



INSTITUTE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

**INCIDENCE AND PREDICTORS OF UNPLANNED
READMISSION OF HEART FAILURE PATIENTS TO
PUBLIC HOSPITALS IN NEKEMTE TOWN WEST
OROMIA, ETHIOPIA 2025: A RETROSPECTIVE
COHORT STUDY**

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HEALTH)**

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As members of the examining the final MPH thesis open defense, we certify that we have read and evaluated the thesis prepared by **Abdisa Endalew Terefe** under the title Incidence and predictors unplanned hospital readmission of heart failure patients to public Hospitals in Nekemte Town West Oromia, Ethiopia 2025 and we recommended that the thesis be accepted as fulfilling the requirement of the degree of Master of public Health in **General Master of Public Health**

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ABSTRACT

Background: Unplanned hospital readmissions were 25% within 30 days after discharge from an index admission are a global issue that casts doubt on the quality of healthcare. Heart failure is a major source of unscheduled readmissions globally and its burden grows with time. Its impact has doubled in country like Ethiopia.

Objective: To determine incidence and predictors of unplanned hospital readmission among heart failure patients in Nekemte Town public Hospital, West Oromia, Ethiopia 2025.

Methods: An institutional-based 6 years Retrospective Cohort study was conducted among Heart failure patients and 339 patients were selected using Systematic random sampling from two public hospitals, Nekemte Town. The data was collected using Kobo Collect tool application exported to SPSS Version 27 for analysis. The Kaplan-Meier and log-rank were used to estimate and compare survival time. A Cox proportional hazard model was utilized, conducting both Bi-variable and multi-variable analyses to investigate how predictors affect the timing of unscheduled hospital readmissions. The strength of association was assessed by adjusted hazard ratio (AHR), and statistical significant was declared for p-values < 0.05 and a 95% confidence interval (CI).

Result: Finding of the study indicated that cumulative Incidence of unplanned hospital readmission among heart failure patients was 25.8% within 30 days of last discharge and response rate of the study was 98%. From multivariate cox proportional hazards analysis age greater than or equal to sixty five (AHR: 3.40, 95% CI: 1.97, 5.87), rural in residency (AHR: 2.35, 95% CI: 1.40, 3.94), poor medication adherence (AHR: 2.03, 95% CI: 1.26, 3.25), and Hospital Stay of ≥ 7 days (AHR: 3.10, 95% CI: 1.92, 5.01) were significant predictors of unplanned hospital readmission.

Conclusion: finding of study showed that incidence rate was 9.41 readmissions per 1000 person-day time observation. Older age, rural residency, poor medication adherence and long hospital stay were significant predictors of unplanned hospital readmission. Giving more attention to older patients with heart failure, increase access of quality care at periphery, educating family and patients on proper use of prescribed medication, and treating heart failure and all underlying causes of prolong hospital stay will enhance chance to reduce readmission.

Key Words: Heart Failure, Time to Readmission, Incidence rate, Predictors, Nekemte, Ethiopia

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TABLE OF CONTENTS

ABSTRACT.....	II
ACKNOWLEDGMENT	III
LIST OF TABLES.....	VI
LIST OF FIGURES	VII
ACRONYMS	VIII
1. INTRODUCTION.....	1
1.1 Background	1
1.2 Statements of the Problem.....	3
1.3 Significance of the Study	5
2. LITERATURE REVIEW	6
2.1. Incidence of unplanned hospital readmission among heart failure patients.....	6
2.2. The median time of unplanned readmission among heart failure patients.....	7
2.3. Predictors of unplanned hospital readmission among heart failure patients	8
2.3.1. Socio Demographic Factors.....	8
2.3.2. Clinical Factors.....	9
2.3.3. Factors related to previous Discharge.....	9
2.3.4. Behavioral and Psychosocial Factors	10
2.4 Conceptual Frame work	11
3. OBJECTIVES	12
3.1 General Objectives	12
3.2 Specific Objectives.....	12
4. METHODS AND MATERIALS.....	13
4.1 Study Area and period	13
4.2 Study Design	14
4.3 Source population.....	14
4.4 Study population	14
4.5 Study unit	14
4.6 Inclusion criteria and Exclusion criteria.....	14
Inclusion criteria	14
Exclusion criteria.....	14
4.7 Sample size determination and sampling procedure's	14
4.7.1 Sample size Determination.....	14
4.7.2 Sampling technique and procedure.....	15
4.9 Data collection tools and procedures,	17
4.10 Data quality control.....	17
4.11 Study Variables.....	17
4.11.1. Dependent Variable.....	17
4.11.2. Independent variables	17
4.12 Operational definition	18
4.13 Data Processing and Analysis	18

4.14 Ethical Consideration	19
4.15 Dissemination and Utilization of Results.....	19
5. RESULT	20
5.1 Socio Demographic Characteristics	20
5.2 Behavior Related Risk Factors	22
5.3 Baseline laboratory marker, Clinical characteristics and treatment related characteristics of study participants	23
5.4 Comorbid Related Factors.....	24
5.5 The Incidence and Kaplan- Meier hazard estimation of unplanned hospital readmission.....	25
5.6 Predictors of Unplanned Readmission	31
6. DISCUSSION	35
7. LIMITATION OF THE STUDY	37
8. CONCLUSION AND RECOMMENDATION.....	38
8.1 Conclusion.....	38
8.2 Recommendation.....	38
9. REFERENCE.....	39
10. APPENDIX.....	44
10.1 Appendix 1 Data collection Tools	44

LIST OF TABLES

Table 1 Sample size determination and assumptions used for the study on incidence and predictors of unplanned readmission among heart failure patient at public hospital in Nekemte town, West Oromia, Ethiopia 2025	15
Table 2: Socio Demographic characteristics of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025	20
Table 3: Behavior Related risk Factors of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025	22
Table 4: Baseline Laboratory marker, clinical characteristics and Treatment related characteristics of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025.....	23
Table 5: Comorbid Related factors of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025	24
Table 6: Person-time Features of study Participants in Heart patients with unplanned readmission at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025	26
Table 7: Bivariable and multivariable Cox proportional hazard regression model of the study of unplanned readmission of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025	32

LIST OF FIGURES

Figure 1: conceptual framework about the Incidence and Predictors of unplanned readmission among Heart Failure patients in public Hospital of Nekemte Town west Oromia Ethiopia after reviewing different literature	11
Figure 2 : Schematic presentation of the sampling procedure used for the study on incidence and predictors of unplanned readmission among heart failure patient at public hospital in Nekemte town, West Oromia, Ethiopia 2025 (n=339).....	16
Figure 3: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with categories of age at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)	27
Figure 4: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Residency at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001).....	28
Figure 5: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Medication Adherence at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)	29
Figure 6: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Medication Adherence at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)	30

ACRONYMS

ACCF:	American College of Cardiology Foundation
AHA:	American Heart Association
AIDS:	Acquired Immunodeficiency Syndrome
AOR:	Adjusted Odds Ratio
COPD:	Chronic Obstructive Pulmonary Diseases
CVD:	Cardio Vascular Diseases
HF:	Heart Failure
HIV:	Human Immunodeficiency virus
HMIS:	Health Management Information System
ICU:	Intensive Care Unit
NCD:	Non-Communicable Diseases
NSH:	Nekemte Specialized Hospital
NYHA:	New York Heart Association
SDG:	Sustainable Development Goal
SPSS:	Statistical Package for Social Sciences
SSA:	Sub-Saharan Africa
WUCS:	Wallaga University Compressive Specialized Hospital

1. INTRODUCTION

1.1 Background

American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) guidelines currently define heart failure (HF) as a complex clinical syndrome that arises from structural or functional impairment of ventricular filling or ejection of blood, which in turn leads to the cardinal clinical symptoms and signs of heart failure. Since many patients present without signs or symptoms of volume overload, the term "heart failure" is preferred over the more archaic term "congestive heart failure," (1). A defect in the structure or function of the heart that prevents the heart's output from meeting the body's metabolic needs in spite of normal filling pressures is known as heart failure(2). Even though HF treatment methods and medical equipment have advanced significantly in recent decades, HF-related hospitalization is still a major issue globally. Patients with heart failure frequently stay in the hospital for an extended period of time, and they frequently return to the hospital shortly after. Crucially, lowering medical care costs has been focused on HF and its 30-day readmission rate (3).

Millions of individuals worldwide suffer from heart failure, which is a major public health concern that raises healthcare expenses and morbidity and mortality rates (4). More than 8 million people in the US alone are predicted to experience heart failure by 2030 due to the rising prevalence of the condition (5).

Heart failure patients' hospital stays are frequent and represent a considerable amount of healthcare spending. But even with improvements in heart failure care, up to 25% of patients with heart failure are readmitted within 30 days of their discharge, meaning that 30-day readmission rates are still high (6). In the management of heart failure, lowering readmission rates is essential since readmissions can raise morbidity, mortality, and medical expenses (7). When creating methods to lower readmission rates, it is essential to identify the causes that lead to readmission. The impact of heart failure medication classes on readmission rates are not fully known, despite the fact that a number of patient-related factors, including comorbidities and advanced age, have been recognized as risk factors for readmission (8).

It has been demonstrated that medication therapy lowers morbidity and mortality in heart failure patients, making it an essential component of heart failure management (9). When treating heart failure, a number of medication classes are frequently administered, such as beta-blockers, aldosterone antagonists, diuretics, angiotensin-converting enzyme inhibitors (ACEIs), and angiotensin II receptor blockers (ARBs) (10). Even though nations like Ethiopia have committed to Sustainable Development Goal 3.4, the main focus is on primary healthcare, with little attention paid to quality enhancement (11).

Unplanned hospital readmissions within 30 days after discharge from an index admission are a global issue that casts doubt on the quality of healthcare and are commonly recognized as standards of that quality. Heart failure is also the most common reason for readmissions and hospital admissions (12).

1.2 Statements of the Problem

Cardiovascular diseases (CVDs) are the leading cause of death worldwide, accounting for more deaths each year than all other causes combined. In 2016, an estimated 17.9 million deaths worldwide were attributed to CVDs, accounting for 31% of all fatalities. Heart attacks and strokes are the cause of 85% of these fatalities. More than 75% of deaths from CVD occur in low- and middle-income nations. CVDs are responsible for 37% of the 17 million early deaths (under 70) attributed to non-communicable illnesses (13).

Over 20 million people worldwide suffer from heart failure, a growing issue. Approximately 2% of adults in wealthy nations have heart failure. The prevalence of HF increases exponentially with age, affecting 6–10% of those over 65 (1).

Patients with heart failure in Africa are not well-informed about their condition, its treatments, or its adverse effects. Issues with discharge planning and a rise in hospital admissions are the main causes of these poor results (14). In contrast to high-income nations, heart failure impacts economic growth in sub-Saharan Africa by affecting young and middle-aged adults (15). According to hospital studies conducted in Somalia, heart failure accounts for 9.4% to 42.5% of medical admissions and 25.6 to 30.0% of admissions to cardiac units (16).

Higher rates of morbidity and mortality have been associated with readmissions for heart failure. Mortality rates from unplanned ICU readmissions ranged from 26% to 58%. Within 30 days following the initial hospital discharge, almost 16% of unscheduled intensive care unit readmissions took place (17). Due to the substantial mortality and morbidity they cause, readmissions for heart failure place a heavy strain on individuals and healthcare systems (18).

The third most common reason for admission to the WUCSH Adult ICU is heart failure. (Meningitis 10.7%, Bronchial Asthma 9.7%, CHF 8.5%, stroke 8.1%, Trauma 7.3%; Other 9.9%; this includes esophageal cancer, aspiration pneumonia, uterine rupture, UTI, suicide attempt, poisoning, and other conditions) (19). Heart failure is a major source of unscheduled readmissions globally and its burden grows with time. Additionally, in nations like Ethiopia that have few health resources, its impact has increased. Reducing unscheduled hospital readmissions and enhancing clinical outcomes depend on identifying and addressing the potential contributing factors (20).

Regardless of the severity of the patients' underlying conditions, the 28-day hospital readmission for heart failure has a significant financial impact on the healthcare system and is associated with a higher short- and long-term mortality rate of 39% as opposed to 12% for patients who do not experience readmission episodes (21).

Heart failure is linked to an increased risk of death and unanticipated readmissions, and it is a common cause of hospital stays and readmissions. It is estimated that more than 20% of HF patients will need to be readmitted within 30 days (21). The quality of life for HF patients might be significantly impacted by high readmission rates. Compared to high-income nations, HFs develop earlier and account for a larger percentage of readmissions, particularly in low- and middle-income countries like Ethiopia (22).

Study was done scarcely as a whole in country and not done in the current study area. Additionally, there is a lack of studies indicate types of medication prescribed at hospital discharge, comorbid conditions and behavior related risk factors which may influence the unplanned Hospital readmission of heart failure patients. The aim of the study was to determine incidence and predictors of unplanned hospital readmission of heart failure patients at Nekemte Town Public Hospitals.

1.3 Significance of the Study

The results of this study will help to improve the quality of HF patient care by identifying predictors of unplanned readmission heart failure patients to improve outcome of HF patient. The result of the study will be used to mitigate the clinical and financial burdens of patient care, to improve quality health service, as input for planner and policy maker and used as reference by another researcher.

2. LITERATURE REVIEW

2.1. Incidence of unplanned hospital readmission among heart failure patients

Within six months of their discharge, 570 patients (50%) in the derivation group were readmitted to the hospital. In a Yale University retrospective analysis of 570 readmitted patients, the majority ($n = 287$; 50%) had heart failure (23). From the retrospective study done in China cause of the rate of unplanned 30-day hospital readmissions is 11% (24).

Retrospective study done study subjects with nurse home follow up intervention, Exercise only intervention, both nurse home follow up and exercise intervention, and control group intervention in Tokyo shows that 10% (5 of 49) of the Nurse Home/telephone follow-up intervention group, 14% (7 of 49) of the Exercise only intervention group, 8% (4 of 53) of the Exercise and Nurse Home/telephone follow-up intervention group, and 25% (13 of 53) of the control group experienced an unscheduled hospital readmission in the 28 days after discharge (25). Following medical and surgical admissions, the 30-day unplanned hospital readmission rates were 3.8% (5583 of 147,423) and 3.3% (11,142 of 339,228), respectively. Of all unique patients admitted to the medical group, 5102 (3.6%) had readmissions at least once, 383 (0.3%) had readmissions twice, and 77 (0.1%) had readmissions at least three times (26). A retrospective study in USA shows 253 patients Within 30 days following the index discharge, the rate of unscheduled readmission to the hospital was 24.50% (62/253) (27).

According to prospective research conducted in Spain, the rates of readmission for cardiovascular reasons were 7.1% and 13.9% at 15 and 30 days after discharge, respectively (30). Retrospective study in Brazil indicated, 71 (22%) of the 372 patients were readmitted within 30 days of being discharged from the hospital (28). Retrospective cohort study in Australia, the total cohort 28,488 patients, 3059 patients (10.7%) experienced an unscheduled readmission to the hospital. In 1848, out of 3059 patients (60.4%) who were readmitted, the main reason was cardiac in character. The great majority of cardiac readmissions were brought on by either ischemic heart disease or undiagnosed cardiac signs and symptoms (29). More heart failure patients were readmitted within 30 days of discharge, according to heart failure readmission

results computed from the data sample (67%) than not readmitted (33%) (30). In all, 121 heart failure patients were included in the retrospective study at Beijing Hospital. Over the course of the 30-day median follow-up period, 25 patients (20.7%) experienced unplanned readmissions, while the remaining patients (96, 79.3%) experienced no readmission events (31).

Cohort study done on heart failure patients indicated out of 2422 patients in the training cohort, 581 were readmitted unplanned within 30 days, 102 were readmitted out of 434 patients in the validation cohort, and 130 were readmitted out of 555 patients in the validation cohort, according to a retrospective study conducted in Chicago. The readmission rates for train, validation, and test were 23.9, 23.5, and 23.4%, respectively (17). In a retrospective analysis of 2254 patients at Guangdong Medical University's affiliated hospital in Zhanjiang, China, the 30-day all-cause readmission rate was 7.1% (3).

From retrospective study done in south Walo public Hospitals' on 572 adult heart failure patients, 151 were readmitted within 30 days after being released, for a 26.40% total readmission incidence (12). A study conducted in Northwest Ethiopia found that, with a sample mean of 0.89 and a variation of 2.19, 35.7% of HF patients had at least one readmission (22). According to a study conducted at South Wollo Public Hospital, 151 out of 572 adult heart failure patients were readmitted within 30 days of their discharge, yielding a cumulative readmission incidence of 26.40% (95% CI: 23.0, 30.2) for the follow-up period (32).

2.2. The median time of unplanned readmission among heart failure patients

Early discharge was linked to a greater readmission rate within seven days, according to an analysis of English administrative data (33). According to a retrospective research conducted in Spain, 5.7% of patients were readmitted within seven days following TAVR (33). According to a population-based retrospective study on readmitted patients conducted in Australia, 229 patients (11.14%) and 134 patients (6.52%) experienced unexpected and planned readmissions, respectively; Within seven days following discharge, a large number of readmissions (41.3%) happened (34).

According to a retrospective study done in China, the median readmission interval was 12 days (IQR: 6–21) from the discharge date. Days 0–3, 0–7, and 0–15 after discharge accounted for 14.7%, 30.8%, and 60.0% of all 30-day readmissions, respectively, while 16–30 days after release was when 40% of the readmissions happened (35). According to an Australian retrospective study, the peak daily risk of unplanned readmissions happened on days 2–4 after discharge, and the median duration to readmission was 9 (IQR 4–17) days after discharge (33). The median readmission period for 572 adult heart failure patients who were retrospectively monitored at South Walo Public Hospitals was 16 days (95% CI: 14, 17), with minimum and maximum follow-up times of 3 and 30 days (32).

2.3. Predictors of unplanned hospital readmission among heart failure patients

2.3.1. Socio Demographic Factors

From retrospective study in Netherland on heart failure patients aging had about 1.5 time folds hazard of unscheduled hospital readmission of patients with heart failure of lower age , Week 1 had the greatest rates: 3.7% of patients with heart failure (HF) were readmitted (36).

Cross sectional study done on heart failure patients in Australia, older age has about 3 times odds readmission 28 days after discharge, men were more likely to be readmitted by 1.3 folds to female, those who lived alone were more likely to have low educational attainment, and those who had (semi-)private hospital insurance had 1.2 time lower risk of readmission (37). From retrospective study done at Oman, older age patients experienced 2 folds an unplanned readmission within 28 days of last discharge and those stayed 6 days in hospital had 1.6 times risk of un planned hospital readmission (21). Living in rural area increase chance of readmission by 0.27 times when compared with those in Urban (38).

According to the multivariable Cox-Proportional Hazards analysis of an institution-based retrospective study conducted at South Walo Public Hospitals, patients with heart failure who were 65 years of age or older had a risk of unplanned readmission that was more than twice as high as those who were between the ages of 18 and 64.

Rural residents had an unplanned readmission risk among heart failure patients that was 1.85 times greater than that of urban residents (32).

2.3.2. Clinical Factors

A retrospective study done in America indicates that Hemoglobin decrease by 1gm/dl, increase hazards of readmission by 1.2, decreases Creatinine level by 10mg/dl increases hazard risks by 1.1 folds, having COPD increases hazard by 1.5 (39). Another retrospective study done in America on heart failure patients shows that having pulmonary hypertension increase hazard risk by 1.04 fold when compared with patients with no Hypertension (40).

Retrospective study of Thailand shows patients with Hemoglobin less than 11mg/dl had increases risk of readmission by 2.2 folds comparing with those have greater hemoglobin, and having creatinine level $> 2\text{mg/dl}$ increases risk by 1.3 (41).

According to a retrospective study using a historical cohort of patients receiving assistance at a private hospital in Recife, PE, Brazil, having hypertension increases the odds of readmission by 1.89.folds as compared to those have no hypertension (28). From retrospective Study done on heart failure patients at Oman the unplanned readmission was higher among patients with diabetes mellitus , hypertension , and patients treated with poly pharmacy (21).

Cross sectional study done on women with heart failure in Australia, notable variations were noted. Compared to those without, patients who experienced a 30-day readmission were more likely to have diabetes, congestive heart failure, lung, colon, or prostate cancer, or COPD as their primary diagnosis (37)

Retrospective observational study done at central Ethiopia indicates, the majority of patients had biventricular heart failure, and the group with LVEF $\leq 40\%$ had a higher percentage of patients with left ventricular heart failure than the group with LVEF $> 40\%$; The number of patients with class IV HF was higher in the lower LVEF ($\leq 40\%$) group than in the LVEF $> 40\%$ group, and nearly two-thirds of the patients had NYHA class IV HF (42).

2.3.3. Factors related to previous Discharge

In Australia, retrospective study shows Unplanned readmission rates within 28 days after hospital discharge are thought to be a sign of the safety and quality of

healthcare(34). Compared to patients discharged without beta blockers, those who were discharged with BB at index admission had a 52% lower risk of an unplanned readmission (32). From prospective study in Spain independent predictors of 30-day readmission included more than one prior HF admission, prior AMI, congestive symptoms at discharge, glomerular filtration rate (GFR) at discharge calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD) equation < 60 mL/min/1.73 m², weight loss $< 5.6\%$, and mean length of stay > 9 days (43).

Retrospective Study done in Oman shows that Readmission risk was higher for patients with poly pharmacy, low functional status, and feeding tube use (21). From retrospective study done in South Wollo Public Hospital patient discharged with beta-blockers were 52% less likely risk of readmission (32). A Cox-Proportional Hazards analysis of an institution-based retrospective study conducted at South Walo Public Hospitals indicate that unexpected readmission was 3.68 times greater for patients who stayed longer than seven days during index admission compared to those who stayed one to seven days (32).

2.3.4. Behavioral and Psychosocial Factors

Being single or separated decreased the self-care adherence score by 0.25 points according to a mixed study conducted in Ethiopia (44). Retrospective study of Thailand shows patients who has history smoking had 2.9 times risk of readmission than patients not smoking (41). Prospective study done in Beijing Hospital having history smoking rise the risk of readmission by 36% (45) From systematic review done in USA for hospitalization outcomes, intervention not with self-monitoring patients' medication taking had higher than those with self-monitoring (46). Cross sectional study done in Saud Arabia shows, Medication non adherence rises readmission rate heart failure patients by 2.4 % (47)

2.4 Conceptual Frame work

Conceptual Frame Work after reviewing different Literatures (17) (42) (48) (49)

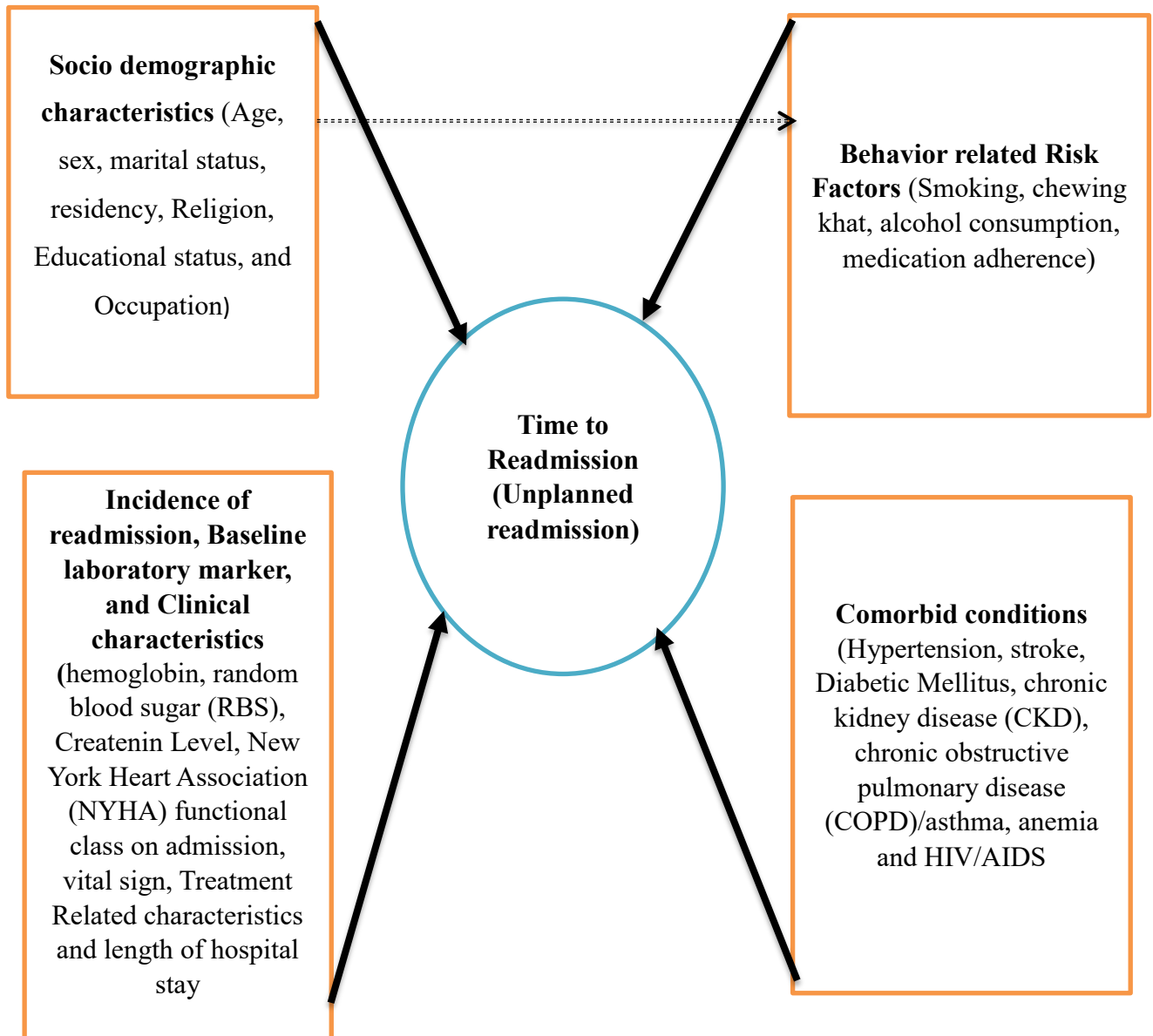


Figure 1: conceptual framework about the Incidence and Predictors of unplanned readmission among Heart Failure patients in public Hospital of Nekemte Town west Oromia Ethiopia after reviewing different literature

3. OBJECTIVES

3.1 General Objectives

To determine incidence and predictors of unplanned hospital readmission among heart failure patients in Nekemte Town public Hospital, West Oromia, Ethiopia 2025.

3.2 Specific Objectives

To determine incidence of unplanned hospital readmission among heart failure patients in Nekemte Town public Hospital, West Oromia, Ethiopia, 2025

To identify predictors of unplanned hospital readmission among heart failure patients in Nekemte Town public Hospital, West Oromia, Ethiopia, 2025

4. METHODS AND MATERIALS

4.1 Study Area and period

The study was conducted in public Hospitals found in Nekemte town (Nekemte specialized hospital and Wallaga University Compressive Specialized Hospital), Oromia regional state, Western Ethiopia. Nekemte is located at a distance of 331km West of Addis Ababa, in Oromia Regional State. Nekemte Specialized Hospital has been in operation for the past 90 years, with a few additions and modifications. In 2020, the Oromia Regional Health Bureau and the Federal Ministry of Health issued specialized hospitals. Since the number of people receiving care there has grown rapidly to 3.5 million, making it one of the region's specialty hospitals. It also serves as a referral center for around 11 million people in western Ethiopia. The governing board and hospital administration made the decision to introduce new services in 2018 as a result of the rapidly increasing demand for community health-seeking behavior.

These services included burn units, lithotripsy units, pathology units with pathologists, orthopedics units with surgeons who specialize in road traffic accidents (RTA), radiology units with radiologists, a fully equipped adult intensive care unit (ICU), and a separate Obstetrics operation theater (OR). As a result, the hospital has 250 beds and several departments, including internal medicine, surgery, pediatrics and neonatology, obstetrics and gynecology, and emergency room; in addition, there are 32 general practitioners, three internists, two pediatricians, four surgeons, four emergency surgeons, three obstetricians and gynecologists, and other medical professionals. Two million people in East Wallaga and the surrounding areas are served by the hospital (50). Wollega University Compressive Specialized The hospital was founded in 2016 and serves as a hands-on training facility for over fourteen departments, offering preventative and curative care to more than five million people in the surrounding area (51). It has 279 beds. Wallaga University Compressive Specialized Hospital has around 232 health workers(52).

The research was conducted between February 10th, 2025 to March 14th, 2025.

4.2 Study Design

Institution-based retrospective cohort study design was carried out.

4.3 Source population

All patients with heart failure readmitted to Nekemte Town Public hospitals'

4.4 Study population

Heart failure patients whose medical record was enrolled for readmission at medical ward from January 1, 2019, to December 31, 2024, in public hospitals found in Nekemte Town.

4.5 Study unit

Heart Failure patient whose medical record was randomly selected from readmitted to medical ward registers from January 1st, 2019, to December 31, 2024, in public hospitals found in Nekemte Town.

4.6 Inclusion criteria and Exclusion criteria

Inclusion criteria

All heart failure patients who were attended at public hospitals (Nekemte Specialized Hospital and WUCSH) in Nekemte Town from January 1, 2019, to December 31, 2024, were included in the study.

Exclusion criteria

Heart failure patients with incomplete baseline data, transfer to other Hospital, and patients discharged with death were excluded.

4.7 Sample size determination and sampling procedure's

4.7.1 Sample size Determination

The potential calculated sample size by taking into account various significant variables from the previous studies with 10% of the incomplete records is displayed below. The sample size was determined using the double population proportion formula, taking into account factors that are significantly associated with the outcome variable, assuming a 95% confidence interval, significance level (5%), power 80%,

and ratio of exposed to non-exposed (1:1) using Epi Info Version 7.2.4.0 (Centers for Disease Control and Prevention). (**Table 1**)

Table 1 Sample size determination and assumptions used for the study on incidence and predictors of unplanned readmission among heart failure patient at public hospital in Nekemte town, West Oromia, Ethiopia 2025

Associated Variables	Exposed	Unexposed	AHR	Calc. Sample	10% Non-response (Incomplete Data Record)	Total Sample Size	Reference
Age ≥ 65	48	103	3.17	170	17	187	(20)
Residence (Rural)	114	37	2.47	308	31	339	(20)
Hgb level < 13mg/dl	130	21	6.20	58	6	64	(20)
Length of Hospital Stay (> 7days)	78	73	3.68	98	10	108	(32)

The final sample size was **339** which is larger from significant variables (20).

4.7.2 Sampling technique and procedure

Within Six-year study period from January 1, 2019, to December 31, 2024, about 11865 heart failure (HF) patients were attended the two hospitals (6755 at NSH and 5110 at WUCSH). The study's sample size was split evenly between the two hospitals to guarantee a representative sample. A total of 339 patients' medical record numbers (MRNs) were selected using a systematic random sampling technique from the hospital's electronic database and health management information system (HMIS) registry books, which was served as the sampling frame. The first k^{th} patient was chosen by lottery ($k=35$, the 1^{st} k^{th} was 13). (Figure 2)

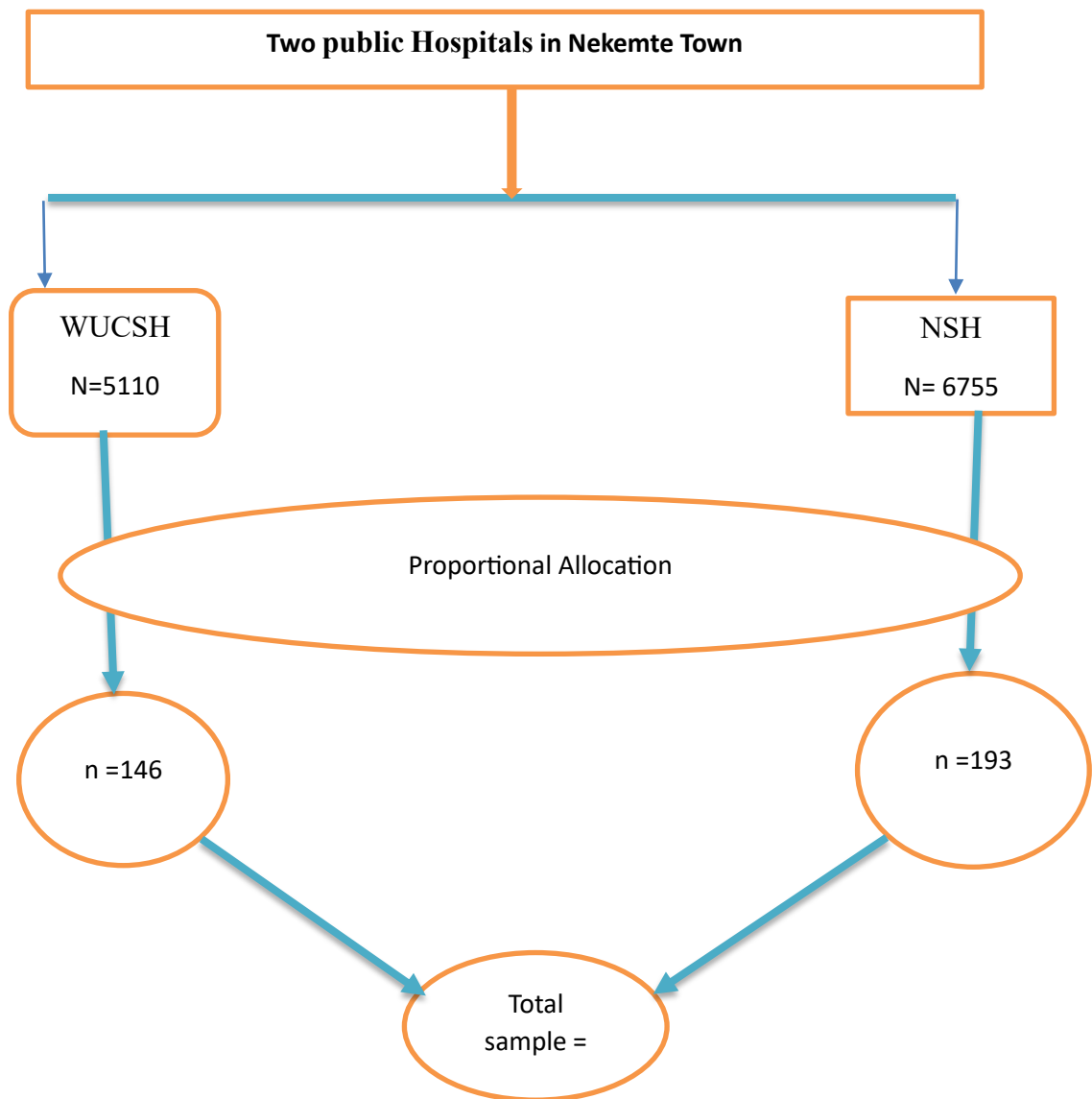


Figure 2 : Schematic presentation of the sampling procedure used for the study on incidence and predictors of unplanned readmission among heart failure patient at public hospital in Nekemte town, West Oromia, Ethiopia 2025 (n=339)

4.9 Data collection tools and procedures,

Data collection tools were adapted from previous studies (17) (42) (48) (49). The questionnaire includes socio-demographic Characteristics, Baseline laboratory marker, and Clinical Characteristics, Behavior related Risk Factors and Comorbid conditions of the patient. The questionnaires are structured questions. The questionnaire developed in English. Using the medical registration numbers, the Health Management Information System (HMIS) registration was provided the list of patients who were hospitalized with an index admission of HF.

4.10 Data quality control

4 BSC nurses two from each Hospital were trained on data collection tools and collected the data using Software Kobo Collect. 1 BSC Nurses as supervisors was supervised the data collection process. 10% of the sample size was pretested for completeness and the presence of pertinent variables using a preliminary chart inspection at wallaga University Compressive Specialized Hospital.

4.11 Study Variables

4.11.1. Dependent Variable

Time to Hospital Readmission (Unplanned readmission)

4.11.2. Independent variables

Socio-demographic Characteristics (Age, Sex, Marital status, Residency, Religion, Educational status, occupation and ethnicity)

Baseline laboratory marker and Clinical characteristics (hemoglobin, random blood sugar (RBS), Creatinine level, New York Heart Association (NYHA) functional class on admission, vital sign (Blood pressure), History of Previous Admission with Heart failure and length of hospital stay)

Behavior related Risk Factors (Smoking, chewing khat, alcohol consumption, medication adherence)

Comorbid conditions (Hypertension, stroke, Diabetic Mellitus, chronic kidney disease (CKD), chronic obstructive pulmonary disease (COPD)/asthma, anemia and HIV/AIDS)

4.12 Operational definition

Hospital Readmission: is an episode when Heart failure patients who had been discharged from hospital readmitted within 1 months (4 weeks) (53).

Comorbidity: is the existence of one or more diseases co-occurring besides heart failure

Event: The incidence of readmission within 30 days following an index admission and hospital release.

Follow up time: Time from of discharge to until an event occurs (30 days).

Censored: Patients with no event within 30 days during the follow-up period

Survival status: The condition of heart failure patients at the end of the observation period (censored or readmitted).

Incomplete patient data on chart: refer to patients' charts with no date of discharge date, readmission date, risk factors and laboratory results of complete blood count (CBC) at discharge during the index admission.

Poor Medication Adherence: is condition in which medication are not taken as prescribed, this behavior may range from jumping doses, taking medication infrequently or incorrect doses, and even taking more than prescribed (54).

4.13 Data Processing and Analysis

Kobo Collect tool was used for data collection and entry, and data was exported to SPSS version 27 for further analysis. The consistency and completeness of the data was examined. To determine the number of missing values, the existence of influential outliers, and normality, exploratory data analysis was conducted. Following that, cross-tabulations of tables and figures was used to summarize the data using relative frequency and percentage prior to analysis. Variables for inclusion in the multivariable analysis were found by the bi-variable analysis ($p \leq 0.25$). Effect sizes were estimated using Cox proportional hazard analysis, with $p < 0.05$ designated as the statistical significance level. Model fitness for Cox proportional Hazard was checked using global test and yield ($\text{Chi}^2 = 0.18$, $p\text{-value} = 0.667$). The distribution of survival time was estimated using descriptive survival analysis, Kaplan-Meier survival function calculation. Each person-day observation was used to calculate the

incidence of readmission. To assess the cumulative odds of readmission at various time periods, the lifespan table was calculated.

4.14 Ethical Consideration

Before beginning the study, ethical approval from the Institute of Health Sciences' ethical review board (IRB) was sought and supportive letter was taken from wallaga university post Graduate study. Prior to beginning data collection, the hospitals were notified of the study's purpose to hospital administration following ethical clearance. Personal identifiers was not included in the data collecting format in order to protect the confidentiality of the study participants' information, and all recorded data were stored in a secure location that is only accessible by the primary investigator.

4.15 Dissemination and Utilization of Results

The study's findings were disseminated to hospitals and other organizations as needed, and submitted in hard copy and soft copy to the Department of Public Health at Wallaga University Institute of Health Science. The Wallaga University School of Health Science, Department of Public Health community, as well as the hospital's medical personnel, were shown the study's results. It was presented at seminars and conferences. In order to make the research findings easier to access and utilize on various websites, result will be submitted for publication in respectable journals.

5. RESULT

5.1 Socio Demographic Characteristics

Among 339 medical records reviewed, 334 were met the inclusion criteria; resulting response rate of 98.53%. From these 187 (55.9%) were female, 126 (37.7%) were Urban in residency, 278 (83.2%) were married, 155 (46.4%) were protestants, 190 (56.9%) were attended Primary school and majority 239 (71.6%) were farmer in occupation (**Table 2**). Concerning age distribution the median age of the participant was 46 and mean of 46.69 ± 17.72 SD (standard deviation).

Table 2: Socio Demographic characteristics of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025

Variables	Category	Status		Total (%)
		Readmitted (%) (n=86)	Censored (%) (n=248)	
Age (32)	< 65	53 (61.6)	226 (91.1)	279 (83.5)
	>= 65	33 (38.4)	22 (8.9)	55 (16.5)
Sex	Male	37 (43)	110 (44.5)	147 (44.1)
	Female	49 (57)	138 (55.7)	187 (55.9)
Residency	Urban	19 (22.1)	107 (43.2)	126 (37.7)
	Rural	67 (77.9)	141 (56.9)	208 (62.3)
Marital Status	Single	2 (2.3)	29 (11.7)	31 (9.3)
	Married	70 (81.4)	208 (83.9)	278 (83.2)
	Widowed	14 (26.3)	11 (4.4)	25 (7.5)
Religion	Orthodox	34 (39.5)	91 (36.7)	125 (37.4)
	Protestant	34 (39.5)	123 (49.6)	155 (46.4)
	Muslim	18 (20.9)	34 (13.7)	52 (15.9)
Educational Status	Unable to read and write	42 (48.8)	71 (28.6)	113 (33.8)

	Primary School and above	44 (51.2)	177(71.4)	221 (66.2)
Occupation	Farmer	72 (83.7)	167 (67.3)	239 (71.6)
	Merchant	7 (8.1)	36 (14.5)	43 12.9
	Student	2 (2.3)	27 (10.9)	29 (8.7)
	Other *	5 (5.8)	18 (7.3)	23 (6.8)

*** (Government employed and daily laborers)**

5.2 Behavior Related Risk Factors

Among 334 medical records reviewed 25 (7.5%) had history of Smoking, 86 (25.7%) had history alcohol consumption, 28 (8.4%) had history of chewing kchat and 82 (24.5 %) had history of drug discontinuation (Table 3).

Table 3: Behavior Related risk Factors of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025

Variables	Category	Status		Total (%)
		Readmitted (%) (n=86)	Censored (%) (n=248)	
Smoking	Yes	8 (9.3)	17 (6.9)	25 (7.5)
	No	78 (90.7)	231 (93.1)	309 (92.5)
Alcohol consumption	Yes	26 (30.2)	60 (24.2)	86 (25.7)
	No	60 (69.8)	188 (75.8)	248 (74.3)
Chewing kchat	Yes	9 (10.5)	19 (7.7)	28 (8.4)
	No	77 (89.5)	229 (92.3)	306 (91.6)
Medication Adherence	Yes	48 (55.8)	204 (82.3)	252 (75.5)
	No	38 (44.2)	44 (17.7)	82 (24.5)

5.3 Baseline laboratory marker, Clinical characteristics and treatment related characteristics of study participants

From study participants 95 (28.4%) had hemoglobin level of <13gm/dl, 48 (14.4%) had random blood sugar of > 200mg/dl and 27 (8.1%) had cretenine level of >1.3mg/dl. Regarding clinical characteristics of participants 72 (21.6%) had systolic blood pressure of >=140 mmgh, majority 284 (85%) had NYHA Class IV at admission, and 176 (52.7%) were stayed hospital more than seven days. Related to treatment character at discharge of index admission 269 (80.5%) were received Digoxin, 313 (93.7%) were received diuretics, 76 (22.8%) were received Angiotensin converting enzyme inhibitor (ACEI), 44 (13.2%) were received Beta Blocker (BB) and 37 (11.1%) were received Angiotensin Receptors blockers (ARB) (Table 4).

Table 4: Baseline Laboratory marker, clinical characteristics and Treatment related characteristics of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025

Variables	Category	Status		Total (%)
		Readmitted (%) (n=86)	Censored (%) (n=248)	
Hemoglobin level	< 13mg/dl	33 (38.4)	62 (25)	95 (28.4)
	> = 13mg/dl	53 (61.6)	186 (75)	239 (71.6)
Random Blood sugar	=< 200 mg/dl	80 (93.1)	206 (83.1)	286 (85.6)
	>200 mg/dl	6 (6.9)	42 (16.9)	48 (14.4)
Creatinine Level	= < 1.3mg/dl	80 (93.1)	227 (91.5)	307 (91.9)
	> 1.3 mg/dl	6 (6.9)	21 (8.5)	27 (8.1)
Systolic Blood Pressure in mmgh	< 140	60 (69.8)	202 (81.5)	262 (78.4)
	>= 140	26 (30.2)	46 (18.5)	72 (21.6)
NYHA Class	Class 3	5 (5.8)	45 (18.1)	50 (15)
	Class 4	81 (94.2)	203 (81.6)	284 (85)

Length of Hospital stay in days	< 7	59 (68.6)	99 (39.9)	158 (47.3)
	>= 7	27 (31.4)	149 (60.1)	176 (52.7)
Treated by Digoxin	Yes	79 (91.9)	190 (76.6)	269 (80.5)
	No	7 (8.1)	58 (23.4)	65 (19.5)
Treated by Diuretics	Yes	80 (93.1)	233 (93.6)	313 (93.7)
	No	6 (6.9)	15 (6.1)	31 (9.3)
Treated by ACEI	Yes	25 (29.1)	51 (20.6)	76 (22.8)
	No	61 (70.9)	197 (79.4)	258 (77.2)
Treated by BB	Yes	17 (19.8)	27 (10.9)	44 (13.2)
	No	69 (80.2)	221 (89.1)	290 (86.8)
Treated by ARB	Yes	15 (17.4)	22 (8.9)	37 (11.1)
	No	71 (82.6)	226 (91.1)	297 (88.9)

5.4 Comorbid Related Factors

From 334 charts reviewed 23 (6.9%) had history of Diabetic mellitus, 24 (7.2%) had history of Bronchial Asthma, 21 (6.3%) had history of Chronic Obstruction of Pulmonary Diseases, 35 (10.5 %) had History of Chronic Kidney Diseases, 24 (7.2%) had history of uncontrolled Hypertension, 40 (11.9%) had history of Anemia, 20 (5.9%) had history HIV/AIDS and 23 (6.9%) had history of stroke (Table 5).

Table 5: Comorbid Related factors of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025

Variables	Category	Status		Total (%)
		Readmitted (%) (n=86)	Censored (%) (n=248)	
History of Diabetic Mellitus	Yes	3 (3.5)	20 (8.1)	23 (6.9)
	No	83 (96.5)	228 (91.9)	311 (93.1)
History Bronchial	Yes	7 (8.1)	17 (6.9)	24 (7.2)

Asthma	No	79 (91.9)	231 (93.2)	310 (92.8)
History COPD	Yes	2 (2.3)	19 (7.7)	21 (6.3)
	No	84 (97.7)	229 (92.3)	313 (93.7)
History of Chronic Kidney diseases	Yes	14 (16.3)	21 (8.5)	35 (10.5)
	No	72 (83.7)	227 (91.5)	299 (89.5)
History of Un controlled Hypertension	Yes	11 (12.8)	13 (5.2)	24 (7.2)
	No	75 (87.2)	235 (94.8)	310 (92.8)
History of Anemia	Yes	15 (17.4)	25 (10.1)	40 (11.9)
	No	71 (82.6)	223 (89.9)	294 (88.1)
History HIV/AIDS	Yes	3 (3.5)	17 (6.9)	20 (5.9)
	No	83 (96.5)	231 (93.2)	314 (94.1)
History of Stroke	Yes	4 (4.7)	19 (7.7)	23 (6.9)
	No	82 (95.3)	229 (92.3)	311 (93.1)

5.5 The Incidence and Kaplan- Meier hazard estimation of unplanned hospital readmission

A total of 334 Heart Failure Patients were involved in study with minimum of 5 days and maximum Of 30 days of follow-up time. In this study, 86 patients were readmitted within 30 days of their previous discharge. Resulting in a cumulative incidence of 25.8% (95% CI: 21.40 - 30.79) during follow up period. The total follow up time was 9137 person-days, with an incidence rate of 9.41 readmissions per 1000 person-day time observation (95% CI 7.62, 11.63) (**Table 6**)

Table 6: Person-time Features of study Participants in Heart patients with unplanned readmission at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025

Cohort in days	person-time	Failures	Rate	[95% Conf. Interval]
(0 - 5]	1670	1	.0005988	0.0000843 - 0.0042509
(5 - 10]	1657	5	.0030175	0.001256 - 0.0072496
(10 - 15]	1618	13	.00803461	0.0046653 - 0.0138371
(15 - 20]	1536	24	.015625	0.010473 - 0.0233115
(20 - 25]	1388	33	.02377522	0.0169024 - 0.0334426
(25 - 30]	1268	10	.00788644	0.0042433 - 0.0146573
Total	9137	86	.00941228	0.0076192 - 0.0116274

The overall summary of Kaplan-Meier estimate indicate that the hazard of unplanned readmission of heart failure was not occurred during the 1st five days following discharge of last admission and relatively increased the hazard of unplanned readmission as follow-up time increased. The survival function of unplanned readmission of heart failure at start of follow up was 100%. The hazard of unplanned readmission at five days, ten days and fifteen days were 0.059 %, 0.3%, and 0.8% respectively. During follow –up time after fifteen days the hazard curves tends to rise rapidly.

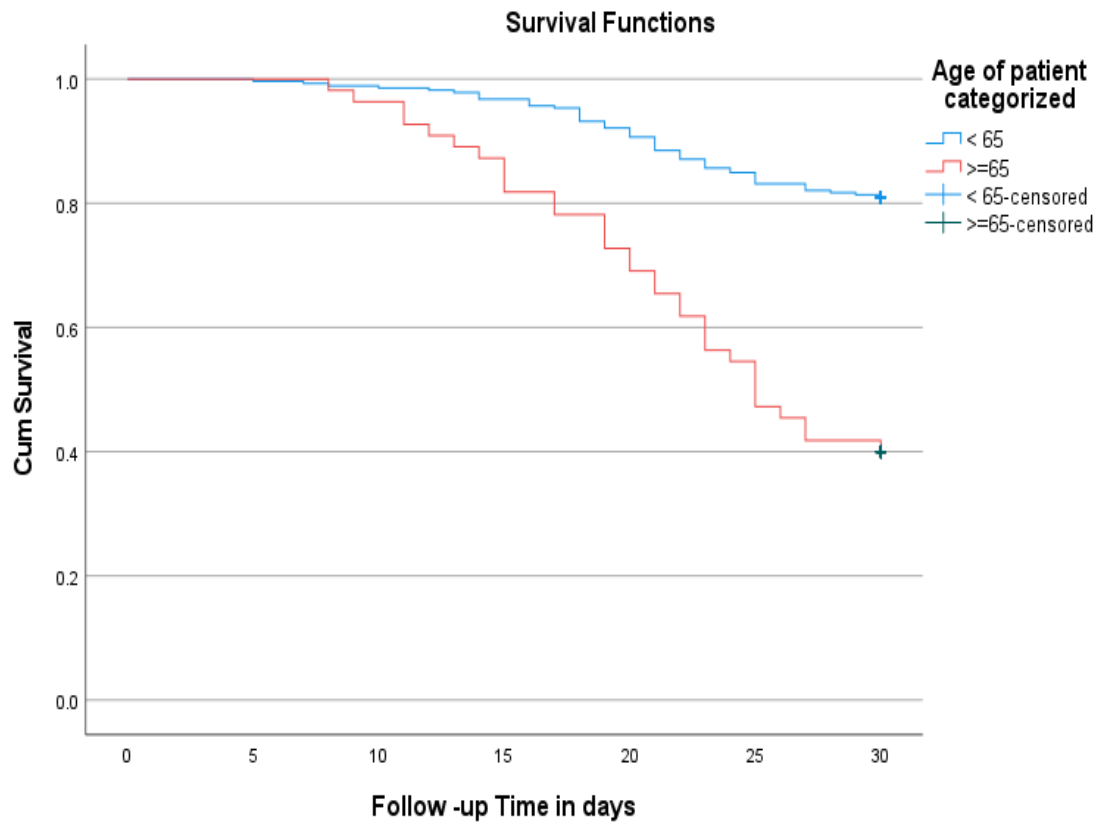


Figure 3: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with categories of age at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)

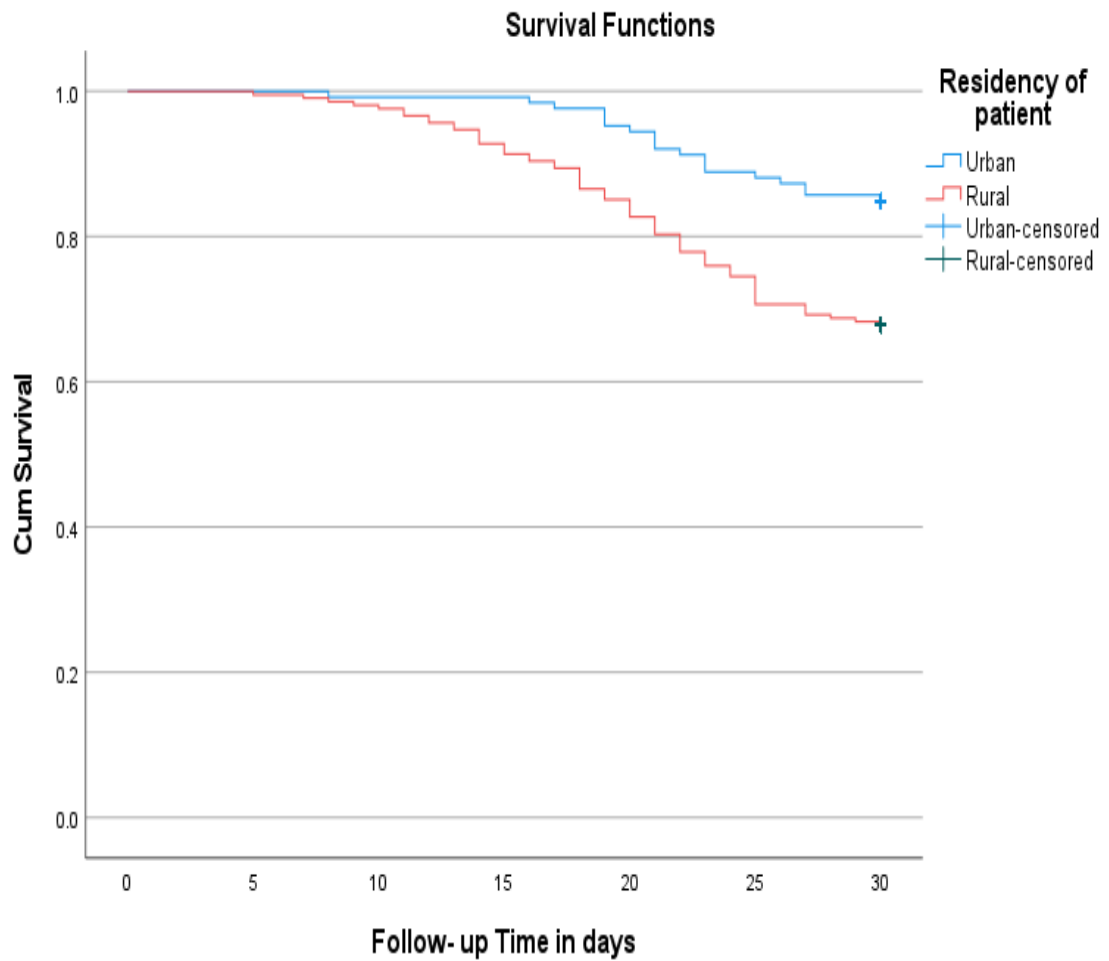


Figure 4: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Residency at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)

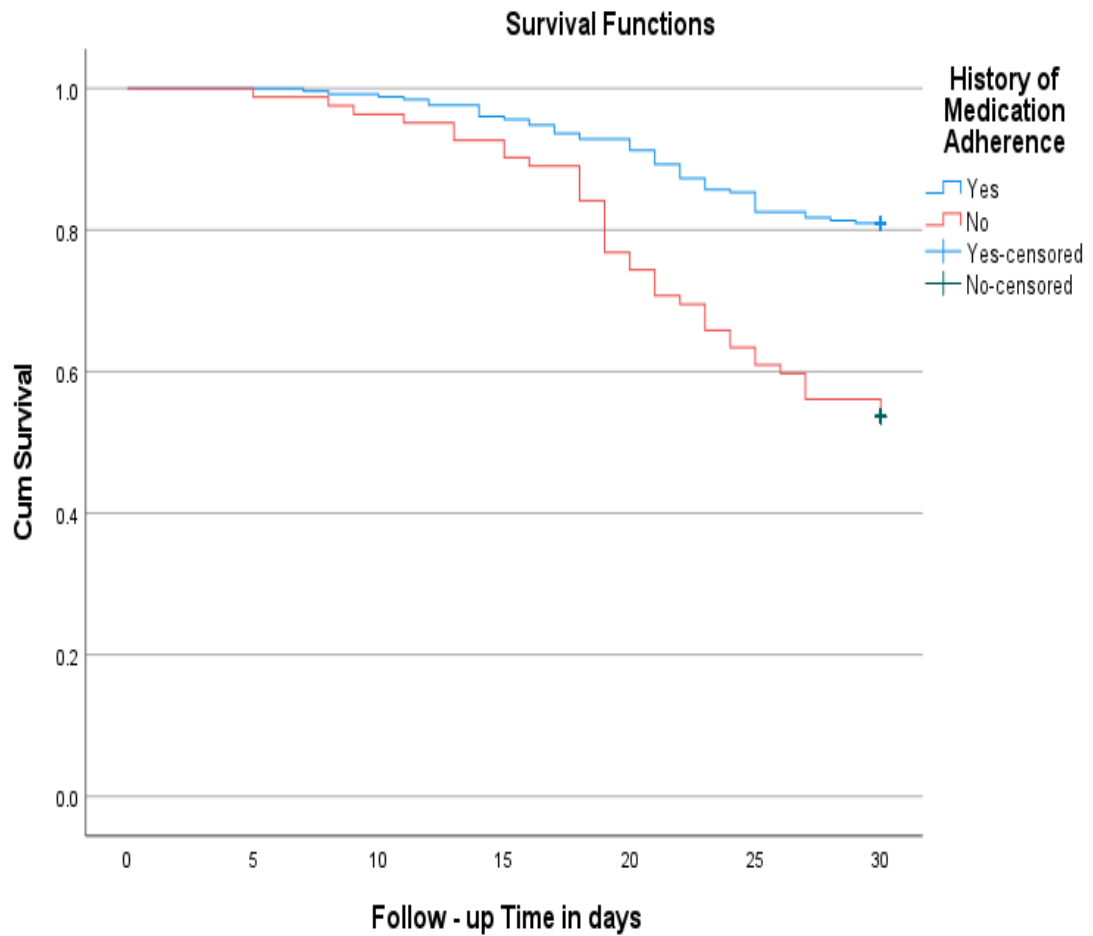


Figure 5: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Medication Adherence at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value <.001)

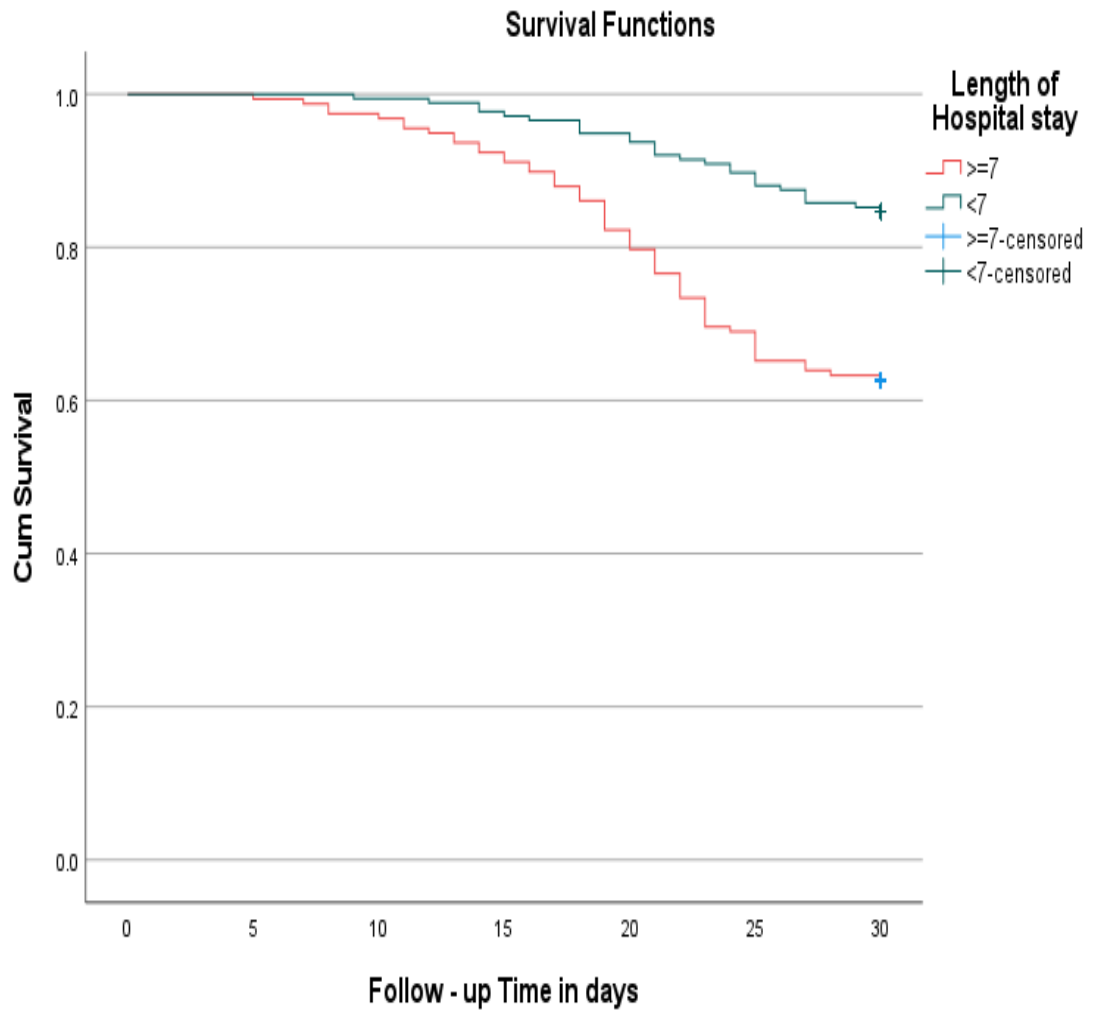


Figure 6: Kaplan-Meier estimate survival Function of unplanned readmission of Heart failure patients with Medication Adherence at public Hospitals in Nekemte Town, West Oromia, Ethiopia 2025 (log rank, P-value $< .001$)

5.6 Predictors of Unplanned Readmission

Binary Cox regression model was used to select candidate variables with p-value of less than 0.25 and from this model about 18 independent variables were selected for multivariable analysis (**Table 7**). The candidate variables were entered to multivariable Cox regression model to select final significant variables. And about four variables were selected with p-value less than 0.05. In Multivariable Cox proportional hazards model; age, Residency medication adherence, and length of Hospital stay were significant predictors of unplanned readmission with p-value of less than 0.05 (**Table 7**)

A multivariable cox-proportional Hazards analysis show that patients with heart failure who were aged greater or equal to sixty five years had more than three times hazard of un planned readmission (AHR: 3.40, 95% CI: 1.97,5.87) compared to heart failure patients with age less than 65 years. Heart failure patients of rural residency had more than 2 folds hazards of unplanned readmission to hospital comparing to heart failure of urban residency with (AHR: 2.35,95% CI: 1.40, 3.94).

Patients with Poor Medication adherence had more than 2 folds hazards of readmission (AHR: 2.03, 95% CI: 1.26, 3.26) when compared with those patient who took their medication accordingly. The Hazard of un planned readmission was three times higher for patients who stayed more than seven days in Hospital comparing to those stayed less than seven days in hospital (AHR: 3.10, 95% CI:1.92, 5.01).

Table 7: Bivariable and multivariable Cox proportional hazard regression model of the study of unplanned readmission of Heart failure patients at public Hospitals in Nekemte Town, West Oromia, Ethiopia, 2025

Variables	Categories	Status		CHR (95%CI)	AHR (95%CI)	P-value
		Readmitted n (%)	Censored n (%)			
Age	<65	53 (61.6)	226 (91.1)	(1)	(1)	
	≥65	33 (38.4)	22 (8.9)	4.14(2.68, 6.40)	3.01(1.79, 5.05)	<0.001
Residency	Urban	19 (22.1)	107 (43.2)	(1)	(1)	
	Rural	67 (77.9)	141 (56.9)	0.41 (0.25, 0.69)	2.35(1.40, 3.94)	0.001
Marital Status	Single	2 (2.3)	29 (11.7)	(1)	(1)	.183
	Married	70 (81.4)	208 (83.9)	4.23 (1.04, 17.25)	2.64(0.64, 10.95)	
	Widowed	14 (26.3)	11 (4.4)	12.51(2.84, 55.09)	4.01 (0.84,19.01)	
Educational Status	Primary school and above	44 (51.2)	177(71.4)	(1)	(1)	
	Unable to read and write	42 (48.8)	71 (28.6)	1.99 (1.31, 3.05)	.90 (.54,1.52)	.701
Occupation	Farmer	72 (83.7)	167 (67.3)	(1)	(1)	
	Merchant	7 (8.1)	36 (14.5)	0.49 (0.22, 1.06)	1.11(.44, 2.80)	.831

	Student	2 (2.3)	27 (10.9)	.20 (.05,.83)	2.41(.014,41.88)	.738
	Other *	5 (5.8)	18 (7.3)	.68 (.27, 1.68)	1.03 (.37, 2.85)	.955
Hemoglobin level	< 13mg/dl	33 (38.4)	62 (25)	(1)	(1)	
	>= 13mg/dl	53 (61.6)	186 (75)	0.59 (0.38, 0.91)	0.77 (0.49,1.22)	0.262
Random Blood sugar	=< 200 mg/dl	80 (93.1)	206 (83.1)	(1)	(1)	
	>200 mg/dl	6 (6.9)	42 (16.9)	0.42 (0.18, 0.96)	2.52 (1.09,5.83)	0.301
Systolic Blood Pressure in mmgh	< 140	60 (69.8)	202 (81.5)	(1)	(1)	
	>= 140	26 (30.2)	46 (18.5)	1.71 (1.08, 2.71)	0.80 (0.47, 1.35)	0.401
Medication Adherence	Yes	48 (55.8)	204 (82.3)	(1)	(1)	
	No	38 (44.2)	44 (17.7)	0.35 (0.23, 0.53)	2.21 (1.39, 3.50)	<0.001
NYHA Class	Class 3	5 (5.8)	45 (18.1)	(1)	(1)	
	Class 4	81 (94.2)	203 (81.6)	3.15 (1.28, 7.77)	1.19 (.45, 3.14)	.730
Treated by Digoxin	Yes	79 (91.9)	190 (76.6)	3.01 (1.39, 6.53)	1.71(0.77, 3.79)	0.185
	No	7 (8.1)	58 (23.4)	(1)	(1)	
Treated by ACEI	Yes	25 (29.1)	51 (20.6)	1.49 (.94, 2.39)	1.34 (0.84, 2.22)	0.285
	No	61 (70.9)	197 (79.4)	(1)	(1)	
Length of Hospital stay	< 7	59 (68.6)	99 (39.9)	(1)	(1)	
	>= 7	27 (31.4)	149 (60.1)	2.84(1.80, 4.48)	2.72 (1.71, 4.31)	<0.001

History of Diabetic Mellitus	Yes	3 (3.5)	20 (8.1)	0.48 (0.18, 1.46)	1.13 (.33,3.80)	.848
	No	83 (96.5)	228 (91.9)	(1)	(1)	
History COPD	Yes	2 (2.3)	19 (7.7)	0.34 (0.08, 1.36)	083 (.20, 3.53)	.801
	No	84 (97.7)	229 (92.3)	(1)	(1)	
History of Chronic Kidney diseases	Yes	14 (16.3)	21 (8.5)	1.79 (1.01, 3.18)	1.74 (0.97, 3.13)	.097
	No	72 (83.7)	227 (91.5)	(1)	(1)	
History of Un controlled Hypertension	Yes	11 (12.8)	13 (5.2)	2.08 (1.11, 3.92)	1.07 (0.48, 2.37)	.877
	No	75 (87.2)	235 (94.8)	(1)	(1)	
History of Anemia	Yes	15 (17.4)	25 (10.1)	1.62 (0.93, 2.82)	1.19 (.60, 2.39)	0.616
	No	71 (82.6)	223 (89.9)	(1)	(1)	

*** (Government employed and daily laborers)**

6. DISCUSSION

The aim of the study was to determine incidence and predictors of unplanned hospital readmission of heart failure patients at Nekemte Town Public Hospitals. The study shows that cumulative incidence of unplanned hospital readmission was 25.8%. This was consistent with the result of study done in Australia (25%) (23), Spain (21%) (29), Brazil (22%) (22), Chicago (23.4) (17), Oman (24%) (21), Beijing Hospital (20.7%) (34) and South Walo Public Hospitals (26.4%) (32). Possible reason may be chronic illness coexist most of the time which similar around the globe, lack of enough support from family and care givers, increasing effect of globalization, and infections due to reduced immunity by chronic illness.

Contrary to this, result of this study was lower to studies done in Mid-Atlantic Region (67%) (55), Australia (60.4%), Australia (41.3%) (35), Yale University Conn (50%) (23). This could be occurred due to follow up time was different, higher life expectancy (Australia (83.2) vs Ethiopia (67.6), mid Ailanthic region (77.2) vs Ethiopia (67.7). In addition to this the result of this study Higher to result of studies done in China (11%) (24), Japan Tokyo (3.8%) (26) and Yekatet 12 Hospital (13.2%) (42). Justification is the length follow-up time was different. Socioeconomic status of the study population is lower to participants of China, Japan and Addis Ababa, health care quality, post discharge support (house to house service), service provided, better medication supply and insurance coverage the study participants may be different.

Finding of the study indicate that being older (age ≥ 65 years) increases the hazards of unplanned readmission comparing with whose age < 65 years. This finding goes in line with study done in Netherlands (36), Australia (37), Oman (21) and study done in Northern Ethiopia (20). The viable reason why hazards increased in old age may be: rising chronic diseases prevalence, usage poly pharmacy for chronic illness, limitation in physical activities, cognitive decline which may in turn affect self-care, a greater susceptibility to adverse events, and lack social support due to unable to perfume daily activities. Besides to this old age is number one risk factor for chronic diseases including Heart failure; the quality of life is significantly affected by getting older which in turn increase chance getting illness.

Being rural resident was significant independent predictors of unplanned hospital readmission. The finding was consistent with the study done in Chile (38), and

Northern Ethiopia (12). The reason behind may be due to limited access to specialized care (specialist, specialized equipment, and advanced diagnostic tool), and transportation. Limited family support, unable to maintain follow-up schedule, reduced compliance to prescribed medication.

Poor medication Adherence is other significant predictors of unplanned hospital readmission among heart failure patients from cox proportional hazard. The result study was match with result of study done in USA (46), Saud Arabia (47), and North west Ethiopia(44). Contributing factors may be number and dosing frequency cardiac medication, lack of knowledge about medications, difficulty in taking medication, adverse side effect of medications, cost medications, financial difficult to collect medication, psychological factors(fear depression worry and limited social support could be possible reasons.

This study found that heart failure patients stayed hospital for more than seven days had hazards of unplanned hospital readmission comparing to those stayed less than seven days during their admission. This was similar with the result of study done in German(43), North West Ethiopia (32). This is may be related more complicated case more hospital stay, it could implies presence of underlying conditions or complications, and approach to treat the patients will its own consequences.

7. LIMITATION OF THE STUDY

The study was retrospective (historical) it uses secondary data. Because of small sample size and short follow-up time the median time of readmission was not estimated. Important variables like income of house hold, dietary habit of the study subject, history of family support, and cost for care both in cash and kind were not included in study since it difficult to get information from patient charts.

8. CONCLUSION AND RECOMMENDATION

8.1 Conclusion

The incidence of unplanned hospital readmission among heart failure patients was high. Age greater or equal to 65 years, rural residency, poor medication adherence and long hospital stay during index admission were significant predictors of unplanned hospital readmission. Giving more attention to older patients with heart failure, increase access of quality care at periphery, educating family and patients on proper use of prescribed medication, and treating heart failure and all underlying causes of prolong hospital stay will enhance chance to reduce readmission.

8.2 Recommendation

For health care providers: educating patients and their families on medication adherence, life style modification and identifying early warning signs of worsen heart failure.

For hospital: Ensure effective communication between staffs and patients or their families, and providing access to home health care.

Researcher: conducting further study with other design to dig out other predictors of the incidence unplanned readmission.

9. REFERENCE

1. Circulatory AIN, Functions R, Vascular P. Harrison Principle of Internal Medicine. In: Douglas L. Mann MC, editor. 19th ed. 2015. p. 1500–19.
2. Standard Treatment Guidelines for General Hospitals Fourth Edition,. 2021;
3. Hu J bo, He Z kai, Cheng L, Zheng C zhou, Wu B zhen, He Y. A Predictive Model of Early Readmission for Patients with Heart Failure. 2022;88–96.
4. Ziaecian B, Fonarow GC, Young CE, South D, Angeles L, Angeles L. HHS Public Access. 2017;13(6):368–78.
5. States U, Pearson-stuttard J, Oxon MA, Guzman-castillo M, Penalvo JL, Rehm CD, et al. Epidemiology and Prevention Modeling Future Cardiovascular Disease Mortality in the. 2016;967–78.
6. Farré N, Vela E, Clèries M, Bustins M, Cainzos-achirica M, Enjuanes C, et al. Medical resource use and expenditure in patients with chronic heart failure : a population-based analysis of 88 1 95 patients. 2016;32–40.
7. Goldgrab D, Balakumaran K, Kim MJ, Tabtabai SR. Updates in heart failure 30-day readmission prevention. 2019;(November 2018):177–87.
8. Sond J, Lau CSM, Siracuse BL. Determining 30-day readmission risk for heart failure patients : the Readmission After Heart Failure scale. 2018;127–41.
9. Mar A, Damas-fuentes M, Cornejo-pareja I, Tinahones FJ. Heart Failure in Type 1 Diabetes : A Complication of Concern ? A Narrative Review. 2021;1–15.
10. Omboni S. Angiotensin Receptor Blockers Versus Angiotensin Converting Enzyme Inhibitors for the Treatment of Arterial Hypertension and the Role of Olmesartan. Adv Ther. 2019;36(2):278–97.
11. Croke K, Ave H. The origins of Ethiopia ’ s primary health care expansion : The politics of state building and health system strengthening. 2020;(November):1318–27.
12. Ayenew B, Kumar P, Hussein A. Unplanned readmission to hospital and its predictors in heart failure patients , Ethiopia : a retrospective cohort study. 2022;
13. Mellitus D, Kidney C, Diseases C. NATIONAL STRATEGIC PLAN FOR THE PREVENTION AND CONTROL OF MAJOR NON-COMMUNICABLE DISEASES. 2024;(July 2020).
14. Mebazaa A. HHS Public Access. 2021;6(1):1–33.
15. Anderson SL, Marrs JC. A Review of the Role of the Pharmacist in Heart Failure Transition of Care. Adv Ther. 2018;35(3):311–23.

16. Farah M, Mohamud Y, Osman M, Jeele O, Cetinkaya O. Baseline Characteristics , Risk Factors and Etiology of Heart Failure Among Patients Hospitalized at a Teaching Hospital in Somalia : Cross-Sectional Study. 2022;(September):63–71.
17. Pishgar M, Theis J, Rios M Del, Ardati A, Anahideh H, Darabi H. Prediction of unplanned 30 - day readmission for ICU patients with heart failure. BMC Med Inform Decis Mak. 2022;1–12.
18. Id H peter B la R, Peden CJ, Soong J, Holman PA, Bogdanovskaya M, Barclay L. PLOS ONE Reasons for readmission after hospital discharge in patients with chronic diseases — Information from an international dataset. 2020;
19. Desalegn N. International Journal of Anesthesiology & Research (IJAR) ISSN 2332-2780 Causes of Admission And Clinical Outcomes Among Adult ICU Admitted Patients at Wollega University Referral Hospital. 2021;09(03):636–41.
20. Ayenew B, Kumar P, Hussein A. Incidence and predictors of unplanned 30 - day hospital readmissions among heart failure patients in Ethiopia : a 5 - year retrospective cohort study. Sci Rep [Internet]. 2024;(0123456789):1–9. Available from: <https://doi.org/10.1038/s41598-024-71257-x>
21. Al-maqbali JS, Yusuf Z, Mohammed A, Alawi A. Incidence and Risk Factors for 28 Days Hospital Readmission: A Retrospective Study from Oman 1. 2022;37(5):5–10.
22. Gedfew M. Number of readmissions and its determinants among patients with heart failure at referral hospitals in Amhara region , Northwest Ethiopia ; 2023 , A Zero-Inflated Negative Binomial model. 2023;1–16.
23. Krumholz HM, Chen Y ting, Wang Y, Vaccarino V, Radford MJ, Horwitz RI, et al. Predictors of readmission among elderly survivors of admission with heart failure. 1995;
24. Wang H, Johnson C, Robinson RD, Nejtek VA, Schrader CD, Leuck J, et al. Roles of disease severity and post- discharge outpatient visits as predictors of hospital readmissions. BMC Health Serv Res. 2016;1–10.
25. Finlayson K, Chang AM, Courtney MD, Edwards HE, Parker AW, Hamilton K, et al. Transitional care interventions reduce unplanned hospital readmissions in high- risk older adults. 2018;9:1–9.
26. Ohnuma T, Shinjo D, Brookhart AM, Fushimi K. Predictors associated with unplanned hospital readmission of medical and surgical intensive care unit survivors within 30 days of discharge. 2018;1–9.
27. Wang H, Robinson RD, Johnson C, Zenarosa NR, Jayswal RD, Keithley J, et al. Using the LACE index to predict hospital readmissions in congestive heart

- failure patients. 2014;1–8.
28. Sarteschi C, Souza WV De, Medeiros C, Martins M, Ângela E, Cesse P, et al. Predictors of Post-Discharge 30-Day Hospital Readmission in Decompensated Heart Failure Patients. 2020;33(2):175–84.
 29. Biswas S, Dinh D, Lucas M, Du SJ, Brennan AL, Liew D, et al. Incidence and Predictors of Unplanned Hospital Readmission after Percutaneous Coronary Intervention. 2020;1–11.
 30. Douglas-cooke A. Running Head: 30-DAY READMISSIONS AFTER HEART FAILURE 1. 2021;1–159.
 31. Cui L, Wang H. Factors influencing unplanned readmission within 30 days in patients with heart failure and their predictive value : a prospective study. 2024;1–20.
 32. Ayenew B, Kumar P, Hussein A, Gashaw Y, Girma M, Ayalew A, et al. Heart failure drug classes and 30-day unplanned hospital readmission among patients with heart failure in Ethiopia. J Pharm Heal Care Sci [Internet]. 2023 Nov 27;9. Available from: <https://discovery.researcher.life/article/heart-failure-drug-classes-and-30-day-unplanned-hospital-readmission-among-patients-with-heart-failure-in-ethiopia/9e227f8e8a3e30e0bb4f48a29cc966b9>
 33. Heart IJC, Patel A, Khawaja S, Dang T, Ranasinghe I. Incidence , timing and variation in unplanned readmissions within 30-days following isolated coronary artery bypass grafting. IJC Hear Vasc [Internet]. 2025;56(July 2024):101552. Available from: <https://doi.org/10.1016/j.ijcha.2024.101552>
 34. Shebeshi DS, Dolja-gore X, Byles J. Unplanned Readmission within 28 Days of Hospital Discharge in a Longitudinal Population-Based Cohort of Older Australian Women. 2020;
 35. Pu B, Wang W, Yu Y, Peng Y, Lei L, Li J, et al. Characteristics and Factors of 30-Day Readmissions after Hospitalization for Acute Heart Failure in China. 2024;25(8).
 36. Riet G, Latour MVRCHM, Scholte RJGPWJM. Readmission and mortality in patients ≥ 70 years with acute myocardial infarction or heart failure in the Netherlands : a retrospective cohort study of incidences and changes in risk factors over time. 2019;134–41.
 37. Zumbrunn A, Bachmann N, Bayer-oglesby L, Joerg R, Team S. Social disparities in unplanned 30-day readmission rates after hospital discharge in patients with chronic health conditions : A retrospective cohort study using patient level hospital administrative data linked to the population census in Switzerland. 2022;1–26.
 38. Verdejo HE, Ferreccio C, Castro PF. H e a r t Fa i l u r e i n R u r a l

Communities. *Heart Fail Clin* [Internet]. 2015;11(4):515–22. Available from: <http://dx.doi.org/10.1016/j.hfc.2015.07.011>

39. Biagioni C, Puri R, Delarochelli re R, Dumont E, Doyle D, Paradis J michel, et al. Incidence, Causes, and Predictors of Early (# 30 Days) and Late Unplanned Hospital Readmissions After Transcatheter Aortic Valve Replacement. 2015;8(13):1748–57.
40. Durand E, Doutriaux M, Bettinger N, Tron C, Fauvel C, Bauer F, et al. Incidence, Prognostic Impact, and Predictive Factors of Readmission for Heart Failure After Transcatheter Aortic Valve Replacement. 2017;10(23).
41. Phemphul C, Pansila W, Vibulchai N, Wongvipaporn C. Factors Predicting Hospital Readmission among Thais with Post Myocardial Infarction [version 1 ; peer review : 1 approved with reservations , 2 not approved]. 2022;1–16.
42. Solela G. Clinical characteristics , treatment patterns , and outcomes of hospitalized patients with acute heart failure in central Ethiopia : a retrospective observational study. 2024;1–12.
43. Delgado JF, Crespo-Leiro MG, Pascual Figal D, Garc a RV, Gonz lez-Juanatey JR, Claret RB, et al. Patient-Associated Predictors of 15- and 30-Day Readmission After Hospitalization for Acute Heart Failure. *Curr Heart Fail Rep* [Internet]. 2019 Nov 25;16. Available from: <https://discovery.researcher.life/article/patient-associated-predictors-of-15-and-30-day-readmission-after-hospitalization-for-acute-heart-failure/7895cc2e973f36cb97c8196fe3e3548e>
44. Dessie G, Burrowes S, Mulugeta H, Haile D, Negess A, Jara D, et al. Effect of a self - care educational intervention to improve self - care adherence among patients with chronic heart failure : a clustered randomized controlled trial in Northwest. 2021;1–11.
45. Cui L, Wei X, Liang T, Yan R, Du M, Alimire T, et al. Factors influencing unplanned readmission within 30 days in patients with heart failure and their predictive value: a prospective study. *BMC Cardiovasc Disord*. 2025;25(1).
46. Dunbar-jacob JM. Medication Adherence Interventions Improve Heart Failure Mortality and Readmission Rates: Systematic Review and Meta-Analysis of Controlled Trials. :1–18.
47. Murad H, Basheikh M, Zayed M, Albeladi R, Alsayed Y. The Association Between Medication Non-Adherence and Early and Late Readmission Rates for Patients with Acute Coronary Syndrome. 2022;(August):6791–9.
48. Tigabe M. Clinical Characteristics and In-Hospital Outcome of Acute Heart Failure Patients Admitted to the Medical Ward of University of Gondar Comprehensive Specialized Hospital , Northwest. 2021;(September).

49. Abdelhafeez MF, Ahmed M, Mansour M, Mostafa MM, Almasry MA. Predictors of Postoperative 30 Days Unplanned Readmission among Patients Undergoing Cardiac surgeries. 2024;33–42.
50. Kumara MG, Debelew GT. Trend , prevalence , and associated factors of uterine rupture at Nekemte Specialized Hospital , Oromia Regional State , Western. 2024;1–14.
51. Shama AT, Terefa O, Gadisa I, Feyera G, Tamiru G, Terefa DR. Surgical management outcome and its associated factors among intestinal obstruction patients admitted to adult surgical ward of Wollega University Referral. 2023;1–9.
52. Tolossa T, Fetensa G, Ayala D, Wakuma B. Health professionals ' COVID-19 vaccine acceptance and associated factors in Wollega University referral hospital , Western Ethiopia : A cross- sectional study. Hum Vaccin Immunother [Internet]. 2022;18(5). Available from: <https://doi.org/10.1080/21645515.2022.2069960>
53. Rosano GMC, Vitale C, Adamo M, Metra M. Roadmap for the management of heart failure patients during the vulnerable phase after heart failure hospitalizations : how to implement excellence in clinical practice. 2022;0.
54. Jimmy B, Jose J. Patient Medication Adherence: Measures in Daily Practice. 2011;26(3):155–9.
55. Baughman D. Hospital Readmission Rates for Patients Receiving In-Person vs . Telemedicine Discharge Follow-Up. 2024;(May).

10. APPENDIX

10.1 Appendix 1 Data collection Tools

The aim of the study is to assess the incidence and predictors of unplanned readmission among heart failure patients admitted to public Hospital in Nekemte Town from Jan 1, 2019 - Dec 28 2024

I. Socio Demographics	
101. Card number	_____ ,
102. Date of admission (dd/mm/yyyy)	_____
103. Age (in years)	_____
104. Sex	1 Male 2 Female
105. Residency	1 Urban 2 Rural
106. Marital status	1 Single 2 Married 3 Widowed 4 Divorced
106. Religion	1 Orthodox 2 protestant 3 Muslim 4 Others
107. Ethnicity	1 Oromo 2 Amhara 3 Gurage 4 Others
108. Educational status	1 unable to read and write 2 Primary 3 Secondary 4 College and above
109. Occupation	1 farmer 2 merchants 3 Government employee 4 Students 5 Others

110.. Date of last Discharge (dd/mm/yyyy)	_____
II. Behavior related Risk Factors	
200. Smoking	1 yes 2 No
201. Alcohol consumption	1 yes 2 No
202. Chewing chat	1 yes 2 No
203. Medication adherence	1 yes 2 No
III. Baseline laboratory marker, medication and Clinical characteristics	
300. Admission status	1. not admitted before 2. admitted within 30 days of last discharge 3 admitted after 30 days of last discharge.
301. if admitted within how many days	
302. Hemoglobin In (g/dl)	_____
303. Random Blood Sugar (mg/dl)	_____
304. Criterine level in mg/dl	_____
305. Blood Pressure in mmHg	_____
306. NYHA Class	1. NYHA class I 2. NYHA class II 3. NYHA class III 4. NYHA class IV
307. length of hospital stay in days	_____
308. Is patient treated with digoxin	1. Yes 2. No
309. Is patient treated with angiotensin converting enzyme inhibitors	1. Yes 2. No

310. Is patient treated with beta blockers	1. Yes 2. No
311. Is patient treated with diuretics	1. Yes 2. No
312. Is patient treated with angiotensin receptors blockers	1. Yes 2. No
IV. Comorbid conditions	
401. Having Diabetic Mellitus	1. yes 2. No
402. Having Asthma	1. yes 2. No
403. Having Chronic Obstructive Pulmonary Disease (COPD)	1. Yes 2. No
404. Having Chronic Kidney Disease	1. Yes 2. No
405. Having Un Controlled HTN	1. Yes 2. No
406. Having Anemia	1. yes 2. No
407. Having HIV/AIDS	1. Yes 2. No
408. Having Stroke	1. yes 2. No