

REVIEW ARTICLE

Coronary Artery Disease: A Global Health Challenge and the Need for Medication Adherence

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ABSTRACT

Coronary artery disease is a major cause of morbidity and mortality among people worldwide. About 9 M deaths were caused by CAD worldwide. Coronary artery disease is characterized by the deposition of fatty substances (plaque) in the coronary arteries results into blockage of the arteries. The accumulation of this plaque in the walls of coronary arteries limits the blood flow to the heart muscle which can even leads to angina or a heart attack. Many risk factors like Hypertension, Diabetes, Hyperlipidemia, Smoking, Chronic stress and Genetics can increase the chances of coronary artery disease. Therefore, medication adherence is an important factor which helps to prevent the further complication of the chronic diseases. It acts as a bridge between the treatment and the outcome of disease. In order to prevent negative outcomes in patients with Coronary Artery Disease, Adherence to medication is must. Medication Adherence is becoming a major concern these days. Non-Adherence may occur due to patient's negligence or some other causes such as communication barrier between patient and the health care provider. Some other factors also play an important role in non-adherence like cost of medication, patient's fear and beliefs, complicated medication regimen. Diseases which are chronic require proper adherence to treatment and medication. Cardiovascular diseases like coronary artery disease if left untreated may lead to serious complications including hospitalization. Therefore, Medication Adherence is necessary to prevent further complications. Some interventions like patient counselling, improving medication regimen also helps in enhancing the adherence to medication.

KEYWORDS: Medication adherence, coronary artery disease, pathophysiology, non-adherence, intervention to improve adherence.

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INTRODUCTION

Medication Adherence describes the level to which the patient complies with the medical advice of taking medication as per the healthcare professional. It is a very crucial factor responsible for the therapeutic outcomes of medication in patients with chronic diseases. Medication Adherence is a very important factor which acts as a link between the treatment of disease and the outcome in medical care. Adherence to medication is necessary to prevent negative outcomes in chronic diseases like cardiovascular diseases. Adherence to medication means that the patient takes the proper dose of medication at proper time which helps to maintain the desired therapeutic level of drug in the body. It allows to prevent complications, helps in disease management and increases the quality of life of individuals. Non adherence worsens the condition which may also results in hospitalization. By adhering to the medication, patient can prevent further complications [1-2]. Other name for coronary artery disease is coronary heart disease / ischemic heart disease. The primary cause of death in developed and developing nation is coronary artery disease. It is one of the major causes of Mortality and Morbidity [3]. In 2017, It was estimated that CAD affects approximately 126 million people worldwide accounting for (1655 per 10,000) representing about 1.72% of world's population. Also 9 million deaths were caused by CAD worldwide. According to the prediction, the occurrence of CAD would rise to more than 1845 per 1000,000 by the year 2030 [4]. Coronary artery disease primarily caused by atherosclerosis of the

coronary arteries Atherosclerosis is characterized by the thickening and hardening of arterial walls due to buildup of plaque. This plaque restricts the blood flow which can even results into myocardial infraction. Some fats, cholesterol and other substances lead to the formation of this plaque known as Atheroma. Plaque deposition occurs in the CAD. With the passage of time, the plaque which deposited in the coronary arteries results in the thickening and hardening of arterial walls. This leads to restriction in blood flow. Angina and even a heart attack can result from reduction in the blood flow to the coronary arteries which are responsible to provide oxygen rich blood to the heart muscle. Some risk factors like hypertension, diabetes, hyperlipidaemia etc. contribute to CAD [5].

CAUSES

Coronary Artery Disease results from the accumulation of fatty material called plaque in the coronary arteries. This condition is known as Atherosclerosis which results into thickening of arterial walls. The heart muscle receives blood from the coronary arteries and when the plaque accumulation occurs inside these arteries, it leads to blockage. This blockage can also result into ischemia which is characterized by insufficient oxygen supply to the heart muscles or in some cases transform into myocardial infraction commonly known as heart attack. Hyperlipidaemia is also another contributing factor for CAD. The buildup of plaque in arteries is due to the deposition of cholesterol. This plaque when obstructs the arteries, blood flow decreases. Other causes for CAD include some risk factors like hyperlipidaemia, diabetes, obesity, smoking, hypertension, chronic stress and some genetics and family history [6].

RISK FACTORS

Following risk factors are responsible for the contribution of CAD [7-10]

1. **Hypertension:** Hypertension is the most common risk factor of coronary artery disease. It harms the coronary artery walls.
2. **Hyperlipidaemia:** High cholesterol levels can lead to plaque buildup in the artery walls which can cause blockage of the arteries.
3. **Diabetes:** Diabetes Mellitus is associated with an increased risk of coronary artery disease.
4. **Obesity:** Obesity increases the chances of Diabetes, Hypertension, Hyperlipidaemia which in turn leads to increase the risk of coronary artery disease.
5. **Smoking:** It causes plaque formation in the lining of the blood vessels and hinders the oxygen transport.
6. **Chronic Stress:** Stress can induce high blood pressure which leads to increase CAD.
7. **Genetics and Family History:** The risk of developing CAD is likely to be present more in people with the family history of the disease.

PATHOPHYSIOLOGY

The main reasons for CAD are development of atherosclerosis which is marked by the accumulation of plaque in the inner lining of the arteries resulting into hardening and thickening of the arterial wall. CAD is a type of cardiovascular disease in which deposition of plaque occurs which tends to constrict the coronary arteries. Hyperlipidaemia is also a major cause of the development of atherosclerosis. The plaque when deposits in the walls of coronary arteries restricts the blood flow to the heart. The coronary arteries are responsible for providing oxygen rich blood to the heart muscle and when these arteries become obstructed due to plaque, flow of blood to the heart decreases. This can result into angina or even heart attack [11-12]. Atherosclerosis is caused by hyperlipidaemia and lipid oxidation. It is an inflammatory disease. In the process of atherosclerosis, inflammation played an important role. Fatty deposits which is known as atheromatous plaques can be seen in the inner layers of the arteries. When cholesterol accumulates inside the arterial intima, it initiates the plaque formation. Coronary artery disease begins with the formation of fatty streaks within the walls of coronary arteries which is the first sign of atherosclerosis. The lipoproteins are transported into the artery walls particularly into the subendothelial space, is where the fatty streak begins. As the fatty material starts depositing in the endothelium, the immune cells known as macrophages gathered to the site in order to break the material. The fatty streaks which are the initial sign of atherosclerosis develops into atheroma and atherosclerotic plaque [13-14]. Endothelial damage may arise from lipid deposition or another reason is also associated with the formation of fibrous cap. Macrophages, T lymphocytes and collagen rich fibre tissues make up the fibrous cap. Due to variety of factors like inflammation or oxidative stress, this fibrous cap weakens and ruptures. This rupturing of fibrous cap exposes the lipid and collagen to the blood stream which leads to the accumulation and adhesion of platelets and the blood clot formation which can obstruct the blood flow [15-17].

Types of CAD

1. Stable ischemic heart disease: It is due to the atherosclerotic plaque in the coronary arteries. This causes reduction in the oxygen supply to the coronary arteries.
2. Acute coronary syndrome: It results in the sudden blockage of blood supply to the heart muscle. The deposition of plaque narrows the blood flow due to the rupturing and clot formation which may obstruct the flow of blood and may result in a heart attack [18].

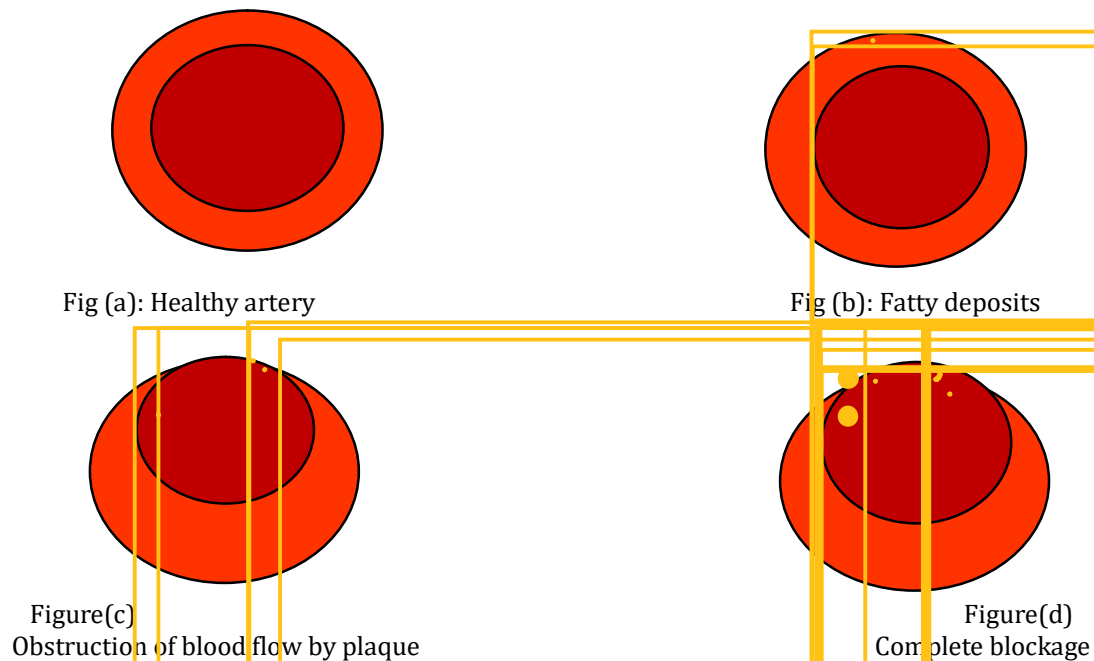


Figure 1: Plaque formation in coronary arteries

Treatment

The treatment of CAD involves some medications like beta blockers, anti-platelet drugs, calcium channel blockers along with lifestyle management. Antiplatelet agents like clopidogrel, aspirin are used in the treatment of coronary artery disease. Beta blockers like metoprolol which is used in the treatment of angina helps in reduction of heart rate which in return also prevents ischemia. Calcium channel blockers like diltiazem, nifedipine are also used. Sub lingual nitro-glycerine is used to provide immediate relief from angina by increasing the oxygen supply to myocardium. Some lifestyle changes like quitting smoking, losing weight, avoiding processed food, taking healthy and nutritious diet including fruits, vegetables, whole grain food, avoiding the sedentary lifestyle etc are some lifestyle changes which can lower the chances of developing cardiovascular diseases [19-20].

ROLE OF MEDICATION ADHERENCE IN CORONARY ARTERY DISEASE

Adherence to medication is defined as the active involvement of patients in following their medical regimen. Now a days medication adherence is an increasing concern to healthcare system. Non adherence is common and is linked with many negative outcomes and increased healthcare cost. For example: If a patient constantly misses her/his medication, the drug level in the body will not remain within the therapeutic range. Non adherence also results in poor health outcomes and increased hospitalization. Therefore, adherence to the medication is necessary for the patients having chronic diseases like cardiovascular disease. It helps to minimize the complications associated with the disease, promotes better recovery, increases quality of life. It also helps to maintain the therapeutic drug level in the body which is necessary for the treatment and for the prevention from further complication [21].

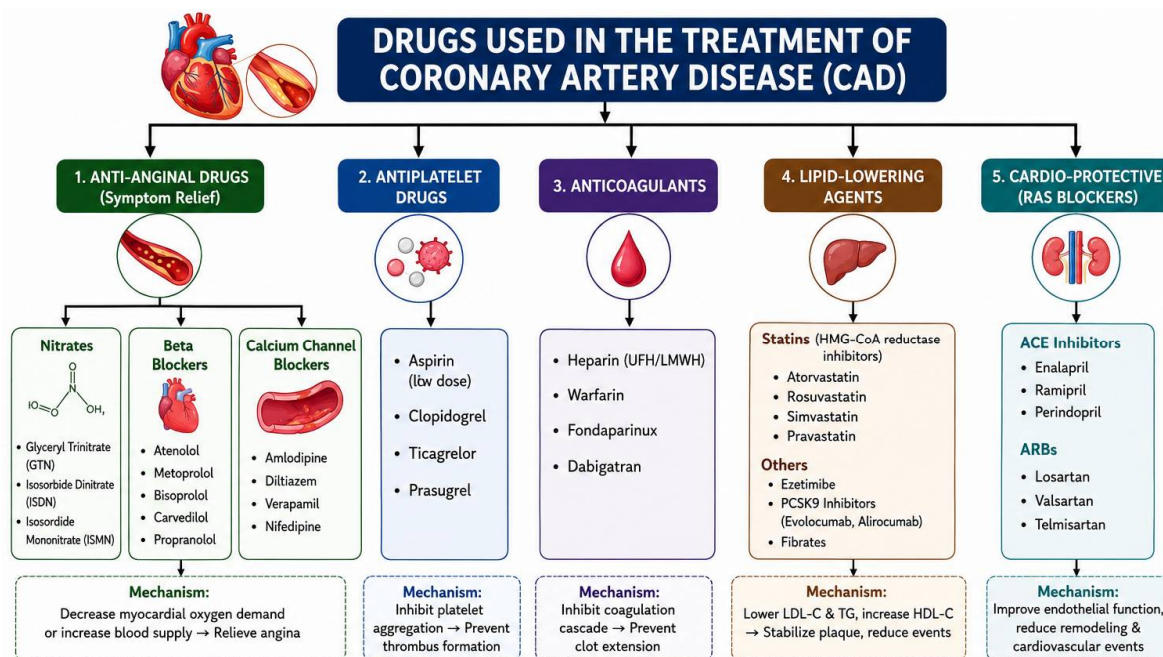


Figure 2: Drugs used in the treatment of CAD

Methods to assess medication adherence

These are the methods used for the determination of medication adherence. Some of them are questionnaire, prescription refill, electronic monitoring device, and pill count method [22-24].

1. Questionnaire: This is the easiest way to determine the medication adherence. This includes self-made questionnaire for patients to assess the medication adherence. For Example (Did you remember to take your medicine yesterday?) or (Do you forget to take your medicines?).

2. Prescription refill: Another way to assess the medication adherence is by checking prescription refill of patient.

3. Pill count: In this method, pills like tablet and capsules are counted. The no. of pills given to the patient and the no. of pills returned are counted.

4. Electronic monitoring device: To monitor the medication adherence, many monitoring devices are created. There is a microprocessor inside these devices which records the date and time on which patient takes a dose of medication. This helps to record the adherence in a proper manner.

Reasons for medication non adherence

Non adherence with the medication is a major problem among patients. Patients are non-adherent during the treatment. Non adherence to the medication may be due to patient, treatment or communication barrier between patient and the healthcare provider. Intentional nonadherence occurs when patient chooses not to take medication or follow the prescribed treatment. Patient perspective and degree of understanding are important factors for intentional nonadherence. In some patients there is confusion regarding their medication and their side effect or they might have noticed some side effects. Unintentional nonadherence occurs due to forgetfulness and lack of understanding towards the use of medication. Geriatrics are more non adherent due to forgetfulness. Non adherence may also occur when the medical regimen is complicated [25].



Figure 3. Barriers to Medication Adherence

Others factors for nonadherence

There are some other factors responsible for non-adherence: - [26-28]

- 1. Cost:** It sometimes become the barrier in the process of medication adherence. High price of medications can lead to non-adherence of medications by the patients.
- 2. Communication barrier:** It also plays a big role in the process of non-adherence. Miscommunication between the patient and the health care provider leads to non-adherence. This may happen if a patient doesn't understand the need of medicine or the medication regimen.
- 3. Side effects:** Some patients observed side effects from a medication, they discontinued the medication without even telling the healthcare provider. This also contributes to non-adherence.
- 4. Forgetfulness:** Forgetting to take medicines as prescribed is also a reason for non-adherence.
- 5. Beliefs about consequences:** Beliefs like there is no need of treatment or medication, doubting the efficiency of medicine are some factors responsible for non-adherence.
- 6. Lack of symptoms:** Patient stops taking medication when lack of symptoms occurs. One another reason for stopping medication is when patient thinks that the condition is controlled and there is no need of taking medications without informing the healthcare provider.

Interventions to improve medication adherence

Medication adherence can be improved when patient and healthcare system work jointly. Interventions like patient counselling, educating patients, medication reminders, improving medication regimen are helpful in maintaining medication adherence.

1. Patient counselling: To improve medication adherence, patient counselling is one of the major interventions. Patient counselling includes educating the patients with reference to their medical condition and treatment. It also helps patients to understand their medication regimen. Patient counselling can be done by Pharmacist or healthcare provider to educate people about their treatment and medication. In patient counselling, pharmacist or healthcare provider tells the patient how to take their medicine, how many times to take a medicine, in which time should they take medicine. Educating the patient as well as their family about the disease and the treatment helps in medication adherence. [29]

2. Improving medication regimen: Medication adherence can be improved by simplifying the medication regimen. Complex medication regimen leads to non-adherence. Medication regimen which

includes taking a medicine twice a day or taking multiple medicine a day makes it difficult for the patient in adhering to it. Therefore, by providing combination pills instead of multiple pills helps in improving medication adherence. [30]

3. Medication Reminders: Reminders like text message, telephone calls can be effective in medication adherence. Patient who forgets to take prescribed medicine on time found helpful to these medication reminders. Some personalized medication reminders will help in enhancing the medication adherence. [31]

4. Clinical Pharmacist consultation: Pharmacist play an important role to improve medication adherence. By improving the medication regimen, giving education to patients and their family regarding treatment plan, pharmacist helps to improve the medication adherence. Also educating the patient about their disease and the consequences occur in future due to non-adherence makes it easier to improve medication adherence. [32]

CONCLUSION

Coronary Artery Disease is occurring worldwide. It is the leading cause of death worldwide. With proper treatment and by changing lifestyle habits, it can be cured. Medication Adherence is another important factor for preventing the complications. Many people became non adherent during the treatment. Non adherence can lead to serious complications. Therefore, in conclusion, Medication Adherence is necessary in promoting quality life to individuals and also in minimizing the complication of the disease. Some interventions like patient counselling, improving medication regimen also helps in improving the Medication adherence.

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