

## **A study on pattern of inotropes used in the intensive care unit at tertiary care hospital**

Hemanth Kumar Annam, Shravya Kongari, Pallavi Tekumalla, Jhansi Bhukya and Istak Rabbana,

Department of Pharmacy Practice, Anurag Pharmacy College, Kodad-508206, Telangana, India

### **Corresponding author address:**

Mr. Hemanth Kumar Annam

Department of Pharmacy Practice, Anurag Pharmacy College, Kodad-508206,

## Abstract

The present study was to analyse the pattern of inotropes used in intensive care units at a tertiary care hospital. This study helps to review the currently available inotropes and their specific uses in hemodynamic management for critically ill patients. In one of the districts of Telangana a prospective observational study was conducted to collect the data based upon inclusion and exclusion criteria. A structured proforma was designed to collect the information from patients of all age groups with a varied diagnosis, who are on inotropes. 250 patient's data was collected in 6-month study period. Collected data was analysed for the pattern of inotropes used, the factors influencing the ICU length of stay and mortality. They were categorised based up on their gender, age group, number of inotropes used during the hospital stay, department of admission, discharge status, and number of days of hospital admission. Out of 250 patients most of the patients were admitted in cardiology ICU, followed by general medicine ICU, and pulmonology ICU. Most of the cases were treated with positive inotropes. Our study found that out of 250 patients the mortality rate was seen to be 9%, and most commonly used inotrope was noradrenaline, followed by dobutamine.

**Keywords:** Inotrope, Hemodynamic, Pulmonology, Mortality rate, Noradrenaline, Dobutamine.

### 1. Introduction

Inotropic agents increase myocardial contractility without depending on changes in heart rate. Inotropic agents increase heart rate, they can improve the systolic performance either by direct or indirect vasodilator action. Inotropes are most commonly used to stabilize the patients in different intensive care units (MICU, SICU, CICU and RICU) (Francis *et al.*, 2014). Inotropes are chosen in patients with acute systolic heart failure presenting with end stage organ dysfunction sign and symptoms (Albert *et al.*,2010). Inotropes use is limited to patients with severe hemodynamic impairment, *e.g.*, severe heart failure, cardiogenic shock, and septic shock, patients underwent to major surgery or victims of significant trauma (Bellomo *et al.*,2004). The clinical effectiveness of these inotropes has been identified through their impact on the hemodynamic endpoint (Ali *et*

*al.*,2008). The selection of inotrope is based upon the patients underlying disease state and preference of clinicians (Carver *et al.*,1991).

### **Uses of inotropes**

Inotropes improve cardiac output (CO), thereby enhance mean arterial pressure (MAP) and increase the blood perfusion to main organs and tissues. Inotropes improve CO by increasing both heart rate along with systolic volume (Alhazzani *et al.*,2017).

### **Side effects**

Sometimes a medicine causes unwanted effects. Inotropic agents have some side effects along with myocardial ischemia (Belletti *et al.*,2020). Low blood pressure (hypotension), an irregular heartbeat that causes dizziness, palpitations, shortness of breath, sweating, or fainting, Trouble with your eyesight, such as blurry eyesight, double vision, dizziness or light-headedness, headache, loss of appetite, fatigue, diarrhoea, erectile dysfunction, breast enlargement in men, decreased sex drive, Skin rash eye sensitivity to light, nosebleeds and bleeding gums (Cohen-Solal *et al.*,2008).

### **Types of inotropes**

There are two types of inotropes positive inotropes and negative inotropes.

Positive inotropes give strength the heart's contractions, so with less heart beats it can pump large amount of blood (Felker *et al.*,2003). Examples: Dobutamine, Dopamine, Epinephrine, Nor-Epinephrine, Isoprenaline, Digoxin, Amrinone and Milrinone. Negative inotropes weaken the force of the heartbeat. Examples: Diltiazem, Atenolol, Propranolol, Amlodipine, Carvedilol, Disopyramide, Quinidine (Kalam *et.al.*,2020).

## **2. Materials and Methods**

### **Inclusion criteria**

Patient's case record of all age groups (mostly above 18 years old) who are receiving inotropic therapy in intensive care units at a tertiary care hospital. (CICU, MICU, SICU, RICU).

### **Exclusion criteria**

Patients with Psychiatric illness, outpatients, and who are not willing to participate.

The relevant literature review was done. The protocol and data collection form were designed and submitted to ethical committee approval. After getting the approval from the ethical committee data collection process was started according to inclusion the exclusion and criteria.

The primary objectives of this research work are:

- To study the pattern of inotropes used in Intensive care units of tertiary care hospital.
- To review the currently available inotropes their specific uses in critical care.
- To assess how inotropes are prescribed and administered in hemodynamic management.

Source of data: Data collected from Intensive care units a Tertiary Care Hospital.

Study site: tertiary care hospital in Telangana state.

Study Duration: 6 Months.

Study Design: single centered, Prospective observational study.

Sample size: Minimum of 250 patients.

Protocol number: ANRP/2022/03, dated on 29/09/2021.

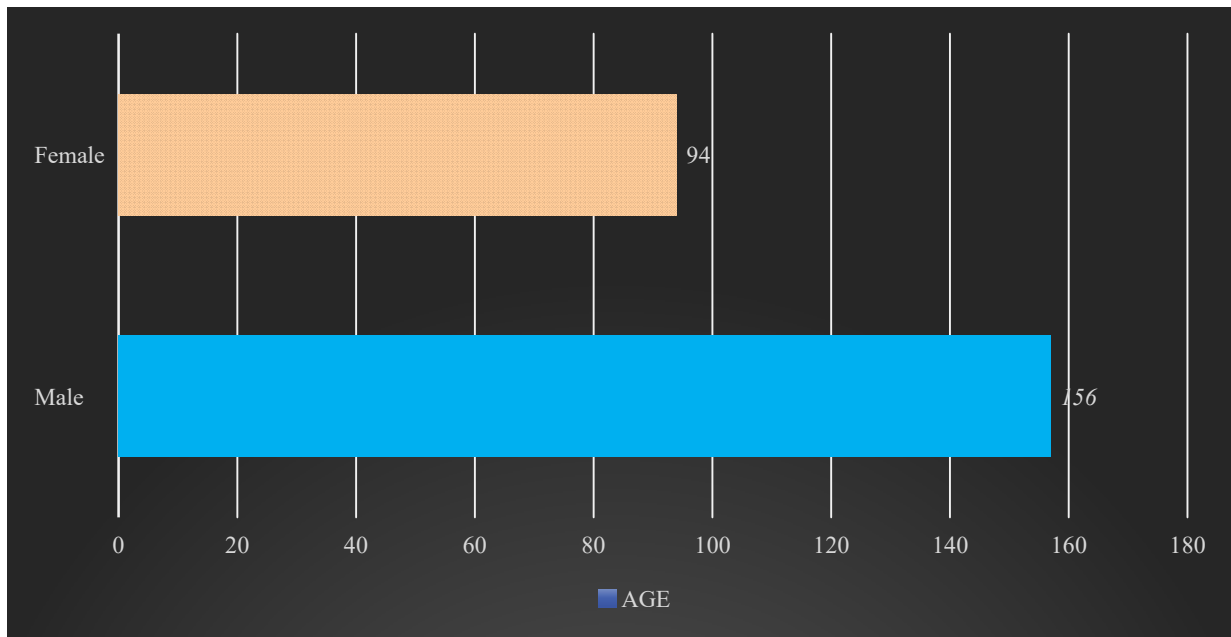
Ethical considerations: ethical committee approval was taken from ethical board.

### 3. Results

A total number of 250 cases were collected, of which 156(62%) cases were male and rest of i.e., 94(38%) cases were female.

**Table 1: Gender wise distribution**

Gender	Total no of cases
Female	94(38%)
Male	156(62%)
<b>Total</b>	<b>250</b>

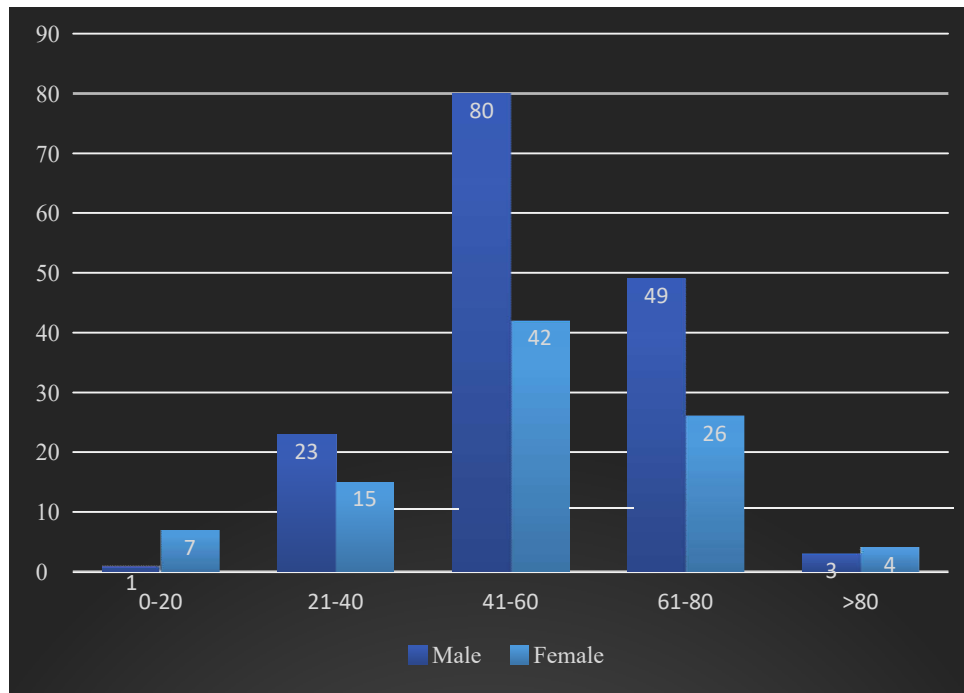


**Figure 1: Gender wise distribution.**

Out of 250 cases ( including both male and female) 122(49%) cases were in the age group of 41-60 years, 75(30%) cases were in the age group of 61-80 years, 21-40(15%) cases were in the age group of 21-40 years, 8(3%) cases were in the age group of 0-20 years and 7(3%) cases were in the age group of above 81 years.

**Table 2: Age wise distribution**

Age	Male	Female	Total cases	Percentage
0-20	1	7	8	3%
21-40	23	15	38	15%
41-60	80	42	122	49%
61-80	49	26	75	30%
Above 81	3	4	7	3%
<b>Total cases</b>	<b>156</b>	<b>94</b>	<b>250</b>	<b>100%</b>

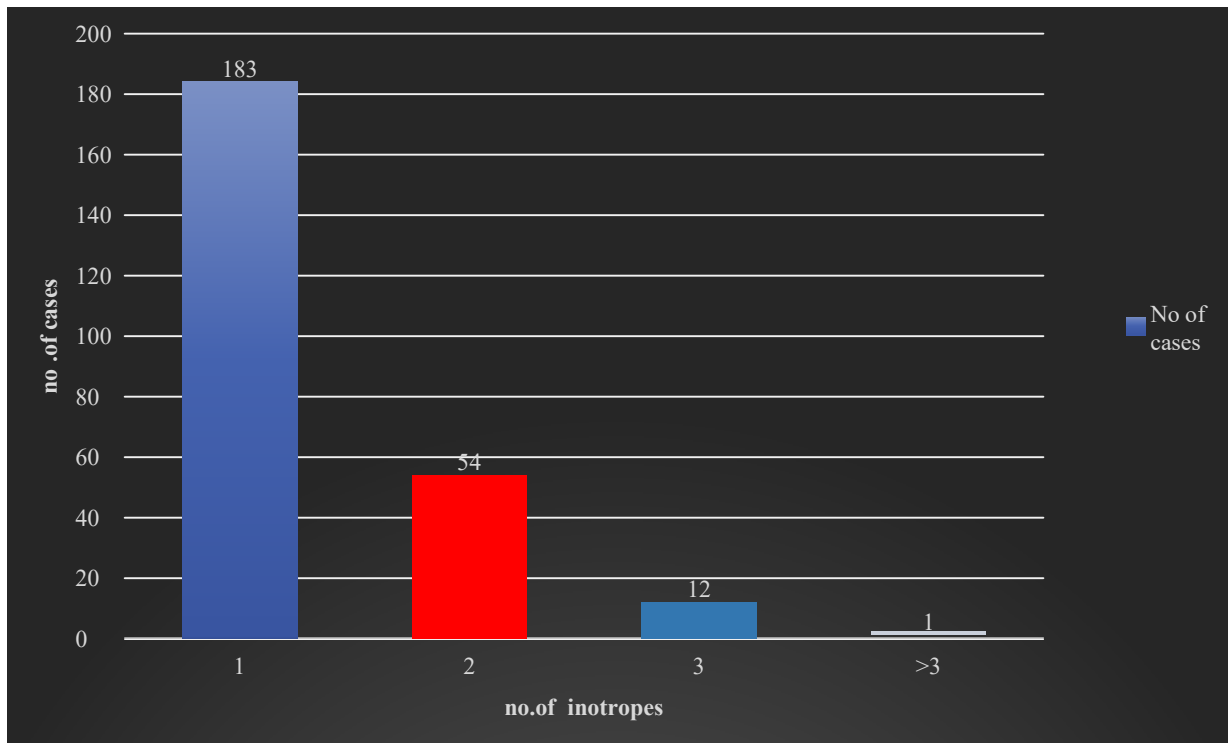


**Figure 2: Age wise distribution.**

Out of 250 cases , 183 cases were stabilized by using one inotrope, 54 cases were stabilized by using 2 inotropes, 12 cases were stabilized by using 3 inotropes and rest of cases were stabilized by using more than three inotropes.

**Table 3: Number of inotropes wise distribution**

No.of inotropes used	No .of cases
1	183
2	54
3	12
More than 3	1
<b>Total</b>	<b>250</b>

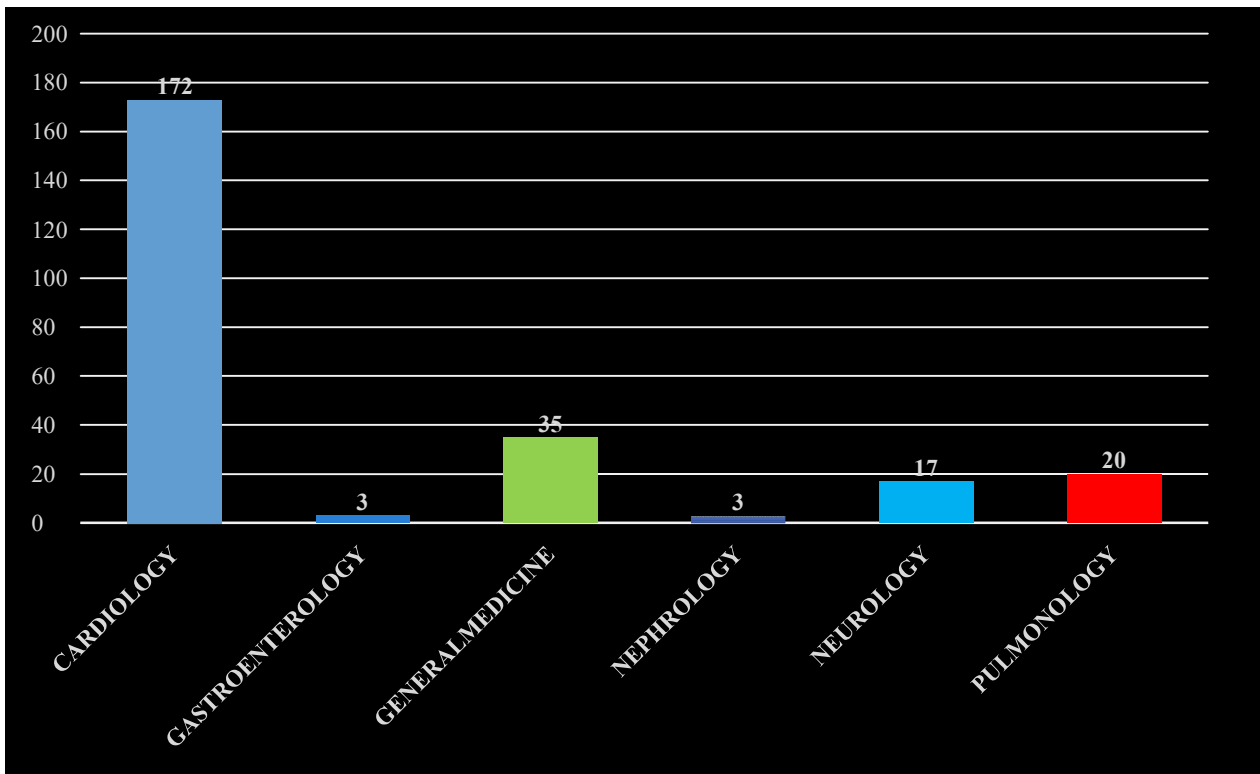


**Figure 3: Number of inotropes wise distribution.**

out of 250 cases, 172 (69%) cases were admitted in cardiology department,35(14%) cases were admitted in general medicine, 20(8%) cases were admitted in pulmonology department, 17(7%) cases were admitted in neurology department, 3(1%) cases were admitted in nephrology department and 3(1%) cases were admitted in gastroenterology department.

**Table 4: Department wise distribution**

Department	Total cases	Percentage
Cardiology	172	69%
General medicine	35	14%
Neurology	17	7%
Nephrology	3	1%
Gastroentrology	3	1%
Pulmonology	20	8%
<b>Total</b>	<b>250</b>	<b>100%</b>



**Figure 4: Department wise distribution.**

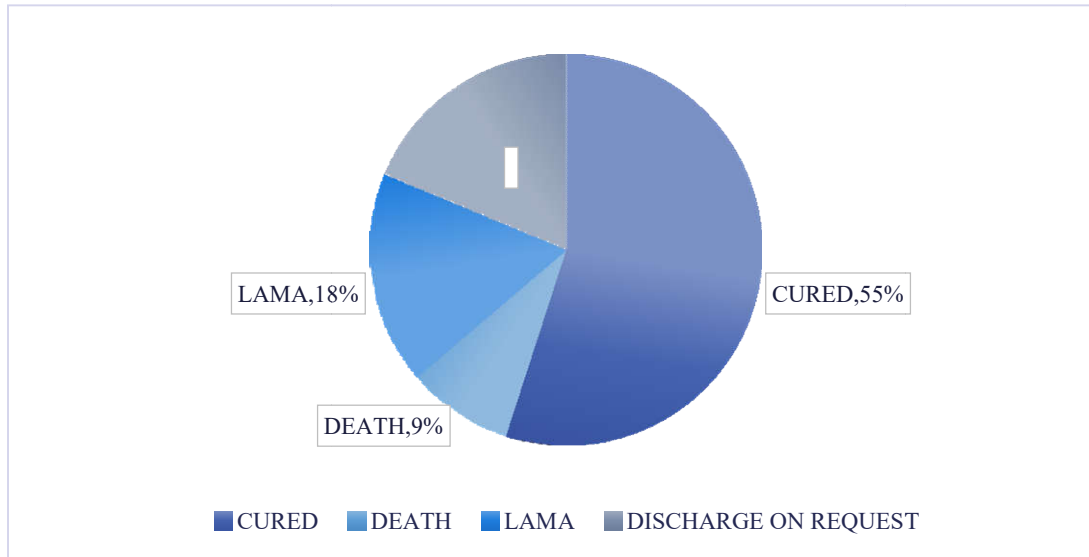
out of 250 cases, 55% (137) cases were cured,19% (47) cases were Discharged on request,17% (44) cases were LAMA, and 9% (22) cases were Died.

**Table 5: Discharge status wise distribution**

Discharge status	Total no of cases	Percentage
Discharge on request	47	19%
LAMA*	44	17%
Cured	137	55%
Died	22	9%
<b>Total</b>	<b>250</b>	<b>100%</b>

\*LAMA-left against medical advice



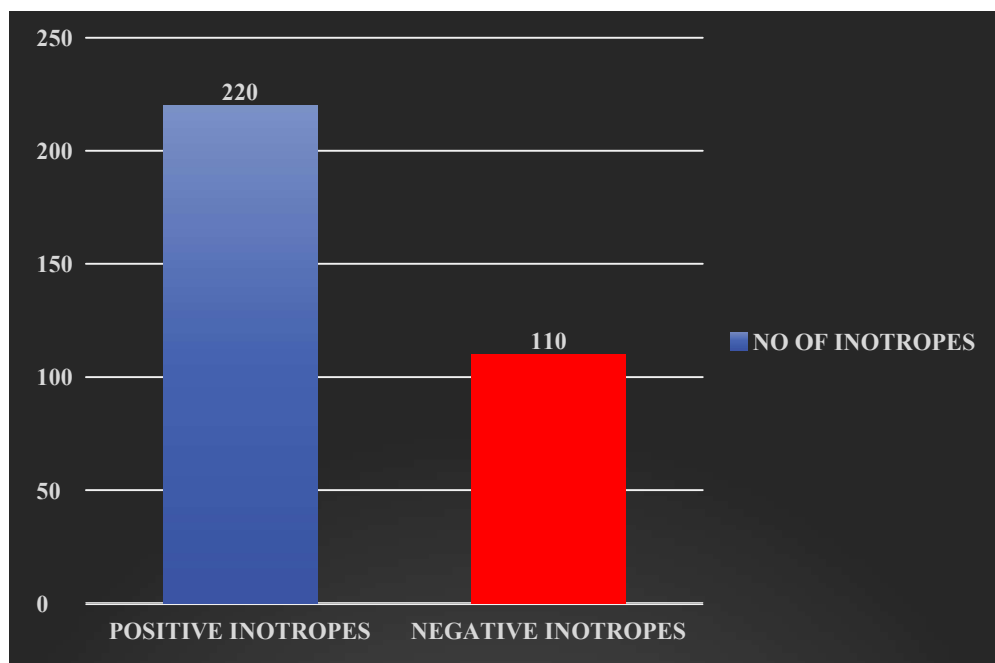


**Figure 5: Discharge status wise distribution.**

out of 250 cases, 220 positive inotropes were used and 110 negative inotropes were used.

**Table 6: Inotrope type wise distribution**

S.no	Positive inotropes	Negative inotropes
1	220	110

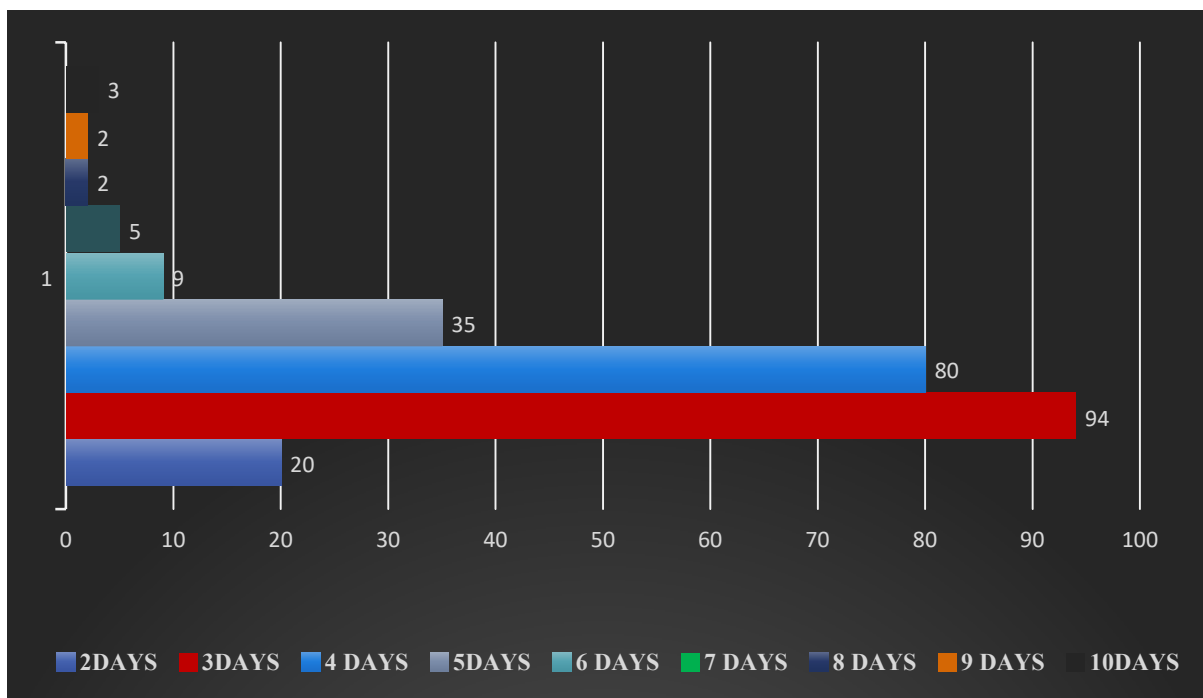


**Figure 6: Inotrope type wise distribution.**

Out of 250 cases, 94 cases were admitted for 3days,80 cases were admitted for 4days,35 cases were admitted for 5days,20 cases were admitted for 6days,9cases were admitted for 8days,5cases were admitted for 7days,3cases were admitted for 10days and 2cases were admitted for 9days.

**Table 7: Duration of hospitalization**

S.no	Duration of hospitalization	No of cases
1	2 Days	20
2	3 Days	94
3	4 Days	80
4	5 Days	35
5	6 Days	9
6	7 Days	5
7	8 Days	2
8	9 Days	2
9	10 Days	3



**Figure 7: Duration of hospitalization.**

**Table 8:** Inotropes in different cases including both positive and negative

S.no	Inotropes	No of cases (n=250)
1	Amlodipine	4
2	Amlodipine/norad	3
3	Arkamin	1
4	Bisoprolol	1
5	Cardinol/dobutamine/cardisure	2
6	Cardisure/cardirone/dobutamine	1
7	Cardisure/digoxin/dobutamine	1
8	Cardisure/dobutamine	3
9	Cardivas /dobutamine	1
10	Cardivas cr	14
11	Cardivas/digoxin	1
12	Digoxin	6
13	Digoxin/dobutamine	1
14	Dobutamine	52
15	Dobutamine/cardivas cr	2
16	Dobutamine/norad/amlodipine	2
17	Dobutamine/norad/cardisure	1
18	Dobutamine/norad/digoxin	3
19	Dobutamine/norad/isoprenaline/digoxin	1
20	Dopamine/dobutamine	1
21	Isoprenaline/amlodipine	1
22	Labetalol	2
23	Labetalol/arkamin	1
24	Labetalol/metaprolol	1
25	Labetalol/norad	1
26	Labetalol/norad/dopamine	1
27	Metaprolol/norad	13
28	Metaprolol	25
29	Metaprolol/telma	3
30	Metaprolol/dobutamine	1
31	Nicardia	6
32	Nifedipine/metaprolol	2
33	Norad	66
34	Norad/cardirone plus	2
35	Norad/cardivas	1
36	Norad/dobutamine	11
37	Norad/dobutamine/adrenaline	1
38	Norad/dopamine	1
39	Norad/isoprenaline	1
40	Norad/nicardia	1
41	Propranolol	3
42	Telma	5



Finally we observed that mostly used and prescribed inotrope was nor-adrenaline followed by dobutamine, and metoprolol. The inotrope very rarely used one was labetalol and combination form of inotropes .

## **5. Conclusion**

Currently and highly available inotropes are Norad, Dobutamine, Metoprolol, Cardivas CR. Norad is a positive inotrope, to increase blood pressure in acute, severe, hypotensive states when low systemic vascular resistance persists despite adequate fluid resuscitation. Norad is also a choice of managing septic shock. Dobutamine is widely used in the short-term treatment of severe heart failure and cardiogenic shock and is a first-line agent to increase cardiac output in septic shock, although usually in combination with a vasoconstrictor agent. Metoprolol is a negative inotrope. It is commonly used in the treatment of cardiovascular diseases and to reduce the risk of re-infarction and the related myocardial infarction. They almost universally reduce myocardial oxygen consumption and hence the degree of cardiac ischemia. Cardivas CR is a negative inotrope. It is used in the treatment of hypertension, angina pectoris, heart failure. The choice of type of inotropes were prescribed was according to the clinical condition of the case. Like positive inotropes were prescribed to increase the cardiac output and negative inotropes were prescribed to decrease the cardiac output. With this study we conclude that all the inotropes are prescribed with the accurate dose and we found that the available inotropes for treating the patients who were admitted in intensive care units. In our study site inotrope prescribed pattern showed that predominant use of noradrenaline followed by dobutamine.

## **Conflict of interest**

The authors declare no conflicts of interest relevant to this article.

**References**

**Albert NM, Boehmer JP, Collins SP, Ezekowitz JA, Givertz MM, Katz SD, Klapholz M, Moser DK, Rogers JG, Starling RC, Stevenson WG, Tang WH, Teerlink JR and Walsh MN. (2010).** HFSA 2010 comprehensive heart failure practice guideline. *J Card Fail*, **16**(6): e1–194.

**Alhazzani W, Antonelli M, Evans LE, Ferrer R, Levy MM and Rhodes A. (2017).** Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med.*; **43**(3):304–77.

**Ali, A.; Bunnell, E.; Kumar, A.; Milcarek, B.; Parrillo, J.E. and Schupp, E. (2008).** Cardiovascular response to dobutamine stress predicts outcome in severe sepsis and septic shock. *Critical Care*, **12**(2): R35.

**Belletti,A.; Guvakov, D. and Lomivorotov, V. (2020).** Current practice of calcium use during cardiopulmonary bypass weaning: results of an international survey. *J Cardiothorac Vasc Anesth.* ; **34**: 2111-2115

**Bellomo, R.; Buxton, B.; Doolan, L. and Gillies, M. (2004).** Bench-to-bedside review: Inotropic drug therapy after adult cardiac surgery—a systematic literature review. *Critical Care*, **9**(3): 266-279.

**Carver JR, Packer M and Rodeheffer RJ (1991).** Effect of oral milrinone on mortality in severe chronic heart failure. *New England Journal of Medicine*; **325**:1468–75.

**Cohen-Solal A, Dickstein K and Filippatos G (2008).** ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. *European Heart Journal*; **29**:2388–442.

**Francis GS, Bartos JA and Adaya S. (2014).** Inotropes. *Journal of the American College of Cardiology*, **63** (20):2069-78.

**G.M. Felker, R.L. Benza, A.B. Chandler, et al. (2003).** Heart failure etiology and response to milrinone in decompensated heart failure: results from the OPTIME–CHF study. *J Am Coll Cardiol*, **41** , pp. 997-1003

**Kalam MN, Rasool MF, Rehman AU and Ahmed N. (2020).** Clinical Pharmacokinetics of Propranolol Hydrochloride: A Review. *Curra Drug Metab.*; **21**(2):89-105.