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Short Communication

Survey study to evaluate nitroglycerin and beta-blocker usage in the real-world management of angina: the cardiologists perspective

Ojaskumar D. Agrawal*, Pratibha Karande, Nitinkumar S. Doshi, Kunal Khobragade

Department of Medical Affairs, Mankind Pharma Pvt. Ltd., Seawood, Navi Mumbai, Maharashtra, India

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***Correspondence:**
Dr. Ojaskumar D. Agrawal,
E-mail: ojasagrawal@gmail.com

ABSTRACT

Angina pectoris is one of the major clinical burden in India, where ischemic heart disease (IHD) is rising with an alarming rate. Management strategy for acute angina includes nitroglycerin and for chronic stable angina, β-blockers used as a first-line therapy. A multicenter, cross-sectional, questionnaire-based survey was conducted. A 35-item online MCQs was provided to Ten cardiologists, and most cardiologists identified sedentary lifestyle, hypertension and smoking as major coexisting risk factors (70%), with atherosclerosis being the leading cause of stable angina (60%). Elderly patients aged 50-70 years were considered at highest risk commonly presented with atypical symptoms (60%). For stable angina, echocardiography (50%) and exercise stress testing (40%) were preferred, whereas for vasospastic angina, provocative testing (50%) was favored. Physical exertion was the predominant trigger (80%), and BNP was considered usually normal in angina without myocardial infarction (50%). β-blockers, like metoprolol (60%) and bisoprolol (20%) were preferred as first-line therapy (90% agreement). Long-acting nitrates were majorly used in chronic stable angina (80%), whereas to prevent nitrate tolerance, 12 to 14 hours of nitrate-free interval (50%) was commonly recommended. This survey represents patient-centric and guideline-directed approach to angina pectoris management among cardiologists. There is a strong harmony on the importance of risk assessment, and proper use of non-invasive diagnostic test. Beta-blockers-particularly metoprolol and bisoprolol-along with long-acting nitrates, emerge as the most commonly preferred agents, underscoring both therapeutic familiarity and adherence to safety considerations in routine clinical practice.

Keywords: Angina, Nitroglycerin, Beta-blocker, Cardiologist, Cross-sectional survey

INTRODUCTION

Nitroglycerin and β-blockers, considered to be the foundational treatment in the management of angina, addressing both symptom relief and underlying diseased condition. By reducing oxygen demand of myocardium, nitroglycerin gives immediate and effective relief of anginal episodes by through venodilation and improving coronary blood flow, making it indispensable for acute symptom control. By lowering heart rate, myocardial contractility, reduce oxygen consumption, and blood pressure, β-blockers are considered first-line agents for chronic stable angina with reported prognostic benefit in suitable patients. In India, where the burden of coronary artery disease and angina continues to rise due to high prevalence of hypertension, diabetes, and dyslipidemia, these agents are widely used in routine clinical practice. Their established efficacy, safety profile, affordability, and strong guideline endorsement make nitroglycerin and β-blockers central to angina management in the Indian healthcare setting.[1]

Chronic stable angina is a frequent clinical manifestation of chronic coronary artery disease, arising from an imbalance between myocardial oxygen supply and demand during physical or emotional stress. Pharmacological therapy remains the cornerstone of symptom control in chronic coronary syndromes. β-

blockers are recommended as first-line agents due to their ability to reduce heart rate and myocardial oxygen consumption, while long-acting nitrates effectively prevent exertional angina by improving coronary perfusion and reducing preload. Used alone or in combination, these agents form the foundation of guideline-directed management for chronic stable angina.[2]

In the acute setting, sublingual nitroglycerin is recommended as the first-line therapy for rapid relief of anginal symptoms owing to its rapid onset of action. Patients should be advised to avoid strenuous physical activity until the diagnostic evaluation is completed and be clearly instructed on appropriate actions to take if anginal chest pain persists or worsens, suggestive of an acute myocardial infarction.[3]

The β-blockers usage has increased rapidly and became the major first-line therapy for improvements in the symptomatic management of angina. This results in the improvements in mortality in acute myocardial infarction (MI) and in post-MI. β-blockers also reduce arrhythmias after cardiac and non-cardiac surgery. Thus, β-blockers have an established role in improving both mortality and symptom control in ischaemic heart disease, arrhythmias and hypertension.[4] A recent meta-analysis showed that treatment with a β-blocker reduced mortality in patients with stable angina who had undergone percutaneous revascularization.[5]

In spite of clear guideline recommendations, management of angina often vary widely based on clinical setting, comorbidities, cardiologist experience, and regional treatment patterns. In India, the comorbidity in patients, heterogeneous healthcare infrastructure, availability of medications, cost considerations, and cardiologist-patient dynamics play a vital role in prescription pattern and decisions.

The study further state that, nitrates are commonly used for chronic stable angina, and importantly nitrates along with β-blockers, are most commonly prescribed medication.[6]

METHODS

Real-world, in clinic view point of cardiologists regarding diagnosis, treatment and difficulties of angina management investigated through cross sectional survey.

Responses from 10 cardiologists (collected from 06th Jan 2025 to 19th April 2025) actively involved in the treatment of patient with angina were included in the study. A structured online questionnaire was used to gather data on angina patients' profile, diagnosis and drug therapy in real-world experiences. Microsoft excel (version 22502) was used for statistical analysis of the responses to find out meaningful insights.

Through a review of the literature, the questionnaire covered four crucial aspects of angina management: Life style and comorbidity, diagnostic preferences, medication practices and it's safety profile and patient education.

RESULTS

Life style and comorbidity

Among various risk factors, and comorbidities like diabetes, hypertension, dyslipidemia, and smoking play a pivotal role in development of coronary artery disease. In Indian population, metabolic comorbidities and premature atherosclerosis are particularly prevalent, often leading to early-onset ischemic symptoms. Majority (70%) of cardiologists reported that 'all of above' risk factors are commonly associated with angina. Very small portion (10% each) of cardiologists reported hypertension, sedentary lifestyle and smoking individually as the most common risk factor for angina (Figure 1).

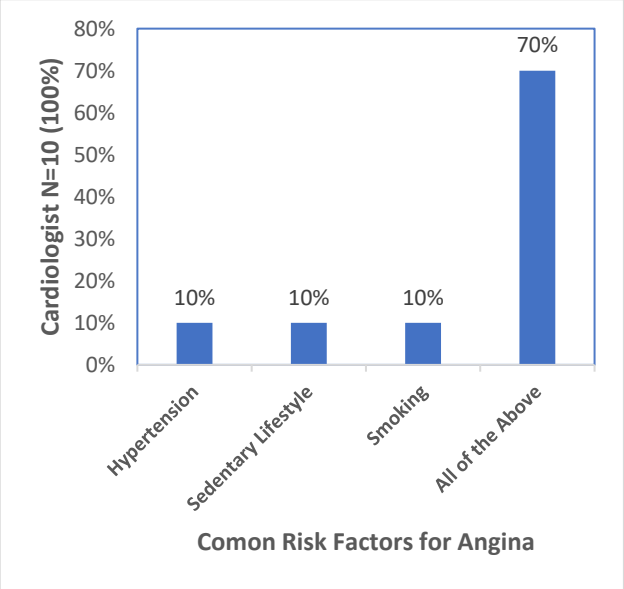

Figure 1: Common risk factors for angina.

The majority of cardiologists (60.0%) reported that atherosclerosis is the primary cause of stable angina. This indicates, stable angina is most commonly the result of obstructive CAD, characterized by fixed atherosclerotic plaques that limit myocardial blood flow during increased oxygen demand. An equal portion (20.0% each) of cardiologists reported that coronary artery spasm and valvular heart disease are the primary causes (Figure 2).

As far as the conditions which are most associated with 'unstable angina', majority of cardiologists (40.0%) have reported that myocardial infarction and peripheral arterial disease are associated with it.

The bigger group of cardiologists (60.0%) reported that elderly patients are more likely to present with 'atypical

symptoms of angina'. An equal proportion of cardiologists (20.0%) identified patients with diabetes and young athletes are also more likely to present with atypical symptoms.

The majority of cardiologists (80.0%) reported that physical exertion is the most common trigger in patients with stable angina. Around (20.0%) of cardiologists reported emotional stress as the most common trigger. A question on age was also recorded, because it is a major non-modifiable factor in CAD, with angina incidences rising sharply after 65 years due to vascular aging and plaque buildup. The half of cardiologists (50.0%) reported that 50 to 70 years age group is at the highest risk of developing angina, whereas 40.0% of them reported the 30 to 50 years age group is at highest risk.

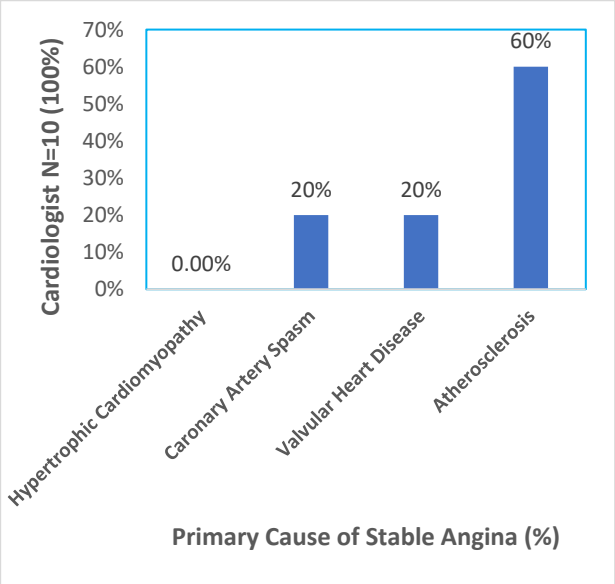

Figure 2: Primary causes of stable angina.

Diagnostic preferences

For the diagnosis, most commonly used non-invasive test for stable angina are exercise stress testing, myocardial perfusion imaging, stress echocardiography, and coronary computed tomography angiography (CCTA) are widely utilized. The majority of cardiologists (50.0%) reported that the echocardiogram is the most commonly used non-invasive test for diagnosing stable angina. Around 40.0% of Cardiologists indicated that the exercise stress test is most commonly used.

Coronary angiography with provocative testing using agents such as acetylcholine or ergonovine remains the gold standard for diagnosing vasospastic angina, particularly when spontaneous episodes are not captured on ECG. The majority of cardiologists (50.0%) reported that provocative testing with ergonovine or acetylcholine is the most appropriate diagnostic test for patients with suspected vasospastic angina. Around 40.0% of Cardiologists reported that the exercise treadmill test is most appropriate diagnostic test (Figure 3).

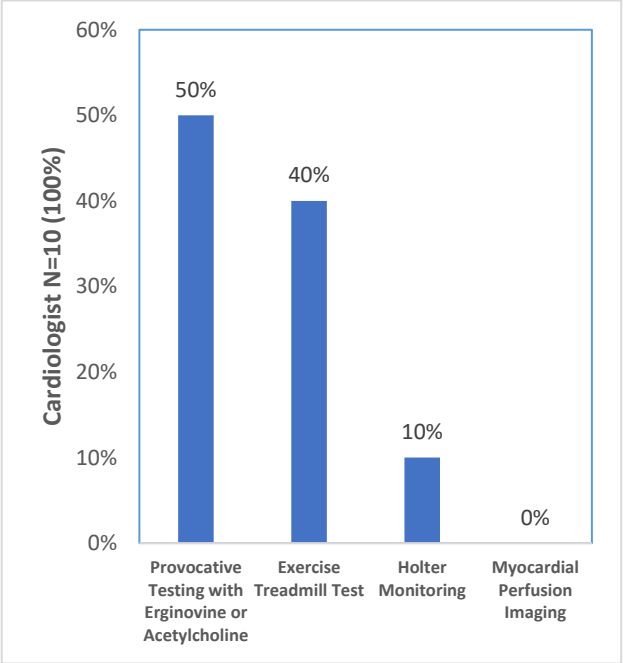

Figure 3: Diagnostic tests for suspected vasospastic angina.

Diagnosis using biomarker testing, particularly the measurement of cardiac troponins, plays a central role in identifying myocardial injury. The majority (50.0%) of cardiologists reported that BNP is typically normal in angina without myocardial infarction. Around 20.0% of cardiologists reported that troponin is typically normal in such cases. Similarly, another 20.0% of cardiologists reported that all of the above biomarkers (CK-MB, troponin, BNP) are typically normal (Figure 4).

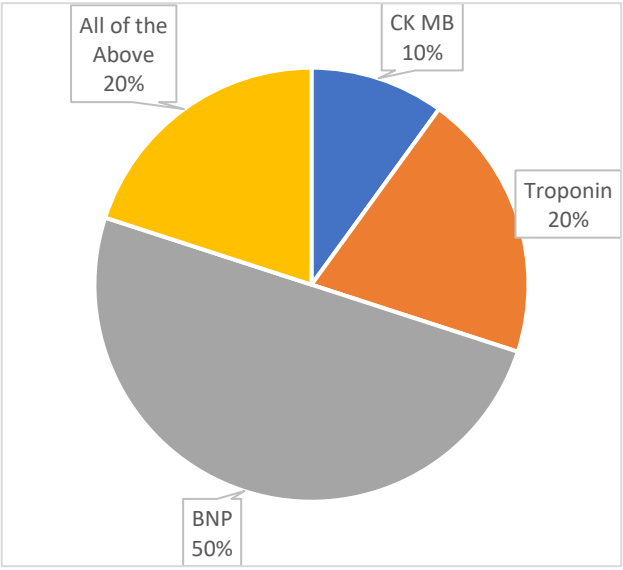

Figure 4: Angina without myocardial infraction: % of patients.

Normal biomarker values of tests

The diagnosis of elderly patients with angina, most common challenge for cardiologist is the presence of comorbidity. As reported by cardiologist that, an equal majority (40.0% each), poor symptom reporting and presence of comorbidities are the most complicating factors in diagnosing angina in elderly patients.

Unstable angina (UA) was reported to account for 21 to 30% of patients in routine clinical practice by the majority of cardiologists (60.0%), reflecting their real-world diagnostic experience. The majority of cardiologists (70.0%), reported that 25 to 50% of patients who present with chest pain are eventually diagnosed with angina, and fairly good number (20.0%) of cardiologists reported that 51 to 75% of chest pain is of angina.

Medication practices and safety profile of anti-anginal drugs

While reporting various approaches to treat angina in diabetic patients compared to non-diabetics, majority of cardiologists (50.0%) reported that they follow more aggressive risk factor management in diabetic patients. Around 30.0% of cardiologists reported placing less focus on medications in diabetics, and 20.0% of them stated using the same approach for both diabetic and non-diabetic patients.

Sublingual nitroglycerin provides rapid relief from angina by dilating coronary arteries and improving blood flow to ischemic myocardium, typically within 1 to 3 minutes of administration. Around 30% of cardiologist are strongly agree that nitroglycerin is effective in providing acute relief of angina. The majority of cardiologists (40.0%) agreed that nitroglycerin is effective in providing acute relief of angina (Figure 5).

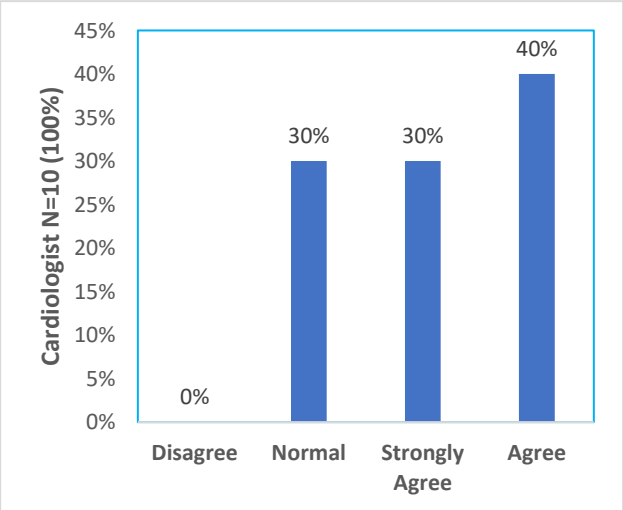

Figure 5: Perception of nitroglycerin effectiveness in acute angina relief.

Current guidelines recommend β-blockers as initial therapy in patients with stable angina, especially those with a history of myocardial infarction or reduced left ventricular function. The majority of cardiologists (50.0%) strongly agreed that β-blockers should be first-line therapy for stable angina, whereas 40.0% of agreed with this statement.

For the common angina management, Nitrate therapy remains central, due to its vasodilatory effects, especially useful for chronic, predictable symptoms. Most cardiologist (80.0%) reported that chronic stable angina is the condition in which long-acting nitroglycerin is most commonly indicated. To maintain effectiveness, it is essential to implement a daily 'nitrate-free interval' of 10 to 14 hours, typically during nighttime when anginal demand is lowest. Survey showed that, the majority of cardiologists (50.0%) reported that a 12-14 hours daily nitrate-free interval is recommended to prevent tolerance. Report suggest that, the majority of Cardiologists (60.0%) agreed and another 30.0% have strongly agreed that combination therapy of nitroglycerin and β-blockers is superior to monotherapy.

For a patient group benefited the most from long-acting nitrates, the majority of cardiologists (50.0%) reported that patients with acute coronary syndrome benefit the most from long-acting nitrates. Around 20.0% of cardiologists reported that patients with asymptomatic coronary artery disease as benefiting from long-acting nitrates. Understanding common side effects of nitroglycerin, such as headache and hypotension, is essential for optimizing its use in angina management and improving patient adherence. The majority of cardiologists (40.0%) reported hypotension as a common side effect of nitroglycerin in clinical practice. Around 30.0% of cardiologists reported hyperglycemia as a common side effect.

Co-administration of phosphodiesterase type 5 (PDE5) inhibitors are contraindicated because it may result in profound hypotension, syncope, or myocardial ischemia. Survey suggest that, the majority of Cardiologists (50.0%) reported that phosphodiesterase inhibitors (e.g., sildenafil) should not be co-administered with nitroglycerin and around 40.0% of them reported β-blockers as medications that should not be co-administered. The majority (50.0%) of Cardiologists reported headache as the most common side effect of long-acting nitroglycerin. Also, majority (60.0%) of cardiologists reported Metoprolol as their preferred β-blockers to control angina with limited chances of side effects.

Patient education

Patient awareness of the expected side effects of nitrates, particularly the frequent occurrence of headaches and postural hypotension, is essential for ensuring adherence and preventing unnecessary treatment discontinuation.

Inadequate counseling may lead to poor compliance, fear of symptoms, or misuse, especially in elderly or multi-comorbid patients. The survey suggested that, majority (50.0%) of cardiologists reported a neutral stance on the statement that patients should be educated about nitroglycerin side effects prior to prescription. Around 40.0% of cardiologists agreed with the given statement. About (10.0%) of cardiologists strongly agreed with the importance of educating patients about nitroglycerin side effects (Figure 6).

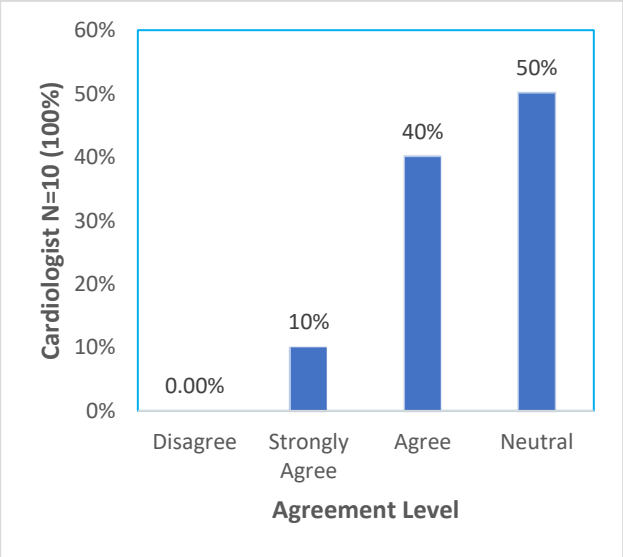

Figure 6: Patient education-nitroglycerin side effect: agreement levels.

DISCUSSION

Life style and comorbidity

Physical inactivity and sedentary behavior are now recognized as independent contributors to coronary risk and symptomatic ischemia.[7] Contemporary guidelines and epidemiologic data emphasize the synergistic role of traditional risk factors-particularly hypertension, tobacco use, and low physical activity-in driving atherosclerosis and ischemic symptoms.[3] Consistent with this evidence, 70.0% of cardiologists in the survey identified hypertension, sedentary lifestyle, and smoking as commonly coexisting risk factors for angina.

A majority of cardiologists (60.0%) identified atherosclerosis as the primary cause of stable angina, while coronary artery spasm and valvular heart disease were each reported by 20.0% of cardiologist. This distribution aligns with established evidence that, although atherosclerotic coronary artery disease is the predominant etiology of angina, alternative mechanisms such as vasospasm and flow-limiting structural heart disease contribute in a meaningful subset of patients.[8] Unstable angina is a manifestation of acute coronary syndrome and is most commonly related to underlying atherosclerotic coronary artery disease. In the present survey, myocardial infarction and peripheral arterial disease were each identified by 40% of cardiologists as the most commonly associated conditions, reflecting the systemic atherosclerotic burden typical of ACS. Arrhythmias and coronary plaque rupture were less frequently reported (10% each), supporting their recognized but comparatively less emphasized contributory roles in unstable angina.

Elderly patients are more likely to present with 'atypical symptoms' of angina or myocardial infarction compared with younger individuals.[9] Consistent with this evidence, 60.0% of cardiologists in the survey reported 'atypical symptom' presentation to be most common in the elderly, while diabetes and young athletes were each identified by 20.0% of cardiologists. In stable angina, physical exertion is recognized as the most frequent and predictable trigger, with emotional stress acting as a secondary contributor.[10] According to survey report, cardiologists (80.0%) reported physical exertion as the main trigger, whereas 20.0% cited emotional stress as the common trigger.

The risk of angina increases gradually above 45 years and 55 years in men and women respectively.[11] The result of present survey suggests that, 50.0% of cardiologists reported that a person with age group 50-70 years is at the maximum risk of developing angina, while 40.0% mentioned that the age group 30-50 year are at highest risk, indicates that, young age population is also at high risk.

Diagnostic preferences

A standard non-invasive modality for the evaluation of stable angina, generally recommended is exercise stress testing, generally combined with electrocardiography.[12] In the current report of survey, cardiologists (50.0%) is of the opinion that, echocardiography as the most preferred non-invasive diagnostic tool, trailed by the exercise stress (40.0%) test, shows the reflecting changeability in diagnostic preferences by cardiologist in routine clinical practice.

For vasospastic angina, provocative testing with intracoronary acetylcholine or ergonovine is a well-established diagnostic approach, with diagnosis confirmed by ≥90% coronary vasoconstriction, ischemic ECG changes and rapid reversal by intracoronary nitroglycerin.[13] Consistent with this evidence, 50.0% of cardiologists in the survey identified provocative testing as the most appropriate diagnostic modality for suspected vasospastic angina, while 40.0% reported the exercise treadmill test as their preferred approach. Cardiac biomarkers such as troponin and CK-MB are typically normal in angina without myocardial infarction, while BNP may vary with ventricular stress but does not indicate myocardial necrosis.[14] Aligning with this, 50.0% of cardiologists reported BNP to be usually normal, while 20.0% identified troponin as normal and another 20.0% reported all biomarkers to be normal in such cases.

Diagnostic challenges in elderly patients were mainly attributed to poor symptom reporting and multiple comorbidities (40.0% each), with limited access to advanced diagnostics cited by 20.0%, aligning with evidence on diagnostic delays in this population.[15] In unstable angina, cardiologists (60.0%) reported that around 21 to 30% of patients are identified with unstable angina, while 20.0% each reported rate of 11 to 20% reflecting the recognized heterogeneity and 31 to 40%, reported presence of non-obstructive disease.[16] Also, cardiologists (70.0%) indicated that 25 to 50% of patients reported with pain in chest are finally identified with angina, which is in consistent with variability reported across clinical practice.[17]

Therapeutic approaches, medication practices and side effects

Patients with diabetes differs from that in non-diabetics while management of angina is concern. This is due to the control of some intensified risk factors in diabetic patients.[18] As per survey report, 50.0% of cardiologists reported adopting intense risk factor control strategies in patients with diabetes. While, 30.0% mentioned comparatively less emphasis on pharmacotherapy of diabetic patient. This indicates differences in real-world clinical practice.

Nitroglycerin is well accepted, first-line therapy for acute angina relief, by over a century of clinical use and guidelines.[19] In the survey, 30.0% are strongly agreed and 40.0% are agreed that nitroglycerin is effective for acute symptom relief. According to ESC and ACC/AHA guideline recommendations, β-blockers were strongly support as first-line therapy for stable angina, with cardiologists (50.0%) strongly agreeing with this recommendation, indicating homogeneity in the clinical setting in reducing myocardial oxygen demand.[20]

For the management of chronic stable angina, long-acting nitroglycerin is generally used. It decreases the severity and frequency symptoms through coronary vasodilation.[21] Consistent with this, cardiologists (80.0%) reported chronic stable angina is main indication for long-acting nitroglycerin. To avoid nitrate tolerance, a daily nitrate-free interval is recommended.[22] and as per our study around 50.0% of cardiologists recommended a 12 to14 hours nitrate-free period. Also, combination therapy with β-blockers and nitrates was advised, with cardiologists (60.0%) approving that this combination is more superior to monotherapy for stable angina management.[23]

The common side effect of nitroglycerin is hypotension due to its potent vasodilatory action, often accompanied by flushing, dizziness and headache.[24] In line with this, 40.0% of cardiologists in the survey identified hypotension as the most common side effect of nitroglycerin, followed by hyperglycemia (30.0%). Concomitant use of nitroglycerin with phosphodiesterase-5 inhibitors such as sildenafil is absolutely contraindicated because of the risk of profound, life-threatening hypotension.[25] Consistent with guideline recommendations, 50.0% of cardiologists reported PDE5 inhibitors should not be co-administered with nitroglycerin, while 40.0% identified β-blockers as drugs requiring caution in co-administration.

Headache is the most common adverse effect of both short- and long-acting nitroglycerin, resulting from its potent vasodilatory action on cerebral vessels.[19] Consistent with this, 50.0% and 40.0% of cardiologists reported that headache and bradycardia are the common side effect of nitroglycerin, respectively. Metoprolol is preferred for angina control due to its β1-cardioselectivity and lesser risk of side effects.[26] Reflecting with this evidence, 60.0% and 20.0% of cardiologists preferred metoprolol and bisoprolol for angina management, respectively.

Patient education

Patient education on nitroglycerin is essential for correct administration, adherence, safety, and avoidance of adverse drug interactions.[27] In the survey, cardiologists (50.0%) reported a neutral stance and 40.0% agreed with patient education for nitroglycerin side effects prior to prescription. Proper usage of the nitroglycerin is important, as incorrect administration – may reduce efficacy and delay symptom relief. Around, 60.0% of cardiologists often counsel patients, while 20.0% each reported always or rarely providing such counseling on nitroglycerin use.

Limitations

Because this study relies on a smaller number of cardiologists and their self-reported data, objectivity may be limited and bias may introduce. Its conclusion is not generalizable and neither do they consider changing treatment trends or patient-level outcomes. Patients' viewpoint was not sufficiently taken in to consideration, therefore, response consistency may vary.

CONCLUSION

This cross-sectional multiple-choice questionnaire survey gives insight into real-world clinical management of angina among cardiologists in India, with specific focus on nitroglycerin and β-blocker. The findings indicate a predominantly evidence-based clinical approach, characterized by appropriate recognition of risk factors, a preference for non-invasive diagnostic modalities, and a clear distinction between stable and unstable angina. β-blockers, viz., metoprolol and bisoprolol, were broadly endorsed as first-line therapy for chronic stable angina. Nitroglycerin remains essential for acute relief and chronic prophylaxis of angina. However, nitrate-free intervals, awareness of nitrate tolerance, and adverse drug interactions are remaining central for discussion.

Cardiologist have demonstrated the awareness of atypical angina in elderly and diabetic patients and appropriate use of biomarkers to exclude myocardial infarction. However, variability in patient counseling, highlights the need for improved patient education.

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