs last for a period of 6 weeks to 3 months. Support groups comprising patients recovered from heart-attack will be a good idea.

To prevent a future heart-attack, the following life style changes are mandatory

1. Avoid smoking (if continued to smoke, chances of a second heart-attack is doubled)
2. Regular Physical activity (will reduce - stress and depression, body weight, blood pressure and cholesterol levels)
3. Choose heart healthy diets

Be regular with the intake of medicines prescribed especially to control the risk factors like diabetes, cholesterol and blood pressure. When ever in doubt, keep in touch with the doctor who can clear your doubts and give advices.

CONCLUSION

The coronary Artery disease is increasing at an alarming rate in India, There is been a steep decline in the prevalence of CAD in the developed world. They achieved this primarily through increasing public awareness about all risk factors, lifestyle leading to CAD and also how quick the appropriate medical care can be given to the patient.

The modifiable risk factor of people of Kerala is very high. Coordinated effort from all parties involved is needed to increase public awareness about CAD and how to provide appropriate medical treatment quickly.

END NOTE

Author Information

1. Dr. CG Bahuleyan, MD, DM, FRCP, FSCAI.
   Chairman and Chief Interventional Cardiologist,
   Cardiovascular Centre,
   Ananthapuri Hospitals and Research Institute,
   Thiruvananthapuram, Kerala, India;
   Honorary Professor,
   Global Institute of Public Health,
   Thiruvananthapuram, Kerala, India
2. Dr. A Jinbert Lordson, MSc, CCRP. Lecturer,
   Global Institute of Public Health,
   Thiruvananthapuram, Kerala, India;
   Research Coordinator,
   Ananthapuri Hospitals and Research Institute,
   Thiruvananthapuram, Kerala, India

Conflict of Interest: None declared

Cite this article as: *Bahuleyan CG, Lordson AJ. Coronary Artery Disease in Kerala: How can we improve Public Awareness for better Patient Outcome? Kerala Medical Journal. 2015 Dec 1;8(4):18–22.*

REFERENCE

1. Report on cause of death in India 2001-2003. Office of the registrar General, Ministry of Home Affairs, New Delhi. (accessed on 18 Dec 2015).
2. Soman CR, Kutty VR, Safraj S, Vijayakumar K, Rajamohanan K, Ajayan K, et al. All-cause mortality and cardiovascular mortality in Kerala state of India: results from a 5-year follow-up of 161,942 rural community dwelling adults. Asia Pac J Public Health. 2011 Nov;23(6):896–903.
3. Geevar Zachariah. Prevalence of risk factors of coronary artery disease (CAD) - Is it different in Kerala? Health Sciences 2013; 2(2):JS003D.

4. Thankappan KR, Shah B, Mathur P, Sarma PS, Srinivas G, Mini GK, et al. Risk factor profile for chronic non-communicable diseases: results of a community-based study in Kerala, India. Indian J Med Res. 2010 Jan;131:53–63.
5. McKeigue PM, Ferrie JE, Pierpoint T, Marmot MG. Association of early-onset coronary heart disease in South Asian men with glucose intolerance and hyperinsulinemia. Circulation. 1993 Jan;87(1):152–61.
6. Vasudevan S Myocardial Infarction in the young Indian patient – An emerging problem KMJ; Vol VI Issue 1: 1-4 (2013)
7. Rajasekharan C, Mithun C B, MATHEW Iype, The clinical profile and prognostic profile factors of Infarction in the young – YSSI STUDY; KMJ: Vol VI Issue 1: 5-10 (2013)
8. Sharma M, Ganguly NK. Premature Coronary Artery Disease in Indians and its Associated Risk Factors. Vasc Health Risk Manag. 2005 Sep;1(3):217–25.
9. Bahuleyan CG. Hospital data on coronary heart disease from North Kerala. In: Vijayaraghavan G, ed. *Cardiovascular Disease Prevention*: Trivandrum Medical College; 1996:54-59.
10. Girija G. Risk factor profile of patients with acute MI. In: Vijayaraghavan G, ed. *Cardiovascular Disease Prevention*: Trivandrum; 1996:78 – 83.
11. Mammi MV, Pavithran K, Abdu Rahiman P, Pisharody R, Sugathan K. Acute myocardial infarction in north Kerala--a 20 year hospital based study. Indian Heart J. 1991 Apr;43(2):93–6.
12. Pyorala K, Palomaki P, Miettinen H, Mustaniemi H, Salomaa V, Valkonen T. Decline in coronary heart disease mortality in Finland: Effect of age and gender distribution on the disease. *Am. J. Ger. Cardiol.* 1994; May/June:20-32.
13. C.G. Bahuleyan. Cardiology. In Krishna Das KV, Editor. Text Book of Medicine, Mumbai: Jaypee Brothers Medical Publications (P) Ltd. 2008. p. 742-883.
14. Kutty VR, Balakrishnan KG, Jayasree AK, Thomas J. Prevalence of coronary heart disease in the rural population of Thiruvananthapuram district, Kerala, India. Int J Cardiol. 1993 Apr;39(1):59–70.
15. Joseph A, Kutty VR, Soman CR. High risk for coronary heart disease in Thiruvananthapuram city: a study of serum lipids and other risk factors. Indian Heart J. 2000 Feb;52(1):29–35.
16. Soman CR, Shahulhameed S, Ramankutty V, Vijayakumar K, Kunjukrishnapillai R, Ajayan K, et al. Cohort profile: the PROLIFE study in Kerala, India. Int J Epidemiol. 2011 Feb;40(1):10–4.
17. Mohanan PP, Mathew R, Harikrishnan S, Krishnan MN, Zachariah G, Joseph J, et al. Presentation, management, and outcomes of 25 748 acute coronary syndrome admissions in Kerala, India: results from the Kerala ACS Registry. Eur Heart J. 2013 Jan;34(2):121–9.
18. Mission Lifeline. (accessed on 20 Dec 2015)
19. STEMI India. Management of ST elevation myocardial infarction. (accessed on 20 Dec 2015)