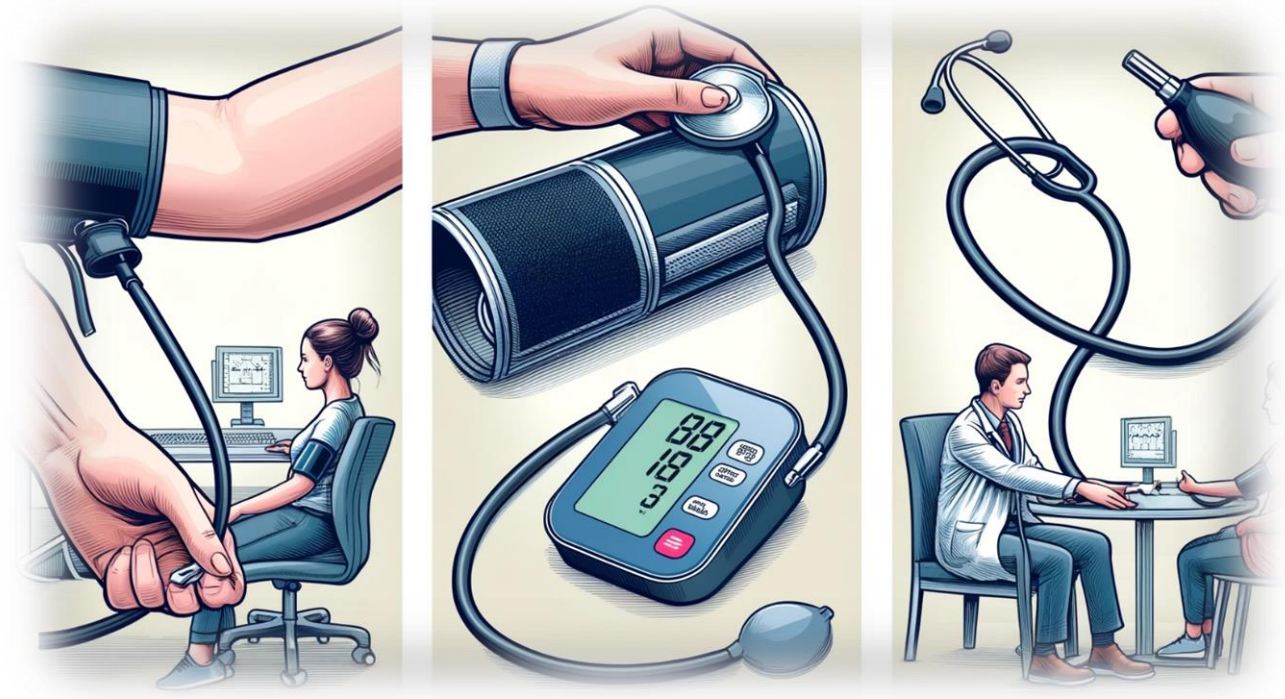
A Survey on Current Practice of Hypertension and Heart Failure Management in India



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Background and Objective of The Survey

Background

Hypertension and heart failure represent major public health challenges in India, a country with a vast and diverse population exceeding 1.3 billion people. Hypertension, often referred to as a silent killer, is a primary risk factor for cardiovascular diseases, including heart failure. The management of these conditions involves complex treatment protocols which can vary widely due to regional differences in healthcare practices and availability of resources. Despite the high prevalence of these conditions, comprehensive data on how they are managed across different regions of India is sparse. This gap in knowledge hinders the ability to implement effective, standardized treatment guidelines and improve patient outcomes nationwide.

Current Practice of Hypertension and Heart Failure Management in India

In India, the management of hypertension and heart failure involves a combination of lifestyle modifications, pharmacological treatments, and, in more severe cases, surgical interventions. The approach to managing these conditions varies significantly across different regions, influenced by factors such as local healthcare infrastructure, availability of specialists, and community awareness.

Hypertension Management

1. Diagnosis and Monitoring: Hypertension is typically diagnosed using sphygmomanometers, with many clinics also adopting digital blood pressure monitors for greater accuracy. Regular monitoring is crucial, and patients are often encouraged to maintain blood pressure logs.

2. Medication: The pharmacological treatment includes a range of antihypertensives such as ACE inhibitors, beta-blockers, diuretics, and calcium channel blockers. The choice of medication depends on the patient's overall health profile, age, and coexisting conditions.

3. Lifestyle Modifications: Patients are counseled on significant lifestyle changes, including salt restriction, increased physical activity, moderation of alcohol intake, and cessation of smoking. Nutritional counseling plays a critical role, with a focus on reducing fat intake and increasing consumption of fruits and vegetables.

Heart Failure Management

1. **Diagnosis and Monitoring:** Heart failure management begins with a thorough clinical evaluation, including echocardiography to assess heart function. Newer

biomarkers and imaging techniques are increasingly available but are not uniformly accessible across all healthcare centers.

2. Medication: Treatment typically involves the use of diuretics to reduce fluid overload, ACE inhibitors or ARBs to decrease heart strain, beta-blockers to manage heart rate, and in some cases, aldosterone antagonists. The recent introduction of drugs like sacubitril/valsartan has been noted for improving outcomes in heart failure patients.

3. Advanced Therapies: In advanced cases, device-based therapies such as implantable cardioverter defibrillators (ICDs) or cardiac resynchronization therapy (CRT) are employed. Heart transplant remains a last resort due to limited availability and high costs.

Objective

- The objective of this survey is to gather detailed insights into the current practices of hypertension and heart failure management across various healthcare settings in India.
- This will involve assessing the diagnostic tools, treatment methods, medication adherence, patient education, and follow-up practices employed by healthcare professionals.
- The aim is to identify commonalities and disparities in management approaches, which will inform efforts to standardize care and optimize treatment protocols.
- Ultimately, this survey seeks to contribute to the improvement of healthcare services for patients suffering from these critical conditions across the country.

METHODOLOGY OF SURVEY

A survey was conducted to understand the current "**A Survey on Current Practice of Hypertension and Heart Failure Management in India**" Setting and to understand the market better and offer better services to improve the patient outcome. A total of **150** doctors from India participated in the survey.

Step 1:

A literature search was done on the topic. Below topics were covered in literature search:

- **Therapeutic Adherence in Hypertension: Current Evidence and Expert Opinion from India**
- **Clinical Profile and 90 Day Outcomes Of 10851 Heart Failure Patients Across India: National Heart Failure Registry**

Step 2:

A survey questionnaire was prepared based on the literature search. The survey form was shared through digital medium with **150** doctors across India.

Step 3:

Their responses were analysed and the findings are provided in this survey analysis booklet.

Therapeutic Adherence in Hypertension: Current Evidence and Expert Opinion from India

Introduction

Hypertension (HTN) significantly impacts various body systems, elevating the risk of cardiovascular (CV) events such as myocardial infarction (MI), stroke, heart failure, renal dysfunction, and increased mortality. Worldwide, around 1.3 billion people are affected by HTN, with the majority residing in low- and middle-income countries (LMICs). Over the last 20 years, the prevalence of HTN has shifted from high- to middle-income countries to LMICs, largely due to lifestyle changes [1,2]. In India, HTN affects approximately 29.8% of the population, with variations observed between rural (27.6%) and urban (33.8%) areas [3]. Globally, awareness, treatment, and control of HTN are insufficient [4-9]. In India, up to 75% of individuals with HTN may be unaware of their condition, resulting in poorly controlled hypertension[3]. Despite improvements over the past 25 years, HTN awareness in India still lags behind countries like the USA, UK, Australia, and Canada [10,11]. Additionally, non-compliance with HTN treatment has not significantly changed over the past two decades [12,13].

Effective HTN control is crucial to reducing the incidence of major adverse cardiovascular events (MACE) and related deaths [14]. Poor medication adherence is linked to increased risks of CV events and mortality [15,16], while better adherence can reduce these risks[17]. Treatment adherence is influenced by various factors including the type of treatment, comorbidities, costs, and the quality of the physician-patient relationship [18,19]. Various strategies can enhance adherence, such as using prescription records, pill counts, digital tools, and fostering better physician-patient cooperation, along with involving other healthcare professionals [22-25]. Adherence to lifestyle modifications like diet, physical activity, and restrictions on salt and alcohol intake is also crucial [20,21]. Given the general lack of awareness and control over HTN in India, enhancing adherence is imperative. This review discusses the evidence on treatment adherence in HTN and offers practical strategies for improving adherence within the Indian context.

➢ Factors affecting adherence in hypertension

Several factors influence medication adherence among individuals with hypertension, categorized into five main groups according to Burnier and Egan. These are sociodemographic factors, healthcare system/team dynamics, therapy-related issues, condition-related challenges, and patient-specific factors[27]. The complexity of these factors often results in varied adherence levels, which are particularly evident in India, where adherence rates range widely from 19% to 96%[16,17,28-35]. This variation is attributed to different methodologies in measuring adherence and the influence of diverse factors such as age, gender, education, economic status, and the duration of hypertension diagnosis.

In India, evidence suggests that non-adherence is frequently due to a lack of disease awareness, the asymptomatic nature of hypertension, and economic constraints[27]. A study by Gupta et al. in Jaipur further explores these issues, identifying key themes that impact adherence: patient experiences, patient attitudes towards treatment, barriers within the health system, and the influence of healthcare professionals[36]. Patients often lack basic knowledge about hypertension, which affects their health behaviors such as diet and physical activity. Healthcare system barriers, such as distance from medical facilities and associated travel costs, also contribute significantly to non-adherence.

Moreover, a meta-analysis reviewing adherence to cardiovascular medications across 44 epidemiological studies found disparities in adherence rates among different types of medications, with higher adherence noted for aspirin and anti-diabetic medications compared to statins and antihypertensives[37]. This could be due to higher awareness of diabetes and the affordability of aspirin. Negative perceptions of treatments also play a crucial role, as evidenced by Nielsen and Nordestgaard's observation that adverse media coverage of statins correlates with poorer adherence and increased rates of myocardial infarction and cardiovascular mortality[38].

This multi-faceted problem of non-adherence in hypertension management underscores the need for targeted interventions that address these varied factors to improve health outcomes in hypertensive patients.

- **Detecting poor adherence**

Detecting poor adherence to hypertension (HTN) treatment, which is typically lifelong, is crucial as any interruption in treatment can adversely affect patient outcomes. Various methods are employed to assess adherence, each with its strengths and limitations:

1. Qualitative Methods:

- Interviews: This method involves physicians directly asking patients about their medication adherence during consultations. While it is cost-effective and straightforward, its main drawback is the lack of reliability due to potential patient bias or misreporting[27].
- Questionnaires: These can provide more structured data but may also face issues with patient willingness to participate and the time required to administer[27].

2. Quantitative Methods:

- Pill Count: Counting remaining pills to estimate adherence is easy to perform but can be deceived if patients adjust the count before visits[27].
- Refill Data: Checking pharmacy refill records provides an indirect measure of adherence by tracking how timely prescriptions are refilled.
- Directly Observed Treatment (DOT): Though highly reliable, implementing this method, where treatment is administered under direct observation, is often impractical outside of controlled settings[27].

3. Technological Methods:

- Electronic Monitoring: Devices that record the date and time when a medication container is opened are very accurate but can be cost-prohibitive[27].

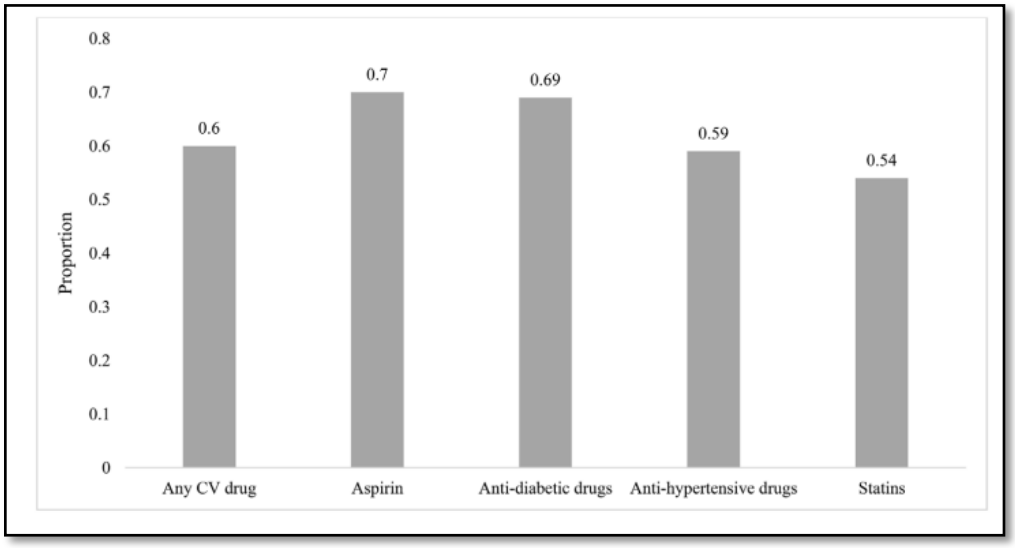


Fig. 1: Adherence rates to different cardiovascular medications

-Drug Assay: Testing blood or urine for the presence of medication provides concrete evidence of ingestion but is invasive and costly[27].

- Digital Medicine: Involves digital tracking technologies integrated into medications that signal when ingested. Although highly accurate, the technology is expensive and not yet widespread in clinical practice[27].

The recent guidelines from the European Society of Cardiology and European Society of Hypertension (ESC/ESH) also underscore the importance of using home blood pressure monitoring as a means to detect poor adherence to antihypertensive therapy[39]. This method can help identify discrepancies in expected treatment outcomes based on prescribed medications.

➢ Strategies to improve drug adherence

The World Health Organization (WHO) highlights that enhancing patient adherence is a crucial step in effectively managing chronic conditions such as hypertension (HTN). The European Society of Cardiology and European Society of Hypertension (ESC/ESH) guidelines, along with the 2020 recommendations from the International Society of Hypertension (ISH), emphasize evaluating adherence routinely and before intensifying antihypertensive treatments. These guidelines advocate for strategies like single combination pills, once-daily dosing, home blood pressure monitoring, and integrating adherence behaviors into daily routines, supported by digital tools like mobile phones [39,40].

▪ Physician-Level Strategies

Physicians play a pivotal role by engaging in comprehensive counseling about treatment and adherence at each consultation. They should actively seek patient feedback on

clinical and lifestyle improvements and work through any barriers to adherence. The utilization of healthcare personnel like nurses can enhance therapy adherence through collaborative interventions, as evidenced by studies showing improved adherence among older adults through nursing-led initiatives[39,42,43].

- **Patient-Level Strategies**

Self-monitoring of blood pressure (SMBP) has been shown to significantly enhance adherence to medication in hypertensive patients. The use of technology, such as telemonitoring and mobile apps for medication reminders, has also proven effective. Motivational strategies, including incentives for achieving adherence and blood pressure control, are additional approaches to improve outcomes[47-49].

Table 1: Strategies to improve medication adherence.

Strategies to improve medication adherence.

Levels	Strategies
Physician level	Patient Counseling
	Feedback on clinical/behavioral improvement
	Identification of adherence related issues
	Involvement of healthcare personnel
	Improving health literacy of patients
	Reducing pill burden
Patient level	Self-monitoring of BP
	Telemonitoring – reminders, apps, etc.
	Motivation – Incentives in insurance premiums, priority physician visit, etc.
	Social support - Family engagement in treatment
Health system	Supporting the development of monitoring systems such as telemonitoring
	Availability of national prescription database
	Increased medication accessibility
	Increased population education and awareness about HTN and treatment
Pharma companies	Reminder packaging
	Development of digital medicine
	Monetary incentive in drug refills
	Patient educational activities

- **Health System-Level Strategies**

At the system level, ensuring easier access to medications, subsidizing single-pill combinations, and bolstering education on hypertension are critical strategies. Building a national prescription database and enhancing the integration of monitoring systems can also support better hypertension control[39].

- **Economic Considerations**

The cost of medications is a significant barrier to adherence. Strategies to manage costs, such as including major antihypertensive drugs in essential medicine lists and monitoring pricing policies effectively, are essential, especially in settings like India where patients bear a substantial part of healthcare expenses[54,55,57].

- **Role of Pharma Companies**

Pharmaceutical companies can contribute by innovating in packaging—such as developing reminder packaging—and actively engaging in patient education to improve adherence[58]

By addressing these various levels—physician, patient, health system, economic factors, and pharmaceutical innovations—adherence to hypertension treatment can be significantly improved, leading to better health outcomes.

➢ Improving adherence to lifestyle interventions

Improving adherence to lifestyle interventions is crucial in managing hypertension (HTN) effectively. Lifestyle changes can significantly reduce blood pressure by 5 to 20 mmHg. Key interventions include reducing salt intake, limiting alcohol consumption, increasing physical activity, following heart-healthy diets such as the Dietary Approaches to Stop Hypertension (DASH) diet, and maintaining a healthy weight[59]. Additionally, community-based programs that involve proactive home visits by trained community health workers have shown to enhance HTN control and reduce mortality rates[60].

Despite the clear benefits, adherence to these lifestyle changes can be challenging. Studies have shown that physicians often recommend lifestyle modifications more aggressively to obese hypertensive patients, yet these patients tend to be less compliant compared to their normal or underweight counterparts. Furthermore, adherence levels vary among different lifestyle changes; for instance, patients are generally more compliant with sodium and alcohol restrictions than with recommendations for physical activity and weight management [20, 34].

This suggests a need for a balanced focus on all recommended lifestyle interventions to manage HTN effectively. Tailored approaches that consider individual patient challenges and preferences may improve overall adherence and outcomes.

Table 2: Practical tips for treatment adherence

Practical tips for treatment adherence in management of hypertension.

Section	Practical tip
Defining adherence	We consider that in defining adherence, three quantifiable phases namely initiation, discontinuation, and implementation, should be adopted in routine practice as well as in designing adherence studies.
Factors associated with adherence	In the Indian context, medication adherence among patients of HTN is generally suboptimal in real-life situations. Multiple factors that are linked to the patients, physicians, and health-system may underlie poor adherence to antihypertensive therapy.
Detecting non-adherence	In the Indian context, we consider that physician counseling during the patient interview is probably the most important method to detect non-adherence. In conjunction with other methods such as pill count, etc. physicians should be able to detect any non-adherence during the patient's interview. A good physician-patient relationship can identify non-adherence accurately.
Strategies to improve adherence	In the Indian context, multiple strategies need to be adopted to improve therapeutic adherence as any single strategy may achieve optimal results. Reducing the pill burden with use of single−pill combinations available at lower costs is probably best strategy to improve medication adherence.
Adherence to lifestyle interventions	In the Indian context, besides medication adherence, it is equally essential to improve the patients' adherence to non-pharmacological interventions to achieve better control of HTN. Effective physician-patient interactions can help in achieving this objective.

Conclusion

In India, raising awareness about hypertension (HTN), improving the accessibility and affordability of treatments, and enhancing disease control are crucial challenges. Therapeutic adherence, often overlooked in clinical practice, plays a key role in managing HTN effectively. Addressing poor adherence requires a comprehensive approach that involves patients, physicians, and the healthcare system. To improve treatment adherence and control HTN, India needs to focus on increasing public awareness, expanding healthcare access, and making medications more affordable. This multi-faceted strategy is essential for tackling HTN in the Indian context.

References

1.World Health Organization. Hypertension. Fact sheet 13 September 2019. Available from: https://www.who.int/news-room/fact-sheets/detail/ hypertension. Accessed February 10, 2020.

2. Salem H, Hasan DM, Eameash A, et al. Worldwide prevalence of hypertension: a pooled meta-analysis of 1670 studies in 71 countries with 29.5 million participants. J Am Coll Cardiol. 2018;71, A1819.

3. Anchala R, Kannuri NK, Pant H, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. J Hypertens. 2014;32:1170e1177.

4. Chow CK, Teo KK, Rangarajan S, et al. Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. J Am Med Assoc. 2013;310:959e968.

5. Mohamed SF, Mutua MK,Wamai R, et al. Prevalence, awareness, treatment and control of hypertension and their determinants: results from a national survey in Kenya. BMC Publ Health. 2018;18, 1219.

6. Gebrihet TA, Mesgna KH, Gebregiorgis YS, et al. Awareness, treatment, and control of hypertension is low among adults in Aksum town, northern Ethiopia: a sequential quantitative-qualitative study. PloS One. 2017;12, e0176904.

7. Hien HA, Tam NM, Tam V, et al. Prevalence, awareness, treatment, and control of hypertension and its risk factors in (Central) Vietnam. Int J Hypertens. 2018,6326984. Article ID.

8. Karmakar N, Nag K, Saha I, et al. Awareness, treatment, and control of hypertension among adult population in a rural community of Singur block, Hooghly District, West Bengal. J Educ Health Promot. 2018;7, 134.

9. Abdul-Razak S, Daher AM, Ramli AS, et al. Prevalence, awareness, treatment, control and socio demographic determinants of hypertension in Malaysian

adults. BMC Publ Health. 2016;16, 351.

10. Gupta R, Gupta VP, Prakash H, Agrawal A, Sharma KK, Deedwania PC. 25-Year trends in hypertension prevalence, awareness, treatment, and control in an Indian urban population: Jaipur Heart Watch. Indian Heart J. 2018;70:802e807.

11. Zhou B, Danaei G, Stevens GA, et al. Long-term and recent trends in hypertension awareness, treatment, and control in 12 high-income countries: an analysis of 123 nationally representative surveys. Lancet. 2019;394:639e651.

12. Joshi PP, Salkar RG, Heller RF. Determinants of poor blood pressure control in urban hypertensives of central India. J Hum Hypertens. 1996;10:299e303.

13. Nagarkar AM, Gadhave SA, Sharma I, Choure A, Morisky D. Factors influencing medication adherence among hypertensive patients in a tertiary care hospital, Pune, Maharashtra. Natl J Community Med. 2013;4:559e563.

14. Cushman WC, Whelton PK, Fine LJ, et al. SPRINT trial results: latest news in hypertension management. Hypertension. 2016;67:263e265.

15. Kim S, Shin DW, Yun JM, et al. Medication adherence and the risk of cardiovascular mortality and hospitalization among patients with newly prescribed antihypertensive medications. Hypertension. 2016;67:506e512.

16. Herttua K, Tab_ak AG, Martikainen P, Vahtera J, Kivim€aki M. Adherence to antihypertensive therapy prior to the first presentation of stroke in hypertensive adults: population-based study. Eur Heart J. 2013;34:2933e2939.

17. Yang Q, Chang A, Ritchey MD, Loustalot F. Antihypertensive medication adherence and risk of cardiovascular disease among older adults: a populationbased cohort study. J. Am. Heart Assoc. 2017;6, e006056.

18. Mekonnen HS, Gebrie MH, Eyasu KH, Gelagay AA. Drug adherence for antihypertensive medications and its determinants among adult hypertensive patients attending in chronic clinics of referral hospitals in Northwest Ethiopia. BMC Pharmacol Toxicol. 2017;18:27.

19. Mancia G, Zambon A, Soranna D, Merlino L, Corrao G. Factors involved in the discontinuation of antihypertensive drug therapy: an analysis from real life data. J Hypertens. 2014;32:1708e1715.

20. Xu KT, Ragain RM. Effects of weight status on the recommendations of and adherence to lifestyle modifications among hypertensive adults. J Hum Hypertens. 2005;19:365e371.

21. Elbur AI. Level of adherence to lifestyle changes and medications among male hypertensive patients in two hospitals in Taif; Kingdom of Saudi Arabia. Int J Pharm Pharmaceut Sci. 2015;7:168e172.

22. Vrijens B, Antoniou S, Burnier M, de la Sierra A, Volpe M. Current situation of medication adherence in hypertension. Front Pharmacol. 2017;8, 100.

23. Parati G, Omboni S, Compare A, et al. Blood pressure control and treatment adherence in hypertensive patients with metabolic syndrome: protocol of a randomized controlled study based on home blood pressure telemonitoring vs. conventional management and assessment of psychological determinants
adherence (TELEBPMET Study). Trials. 2013;14:22.

24. Frias J, Virdi N, Raja P, et al. Effectiveness of digital medicines to improve clinical outcomes in patients with uncontrolled hypertension and type 2 diabetes: prospective, open-label, cluster-randomized pilot clinical trial. J MedInternet Res. 2017;19, e246.

25. Hedegaard U, Kjeldsen LJ, Pottegard A, et al. Improving medication adherence
in patients with hypertension: a randomized trial. Am J Med. 2015;128: 1351e1361.

26. Vrijens B, De Geest S, Hughes DA, et al. A new taxonomy for describing and defining adherence to medications. Br J Clin Pharmacol. 2012;73:691e705.

27. Burnier M, Egan BM. Adherence in hypertension: a review of prevalence, risk factors, impact, and management. Circ Res. 2019;124:1124e1140.

28. Thomas D, Meera NK, Binny K, et al. Medication adherence and associated barriers in hypertension management in India. CVD Prevent Contr. 2011;6:
9e13.

29. Rao CR, Kamath VG, Shetty A, Kamath A. Treatment compliance among patients with hypertension and type 2 diabetes mellitus in a coastal population of Southern India. Int J Prev Med. 2014;5:992e998.

30. Bhandari S, Sarma PS, Thankappan KR. Adherence to antihypertensive treatment and its determinants among urban slum dwellers in Kolkata, India. Asia Pac J Publ Health. 2015;27. NP74e84.

31. Mallya SD, Kumar A, Kamath A, et al. Assessment of treatment adherence among hypertensive patients in a coastal area of Karnataka, India. Int J Commun Med Public Health. 2016;3:1998e2003.

32. Misra P, Salve HR, Srivastava R, Kant S, Krishnan A. Adherence to treatment among hypertensive individuals in a rural population of North India. Indian J Community Health. 2017;29(2):176e181.

33. Balasubramanian A, Nair SS, Rakesh PS, Leelamoni K. Adherence to treatment among hypertensives of rural Kerala, India. J Fam Med Prim Care. 2018;7: 64e69.

34. Venkatachalam J, Abrahm SB, Singh Z, Stalin P, Sathya GR. Determinants of patient's adherence to hypertension medications in a rural population of Kancheepuram District in Tamil Nadu, South India. Indian J Community Med.
2015;40:33e37.

35. Choudhary R, Sharma SM, Kumari V, Gautam D. Awareness, treatment adherence and risk predictors of uncontrolled hypertension at a tertiary care teaching hospital in Western India. Indian Heart J. 2016;68:S251eS252.

36. Gupta S, Dhamija JP, Mohan I, Gupta R. Qualitative study of barriers to adherence to antihypertensive medication among rural women in India. Int J Hypertens. 2019, 5749648. Article ID.
37. Chowdhury R, Khan H, Heydon E, et al. Adherence to cardiovascular therapy: a meta-analysis of prevalence and clinical consequences. Eur Heart J. 2013;34: 2940e2948.

38. Nielsen SF, Nordestgaard BG. Negative statin-related news stories decrease statin persistence and increase myocardial infarction and cardiovascular mortality: a nationwide prospective cohort study. Eur Heart J. 2016;37:
908e916.

39. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of hypertension (ESH). Eur Heart J. 2018;39:3021e3104.

40. World Health Organization. Improving adherence rates: guidance for countries. Available from: https://www.who.int/chp/knowledge/publications/ Adherence_section2.pdf?ua¼1. Accessed March 10, 2020.

41. Unger T, Borghi C, Charchar F, et al. International Society of Hypertension global hypertension practice guidelines. Hypertension. 2020;75:1334e1357,
2020.

42. Verloo H, Chiolero A, Kiszio B, Kampel T, Santschi V. Nurse interventions to improve medication adherence among discharged older adults: a systematic review. Age Ageing. 2017;46:747e754.

43. Romero Guevara SL, Parra DI, Rojas LZ. Teaching: individual" to increase adherence to therapeutic regimen in people with hypertension and type-2 diabetes: protocol of the controlled clinical trial ENURSIN. BMC Nurs. 2019;18:22.

44. Berkman ND, SheridanSL, Donahue KE. Low health literacy and health outcomes: a updated systematic review. Ann Intern Med. 2011;155:97e107.

45. Verma AA, Khuu W, Tadrous M, Gomes T, Mamdani MM. Fixed-dose combination antihypertensive medications, adherence, and clinical outcomes: a population-based retrospective cohort study. PLoS Med. 2018;15, e1002584.

46. Parati G, Kjeldsen S, Coca A, Cushman WC, Wang J. Adherence to single-pill versus free-equivalent combination therapy in hypertension: a systematic review and meta-analysis. Hypertension. 2021;77:692e705.

47. Fletcher BR, Hartmann-Boyce J, Hinton L, McManus RJ. The effect of selfmonitoring of blood pressure on medication adherence and lifestyle factors: a systematic review and meta-analysis. Am J Hypertens. 2015;28:1209e1221.

48. Friedman RH, Kazis LE, Jette A, et al. A telecommunications system for monitoring and counseling patients with hypertension: impact on medication adherence and blood pressure control. Am J Hypertens. 1996;9:285e292.

49. Morrissey EC, Casey M, Glynn LG, Walsh JC, Molloy GJ. Smartphone apps for improving medication adherence in hypertension: patients' perspectives. Patient Prefer Adherence. 2018;12, 813.

50. Hagihara A, Murakami M, Chishaki A, Nabeshima F, Nobutomo K. Rate of health insurance reimbursement and adherence to antihypertensive treatment among Japanese patients. Health Pol. 2001;58:231e242.

51. Morisky DE, DeMuth NM, Field-Fass M, Green LW, Levine DM. Evaluation of family health education to build social support for long-term control of high blood pressure. Health Educ Q. 1985;12:35e50.

52. Kirkland EB, Heincelman M, Bishu KG, et al. Trends in healthcare expenditures among US adults with hypertension: national estimates, 2003e2014. J. Am. Heart Assoc. 2018;7, e008731.

53. Dillon P, Smith SM, Gallagher P, Cousins G. Impact of financial burden, resulting from prescription co-payments, on antihypertensive medication adherence in an older publicly insured population. BMC Publ Health. 2018;18:1e9.

54. Negi S, Neupane D, Sahoo SK, et al. Prices of combination medicines and singlemolecule antihypertensive medicines in India's private health care sector. J Clin Hypertens. 2021;23:738e743.

55. Kotwani A, Ewen M, Dey D, et al. Prices and availability of common medicines at six sites in India using a standard methodology. Indian J Med Res. 2007;125: 645e654.

56. Ahmad A, Khan MU, Patel I. Drug pricing policies in one of the largest drug manufacturing nations in the world: are affordability and access a cause for concern? J Res Pharm Pract. 2015;4:1e3.

57. Kumar R, Kumar N, Ahmad A, et al. Cost comparison of antihypertensive drugs available in India with Drugs Prices Control Order price list. Int J Res Med Sci. 2019;7:101e105.

58. Dupclay L, Eaddy M, Jackson J, Raju A, Shim A. Real-world impact of reminder packaging on antihypertensive treatment adherence and persistence. Patient Prefer Adherence. 2012;6:499e507.

59. Vooradi S, Mateti UV. A systemic review on lifestyle interventions to reduce blood pressure. J Health Res Rev. 2016;3:1e5.

60. Jafar TH, Gandhi M, De Silva HA, et al. A community-based intervention for managing hypertension in rural South Asia. N Engl J Med. 2020;382:717e726.

Clinical Profile and 90 Day Outcomes Of 10851 Heart Failure Patients Across India: National Heart Failure Registry

Introduction

Heart failure (HF) is a complex clinical syndrome that impairs the heart's ability to fill with or eject blood, affecting an estimated 26 million people globally [1]. This condition not only leads to significant disability but also carries a high mortality rate, with around one million adults in the US hospitalized annually [2] and a one-year mortality rate of 23.6% in patients with acute HF in high-income countries [3]. While the prevalence of heart failure varies worldwide [4,5], specific data on its prevalence and incidence in India are relatively limited.

In India, several registries such as the Trivandrum Heart Failure Registry[6-8], the International Congestive Heart Failure registry[9], and the Medanta registry[10] provide valuable insights into the characteristics of patients, prevailing treatment practices, and survival rates. However, these registries do not fully represent the geographic diversity of India[11]. The National Heart Failure Registry (NHFR) aims to fill this gap by including data from a wide range of geographical areas across the country. This introduction sets the stage for a detailed exploration of the demographics, disease etiology, practice patterns, 90-day mortality rates, and predictors of 90-day mortality among patients with acute decompensated HF as captured in the NHFR.

Methods

Study Settings

The National Heart Failure Registry (NHFR) includes a facility-based registry collecting data on Acute Decompensated Heart Failure (ADHF) patients from 53 hospitals across 21 states and four union territories in India, conducted between January 2019 and July 2020. It involved nine nodal centers that are government-funded medical institutes with substantial experience in epidemiological research. These centers coordinated with five additional hospitals each to ensure diverse geographic and ethnic representation[12].

Participants

The study enrolled consecutive ADHF patients over 18 years old who met the European Society of Cardiology (ESC) 2016 criteria for heart failure[13]. All participants underwent echocardiography during their hospital stay.

Data Collection and Definitions

Data were collected on various aspects, including socio-demographic characteristics, heart failure etiology, medical history, and clinical treatments. This was done through medical records and interviews with patients or their immediate family members. Trained nurses entered the data into the NHFR central server using Android or web-based applications. Data accuracy and completeness were routinely checked by the nodal center coordinators with oversight from the National Coordinating Centre at Sree Chitra

Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, India. Heart failure was categorized into three groups based on ejection fraction measurements obtained via echocardiography: HF with reduced ejection fraction (HFrEF), HF with mildly reduced ejection fraction (HFmrEF), and HF with preserved ejection fraction (HFpEF)[14-16].

Longitudinal Follow-up

Follow-up was conducted for a minimum of three months post-admission, either during clinic visits or via telephone, collecting data on rehospitalizations, mortality, and causes of death. Verbal autopsies were conducted for out-of-hospital deaths to determine the cause.

Outcomes

The primary outcome was all-cause mortality at 90 days, analyzed through time-to-mortality data for survival analysis.

Statistical Analysis

Statistical analysis involved comparing categorical variables using chi-square tests and continuous variables using one-way ANOVA if normally distributed. Survival analysis was performed using Kaplan–Meier models and log-rank tests, with further analysis via a Cox proportional hazard model to assess factors associated with 90-day mortality using Stata 16.1[17,18].

Ethical Considerations

Ethical approval was obtained from all participating centers and the coordinating center's ethics committee (SCTIMST). The study was registered with the Clinical Trial Registry of India (CTRI), and informed consent was obtained from all participants[19].

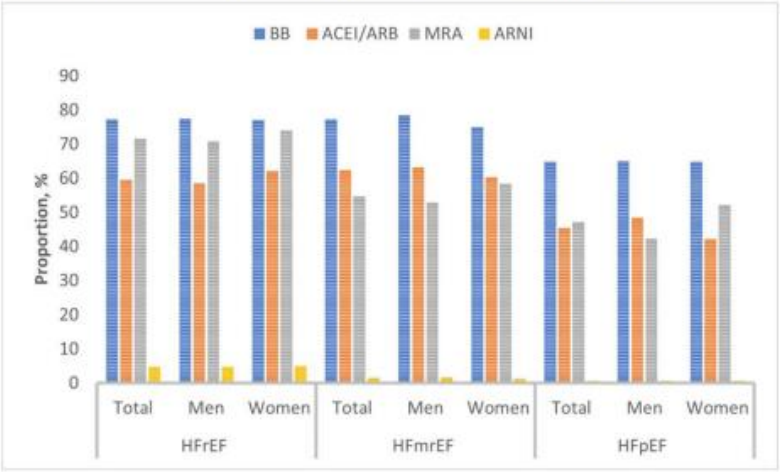
Results

The study recruited a total of 10,851 patients with a mean age of 59.9 years. Women constituted 31% of the study cohort. The average educational attainment was 7.8 years, with 25.5% of participants having less than four years of formal education. The mean Body Mass Index (BMI) was reported as 24.2 kg/m². A large majority, 74.4%, were admitted with de novo heart failure (HF), while the remaining 25.6% were readmissions. Heart failure with reduced ejection fraction (HFrEF) was the most common type, observed in 65.2% of cases, followed by heart failure with mildly reduced ejection fraction (HFmrEF) at 22%, and heart failure with preserved ejection fraction (HFpEF) at 12.7%. Ischemic heart disease was identified as the leading cause of HF in 72% of the cases, with dilated cardiomyopathy at 18%, and rheumatic valvular heart disease in 5.9% of patients.

Co-morbid conditions such as hypertension (48.9%) and diabetes (42.3%) were prevalent. Other conditions included atrial arrhythmia (9.5%), chronic kidney disease (8.5%), stroke (3.0%), and chronic obstructive pulmonary disease (COPD) (6.9%). Tobacco and alcohol use were reported in 33.8% and 16.7% of the study population, respectively.

Clinically, more than two-thirds (71.2%) of patients presented with advanced disease (NYHA Class III or IV). Approximately 35% had a baseline heart rate of over 100 beats per minute. Low blood pressure readings (<90 mmHg systolic and <60 mmHg diastolic) were noted in 4.6% and 5.7% of patients, respectively. The mean serum creatinine level was 1.5 mg/dL and mean hemoglobin was 12.1 g/dL. Abnormal serum sodium (<125 mEq/L) and potassium (>5.5 mEq/L) levels were observed in 3.3% and 4.5% of the patients, respectively.

Figure 1 Intake of key drugs in men and women.ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor–neprilysin inhibitor; BB, beta-blocker; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; MRA, mineralocorticoid receptor antagonists.



Prescription pattern and outcomes

During their hospital stays, 17.6% of the study population required non-invasive ventilatory support, and 3.9% required invasive support. Intravenous inotropes were used in 20.2% of the cases. In patients with heart failure with reduced ejection fraction (HFrEF), 47.5% received guideline-directed medical therapy (GDMT), whereas the use of angiotensin receptor-neprilysin inhibitors (ARNI) was notably low at 4.8% for HFrEF and 4.7% for HFmrEF patients. Digoxin was prescribed in varying percentages across different heart failure categories: 17.3% in HFrEF, 8.2% in HFmrEF, and 16.9% in HFpEF patients.

The use of cardiac devices like CRT (Cardiac Resynchronization Therapy) and ICD (Implantable Cardioverter Defibrillators) was very low at 1.9% across the study. Coronary angiography (CAG) was performed in 35.9% of patients, with half undergoing percutaneous coronary intervention (PCI), and about 3.0% were advised to undergo coronary artery bypass graft surgery (CABG).

The study observed a 90-day mortality rate of 14.2%, with slightly higher mortality in women (14.9%) compared to men (13.9%). In-hospital mortality was 6.7%, highest in the HFrEF group (7.5%) and lowest in the HFmrEF group (5.1%). Not receiving GDMT was associated with higher mortality in patients with HFrEF and HFmrEF. Factors such as baseline body mass index (BMI), ejection fraction (EF), NYHA class, presence of

comorbidities like COPD and atrial fibrillation, and the use of various medications were all significant predictors of 90-day mortality.

Overall, the results underscore the critical need for improved management practices and adherence to recommended treatments to enhance survival outcomes in heart failure patients.

Table 1 Baseline characteristics of the study population

Variables	Overall (*N* = 10 851)	HFrEF (*N* = 7082)	HFmrEF (*N* = 2396)	HFpEF (*N* = 1373)	*P*-value
Age in years, mean (SD)	59.9 (13.5)	60.2 (13.2)	59.9 (13.0)	58.8 (15.7)	0.002
Women, *n* (%)	3366 (31.0)	1975 (27.9)	735 (30.7)	656 (47.8)	<0.001
BMI in kg/m^2, mean (SD)	24.2 (4.0)	24.3 (4.0)	24.2 (4.0)	23.9 (4.2)	0.068
Regions, *n* (%)					<0.001
Low ETLs	2425 (22.4)	1490 (21.0)	686 (28.6)	249 (18.1)	
Lower-middle ETLs	1101 (10.2)	828 (11.7)	188 (7.9)	85 (6.2)	
Higher-middle ETLs	4169 (38.4)	2863 (40.4)	808 (33.7)	498 (36.3)	
High ETLs	3156 (29.1)	1901 (26.8)	714 (29.8)	541 (39.4)	
Educational status, *n* (%)					<0.001
≤4 years of schooling	2765 (25.5)	1856 (26.2)	556 (23.2)	353 (25.7)	
5–8 years of schooling	2804 (25.9)	1821 (25.7)	619 (25.9)	364 (26.5)	
9–12 years of schooling	3815 (35.2)	2395 (33.9)	916 (38.3)	504 (36.7)	
>13 years of schooling	1459 (13.5)	1003 (14.2)	304 (12.7)	152 (11.1)	
Disease aetiology, *n* (%)					
Ischaemic heart disease	7801 (71.9)	5078 (71.7)	2047 (85.4)	676 (49.2)	<0.001
Rheumatic heart disease	641 (5.9)	179 (2.5)	128 (5.3)	334 (24.3)	<0.001
Non-rheumatic VHD	231 (2.1)	123 (1.7)	28 (1.2)	80 (5.8)	<0.001
Dilated cardiomyopathy	1955 (18.0)	1772 (25.0)	160 (6.7)	23 (1.7)	<0.001
Hypertrophic cardiomyopathy	118 (1.1)	41 (0.6)	14 (0.6)	63 (4.6)	<0.001
Restrictive cardiomyopathy	40 (0.4)	11 (0.2)	7 (0.3)	22 (1.6)	<0.001
Peripartum cardiomyopathy	51 (0.5)	41 (0.6)	8 (0.3)	2 (0.2)	0.054
Congenital heart disease	124 (1.1)	39 (0.6)	39 (1.6)	46 (3.4)	<0.001
Myocarditis	58 (0.5)	29 (0.4)	23 (1.0)	6 (0.4)	0.005
Infective endocarditis	20 (0.2)	5 (0.1)	2 (0.1)	13 (1.0)	<0.001
Habits, *n* (%)					
Current tobacco use	3670 (33.8)	2530 (35.7)	807 (33.7)	333 (24.3)	<0.001
Current alcohol use	1808 (16.7)	1207 (17.0)	434 (18.1)	167 (12.2)	<0.001
Co-morbid conditions, *n* (%)					
Hypertension	5303 (48.9)	3318 (46.7)	1245 (52.0)	740 (53.9)	<0.001
Diabetes mellitus	4617 (42.3)	3031 (42.8)	1075 (44.9)	511 (37.2)	<0.001
Stroke	323 (3.0)	205 (2.9)	70 (2.9)	48 (3.5)	0.479
COPD	743 (6.9)	487 (6.9)	137 (5.7)	119 (8.9)	0.003
Chronic kidney disease	921 (8.5)	605 (8.5)	183 (7.6)	133 (9.7)	0.091
History of chemotherapy	62 (0.6)	42 (0.6)	11 (0.5)	9 (0.7)	0.683
Atrial fibrillation/flutter	1029 (9.5)	557 (7.9)	177 (7.4)	295 (21.5)	<0.001
Severe mitral regurgitation	953 (8.8)	707 (10.0)	119 (5.0)	127 (9.3)	<0.001
Hypothyroidism	492 (4.5)	308 (4.4)	93 (3.9)	91 (6.6)	<0.001
Hyperthyroidism	117 (1.1)	72 (1.0)	21 (0.9)	24 (1.8)	0.031
Severity of heart failure, *n* (%)					
Previous admission for HF, *n* (%)	2780 (25.6)	1944 (27.5)	497 (20.8)	339 (24.7)	<0.001
NYHA Class III or more, *n* (%)	7720 (71.2)	5335 (75.4)	1409 (58.9)	976 (71.1)	<0.001
Dependant oedema, *n* (%)	1258 (11.6)	871 (12.3)	186 (7.8)	201 (14.6)	<0.001
Clinical measurements					
Heart rate > 100 beats/min, *n* (%)	3789 (35.0)	2662 (37.6)	652 (27.3)	475 (34.6)	<0.001
Systolic BP < 90 mmHg, *n* (%)	500 (4.6)	356 (5.0)	85 (3.6)	59 (4.3)	0.01
Diastolic BP < 60 mmHg, *n* (%)	615 (5.7)	414 (5.9)	121 (5.1)	80 (5.8)	0.338
QRS duration > 120 ms, *n* (%)	2866 (26.4)	2178 (30.8)	428 (17.9)	260 (18.9)	<0.001
Haemoglobin in mg/dL, mean (SD)	12.1 (2.2)	12.2 (2.1)	12.1 (2.2)	11.5 (2.3)	<0.001
Serum creatinine in mg/dL, mean (SD)	1.5 (1.1)	1.5 (1.1)	1.4 (1.0)	1.5 (1.1)	<0.001
Serum sodium < 125 mg/dL, *n* (%)	354 (3.3)	229 (3.2)	75 (3.1)	50 (3.6)	0.685
Serum potassium > 5.5 mEq/L, *n* (%)	518 (4.5)	345 (4.9)	103 (4.3)	70 (5.1)	0.443

BMI, body mass index; BP, blood pressure; COPD, chronic obstructive pulmonary disease; ETL, epidemiological transition level of states; HF, heart failure; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; NYHA, New York Heart Association; SD, standard deviation; VHD, valvular heart diseases.

Discussion

The findings from the National Heart Failure Registry (NHFR), which is the most extensive HF registry from India with comprehensive regional representation, provide valuable insights into patient characteristics, treatment practices, and 90-day mortality

outcomes. The study cohort, with a mean age of 60, predominantly suffered from ischemic heart disease, accounting for the etiology in three-quarters of the ADHF patients. Despite guidelines, only about half of the patients with HFrEF received guideline-directed medical therapy (GDMT).

The demographic spread of the NHFR includes participants from diverse regions of India, reflecting a wide epidemiological perspective. Interestingly, heart failure patients in India tend to be younger than those in high-income countries, and there's a notable male predominance in HF cases within the NHFR, which aligns with global trends but contrasts with higher female prevalence in high-income regions. This male dominance might be linked to higher rates of ischemic heart disease, which is prevalent among men and the primary cause of HF in the NHFR.

Socio-economic factors also play a significant role in HF outcomes, with an inverse relationship observed between educational level and 90-day mortality. This pattern persists even after adjusting for traditional mortality-associated factors including GDMT usage. Furthermore, there is a concerning trend of higher mortality among women who did not receive GDMT, highlighting a potential area for targeted intervention.

Table 2 Pharmacologic therapy other than disease-modifying agents

	HFrEF, *n* (%)			HFmrEF, *n* (%)			HFpEF, *n* (%)		
Drugs	Total	Men	Women	Total	Men	Women	Total	Men	Women
Digoxin	1225 (17.3)	831 (16.3)	394 (20.0)	197 (8.2)	103 (6.2)	94 (12.8)	232 (16.9)	94 (13.1)	138 (21.0)
Nitrates	1814 (25.6)	1350 (26.4)	464 (23.5)	776 (32.4)	550 (33.1)	226 (30.8)	267 (19.5)	168 (23.4)	99 (15.1)
Vasodilators	482 (6.8)	359 (7.0)	123 (6.2)	202 (8.4)	152 (9.2)	50 (6.8)	72 (5.2)	42 (5.9)	30 (4.6)
CCB	323 (4.6)	233 (4.6)	90 (4.6)	275 (11.5)	196 (11.8)	79 (10.8)	237 (17.3)	123 (17.2)	114 (17.4)
Heparin/LMWH	2542 (35.9)	1858 (36.4)	684 (34.6)	1088 (45.4)	765 (46.1)	323 (44.0)	502 (36.6)	264 (36.8)	238 (36.3)
OAC	363 (5.1)	257 (5.0)	106 (5.4)	108 (4.5)	55 (3.1)	53 (7.2)	230 (16.8)	104 (14.5)	126 (19.2)
Ivabradine	1070 (15.1)	767 (15.0)	303 (15.3)	187 (7.8)	112 (6.7)	75 (10.2)	68 (5.0)	39 (5.4)	29 (4.4)
Pulmonary vasodilators	219 (3.1)	174 (3.4)	45 (2.3)	119 (5.0)	84 (5.1)	35 (4.8)	70 (5.1)	38 (5.3)	32 (4.9)
Antiplatelets	4947 (69.9)	3682 (72.1)	1265 (64.1)	1871 (78.1)	1338 (80.1)	533 (72.5)	744 (54.2)	432 (60.3)	312 (47.6)
Inotropic agents	1712 (24.2)	1248 (24.4)	464 (23.5)	337 (14.1)	210 (12.6)	127 (17.3)	138 (10.1)	59 (8.2)	79 (12.0)

CCB, calcium channel blocker; HF, heart failure; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction, HFrEF, heart failure with reduced ejection fraction; LMWH, low-molecular-weight heparin; OAC, oral anticoagulants.

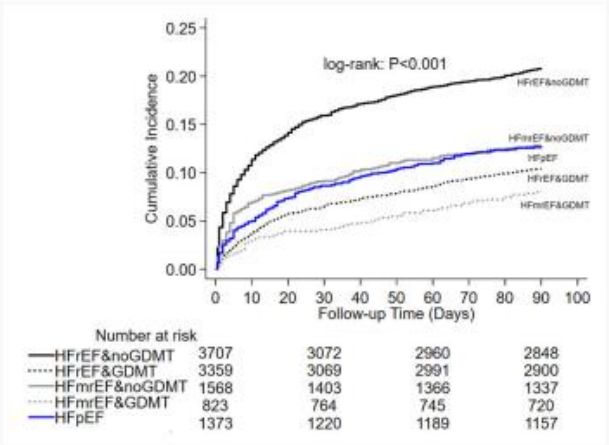
In terms of treatment, the NHFR shows an improvement in the adoption of GDMT compared to earlier registries, suggesting that the establishment and dissemination of registry findings might be enhancing adherence to these guidelines. Yet, the use of advanced treatments like ARNI and devices such as CRT and ICD remains very low compared to high-income countries, likely due to issues of affordability and accessibility.

In-hospital mortality in the NHFR is notably higher than that seen in European registries, though it shows an improvement from previous Indian data. The broad dissemination of the benefits of GDMT and increased uptake could further enhance survival rates for HF patients in India.

Overall, these findings underscore the need for improved treatment protocols and healthcare policies that address both the medical and socio-economic barriers to effective

HF management in India. Further efforts to enhance GDMT uptake and address disparities in healthcare access are crucial for reducing mortality and improving outcomes for HF patients across different socio-economic groups in India.

Figure 2 Guideline-directed medical therapy, heart failure groups and 90 day survival.GDMT, guideline-directed medical therapy; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction.



Conclusions

Ischemic heart disease emerges as the primary cause of heart failure (HF) in a relatively young patient population within the National Heart Failure Registry (NHFR) in India. The data reveals that only about half of the patients who are eligible for treatment receive guideline-directed medical therapy (GDMT), despite its association with significantly improved survival rates for those with heart failure with reduced ejection fraction (HFrEF) and heart failure with mildly reduced ejection fraction (HFmrEF). The 90-day mortality rate, standing at one in seven patients, alongside the suboptimal adherence to GDMT, highlights a critical need for comprehensive national quality improvement programs aimed at enhancing the management of heart failure across India. This initiative could potentially elevate the standard of care and improve patient outcomes significantly.

References:

1. Ambrosy, A. P., Fonarow, G. C., Butler, J., Chioncel, O., Greene, S. J., Vaduganathan, M., Nodari, S., Lam, C. S. P., Sato, N., Shah, A. N., & Gheorghiade, M. (2014). The global health and economic burden of hospitalizations for heart failure: lessons learned from hospitalized heart failure registries. *Journal of the American College of Cardiology, 63*(4), 1123–1133. https://doi.org/10.1016/j.jacc.2013.11.053
2. Virani, S. S., Alonso, A., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., Chamberlain, A. M., Chang, A. R., Cheng, S., Delling, F. N., Djousse, L., Elkind, M. S. V., Ferguson, J. F., Fornage, M., Khan, S. S., Kissela, B. M., Knutson, K. L., Kwan, T. W., Lackland, D. T., ... Tsao, C. W. (2020). Heart disease and stroke statistics—2020 update: A report from the American Heart Association. *Circulation, 141*(9), e139–e596. https://doi.org/10.1161/CIR.0000000000000757

3. Crespo-Leiro, M. G., Anker, S. D., Maggioni, A. P., Coats, A. J., Filippatos, G., Ruschitzka, F., Ferrari, R., Piepoli, M. F., Delgado Jimenez, J. F., Metra, M., Fonseca, C., Hradec, J., Amir, O., Logeart, D., Dahlström, U., Merkely, B., Drozdz, J., Goncalvesova, E., Hassanein, M., ... Mebazaa, A. (2016). European Society of Cardiology Heart Failure Long-Term Registry (ESC-HF-LT): 1-year follow-up outcomes and differences across regions. *European Journal of Heart Failure, 18*(6), 613–625. https://doi.org/10.1002/ejhf.566

4. Savarese, G., & Lund, L. H. (2017). Global public health burden of heart failure. *Cardiac Failure Review, 3*(1), 7–11.

5. Martinez-Amezcua, P., Haque, W., Khera, R., Kanaya, A. M., Sattar, N., Lam, C. S. P., Harikrishnan, S., Shah, S. J., Kandula, N. R., Jose, P. O., Narayan, K. M. V., Agyemang, C., Misra, A., Jenum, A. K., Bilal, U., Nasir, K., & Cainzos-Achirica, M. (2020). The upcoming epidemic of heart failure in South Asia. *Circulation: Heart Failure, 13*(10), e007218. https://doi.org/10.1161/CIRCHEARTFAILURE.119.007218

6. Harikrishnan, S., Sanjay, G., Anees, T., Viswanathan, S., Vijayaraghavan, G., Bahuleyan, C. G., Sreedharan, M., Biju, R., Nair, T., Suresh, K., Rao, A. C., Dalus, D., Huffman, M. D., Jeemon, P., & the Trivandrum Heart Failure Registry Investigators. (2015). Clinical presentation, management, in-hospital and 90-day outcomes of heart failure patients in Trivandrum, Kerala, India: The Trivandrum Heart Failure Registry. *European Journal of Heart Failure, 17*(7), 794–800. https://doi.org/10.1002/ejhf.301

7. Sanjay, G., Jeemon, P., Agarwal, A., Viswanathan, S., Sreedharan, M., Vijayaraghavan, G., Bahuleyan, C. G., Biju, R., Nair, T., Prathapkumar, N., Krishnakumar, G., Rajalekshmi, N., Suresh, K., Park, L. P., Huffman, M. D., Harikrishnan, S., & the Trivandrum Heart Failure Registry Investigators. (2018). In-hospital and three-year outcomes of heart failure patients in South India: the Trivandrum Heart Failure Registry. *Journal of Cardiac Failure, 24*(6), 842–848. https://doi.org/10.1016/j.cardfail.2018.03.005

8. Harikrishnan, S., Jeemon, P., Ganapathi, S., Agarwal, A., Viswanathan, S., Sreedharan, M., Vijayaraghavan, G., Bahuleyan, C. G., Biju, R., Nair, T., Pratapkumar, N., Krishnakumar, K., Rajalekshmi, N., Suresh, K., Huffman, M. D., & the Trivandrum Heart Failure Registry Investigators. (2021). Five-year mortality and readmission rates in patients with heart failure in India: results from the Trivandrum Heart Failure Registry. *International Journal of Cardiology, 326*, 139–143. https://doi.org/10.1016/j.ijcard.2020.11.006

9. Dokainish, H., Teo, K., Zhu, J., Roy, A., AlHabib, K. F., ElSayed, A., ... the International Congestive Heart Failure (INTERCHF) Prospective Cohort Study Investigators. (2017). Global mortality variations in patients with heart failure: results from the International Congestive Heart Failure (INTERCHF) prospective cohort study. *Lancet Global Health, 5*(6), e665–e672. https://doi.org/10.1016/S2214-109X(17)30196-1

10. Chopra, V. K., Mittal, S., Bansal, M., Singh, B., & Trehan, N. (2019). Clinical profile and one-year survival of patients with heart failure with reduced ejection fraction: the largest report from India. *Indian Heart Journal, 71*(3), 242–248. https://doi.org/10.1016/j.ihj.2019.02.012

11. India State-Level Disease Burden Initiative CVD Collaborators. (2018). The changing patterns of cardiovascular diseases and their risk factors in the states of India: the Global Burden of Disease Study 1990–2016. *Lancet Global Health, 6*(12), e1339-e1351. https://doi.org/10.1016/S2214-109X(18)30407-8

12. Harikrishnan, S., Bahl, A., Roy, A., Mishra, A., Prajapati, J., Nanjappa, M. C., Sethi, R., Guha, S., Satheesh, S., Chacko, M., Ganapathi, S., Jeemon, P., & the National Heart Failure Registry, India. (2019). National Heart Failure Registry, India: Design and methods. *Indian Heart Journal, 71*(4), 488–491. https://doi.org/10.1016/j.ihj.2019.09.008

13. Ponikowski, P., Voors, A. A., Anker, S. D., Bueno, H., Cleland, J. G. F., Coats, A. J. S., Falk, V., González-Juanatey, J. R., Harjola, V. P., Jankowska, E. A., Jessup, M., Linde, C., Nihoyannopoulos, P., Parissis, J. T., Pieske, B., Riley, J. P., Rosano, G. M. C., Ruilope, L. M., Ruschitzka, F., ... van der Meer, P. (2016). 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *European Heart Journal, 37*(27), 2129–2200. https://doi.org/10.1093/eurheartj/ehw128

14. Bozkurt, B., Coats, A. J. S., Tsutsui, H., Abdelhamid, C. M., Adamopoulos, S., Albert, N., Anker, S. D., Atherton, J., Böhm, M., Butler, J., Drazner, M. H., Michael Felker, G., Filippatos, G., Fiuzat, M., Fonarow, G. C., Gomez-Mesa, J. E., Heidenreich, P., Imamura, T., Jankowska, E. A., ... Zieroth, S. (2021). Universal definition and classification of heart failure: a report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure. *European Journal of Heart Failure, 23*(3), 352–380. https://doi.org/10.1002/ejhf.2115

15. McDonagh, T. A., Metra, M., Adamo, M., Gardner, R. S., Baumbach, A., Böhm, M., Burri, H., Butler, J., Čelutkienė, J., Chioncel, O., Cleland, J. G. F., Coats, A. J. S., Crespo-Leiro, M. G., Farmakis, D., Gilard, M., Heymans, S., Hoes, A. W., Jaarsma, T., Jankowska, E. A., ... Piepoli, M. F. (2021). 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) with the special contribution of the Heart Failure Association (HFA) of the ESC. *European Heart Journal, 42*(36), 3599–3726. https://doi.org/10.1093/eurheartj/ehab368

16. Nagueh, S. F., Smiseth, O. A., Appleton, C. P., Byrd, B. F., Dokainish, H., Edvardsen, T., Flachskampf, F. A., Gillebert, T. C., Klein, A. L., Lancellotti, P., Marino, P., Oh, J. K., Popescu, B. A., & Waggoner, A. D. (2016). Recommendations for the evaluation of left ventricular diastolic function by echocardiography: an update from the American Society of Echocardiography and the European Association of

Cardiovascular Imaging. *Journal of the American Society of Echocardiography, 29*(4), 277–314. https://doi.org/10.1016/j.echo.2016.01.011

17. Miró, Ò., Rossello, X., Platz, E., Masip, J., Gualandro, D. M., Peacock, W. F., Price, S., Cullen, L., DiSomma, S., de Oliveira, M. T. Jr., McMurray, J. J. V., Martín-Sánchez, F. J., Maisel, A. S., Vrints, C., Cowie, M. R., Bueno, H., Mebazaa, A., & Mueller, C. (2020). Risk stratification scores for patients with acute heart failure in the emergency department: a systematic review. *European Heart Journal Acute Cardiovascular Care, 9*(4), 375–398. https://doi.org/10.1177/2048872620918847

18. Wussler, D., Kozhuharov, N., Sabti, Z., Walter, J., Strebel, I., Scholl, L., Miró, O., Rossello, X., Martín-Sánchez, F. J., Pocock, S. J., Nowak, A., Badertscher, P., Twerenbold, R., Wildi, K., Puelacher, C., du Fay de Lavallaz, J., Shrestha, S., Strauch, O., Flores, D., ... Mueller, C. (2019). External validation of the MEESSI acute heart failure risk score: a cohort study. *Annals of Internal Medicine, 170*(3), 248–256. https://doi.org/10.7326/M18-1967

19. India State-Level Disease Burden Initiative Collaborators. (2017). Nations within a nation: variations in epidemiological transition across the states of India, 1990–2016 in the Global Burden of Disease Study. *Lancet, 390*(10111), 2437–2460. https://doi.org/10.1016/S0140-6736(17)32804-0

20. Adams, K. F., Fonarow, G. C., Emerman, C. L., LeJemtel, T. H., Costanzo, M. R., Abraham, W. T., Berkowitz, R. L., Galvao, M., & Horton, D. P. (2005). Characteristics and outcomes of patients hospitalized for heart failure in the United States: rationale, design, and preliminary observations from the first 100,000 cases in the Acute Decompensated Heart Failure National Registry (ADHERE). *American Heart Journal,

SURVEY FORM

1. In Current clinical practice, what percentage of your patient population consists of individuals with hypertension?

A. <25%

B. 26-50%

C. 51-75%

D. >75%

2. Approximately, what percentage of your hypertensive patients also presents with heart failure?

A. <10%

B. 11-30%

C. 31-70%

D. >70%

3. Which is the most common grade of hypertension been observed in your current clinical practice?

A. Hypertension – Grade 1 (140–159 SBP/ 90–99 DBP)

B. Hypertension – Grade 2 (160–179 SBP/ 100–109 DBP)

C. Hypertension – Grade 3 (≥180 SBP/ ≥110 DBP)

4. What is the currently followed office BP goal in management of hypertension in patients 18 to 64 years old in general?

A. <130/80 mmHg

B. <140/90 mmHg

C. <150/90 mmHg

D. <130/90 mmHg

5. At what BP level, you start treatment in patients of HTN above 60 years without comorbidities?

A. > 150 or 90

B. > 140 or 90

C. > 140 or 80

D. > 130 or 80

6. In your current clinical practice in which condition do you prefer to prescribe beta-blocker therapy in patient with Hypertension?

A. Heart failure with reduced ejection fraction

B. Chronic coronary syndromes

C. Atrial fibrillation

7. Which drug class is mostly used by you for reducing overall cardiovascular risk in patients with Hypertension?

A. RAS blockade

B. Diuretic

C. CCB

D. Beta blocker

8. In which clinical scenarios, do you prefer beta-blockers in management of HTN without comorbidities?

A. Initial agent in all patients

B. Initial agent in all patients aged < 40 years (young hypertensives)

C. Second line drug if BP uncontrolled with first drug

D. Third line agent after ACEIs/ARBs and CCBs or thiazide-diuretic

9. Which is the preferred beta-blocker during your routine clinical practice in elderly patients with heart failure and a reduced left ventricular ejection fraction with hypertension?

A. S-Metoprolol

B. Carvedilol

C. Metoprolol

D. Bisoprolol

10. As per your opinion, do beta-blockers have a definitive place in elderly patients with HF with background of HT therapy?

A. Yes, but in limited patients only

B. Yes, in all suitable patients

C. No

11. Which is the preferred indication in elderly patients for prescribing S-Metoprolol during current clinical practice?

A. Hypertension

B. Angina Pectoris

C. Heart Failure

D. Cardiac Arrhythmia

12. What is usual clinical benefit(s) being observed with the usage of S-Metoprolol during your routine clinical practice in elderly patients with HF and HT?

A. Suitable in patients with or without coexisting diabetes/COPD/Dyslipidemia

B. Effective symptomatic improvement

C. Good tolerability

D. Good patient compliance

13. How often S-Metoprolol being prescribed by you in management of HF and HT in elderly patients?

A. Much frequently

B. Occasionally

C. Never

14. On a scale from 1 to 10, how will you rate the tolerability of S-Metoprolol therapy in HF and HT patients?

A. 1 to 3

B. 4 to 6

C. 7 to 8

D. 8 to 10

15. As per your opinion, are there any specific factors that impact hypertension and heart failure management in your practice?

A. None

B. Lack of regular check-ups

C. Non-availability of necessary diagnostic tests

D. Cultural dietary preferences

E. Preferences for alternative or complementary therapies alongside conventional medical treatments

SURVEY FINDINGS

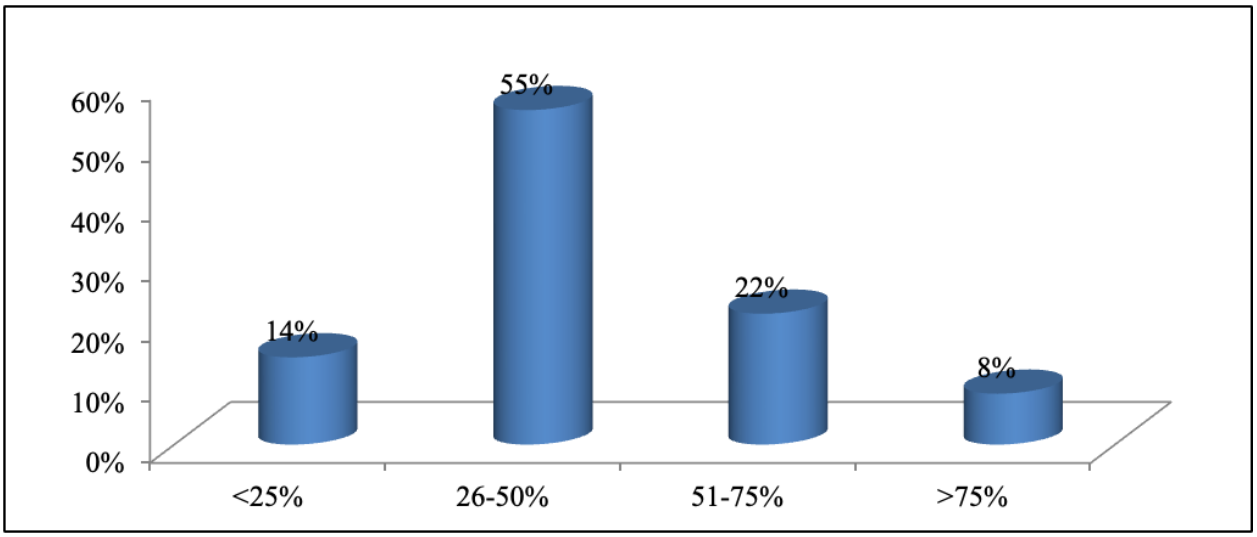
1. In Current clinical practice, what percentage of your patient population consists of individuals with hypertension?

A. <25%

B. 26-50%

C. 51-75%

D. >75%



In current clinical practice, approximately 26-50% of the patient population consists of individuals with hypertension. This indicates a significant portion of patients are dealing with this condition

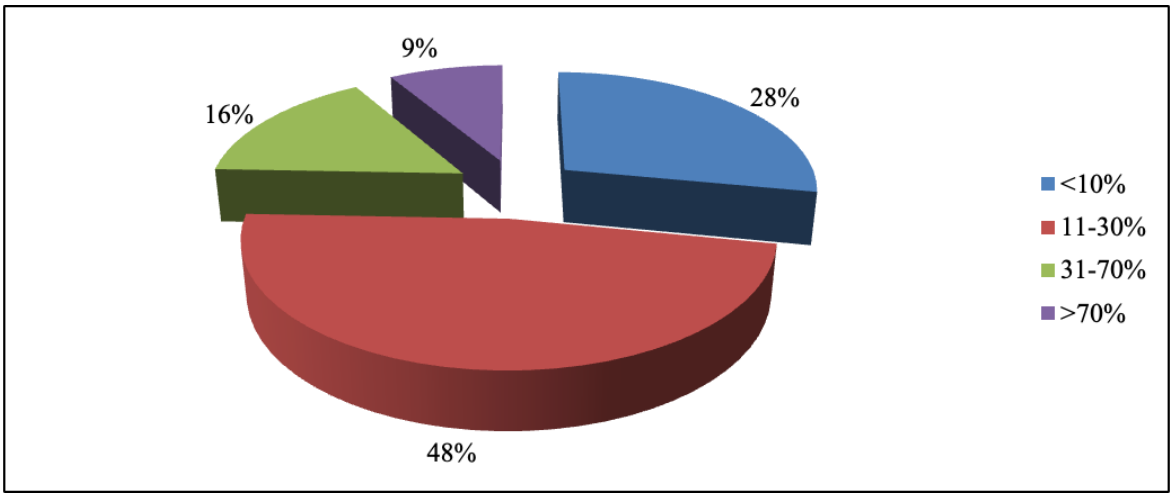
2. Approximately, what percentage of your hypertensive patients also presents with heart failure?

A. <10%

B. 11-30%

C. 31-70%

D. >70%



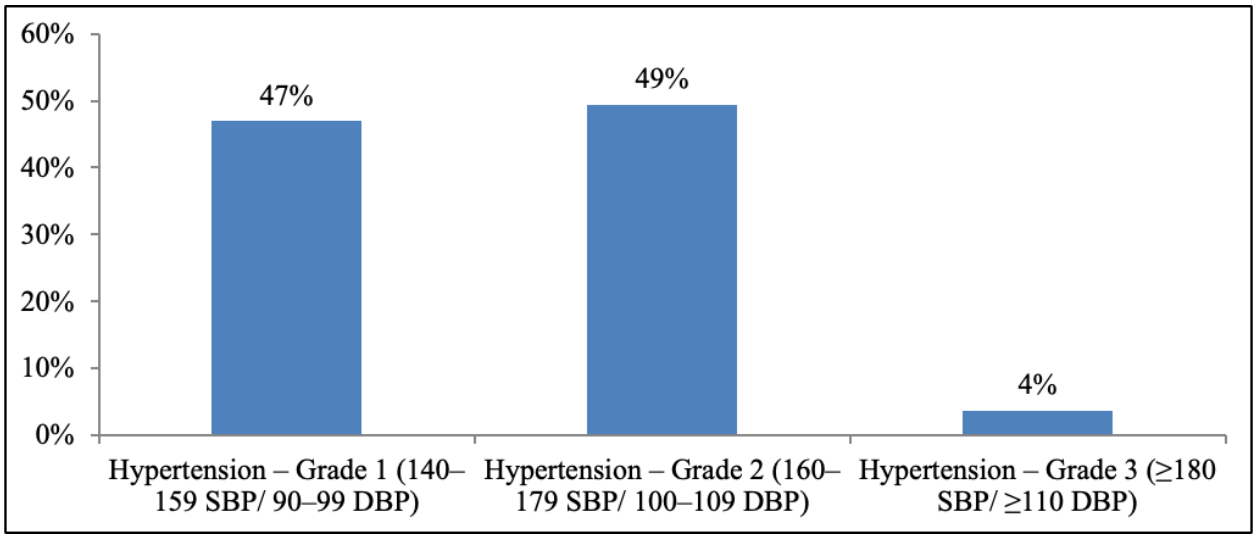
Approximately 11-30% of hypertensive patients also present with heart failure. This indicates a notable overlap between these two conditions in the patient population.

3. Which is the most common grade of hypertension been observed in your current clinical practice?

A. Hypertension – Grade 1 (140–159 SBP/ 90–99 DBP)

B. Hypertension – Grade 2 (160–179 SBP/ 100–109 DBP)

C. Hypertension – Grade 3 (≥180 SBP/ ≥110 DBP)



In current clinical practice, the most common grade of hypertension observed is Grade 2 (160–179 SBP/ 100–109 DBP). This suggests that a significant number of patients have moderately severe hypertension.

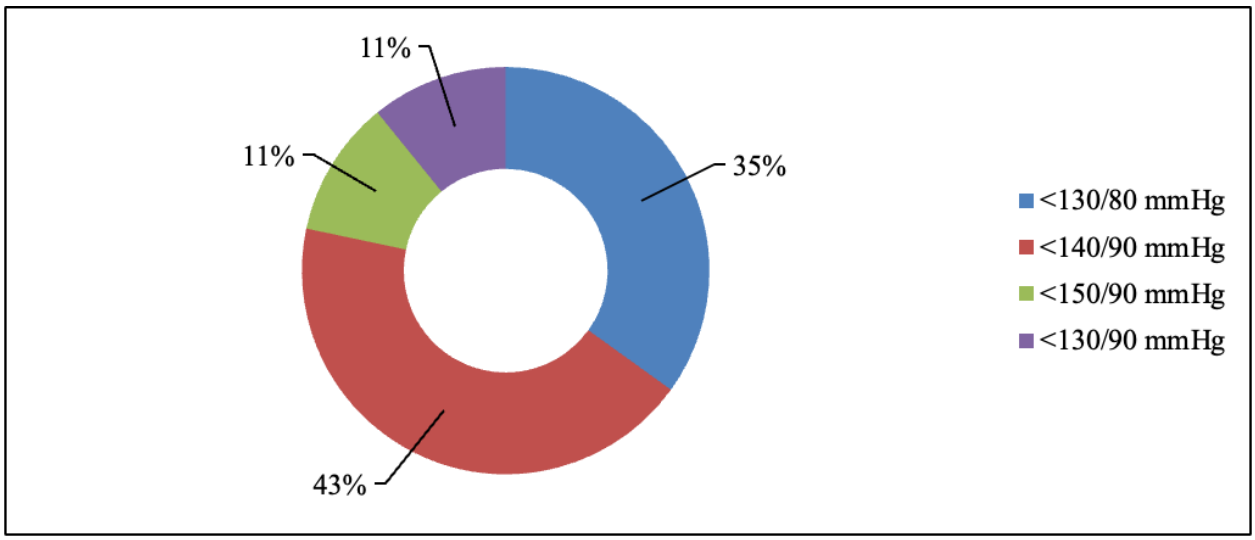
4. What is the currently followed office BP goal in management of hypertension in patients 18 to 64 years old in general?

A. <130/80 mmHg

B. <140/90 mmHg

C. <150/90 mmHg

D. <130/90 mmHg



The currently followed office BP goal in the management of hypertension in patients aged 18 to 64 years is <140/90 mmHg. This target aims to effectively control blood pressure and reduce the risk of hypertension-related complications.

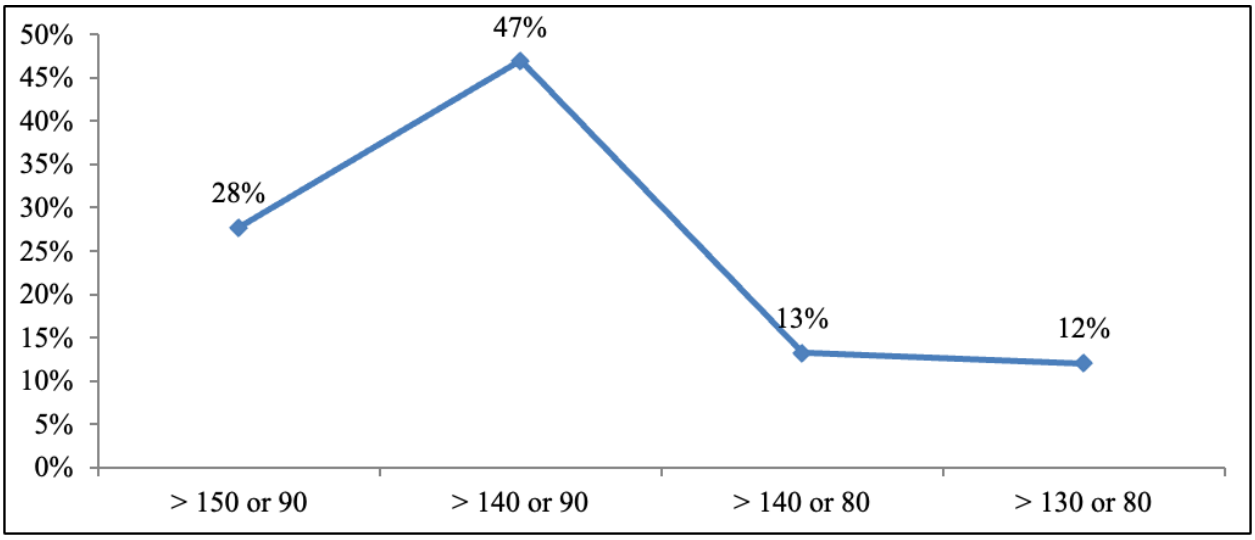
5. At what BP level, you start treatment in patients of HTN above 60 years without comorbidities?

A. > 150 or 90

B. > 140 or 90

C. > 140 or 80

D. > 130 or 80



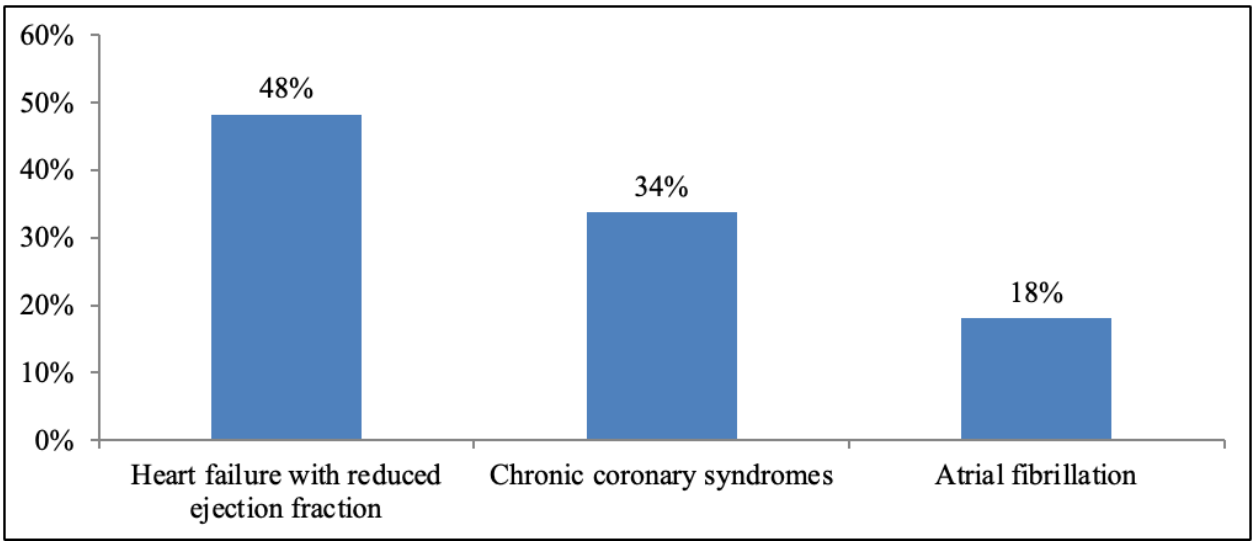
Treatment for hypertension in patients above 60 years without comorbidities is typically started at a BP level of >140/90 mmHg. This threshold helps in managing hypertension effectively in this age group.

6. In your current clinical practice in which condition do you prefer to prescribe beta-blocker therapy in patient with Hypertension?

A. Heart failure with reduced ejection fraction

B. Chronic coronary syndromes

C. Atrial fibrillation



In current clinical practice, beta-blocker therapy is preferred for patients with hypertension who have heart failure with reduced ejection fraction. This treatment approach helps improve heart function and manage hypertension effectively in these patients.

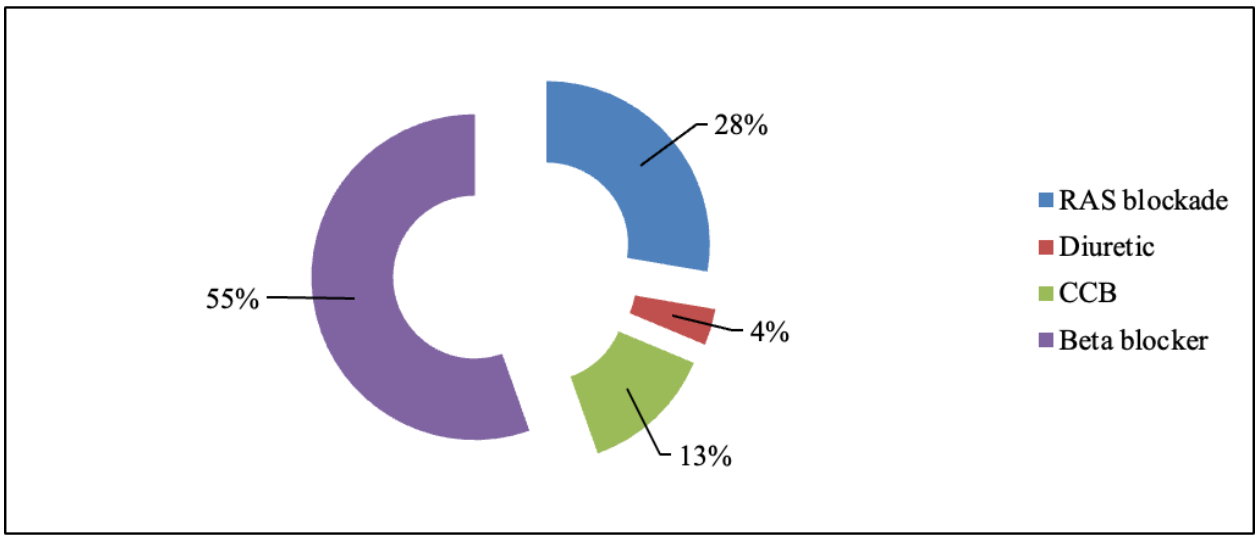
7. Which drug class is mostly used by you for reducing overall cardiovascular risk in patients with Hypertension?

A. RAS blockade

B. Diuretic

C. CCB

D. Beta blocker



To reduce overall cardiovascular risk in patients with hypertension, the most commonly used drug class is RAS blockade. This approach helps in managing blood pressure and provides additional cardiovascular protection.

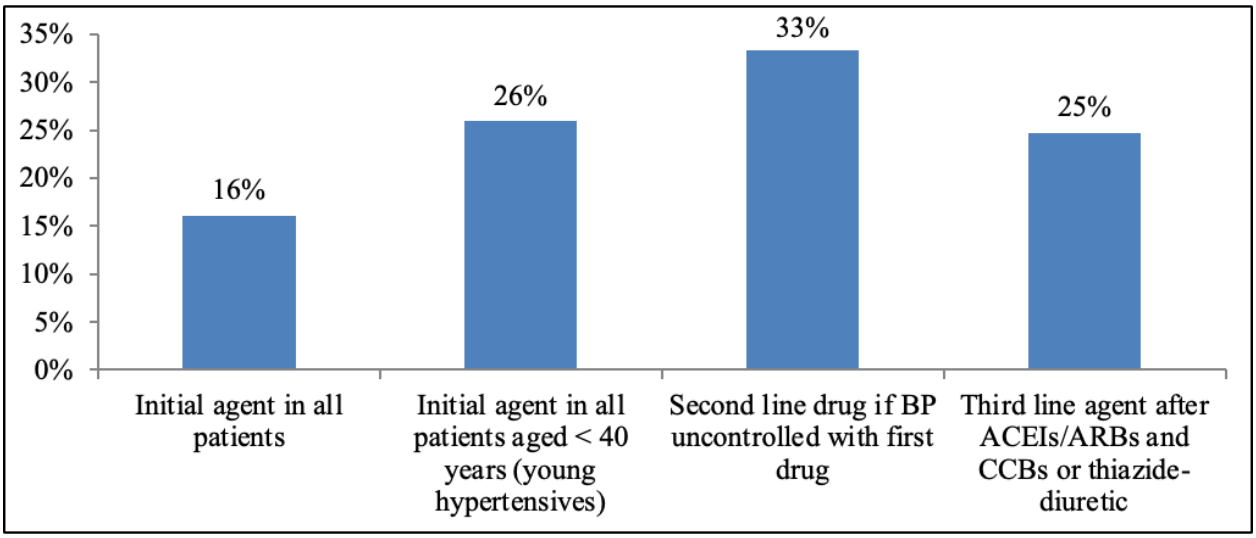
8. In which clinical scenarios, do you prefer beta-blockers in management of HTN without comorbidities?

A. Initial agent in all patients

B. Initial agent in all patients aged < 40 years (young hypertensives)

C. Second line drug if BP uncontrolled with first drug

D. Third line agent after ACEIs/ARBs and CCBs or thiazide-diuretic



In the management of hypertension without comorbidities, beta-blockers are preferred as a second-line drug if blood pressure remains uncontrolled with the initial medication. This approach ensures a step-wise treatment strategy to effectively manage hypertension in patients without complicating factors.

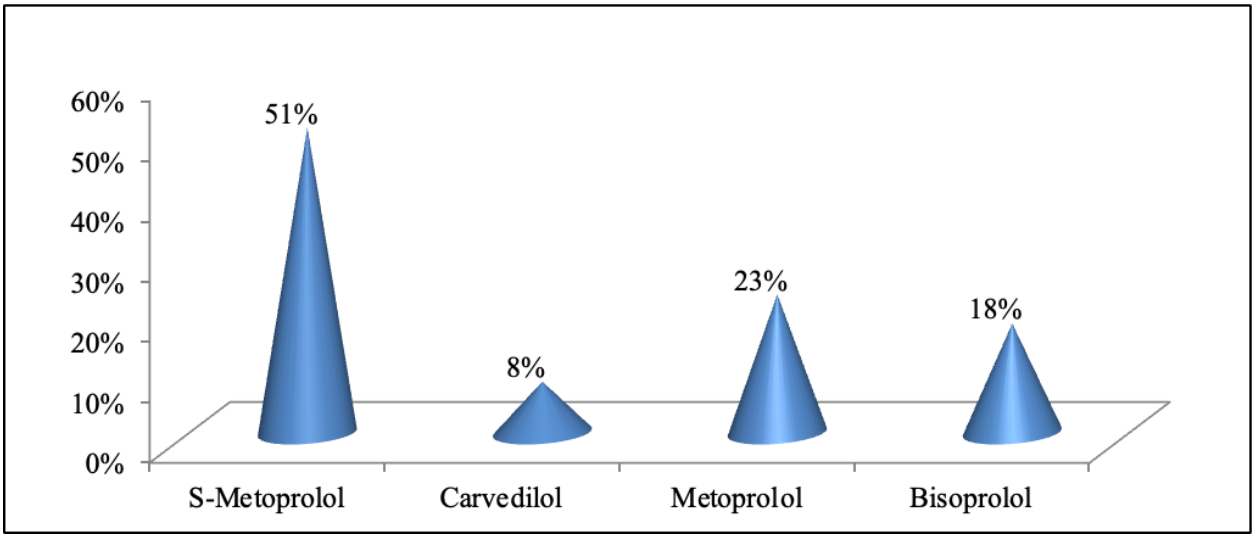
9. Which is the preferred beta-blocker during your routine clinical practice in elderly patients with heart failure and a reduced left ventricular ejection fraction with hypertension?

A. S-Metoprolol

B. Carvedilol

C. Metoprolol

D. Bisoprolol



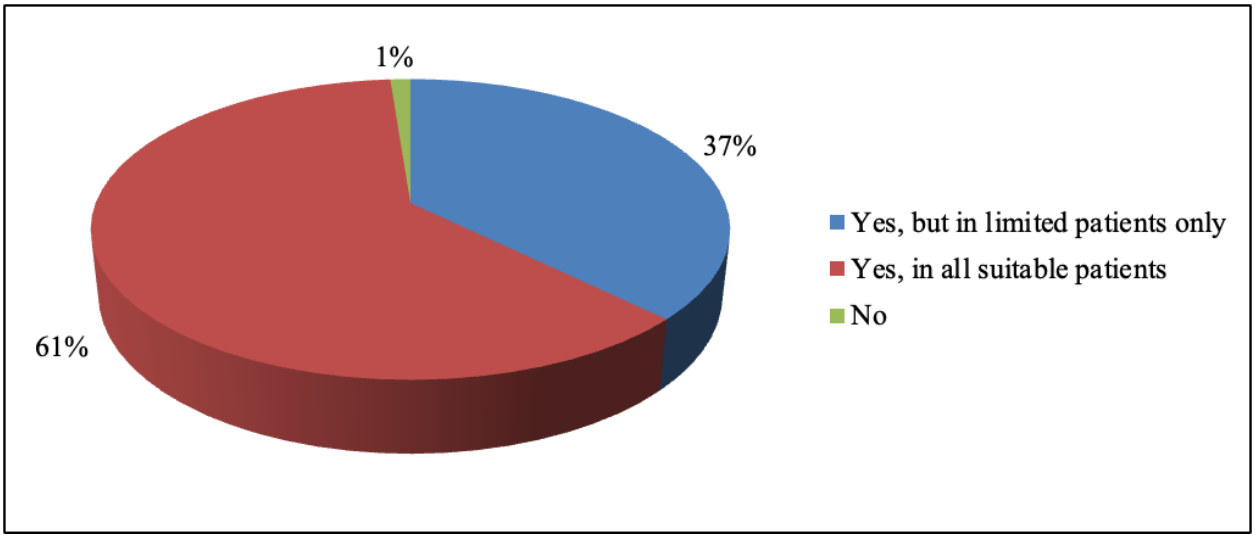
In routine clinical practice, the preferred beta-blocker for elderly patients with heart failure and a reduced left ventricular ejection fraction alongside hypertension is S-Metoprolol. This choice is based on its efficacy and safety profile in this specific patient population.

10. As per your opinion, do beta-blockers have a definitive place in elderly patients with HF with background of HT therapy?

A. Yes, but in limited patients only

B. Yes, in all suitable patients

C. No



As per the opinion, beta-blockers do have a definitive place in elderly patients with heart failure and a background of hypertension therapy. They are considered beneficial for most suitable patients in managing these conditions effectively.

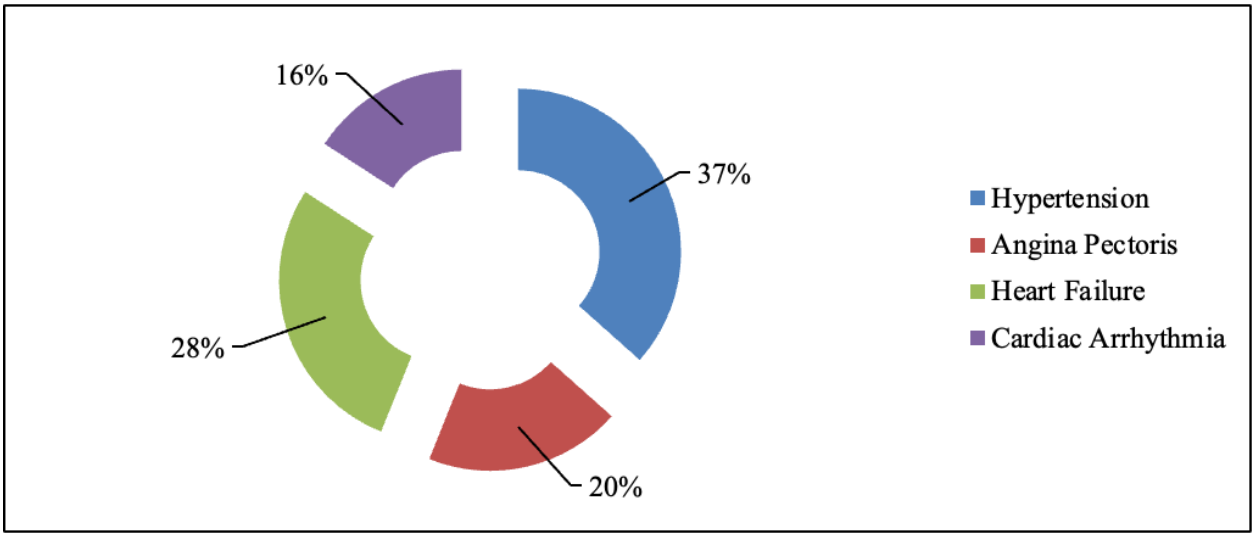
11. Which is the preferred indication in elderly patients for prescribing S-Metoprolol during current clinical practice?

A. Hypertension

B. Angina Pectoris

C. Heart Failure

D. Cardiac Arrhythmia



In current clinical practice, the preferred indication for prescribing S-Metoprolol in elderly patients is hypertension. This choice aligns with its efficacy and safety profile for managing blood pressure in this demographic.

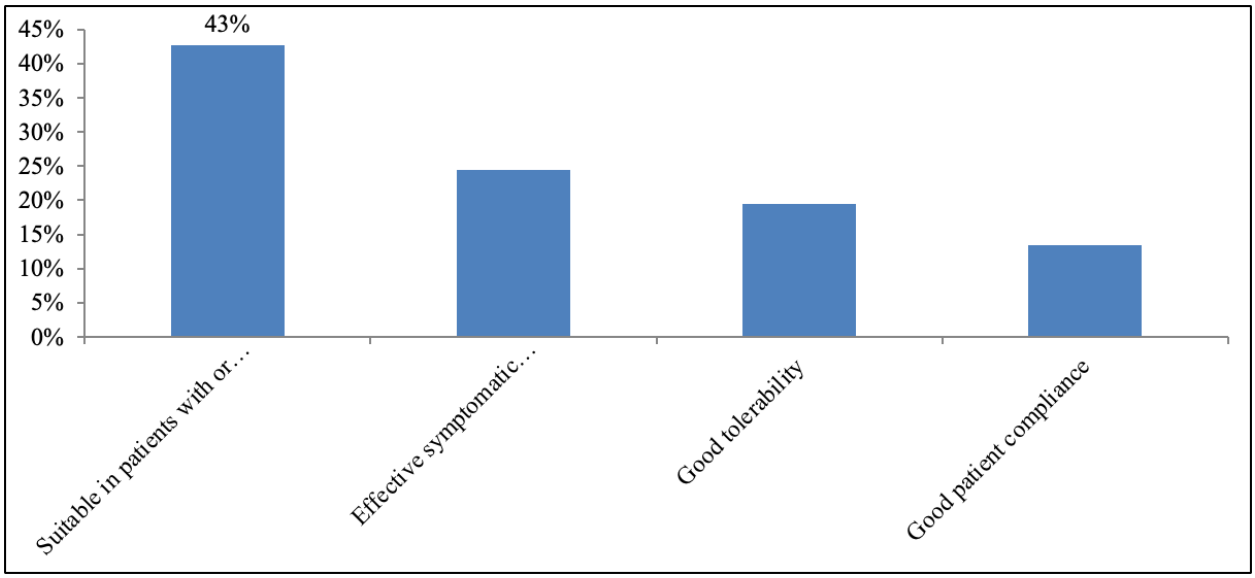
12. What is usual clinical benefit(s) being observed with the usage of S-Metoprolol during your routine clinical practice in elderly patients with HF and HT?

A. Suitable in patients with or without coexisting diabetes/COPD/Dyslipidemia

B. Effective symptomatic improvement

C. Good tolerability

D. Good patient compliance



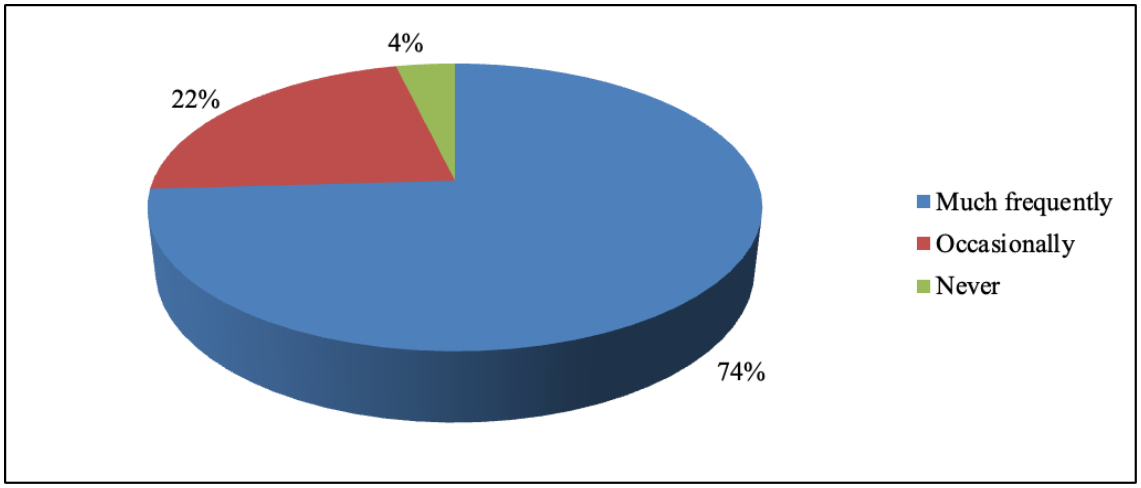
The usual clinical benefits observed with the usage of S-Metoprolol in routine clinical practice in elderly patients with heart failure and hypertension include effective symptomatic improvement, good tolerability, and suitability in patients with or without coexisting conditions such as diabetes, COPD, or dyslipidemia. These factors contribute to its favorable outcomes in managing both conditions concurrently.

13. How often S-Metoprolol being prescribed by you in management of HF and HT in elderly patients?

A. Much frequently

B. Occasionally

C. Never



S-Metoprolol is frequently prescribed in the management of heart failure and hypertension in elderly patients, given its efficacy and suitability for this demographic.

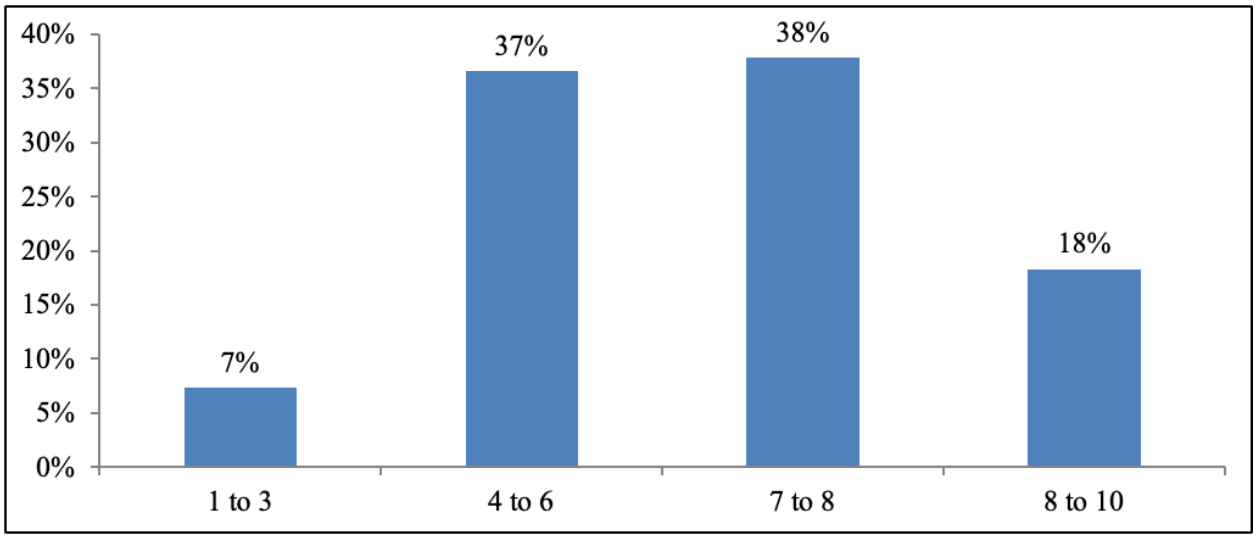
14. On a scale from 1 to 10, how will you rate the tolerability of S-Metoprolol therapy in HF and HT patients?

A. 1 to 3

B. 4 to 6

C. 7 to 8

D. 8 to 10



On a scale from 1 to 10, the tolerability of S-Metoprolol therapy in patients with heart failure and hypertension would typically fall within the range of 7 to 8, indicating good tolerability in a significant portion of patients.

15. As per your opinion, are there any specific factors that impact hypertension and heart failure management in your practice?

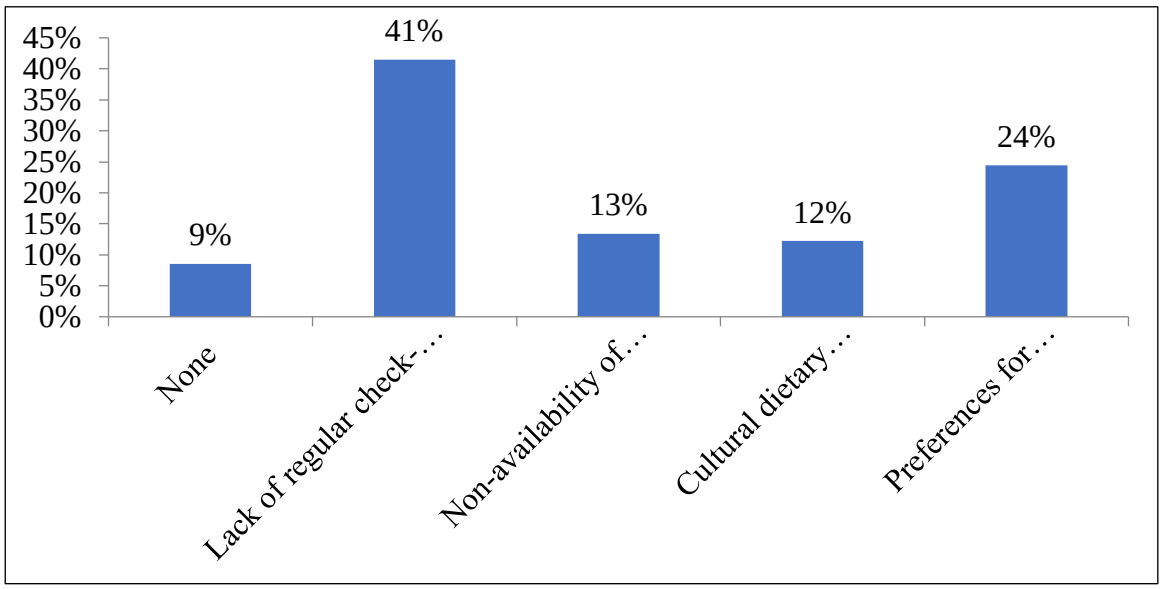
A. None

B. Lack of regular check-ups

C. Non-availability of necessary diagnostic tests

D. Cultural dietary preferences

E. Preferences for alternative or complementary therapies alongside conventional medical treatments



In the opinion, lack of regular check-ups is a specific factor that can impact hypertension and heart failure management in practice. Regular monitoring and follow-ups are crucial for effective management and to prevent complications.

SUMMARY

1. In current clinical practice, approximately 26-50% of the patient population consists of individuals with hypertension. This indicates a significant portion of patients are dealing with this condition.

2. Approximately 11-30% of hypertensive patients also present with heart failure. This indicates a notable overlap between these two conditions in the patient population.

3. In current clinical practice, the most common grade of hypertension observed is Grade 2 (160–179 SBP/ 100–109 DBP). This suggests that a significant number of patients have moderately severe hypertension.

4. The currently followed office BP goal in the management of hypertension in patients aged 18 to 64 years is <140/90 mmHg. This target aims to effectively control blood pressure and reduce the risk of hypertension-related complications.

5. Treatment for hypertension in patients above 60 years without comorbidities is typically started at a BP level of >140/90 mmHg. This threshold helps in managing hypertension effectively in this age group.

6. In current clinical practice, beta-blocker therapy is preferred for patients with hypertension who have heart failure with reduced ejection fraction. This treatment approach helps improve heart function and manage hypertension effectively in these patients.

7. To reduce overall cardiovascular risk in patients with hypertension, the most commonly used drug class is RAS blockade. This approach helps in managing blood pressure and provides additional cardiovascular protection.
8. In the management of hypertension without comorbidities, beta-blockers are preferred as a second-line drug if blood pressure remains uncontrolled with the initial medication. This approach ensures a step-wise treatment strategy to effectively manage hypertension in patients without complicating factors.

9. In routine clinical practice, the preferred beta-blocker for elderly patients with heart failure and a reduced left ventricular ejection fraction alongside hypertension is S-Metoprolol. This choice is based on its efficacy and safety profile in this specific patient population.

10. As per the opinion, beta-blockers do have a definitive place in elderly patients with heart failure and a background of hypertension therapy. They are considered beneficial for most suitable patients in managing these conditions effectively.

11. In current clinical practice, the preferred indication for prescribing S-Metoprolol in elderly patients is hypertension. This choice aligns with its efficacy and safety profile for managing blood pressure in this demographic.

12. The usual clinical benefits observed with the usage of S-Metoprolol in routine clinical practice in elderly patients with heart failure and hypertension include effective symptomatic improvement, good tolerability, and suitability in patients with or without coexisting conditions such as diabetes, COPD, or dyslipidemia. These factors contribute to its favorable outcomes in managing both conditions concurrently.

13. S-Metoprolol is frequently prescribed in the management of heart failure and hypertension in elderly patients, given its efficacy and suitability for this demographic.

14. On a scale from 1 to 10, the tolerability of S-Metoprolol therapy in patients with heart failure and hypertension would typically fall within the range of 7 to 8, indicating good tolerability in a significant portion of patients.

15. In the opinion, lack of regular check-ups is a specific factor that can impact hypertension and heart failure management in practice. Regular monitoring and follow-ups are crucial for effective management and to prevent complications.

CONSULTING OPINION

Market Opportunities:

The combination use of Sodium-Glucose Cotransporter-2 inhibitors (SGLT2i) and Dipeptidyl Peptidase-4 inhibitors (DPP4i) in the Indian healthcare landscape presents significant market opportunities. Emerging clinical evidence supports the synergistic effects of these two drug classes in managing diabetes, indicating a potential increase in demand for combination therapies in the management of hypertension and heart failure as well.

Value for Healthcare Professionals:

Healthcare professionals in India can derive substantial value from the combination use of SGLT2i and DPP4i in managing hypertension and heart failure. The dual mechanism of action addresses multiple pathophysiological aspects, offering a comprehensive approach to cardiovascular risk reduction and improved outcomes. This combination provides healthcare professionals with a versatile tool for tailoring treatment strategies based on individual patient profiles, optimizing care delivery in diverse patient populations.

Adverse Effect Management:

Effectively managing adverse effects is a crucial aspect of utilizing the SGLT2i + DPP4i combination in the context of hypertension and heart failure management. Literature suggests that healthcare professionals should closely monitor patients for potential side effects such as volume depletion, urinary tract infections, and increased risk of hypotension. Establishing a robust monitoring system and patient education can aid in early detection and management of adverse effects, ensuring the safety and tolerability of the treatment regimen.

Effective Management:

The combination of SGLT2i and DPP4i offers effective management of hypertension and heart failure by addressing multiple underlying pathophysiological mechanisms. Healthcare professionals can leverage the complementary actions of these agents to

achieve better cardiovascular risk reduction and improved outcomes for patients. Utilizing combination therapies may lead to enhanced efficacy compared to monotherapy, potentially reducing the need for additional medications and minimizing the risk of treatment-related complications.

Market Positioning:

Positioning the SGLT2i + DPP4i combination in the Indian healthcare market for hypertension and heart failure management requires a strategic approach. Highlighting the synergistic benefits, safety profile, and potential to address unmet needs in cardiovascular risk reduction can enhance the market position of this combination therapy. Collaborative efforts between pharmaceutical companies, healthcare providers, and regulatory authorities are essential for successful market penetration and adoption of combination therapies in clinical practice.

Personalized Treatment Decisions:

The combination use of SGLT2i and DPP4i allows healthcare professionals in India to make personalized treatment decisions based on individual patient characteristics and preferences. Factors such as age, comorbidities, and medication tolerance can be considered when tailoring treatment regimens, ensuring optimal outcomes and patient satisfaction. Personalized approaches contribute to improved treatment adherence and overall quality of care in the management of hypertension and heart failure.

Improving Patient Outcomes:

Utilizing the SGLT2i + DPP4i combination in the Indian healthcare setting has the potential to significantly improve patient outcomes in hypertension and heart failure management. By addressing multiple facets of cardiovascular pathology, this combination may lead to better blood pressure control, reduced cardiovascular risks, and improved quality of life for patients. Monitoring and optimizing therapy in collaboration with healthcare providers can contribute to sustained positive outcomes and enhanced patient well-being.

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