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Predictors of Postoperative Renal Dysfunction among Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

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Abstract

Background: Postoperative renal dysfunction (PORD) is a critical complication following major vascular surgery, associated with elevated morbidity and mortality. Characterized by an acute decline in kidney function after surgery, it complicates recovery and prolongs hospitalization. The occurrence and severity of PORD are influenced by preoperative health status, intraoperative management, and postoperative care. Limited local data exists on the predictors of PORD within the high-risk major vascular surgery population at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa, Ethiopia. Identifying these predictors is crucial for developing targeted interventions to mitigate risk and improve patient outcomes.

Methods: A retrospective cross-sectional study was conducted on patients who underwent major vascular surgery at TASH between January 2018 and December 2024. Data were collected retrospectively from the medical records of eligible patients using a standardized data collection form. Key variables analyzed included socio-demographic information, comorbidities (e.g. diabetes mellitus, hypertension), intraoperative factors (e.g. surgery duration, blood loss, intraoperative hemodynamic status, anesthetic technique), and postoperative care parameters. Renal function was assessed using serum creatinine levels and urine output measurements. Multivariable logistic regression analysis was performed to identify independent predictors of PORD.

Results: Among the 377 patients included in the study, the incidence of PORD was 22.5%. Multivariable logistic regression analysis identified the following independent predictors of PORD: older age (≥60 years) (Adjusted Odds Ratio [AOR] = 5.991, 95% CI = 3.324–10.799, $p < 0.001$), pre-existing chronic kidney disease (AOR = 3.493, 95% CI = 1.520–8.027, $p = 0.003$), history of diabetes mellitus (AOR = 2.368, 95% CI = 1.226–4.573, $p = 0.010$), intraoperative blood loss ≥500 mL (AOR = 4.631, 95% CI = 2.125–10.094, $p < 0.001$), and inadequate intraoperative urine output (<0.5 mL/kg/hr) (AOR = 2.356, 95% CI = 1.129–4.916, $p = 0.022$) were independent predictors of PORD.

Conclusion: This study identified several independent predictors of postoperative renal dysfunction in patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital (TASH), including older age, pre-existing chronic kidney disease, diabetes mellitus,

significant intraoperative blood loss, and inadequate intraoperative urine output. These discoveries emphasize the significance of thorough preoperative evaluation and optimization,

as well as careful intraoperative management, in order to potentially minimize the occurrence of this serious complication in this particular context.

Keywords: Postoperative renal dysfunction, major vascular surgery, predictors, Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia.

Chapter 1: Introduction

1.1 Background

Vascular surgery is a specialized field focused on the treatment of diseases affecting the vascular system, including arteries, veins and lymphatic vessels [1]. Major vascular surgery includes conditions such as aortic aneurysm, peripheral artery disease, iliac artery disease, mesenteric and celiac artery disease, and carotid disease. These procedures, including open aortic repair, endovascular aneurysm repair, and peripheral vascular interventions such as thrombectomy, grafts, and bypass grafts, are critical to managing life-threatening vascular conditions and improving patient outcomes [2]. Despite their importance, these operations carry the risk of postoperative complications, including renal dysfunction.

Postoperative renal dysfunction, characterized by a decline in renal function after vascular surgery, is a significant problem in the surgical population. This condition is often assessed by an increase in serum creatinine,decrease in Urine output or decrease in glomerular filtration rate (GFR) [3]. Renal dysfunction can lead to prolonged hospitalization, increased morbidity, increased costs and mortality, therefore its prevention and treatment in surgical care is essential [4]. The incidence of renal dysfunction varies among different types of surgery and is influenced by a number of factors, including patient comorbidities, surgical techniques, and intraoperative management [5].

Several factors contribute to postoperative renal dysfunction in vascular surgery patients. Baseline renal function is a critical determinant of postoperative renal outcomes, with patients with preexisting renal impairment at higher risk of further renal deterioration after vascular surgery [6]. Intraoperative factors such as the duration of surgery, mode of anesthesia, blood loss, hemodynamic instability, and the use of contrast agents can significantly impact renal function, especially in major vascular surgeries that often involve complex and lengthy procedures [7]. Chronic conditions like diabetes mellitus, hypertension, heart disease,Smoking , and obesity also increase the risk of postoperative renal dysfunction by affecting renal perfusion and exacerbating renal injury following vascular surgery [8, 9]. In addition, inadequate fluid resuscitation or excessive blood loss can lead to renal hypoperfusion and subsequent dysfunction, so effective intraoperative fluid management is essential to maintain renal perfusion and prevent renal complications.

Tikur Anbessa Specialty Hospital, located in Addis Ababa, Ethiopia, serves as a major referral center for complex surgical cases, including large numbers of major vascular cases. The diverse hospital patient population presents unique challenges and opportunities for studying postoperative outcomes [10]. In a resource-limited setting such as Ethiopia, understanding the predictors of postoperative renal dysfunction is particularly important to improve patient care and optimize surgical outcomes.

The hospital's patient demographics, which include a significant proportion of individuals with comorbid conditions prevalent in the Ethiopian population, such as hypertension and diabetes, further underscore the need for targeted research. Identification of specific predictors of renal dysfunction in this setting may provide more effective preoperative assessment, surgical planning, and postoperative care strategies [10, 11].

While there is extensive research on postoperative renal dysfunction in various surgical contexts, studies specifically focused on major vascular surgery in the Ethiopian context are limited. Most existing research often focuses on specific types of vascular procedures, which may not capture the full spectrum of risk factors present in different surgical contexts [12]. A comprehensive study of all major vascular surgeries at Tikur Anbessa Specialist Hospital can address this gap by providing insight into predictors of renal dysfunction across different types of vascular procedures.

This study aims to identify predictors of postoperative renal dysfunction among patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital. Understanding the predictors of postoperative renal dysfunction in the context of major vascular surgery is critical to improving patient outcomes and optimizing surgical care. This study at the Tikur Anbessa Specialist Hospital can contribute valuable insights into factors influencing renal function, address specific issues in the Ethiopian health care environment, and support the development of effective interventions to alleviate renal complications in vascular surgery patients.

1.2 Statement of the Problem

Postoperative renal dysfunction is one of the complications after major vascular surgery and poses challenges for patient treatment and recovery [13]. Despite advances in surgical techniques and perioperative care, the incidence of renal complications remains a unknown, especially in resource-limited facilities such as Tikur Anbessa Specialist Hospital in Addis Ababa, Ethiopia.

Postoperative renal dysfunction, which is characterized by deterioration of kidney function that may be manifested by elevated serum creatinine levels, decrease in UOP, decreased glomerular filtration rate (GFR). This condition is associated with adverse outcomes including prolonged hospital stays,Increase cost, increased morbidity, and higher mortality [14]. In the context of Tikur Anbessa Specialized Hospital, limited data are available on the prevalence and predictors of renal dysfunction after various types of major vascular surgery, which hinders the development of a targeted prevention and treatment strategy [10, 11].

Risk factors for postoperative renal dysfunction are multifaceted and may vary significantly depending on the type of vascular surgery performed. Factors such as complexity and length of surgery, intraoperative hemodynamic management, use of contrast media, and preexisting comorbid conditions all play a role in influencing renal outcomes. The variability of risk factors across different vascular procedures requires a comprehensive analysis to identify common and unique predictors of renal dysfunction [15]. Without a thorough understanding of these risk factors in the specific context of Tikur Anbessa Specialist Hospital, it is challenging to implement effective preventive measures and improve patient outcomes.

There is a paucity of local research examining postoperative renal dysfunction in patients undergoing major vascular surgery in the Ethiopian context [12]. Most existing studies focus on specific types of vascular surgery or are conducted in high-resource settings with different patient demographics and surgical procedures. This lack of localized data limits the ability to tailor prevention and management strategies to the unique needs and conditions of patients at Tikur Anbessa Specialist Hospital. Understanding the specific predictors of renal dysfunction in this setting is essential to develop relevant and effective clinical recommendations.

Tikur Anbessa Specialized Hospital serves a substantial population in Ethiopia with a high burden of complex vascular diseases, including peripheral artery disease and aortic aneurysms, frequently necessitating major surgical intervention [10].There is a study in Tikur anbessa Specialized Hospital Shows fast evolving of cases which need major surgical intervention,Over ayear 386 cases had been seen Only at surgical OPD 20% of them need admission & were operated:Nebyou Seyoum et al.Ethiop J Health sci 2019 May.

This high volume of vascular surgery patients presents a significant clinical challenge concerning postoperative renal dysfunction, a known complication associated with increased morbidity, mortality, prolonged hospital stays, and elevated healthcare costs. Despite the recognized risks, the specific incidence of postoperative renal dysfunction following major vascular surgery at Tikur Anbessa Specialized Hospital remains unexplored. This lack of localized epidemiological data hinders a clear understanding of the magnitude of the problem within this unique clinical context [17].

Furthermore, while established international literature identifies various risk factors for postoperative renal dysfunction (e.g., pre-existing comorbidities like diabetes and hypertension, surgical complexity and duration, intraoperative hemodynamic instability, and the use of contrast media), the applicability and relative contribution of these factors within the specific patient population, surgical practices, and resource constraints of Tikur Anbessa Specialized Hospital are largely unknown. The interplay of these factors may differ significantly from high-income settings where most existing research originates.

The absence of localized data on the predictors of postoperative renal dysfunction across the spectrum of major vascular surgeries performed at Tikur Anbessa Specialized Hospital impedes the development and implementation of targeted, evidence-based preventive and management strategies. Understanding which specific patient-related, surgical, and perioperative factors are most strongly associated with renal complications in this setting is crucial for effective risk stratification and the optimization of perioperative care protocols [11].

To address these issues, there is a critical need for a comprehensive study that identifies predictors of renal dysfunction across different types of major vascular surgery. This study aims to fill critical gaps in knowledge by generating localized data on predictors of postoperative renal dysfunction in major vascular surgery at Tikur Anbessa Specialized Hospital. The findings will contribute to improving clinical decision-making, enhancin

patient care protocols, and ultimately optimizing outcomes for patients undergoing vascular procedures in the Ethiopian healthcare context.

1.3 Significance of the Study

Postoperative renal dysfunction is a serious complication that can significantly affect patient outcomes after major vascular surgery. Kidney damage can lead to prolonged hospitalization, increased morbidity and higher mortality. Given the critical role of renal function in overall health and recovery, understanding the predictors of renal dysfunction is critical to optimizing surgical care and improving patient outcomes. By focusing on patients undergoing major vascular surgery at the Tikur Anbessa Specialist Hospital, this study addresses an urgent clinical problem relevant to both the hospital and the wider context of Ethiopian health care.

Tikur Anbessa Specialist Hospital serves as the main referral center for complex surgical cases in Addis Ababa, Ethiopia. The patient population at this institution is diverse, with a variety of comorbidities and socioeconomic factors that may affect postoperative outcomes. Localized research is necessary to understand how these specific factors influence renal dysfunction in the context of major vascular surgery. As most existing research in renal dysfunction comes from high-resource settings or focuses on specific types of vascular surgery, this study fills a critical gap by providing insights tailored to the unique conditions and patient demographics of Tikur Anbessa Specialist Hospital.

Major vascular surgery involves different procedures with different risk profiles. By studying predictors across all types of major vascular surgery, this research identifies both common and unique risk factors associated with renal dysfunction. This comprehensive approach was provide a more detailed understanding of how various procedures and patient characteristics contribute to kidney injury. These findings are essential for the development of targeted interventions and prevention strategies that address the full spectrum of risks associated with vascular surgery.

Understanding and mitigating postoperative renal dysfunction is an integral part of improving the quality of health care. By providing data-driven insights into predictors of renal injury,

this study was support the development of evidence-based protocols and guidelines for renal risk management in major vascular surgery. Improved quality of care can lead to better patient outcomes, more efficient use of health care resources, and increased overall safety in surgical practice.

The current literature on postoperative renal dysfunction often lacks a comprehensive analysis of different types of major vascular surgery and does not fully reflect the conditions present in resource-limited settings such as Ethiopia. This study was contribute valuable data to the existing body of knowledge, address gaps in understanding, and highlight factors that may be specific to the Ethiopian context. This contribution was not only strengthen scientific knowledge, but also provide a basis for future improvements in research and practice.

The results of this study was have practical implications for clinical practice in Tikur Anbessa Specialist Hospital and similar healthcare facilities. Identification of predictors of renal dysfunction was allow clinicians to tailor preoperative assessment, intraoperative management, and postoperative care based on individual risk profiles. This targeted approach may lead to more effective prevention and treatment strategies, ultimately improving patient safety and surgical outcomes.

The insights gained from this research can inform hospital policies and educational programs aimed at improving renal risk management in vascular surgery. By translating research findings into clinical practice guidelines and training modules, the study was support efforts to improve the skills and knowledge of healthcare professionals and contribute to overall improvements in patient care.

The rationale for studying predictors of postoperative renal dysfunction in patients undergoing major vascular surgery at the Tikur Anbessa Specialized Hospital is the clinical severity of the problem, the need for localized and comprehensive risk assessment, and the potential for a significant contribution to quality improvement and clinical practice. This research was provide fundamental insights into factors influencing renal dysfunction, support the development of predictive models, and inform evidence-based renal risk management strategies, ultimately benefiting both patients and the health care system.

1.4 Objectives

1.4.1 General Objective

- To identify the predictors of postoperative renal dysfunction among patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

1.4.2 Specific Objectives

- To determine the incidence of postoperative renal dysfunction among patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital.
- To identify demographic, perioperative, intraoperative, and postoperative factors associated with postoperative renal dysfunction.

Chapter 2: Literature Review

2.1 Introduction

Postoperative renal dysfunction after major vascular surgery is a serious complication after major vascular surgery. It is characterized by deterioration of kidney function, which may be manifested by increased serum creatinine, decreased glomerular filtration rate (GFR), or both. Identification of predictors of renal dysfunction is essential for improving patient outcomes and for guiding preventive and therapeutic strategies [18]. This literature review examines the prevalence of postoperative renal dysfunction and examines various predictors categorized into demographic, preoperative, intraoperative, and postoperative factors. It also identifies gaps in current research, particularly in the context of low-resource settings such as the Tikur Anbessa Specialist Hospital in Addis Ababa, Ethiopia.

2.2 Prevalence of Postoperative Renal Dysfunction

Postoperative renal dysfunction is a significant concern following major vascular surgery, with varying prevalence rates reported across different studies.Postoperative renal dysfunction including acute kidney injury (AKI) is a common complication after major vascular surgery with an incidence ranging from 11.1% to 49% [19]. The type of procedure performed affects the incidence of AKI, with some studies suggesting that open surgical repair (OSR) may be associated with a higher incidence of AKI compared to endovascular repair (EVAR) [20].In major vascular surgeries,including aortic aneurysm repair& limb revascularization procedures,the reported incidence of PORD,ranging from 10% to as high as 30% in some studies(Mangano et al.,2000;Thakar et al.,2002)

A single-centred retrospective cohort study found that 35% of patients undergoing non-emergent major vascular surgery developed postoperative AKI [21]. Another study found that 24% of patients undergoing open juxtaren repair developed AKI, with 2.2% requiring temporary RRT [22]. The incidence of AKI in patients who underwent suprarenal clamp aortic valve repair (OAR) was 37%, with stage 1, 2, and 3 AKI occurring in 23%, 11%, and 3% of patients, respectively [23]. In contrast, a study of patients undergoing fenestrated endovascular aortic repair (FEVAR) found that 11.1% experienced post-injury stage AKI (I-AKI) [24]. A comparative study of AKI in pararenal aortic aneurysm found that 17.46% of patients who underwent EVAR had AKI compared with 36.11% in the OSR group [20]. These findings suggest that EVAR may be a safer option for patients with pararenal aortic

aneurysm in terms of reducing the risk of AKI. Overall, the literature suggests that AKI is a common complication after major vascular surgery with significant differences in incidence depending on the type of procedure performed. Further research is needed to identify specific factors that contribute to AKI and to develop evidence-based recommendations for the management of AKI in patients undergoing major vascular surgery.

2.3 Predictors of Postoperative Renal Dysfunction

2.3.1 Demographic Factors

Advanced age is a well-established predictor of postoperative renal dysfunction. Elderly patients often show reduced renal reserve, making them more susceptible to renal complications after surgery [22, 25-28]. Research consistently shows that the risk of renal dysfunction increases with age due to age-related decline in renal function and increased susceptibility to kidney damage [29, 30]. The effect of gender on postoperative renal outcomes is less straightforward. While some studies have suggested that men may have a higher incidence of renal dysfunction, potentially due to different comorbidity profiles or physiological responses, others have found no significant differences based on gender. Further research is needed to clarify the role of gender in renal dysfunction [30].

2.3.2 Preoperative Factors

Preoperative renal function is a critical factor in postoperative outcomes. Elevated preoperative serum creatinine or decreased GFR are associated with a higher risk of postoperative renal dysfunction. Assessment of baseline renal function aids risk stratification and tailoring preoperative care, Comorbid chronic diseases such as diabetes mellitus, hypertension and cardiovascular disease are also significant predictors of renal dysfunction [9, 22, 31, 32]. Diabetes mellitus is particularly associated with diabetic nephropathy, which increases the risk of renal complications after surgery [9]. Hypertension can exacerbate renal injury through its effects on renal perfusion. A thorough preoperative evaluation and treatment of comorbidities is key to mitigating these risks [32]. Moreover, nutritional deficiencies or imbalances can affect kidney function. Malnutrition is associated with poorer outcomes due to its effect on wound healing and susceptibility to infections, which can indirectly affect kidney function. Addressing nutritional status before surgery is important to optimize overall surgical outcomes.

2.3.3 Intraoperative Factors

The type and duration of surgical procedure are critical factors affecting renal outcomes following vascular surgeries. Major vascular surgeries, such as open aortic repairs and endovascular procedures, are associated with varying risks of renal dysfunction. Longer operating times and complex procedures increase the risk of renal hypoperfusion,Ischemic reperfusion and subsequent injury [19, 33, 34]. Significant intraoperative blood loss can lead to renal hypoperfusion and an increased risk of renal dysfunction [35]. Therefore, effective blood loss management and transfusion strategies are essential to prevent renal complications.

2.3.4 Postoperative Factors

Postoperative fluid management is essential to maintain kidney function. Both insufficient and excessive fluid resuscitation can lead to renal complications following vascular surgeries. Balanced fluid management helps preserve renal perfusion and prevent acute kidney injury. Maintaining optimal blood pressure is essential to protect the kidneys. Both hypotension and hypertension in the postoperative period can adversely affect kidney function. Careful monitoring and management of blood pressure is necessary to avoid renal complications. Effective postoperative monitoring, including regular assessment of renal function, is crucial for early detection and treatment of renal complications. Early intervention based on monitoring results can prevent severe kidney damage and improve patient outcomes [19].

2.4 Gaps in Existing Literature

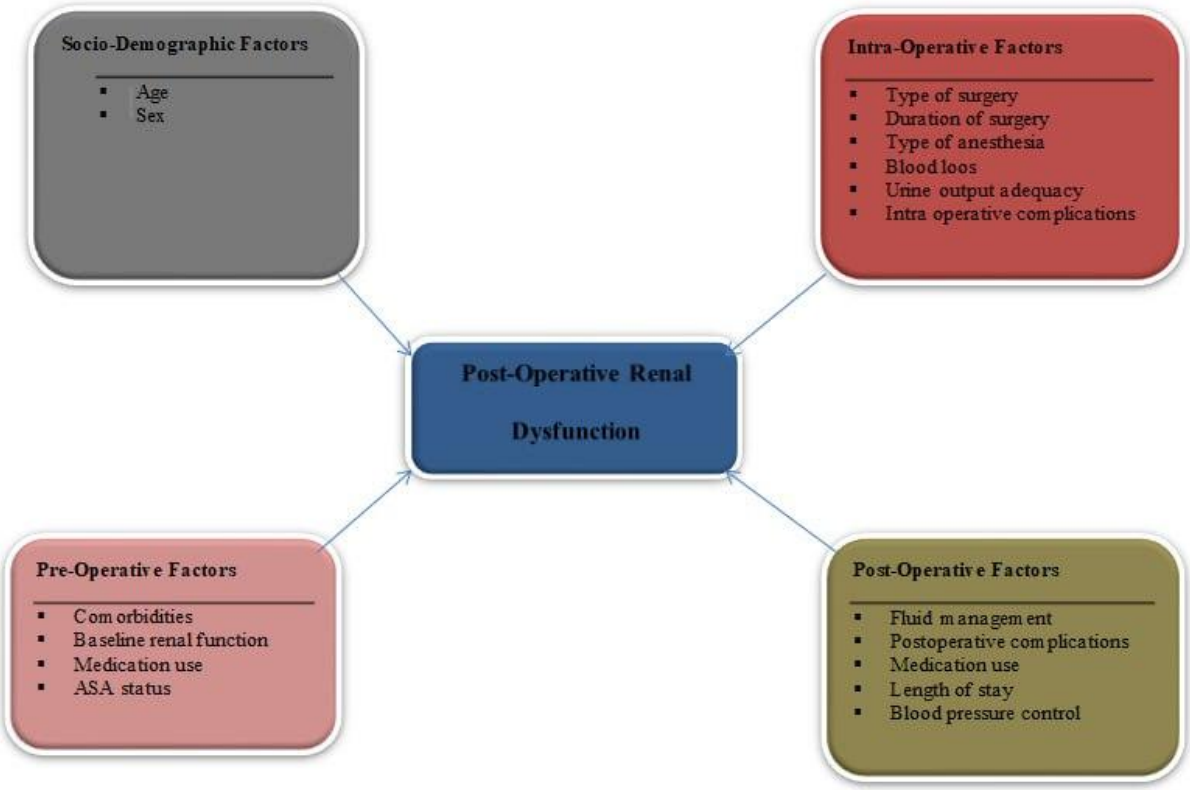
Despite extensive research on postoperative renal dysfunction, several gaps remain, particularly in complex studies that address multiple vascular surgeries and patient demographics in resource-limited settings. Many existing studies focus on high-resource settings and specific types of surgery, which may not fully capture the variability in risk factors and outcomes relevant to settings such as Tikur Anbessa Specialist Hospital. There is a need for localized research to understand the unique predictors of renal dysfunction in the Ethiopian population and to develop context-specific prevention and treatment strategies.

2.5 Conclusion

The literature underscores the complexity of postoperative renal dysfunction, with various demographic, preoperative, intraoperative, and postoperative factors influencing outcomes. Understanding these predictors is crucial for improving patient care and surgical outcomes. This review highlights the need for further research in specific contexts, such as Tikur

Anbessa Specialized Hospital, to address existing gaps and develop effective strategies for managing and preventing postoperative renal dysfunction.

2.6 Conceptual Framework



Chapter 3: Methodology

3.1 Study Design

This study was employ a retrospective cross-sectional study design to investigate the predictors of postoperative renal dysfunction among patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital. The study was cover a period of seven years, from January 2018 to December 2024.

3.2 Study Setting

The study was conducted at Tikur Anbessa Specialized Hospital, a tertiary-level referral hospital in Addis Ababa, Ethiopia. The hospital has a dedicated vascular surgery unit that performs a wide range of vascular procedures, including aortic aneurysm repair, carotid endarterectomy, and lower extremity bypass grafting.

3.3 Population

3.3.1 Source Population

The source population was include all patients who underwent major vascular surgery at TASH from January 2018 to December 2024.

3.3.2 Study Population

The study population was a subset of the source population, specifically those who meet the inclusion criteria.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

- Patients who underwent major vascular surgery during the study period.
- Age > 18years
- Patients with complete medical records, including preoperative, intraoperative, and postoperative data.
- Patients with a baseline serum creatinine & subsequent measurements available.
- Patient kept at least for 48hrs postoperatively

3.4.2 Exclusion Criteria

- Patients with History of Dialysis or ESRD.
- Patients with incomplete or missing medical records.

3.5 Sample Size Determination and Technique

3.5.1 Sample Size Determination

The sample size was determined using the single population proportion formula ($n = Z^2 P (1-P)/d2$) by assuming a 50% proportion of postoperative renal dysfunction, 95% CI and 5% error rate. Where: n = sample size, Z = Z value at 95% confidence level (standard 1.96) and d = tolerance of error 5% or (0.05). Therefore, based on the formula, $n = 1.96^{2}*0.5*(1-0.5)/(0.05)2= 384$.

3.5.2 Sampling Technique

Simple random sampling technique was used to select study participants from the identified source population over the study period till to get adequate numbers of calculated sample size.

3.6 Study Variables

3.6.1 Dependent Variable

Postoperative Renal Dysfunction: Defined as an increase in serum creatinine levels by 0.3 mg/dL or more from baseline or a 50% increase in serum creatinine levels within 48 hours post-surgery,UOP <0.5ml/kg/hr for at least 6hrs,or presumed to have acute kidney injury by the treating physician.

3.6.2 Independent Variables

The independent variables was include:

Demographic variables: age and sex.

Perioperative variables: type of vascular surgery, duration of surgery, type of anesthesia, preoperative laboratory results (e.g., creatinine, hemoglobin).

Intraoperative variables: intraoperative blood loss, intraoperative fluid management, and intraoperative complications (e.g., hypertension,hypotension, hypoxia,oligouria,etc.).

Postoperative variables: postoperative creatinine levels, postoperative hemoglobin levels, postoperative complications (e.g., acute kidney injury,infections,Thrombosis like: myocardial infarction, stroke), and postoperative length of stay.

3.7 Operational Definitions

Major Vascular Surgery: Surgical procedures involving major arteries or veins, including but not limited to aortic aneurysm repair, carotid endarterectomy, and femoral-popliteal bypasses.

Postoperative Renal Dysfunction: A significant deterioration in kidney function as indicated by serum creatinine increase or reduced urine output. Postoperative renal dysfunction was defined as a ≥ 50% increase in serum creatinine from the preoperative baseline,0.3mg/dl increase in Cr within 48hrs,increase to >=1.5X baseline value that is known or presumed within 7 days, UOP<0.5ml/kg/hr at least 6hrs or a decrease in eGFR to < 60 mL/min/1.73 m^2 within 48 hours of surgery.

3.8 Data Collection Tools

Data was collected retrospectively from the medical records of eligible patients. Data was extracted using a standardized data collection form. The following data was extracted:

- Demographic data: age, sex.
- Perioperative data: type of vascular surgery, duration of surgery, type of anesthesia, preoperative laboratory results (e.g., creatinine, hemoglobin)
- Intraoperative data: intraoperative blood loss, intraoperative fluid management, and intraoperative events (e.g., hypotension, hypoxia,arrhythmia,Hypertension,Oligouria)
- Postoperative data: postoperative creatinine levels, postoperative hemoglobin levels, postoperative complications (e.g., acute kidney injury, infections,thrombosis, like ;myocardial infarction, stroke), and postoperative length of stay

3.9 Data Quality Assurance

To ensure data quality, the following measures was implemented:

- Data collection was performed by trained research assistants to minimize errors.
- Double data entry was employed to ensure accuracy, and discrepancies was resolved through cross-checking.

3.10 Data Analysis

Descriptive statistics was used to summarize the demographic, preoperative, intraoperative, and postoperative characteristics of the study population. Binary logistic regression was employed to identify factors associated with postoperative renal dysfunction. Bivariate analysis was employed to examine the relationship between each independent variable and the dependent variable. Variables with a p-value ≤0.2 in bivariate analysis was included in the multivariable logistic regression model to control for confounders. Adjusted odds ratios (AOR) with 95% confidence intervals was reported. Statistical significance was set at $p < 0.05$.

3.11 Ethical Considerations

Ethical approval was obtained from Addis Ababa University,College of Health Science,department of Anesthesiology,Critical care & Pain medicine.Permission was sought from Tikur Anbessa Specialized Hospital for data access. Patient confidentiality was maintained by anonymizing data and restricting access to the research team only. As the study is cross sectional retrospective, informed consent was not be required.

Chapter 4: Results

4.1 Socio-Demographic Characteristics of the Respondents

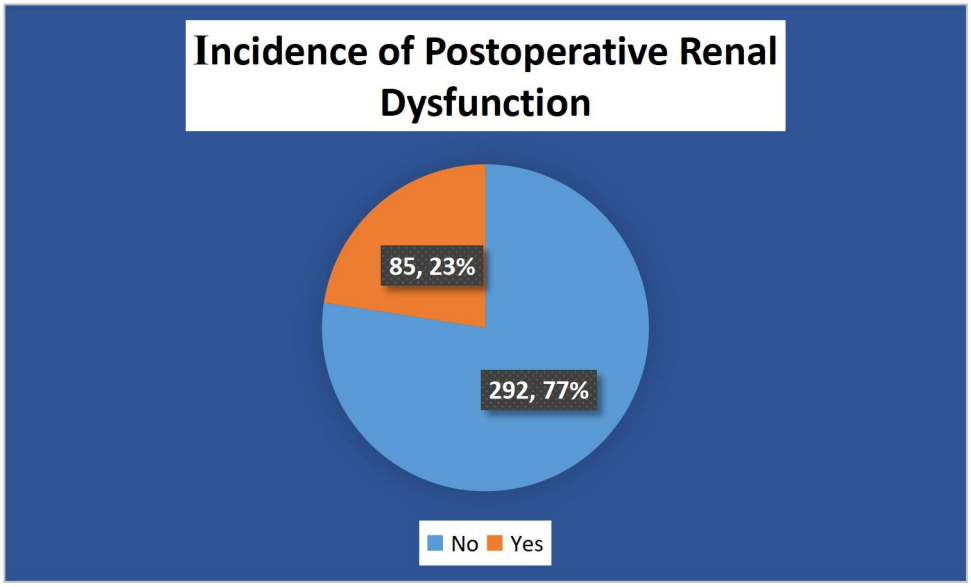
The study population consisted of 377 patients who underwent major vascular surgery. The distribution of sex was relatively balanced, with 52.0% (196) being male and 48.0% (181) being female. Regarding age, the majority of the study participants (76.4%, 288) were younger than 60 years, while 23.6% (89) were 60 years or older. This indicates that the study population comprised a larger proportion of younger individuals, although a significant subset of older patients was also included.

Table 1: Socio-Demographic Characteristics of the Respondents Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital (n=377)

Items	Frequency	Percentage
Sex		
Female	181	48.0%
Male	196	52.0%
Total	377	100.0%
Age		
<60 years	288	76.4%
>=60 years	89	23.6%
Total	377	100.0%

4.2 Incidence of Postoperative Renal Dysfunction among Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital

Out of the 377 patients who were included in the study, 85 patients (22.5%) developed postoperative renal dysfunction, while 292 patients (77.5%) did not experience renal dysfunction following major vascular surgery.



4.3 Preoperative Factors of the Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital

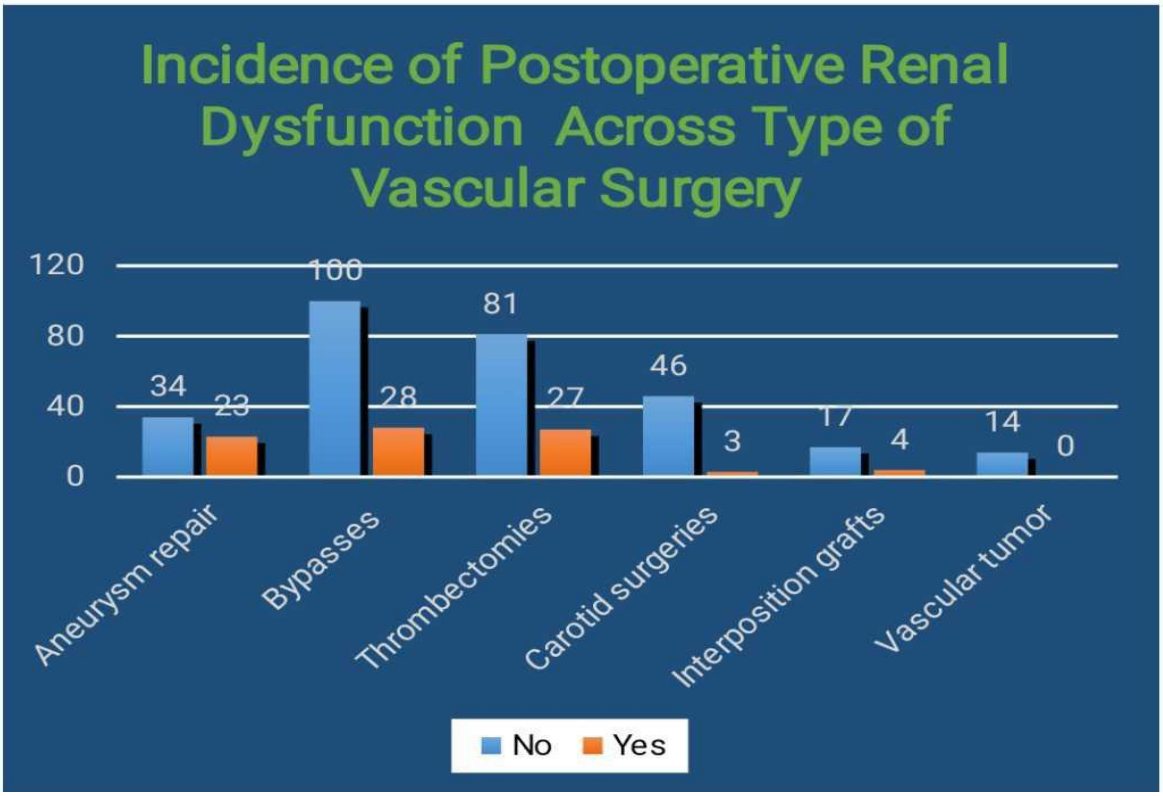
A substantial majority (91.0%) of patients had no history of chronic kidney disease, while 9.0% reported a history of CKD. Regarding cardiovascular comorbidities, 29.7% had a history of heart disease or heart failure, and 43.8% had a history of hypertension. A significant proportion (23.6%) of patients had undergone previous vascular surgery. The majority of patients (82.5%) had no history of diabetes, while 17.5% reported a history. Pre-operative diuretic use was reported by 12.2% of patients. The ASA-PS classification revealed that the largest proportion of patients (50.9%) were classified as ASA 3, followed by ASA 4 (26.3%) and ASA 2 (19.6%). A small percentage were classified as ASA 1 (2.4%) and ASA 5 (0.8%).

Table 2: Preoperative Factors of the Respondents Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital (n=377)

Items	Frequency	Percentage
History of Chronic Kidney Disease		
No	343	91.0%
Yes	34	9.0%

History of Heart Disease or Heart Failure		
No	265	70.3%
Yes	112	29.7%
History of Hypertension		
No	212	56.2%
Yes	165	43.8%
Previous Vascular Surgery		
No	288	76.4%
Yes	89	23.6%
Pre-Operative Creatinine(mg/dl)		
History of Diabetes		
No	311	82.5%
Yes	66	17.5%
Pre-Operative Use of Diuretics		
No	327	86.7%
Yes	50	13.26%
American Society of Anesthesiologists Physical Status (ASA-PS) Classification		
ASA1	9	2.4%
ASA2	74	19.6%
ASA3	192	50.9%
ASA4	99	26.3%
ASA5	3	0.8%

4.4 Incidence of Postoperative Renal Dysfunction across Type of Vascular Surgery



4.4 Intraoperative Factors Related To the Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital

The most common types of vascular surgery performed were aneurysm repair (15.11%), bypass procedures (33.95%), and thrombectomies (28.64%). Carotid surgeries (endartrectomies and others accounted for 12.99% of cases.The procedures done on elective bases were 55.71% & the rest at emergency.

General anesthesia was the most frequently used anesthetic technique (66.8%), followed by neuraxial anesthesia (22.8%). The duration of surgery was predominantly in the range of 2-4 hours (49.6%) and >4 hours (47.5%), with a small percentage (2.9%) lasting less than 2 hours. Intraoperative fluid management primarily involved crystalloids only (70.0%), while 30.0% received a combination of crystalloids and colloids. Hypotension was the most frequent

intraoperative complication (46.9%), followed by other unspecified complications (39.8%). Hypertension accounted for 7.7% of complications, and bradycardia and tachycardia were less common. Intraoperative use of vasopressors or inotropes was required in 40.6% of patients. A significant percentage of patients (67.6%) experienced intraoperative blood loss ≥500 mL, while 32.4% had blood loss <500 mL.

Table 3: Intraoperative Factors of the Respondents Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital (n=377)

Type of surgery	Frequency	Pecentage
Elective	210	55.71%
Emergency	167	44.29%
Type of Vascular Surgery		
Aneurysm repair	57	15.11%
Bypasses (Aortofemoral, Aortiliac, Femoropopliteal, or others)	128	33.95%
Carotid surgery (endarterectomy, or other)	49	12.99%
Major vessel interposition grafts	21	5.57%
Thrombectomies	108	28.64%
Vascular tumor excisions	14	3.71%
Type of Anesthesia		
Peripheral nerve block	9	2.4%
Combined spinal & epidural	12	3.2%
General anesthesia	252	66.8%
Neuraxial (spinal or epidural)	86	22.8%
Regional changed to general	18	4.8%
Duration of Surgery (hours)		

<2 hours	11	3.0%
>4 hours	179	47.5%
2-4 hours	187	49.6%
Intra-Operative Fluid Management		
Crystalloids only	264	70.0%
Combination of crystalloids and colloids	113	30.0%
Intraoperative Complications		
Bradycardia	7	1.8%
Hypertension	29	7.7%
Hypotension	177	46.9%
Other (Specify)	150	39.8%
Intraoperative Use of Vasopressors or Inotropes		
No	224	59.4%
Yes	153	40.6%
Intraoperative Blood Loss (mL)		
<500 mL	122	32.4%
>=500 mL	255	67.6%

4.6 Postoperative Factors Related To the Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital

Post-operative diuretic use was required in 21.0% of patients. The need for vasopressors or inotropes postoperatively was relatively low, with only 10.6% requiring them. Similarly, postoperative transfusion was required in 9.3% of patients. Postoperative complications varied, with "other" complications being the most frequently reported (67.9%). Thrombosis occurred in 16.7% of patients, and infections were reported in 13.8%. Bleeding and collection

were less common. The length of hospital stay was predominantly in the range of 5-10 days (61.0%), with 25.7% staying for more than 10 days and 13.3% staying for less than 5 days. Postoperative urine output was adequate in 76.7% of patients, while 23.3% experienced inadequate urine output.

Table 4: Postoperative Factors of the Respondents Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital (n=377)

Items	Frequency	Percentage
Post-Operative Use of Diuretics		
No	331	87.8%
Yes	46	12.2%
Postoperative Requirement of Vasopressors or Inotropes		
No	337	89.4%
Yes	40	10.6%
Postoperative Transfusion Requirement		
No	342	90.7%
Yes	35	9.3%
Postoperative creatinine (mg/dl)		
Postoperative Complications (check all that apply)		
Bleeding or collection	15	3.97%
Postoperative renal dysfunction	85	22.54%
Infection	33	8.75%
Thrombosis or graft failure	50	13.26%
None	194	51.45%
Length of Hospital Stay (in days)		

5-10 days	230	61.0%
Less than 5 days	50	13.3%
More than 10 days	97	25.7%
Postoperative Urine Output(if documented)		
Adequate	289	76.7%
Inadequate	88	23.3%

4.7 Predictors of Postoperative Renal Dysfunction among Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital

The analysis revealed that older age (≥60 years) was a significant predictor of postoperative renal dysfunction. Patients aged 60 years or older had 5.99 times higher odds of developing renal dysfunction compared to those under 60 years of age (AOR = 5.991, 95% CI = 3.324–10.799, p = 0.000). A history of CKD was also found to be a significant predictor of postoperative renal dysfunction. Patients with a history of chronic kidney disease were 3.49 times more likely to experience renal dysfunction after surgery compared to those without such a history (AOR = 3.493, 95% CI = 1.520–8.027, p = 0.003). Diabetes was another significant predictor of postoperative renal dysfunction. Patients with a history of diabetes had 2.37 times the odds of developing renal dysfunction compared to those without diabetes (AOR = 2.368, 95% CI = 1.226–4.573, p = 0.010). Intraoperative blood loss of 500 mL or more was found to significantly increase the likelihood of postoperative renal dysfunction. Patients who lost 500 mL or more of blood during surgery had 4.63 times higher odds of renal dysfunction compared to those with blood loss of less than 500 mL (AOR = 4.631, 95% CI = 2.125–10.094, p = 0.000). Inadequate urine output during surgery (less than 0.5 mL/kg/hr) was found to be a significant predictor of postoperative renal dysfunction, with odds of renal dysfunction being 2.36 times higher in patients with inadequate urine output (AOR = 2.356, 95% CI = 1.129–4.916, p = 0.022).

Table 5: Predictors of Postoperative Renal Dysfunction among Patients Undergoing Major Vascular Surgery at Tikur Anbessa Specialized Hospital (n=377)

Variables	PORD		COR (95% CI)	AOR (95% CI)	P-value
	No n (%)	Yes n (%)			
Age					
<60 years	250(85.6)	38(44.7)	1	1	
>=60 years	42(14.4)	47(55.3)	7.362(4.298-12.611)	5.991(3.324-10.799)	.000
History of CKD					
No	279(95.5)	64(75.3)	1	1	
Yes	13(4.5)	21(24.7)	7.042(3.349-14.806)	3.493(1.520-8.027)	.003
History of DM					
No	255(87.3)	56(65.9)	1	1	
Yes	37(12.7)	29(34.1)	3.569(2.027-2.284)	2.368(1.226-4.573)	.010
Intraoperative UOP adequacy(0.5ml/kg/hr)					
No	32(11.0)	23(27.1)	1	1	
Yes	260(89.0)	62(72.9)	3.014(1.649-5.509)	2.356(1.129-4.916)	.022
Intraoperative blood loss	48(77.4)	10(11.8)	1	1	0.022
No	180(61.6)	75(88.2)	4.667(2.316-9.404)	4.631(2.125-10.094)	.000
Yes					

Chapter 5: Discussion

The primary objective of this study was to identify predictors of postoperative renal dysfunction among patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. The multivariable logistic regression analysis revealed that age of 60 years or older, a history of chronic kidney disease, a history of diabetes mellitus, intraoperative blood loss of 500 ml or more, and inadequate intraoperative urine output were significantly associated with an increased odds of developing PORD.

The finding that patients aged 60 years or older had a significantly higher likelihood (5.99 times) of experiencing postoperative renal complications is consistent with a substantial body of evidence highlighting age as a critical risk factor for such complications. A comprehensive analysis of 11 studies on acute kidney injury (AKI) following cardiovascular surgery revealed that age is a well-established preoperative risk factor, with a pooled odds ratio of 4.87, indicating a higher likelihood of AKI in older patients [27]. This indicates a consistent pattern across various surgical specialties where older age increases the risk of renal dysfunction following major procedures. Furthermore, a study by Zettervall, S.L., et al on endovascular aneurysm repair noted that patients experiencing renal complications were older (80 years vs. 75 years), indicating that even within older populations, advancing age may further increase risk [28]. The identification of age as an independent preoperative predictor of acute renal failure after non-cardiac surgery [31] broadens this perspective, suggesting that the vulnerability of the kidneys to surgical stress increases with age across various surgical contexts, likely including major vascular surgery. Although the current study utilized a cut-off of 60 years, previous research has emphasized different age thresholds. For example, individuals aged 75 years or older were found to be a significant risk factor for postoperative AKI in cardiac surgery [36]. The difference in the age limit for the study could be due to differences in the patient groups or the types of surgeries performed. However, a study on critically ill vascular surgery patients reported a mean age of 65 ± 15 years in a cohort where nearly half developed AKI [37], suggesting that the age range identified in the current study is indeed relevant for postoperative renal complications in vascular surgery. Furthermore, a research study revealed a pattern of an increasing average age (67 years) among patients who experienced a temporary decrease in kidney function compared to those with stable kidney function (64 years) [38]. This observation strengthens the idea that older age is linked to a higher likelihood of experiencing kidney problems after vascular procedures. The higher

likelihood of developing PORD in older patients can be attributed to various physiological factors linked to aging, such as a gradual decline in renal function, which is characterized by a reduced glomerular filtration rate and decreased renal blood flow(O'Connor et al.,2011). Older individuals are also more prone to having other health conditions like high blood pressure and atherosclerosis, which can worsen their kidney health and ability to handle the stress of surgery. Older patients may have impaired compensatory mechanisms, which could make them more vulnerable to postoperative complications following major vascular surgery.

Older age is often associated with higher risk of renal dysfunction due to decrease renal reserve and presence of comorbid conditionns such as hypertension & DM,in particular individuals above the age of 70(Nishijima et al.,2020)

The finding that a history of chronic kidney disease (CKD) significantly raised the likelihood (3.49 times) of developing PORD is strongly supported by previous research. Preoperative CKD has been consistently shown to be a predictor of postoperative renal complications and mortality, particularly after open aortic surgery [39].The study was conducted to determine the effect of preoperative CKD on postoperative renal complications and mortality in patients undergoing open aortic surgery.A meta-analysis by Ghosh et al.(2019) highlithed that patiennts with CKD are three times more likely experience PORD after major vascular surgery to those with normal renal function. A research study by Zettervall, S.L., et al found that a glomerular filtration rate (GFR) below 60 ml/min was a significant predictor of renal complications, with an odds ratio of 4.6, compared to a rate of 60 ml/min or higher [28]. This corresponds to the knowledge that having impaired kidney function at the beginning of surgery greatly increases the likelihood of further kidney damage after the operation. Additionally, studies on open aortic surgery indicated significantly higher odds ratios for severe (OR 15) and moderate (OR 2.8) baseline chronic kidney disease (CKD) as independent predictors of worsening postoperative renal dysfunction [39]. These findings highlight the significant influence of pre-existing kidney disease on the probability of developing postoperative complications after major vascular procedures. Epidemiological data indicates that a significant number of patients undergoing vascular surgery have chronic kidney disease (CKD), and these individuals are more susceptible to developing acute kidney injury (AKI) after the procedure(Fitzgerald et al.,2015) [40]. The occurrence of CKD during vascular surgery is frequently linked to a greater number of comorbidities, which, when combined, can increase the risk of negative postoperative results [40]. The reduced renal reserve in patients with chronic kidney disease (CKD) makes their kidneys less capable of

handling the additional strain caused by major vascular surgery, thereby increasing their susceptibility to postoperative complications.

The presence of a history of diabetes mellitus (dm) was identified as a significant predictor of PORD in this study, resulting in an increased likelihood of PORD by 2.37 times. This observation is consistent with numerous studies that have identified diabetes as a key risk factor for postoperative renal complications [37].The incidence of postoperative renal complications is higher in patients with diabetes mellitus than in those without diabetes mellitus. Diabetes has been acknowledged as a significant global risk factor for AKI in high-risk vascular patients, and it is a prevalent comorbidity among vascular surgery patients who are at a higher risk for AKI(Miller,P et al.,2017). A comprehensive analysis that included numerous studies also discovered that diabetes mellitus is a risk factor for postoperative renal insufficiency, with a reported odds ratio of 1.987 to 11 [41]. This provides solid quantitative evidence to support the association that was observed in the current study. Furthermore, research focusing on coronary artery bypass grafting (CABG) has shown that patients with diabetes are more susceptible to developing postoperative AKI, even in the absence of pre-existing renal impairment [42].The results of this study suggest that the presence of diabetes may be a significant risk factor for the development of postoperative AKI, regardless of pre-existing renal impairment. This implies that the metabolic abnormalities and vascular complications linked to diabetes can independently contribute to a higher risk of postoperative complications, including those related to vascular surgery. The mechanisms through which diabetes contributes to PORD are multifaceted, involving diabetic nephropathy, an increased susceptibility to ischemic injury due to microvascular disease, and endothelial dysfunction, all of which can impair renal function and increase the likelihood of postoperative complications.

The finding that intraoperative blood loss of 500 ml or more significantly increased the odds (4.63 times) of developing PORD highlights the critical role of maintaining hemodynamic stability during major vascular surgery. This aligns with research that has shown blood loss to be a crucial factor in predicting AKI in different surgical scenarios [25]. One study on pancreas surgery found that blood loss volume exceeding 500 ml was independently associated with AKI, with an odds ratio of 3.81 14, a finding remarkably similar to the current study [33]. While some research on vascular surgery has used a higher threshold for significant blood loss, such as >1000 ml, and still found an association with postoperative AKI (or 1.4) [37], the current study suggests that even a more moderate amount of blood loss

(≥ 500 ml) can be clinically significant in predicting PORD in this specific patient population. In the context of open surgical repair of abdominal aortic aneurysms, blood loss greater than 1 liter has also been identified as an independent risk factor for postoperative renal dysfunction [26]. The variations in the threshold used to define significant intraoperative blood loss across different studies might be attributed to the specific types of surgery, patient characteristics, and the overall physiological reserve of the individuals. Significant blood loss during surgery can lead to renal hypoperfusion, ischemia, and subsequent PORD as the kidneys are deprived of adequate oxygen and nutrients, leading to cellular damage and functional impairment(Hernandez et al.,2019)

Finally, the study revealed that inadequate intraoperative urine output (ml/kg/hr) was associated with a 2.36 times higher odds of developing PORD. This finding aligns with the general understanding that urine output is a sensitive indicator of renal function and can reflect underlying hemodynamic instability or early renal injury during surgery [43]. While a study on major abdominal surgery found no association between intraoperative oliguria (defined as ml/kg/h) and postoperative AKI [34], a meta-analysis across various non-cardiac surgeries demonstrated a significant association between intraoperative oliguria (using the same definition) and an elevated risk of postoperative AKI [44]. This suggests that the relationship between intraoperative urine output and PORD might be context-dependent and could be more relevant in the setting of major vascular surgery compared to some other types of abdominal procedures. The threshold of ml/kg/hr for inadequate urine output is a commonly used clinical definition of oliguria and is recognized as a level that should prompt evaluation for potential renal issues [43]. Inadequate urine output during surgery can be a sign of hypovolemia, reduced renal perfusion pressure, or an early indication of renal dysfunction, all of which can predispose patients to developing PORD in the postoperative period.

In summary, this research has identified several important factors that can predict the occurrence of postoperative renal dysfunction in patients who undergo major vascular surgery at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. These include age of 60 years or older, a history of chronic kidney disease, a history of diabetes mellitus, intraoperative blood loss of 500 ml or more, and inadequate intraoperative urine output (ml/kg/hr). These findings align with previous research conducted internationally on risk factors for postoperative complications in vascular surgery, while also shedding light on the unique circumstances of this patient group.

While the significant predictors identified in our cohort-age, CKD, DM, blood loss (≥500 mL), and inadequate urine output- resonate with established risk factors for PORD across various surgical settings, including general surgery, this research provides a focused and quantified assessment of these risks specifically within a major vascular surgery population in Ethiopia, a context where such granular data is scarce.

Unlike some broader studies in general surgical populations that might emphasize different thresholds for risk factors like blood loss or identify a wider array of less prominent predictors, this study pinpoints the critical impact of these specific factors within the unique physiological and operative demands of major vascular procedures in our setting. For instance, the 500 mL blood loss threshold, while potentially lower than thresholds reported in some general surgery studies, may reflect the heightened vulnerability of renal function in our vascular patients, possibly due to the prevalence of specific comorbidities or the nature of the surgical interventions.

Furthermore, while the general principle of age, pre-existing kidney disease, and diabetes increasing the risk of postoperative complications is well-established across surgical specialties, this study provides specific odds ratios within the Ethiopian vascular surgery context such as age (AOR 5.99), CKD (AOR 3.49), and DM (AOR 2.37). These quantified risks offer a more precise understanding of the magnitude of these associations in our specific patient population compared to potentially broader or less focused estimates from general surgical literature. This allows for more targeted risk stratification and intervention strategies tailored to the specific challenges encountered in vascular surgery at Tikur Anbessa Specialized Hospital.

Furthermore, this study highlights the importance of urine output as a predictor of PORD in vascular surgery patients, which has not been extensively explored in previous research. We found that inadequate intraoperative urine output (ml/kg/hr) was associated with a 2.36 times higher odds of developing PORD, emphasizing the need for close monitoring of urine output during surgery.

In essence, while acknowledging the broader understanding of PORD risk factors derived from general surgical research, our study moves beyond mere replication by providing a detailed, context-specific analysis of these factors within a major vascular surgery cohort in Ethiopia. This contributes novel and essential data that can directly inform clinical practice

and future research within this specific surgical subspecialty and geographical setting, addressing a significant gap in the existing literature.

The implications of these findings for clinical practice at Tikur Anbessa Specialized Hospital are substantial. Thorough preoperative evaluation, paying close attention to age, chronic kidney disease (CKD), and diabetes, is essential for identifying patients who are at a higher risk of developing postoperative complications. Intraoperative management with meticulous attention to detail, focusing on reducing blood loss and maintaining sufficient urine output, should be the primary objective. The creation and execution of customized protocols for assessing risk and providing care before and after major vascular surgery at this hospital could potentially decrease the occurrence of postoperative complications and enhance patient outcomes. Future studies should aim to confirm these results in a larger group of individuals from Ethiopia and investigate other factors that may be unique to this population. Exploring the effects of specific interventions designed to address the identified risk factors on the occurrence of PORD would be an important area for future research. Additionally, multi-center studies conducted in Ethiopia and the broader African region are necessary to gain a more comprehensive understanding of PORD in vascular surgery across various healthcare settings and patient populations.

Chapter 6: Conclusion

This research offers valuable information about the predictors of PORD in patients who undergo major vascular surgery at Tikur Anbessa Specialized Hospital. The results indicate a substantial occurrence of PORD (22.5%), emphasizing its importance as a significant complication in this group of patients. The examination of preoperative, intraoperative, and postoperative factors revealed several independent predictors of PORD. Individuals aged 60 years or older, those with a pre-existing history of chronic kidney disease, and those with a history of diabetes mellitus were found to have a higher risk of developing renal dysfunction after major vascular surgery. These findings emphasize the significance of thorough preoperative evaluation and risk assessment, especially in older individuals and those with pre-existing kidney disease or diabetes. Additionally, the factors that occurred during the surgery were important in determining the outcome. The occurrence of substantial blood loss (≥500 ml) and insufficient urine output (<0.5 ml/kg/hr) during surgery were found to be strong indicators of PORD. This highlights the significance of careful intraoperative management, which involves maintaining stable hemodynamics and managing fluid balance effectively to minimize blood loss and ensure proper renal perfusion. Overall, this research highlights specific patient-related and intraoperative factors that are independently linked to a higher likelihood of PORD in patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital. These discoveries hold significant value for medical professionals, as they provide insights into risk assessment, influence perioperative management strategies, and have the potential to enhance patient outcomes in this vulnerable surgical group. Additional research may be necessary to investigate the underlying factors contributing to these associations and to assess the efficacy of interventions specifically designed to reduce the risk of PORD in this context.

Chapter 7:Strength and Limitation of the study

The study Addresses a significant clinical issues in a specific context in Tikur Anbesa speciliazed Hospital,in Ethiopia.This enhances its relevance and applicablity to local healthcare practices.A comprehensive approach and analysis of the study helps to identify key areas for intevention;for evaluation multiple predictors of Postoperative renal dysfunction by considering demographics,preoperative,intraoperative,and postoperative factors.We use a significant sample size which yields meaningful stastical results.We use validated measures for postoperative renal dysfunction with baseline & subsequent measurements of serum creatinine& urine output with adherence to established clinical definitions,enhancing to credibility of the findings.We also consider postoperative confoundings of the study.The application of multivariable logistic regression allows for identification of independent predictors postoperative renal dysfunction while controlling for potential confounders providing clear pictures of relationship a among the variables.

The findings help to develop targeted interventions and clinical guidelines to minimize the risks of postoperative renal dysfunction,ultimately improving patient outcomes.

The limitations of the study are the retrospective nature of the study,which limit to establish

Causality between predictors and postoperative variables.The reliance on medical records for data extraction may lead to incomplete or inaccurate data because of poor documentation practices which vary among healthcare providers.Despite multivariable regression analysis used there may be unmeasured confounding factors that could influence both the exposure and outcomes;Like fluid balance,postop hemodynamics status,poor postoperative followup.

While the study identifies several important predictors,other potential socioeconomic factors & genetic predispositions,may not have been evaluated which could provide additional insight into postoperative renal dysfunction.

Chapter 8: Recommendations

Based on the findings of this study, the following recommendations are proposed to improve the care of patients undergoing major vascular surgery at Tikur Anbessa Specialized Hospital and potentially reduce the incidence of postoperative renal dysfunction (PORD):

For Clinical Practice:

Enhanced preoperative risk stratification: implement a comprehensive preoperative risk assessment protocol that specifically identifies patients with older age (≥60 years), a history of chronic kidney disease, and a history of diabetes mellitus as being at higher risk for PORD. This information should guide the level of monitoring and preventive measures implemented during the perioperative period.

Management of pre-existing conditions: Prior to the surgery, it is crucial to effectively manage pre-existing conditions like chronic kidney disease and diabetes mellitus to ensure the best possible outcome. This may require consultation with a nephrologist or endocrinologist to ensure patients are in optimal health before undergoing major vascular surgery.

Meticulous Intraoperative Management:

- Minimize Blood Loss: Employ strategies to minimize intraoperative blood loss, including meticulous surgical technique, appropriate use of blood conservation techniques, and prompt management of any bleeding.
- Optimize Hemodynamic Stability: Maintain adequate blood pressure and perfusion throughout the surgical procedure. Anesthesiologists should be vigilant in monitoring hemodynamic parameters and promptly addressing any hypotensive episodes.
- Maintain Adequate Urine Output: Closely monitor intraoperative urine output and implement strategies to ensure adequate renal perfusion (target >0.5 mL/kg/hr). This

may involve judicious fluid administration and the use of vasopressors or inotropes when clinically indicated, guided by careful hemodynamic monitoring.

Postoperative monitoring and management: After the surgery, it is crucial to closely monitor the patient's kidney function, especially those who are considered high-risk. Identifying renal dysfunction at an early stage enables prompt action and appropriate management, which may help reduce its severity and influence on patient outcomes.

Judicious use of medications: exercise caution with the use of nephrotoxic medications in the perioperative period and consider alternative agents when appropriate, especially in high-risk patients.

Multidisciplinary Approach: Foster a collaborative approach involving surgeons, anesthesiologists, nephrologists, and intensivists to provide comprehensive care for patients undergoing major vascular surgery and effectively manage postoperative complications, such as renal dysfunction.

For Further Research:

Prospective studies and interventions: conduct studies that follow individuals over time to better understand the factors that contribute to PORD and evaluate the effectiveness of interventions designed to reduce its occurrence. This could involve implementing strategies for efficient fluid management, monitoring blood pressure levels, and identifying early signs of kidney damage.

Biomarker studies: investigate the potential of early biomarkers of acute kidney injury in predicting and diagnosing proteinuria in this patient population. This could expedite intervention and potentially enhance outcomes.

Long-term outcomes: examine the long-term effects of PORD on morbidity, mortality, and quality of life in patients who undergo major vascular surgery at Tikur Anbessa Specialized Hospital.

Resource-specific interventions: investigate cost-effective and resource-appropriate interventions that can be implemented within the specific context of Tikur Anbessa Specialized Hospital to mitigate the risk of PORD.

By following these suggestions, Tikur Anbessa Specialized Hospital can potentially enhance the care provided to patients undergoing major vascular surgery, decrease the occurrence of PORD, and ultimately improve patient results.

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Annexes

Questionnaire

Section 1: Socio-Demographic Information

1. Age
   - 18-30
   - 31-45
   - 46-60
   - 61 and above
2. Gender:
   - Male
   - Female

Section 2: Pre-Operative Factors

1. History of Chronic Kidney Disease:
   - Yes
   - No
2. History of Diabetes Mellitus:
   - Yes
   - No

2.1. If yes

.Oral antidiabetic medications

.Insulin injection

.Both

.Not on medication

3. History of Hypertension:
   - Yes
   - No

3.1 If yes On treatment

.Yes

.No

4. History of Heart Failure Or Known Heart disease
    - Yes
    - No

4.1 On treatment

.Yes

.NO

5. Previous Vascular Surgery:
    - Yes
    - No
6. Pre-Operative Hemoglobin:
    - --(mg/dl)
7. Pre-Operative Creatinine:

    --(mg/dl)
8. Pre-Operative Use of Diuretics:
    - Yes
    - No
9. Use of Nephrotoxic Drugs:
    - Yes
    - No
10. ASA class

Section 3: Intra-Operative Factors

1. Type of Vascular Surgery:
    - Aneurysm repair
    - Carotid surgery(endarterectomy & other interventions)
    - Bypasses(Aortofemoral,aortoiliac,femoropopliteal,others)
    - Thrombectomies
    - Major vessel interposition grafts
    - Vascular tumors surgery
2. Surgical Type
    - Emergency
    - Elective

3. Duration of Surgery (hours):
    - < 2 hours
    - 2-4 hours
    - > 4 hours
4. Anesthesia Type:
    - General Anesthesia
    - Neuraxial(spinal or epidural)
    - Combined Spinal & epidural
    - Regional changed to GA
    - PNB
5. Intraoperative Blood Loss (mL):
    - < 500 mL
    - 500-1000 mL
    - > 1000 mL
6. Use of Contrast Agents:
    - Yes
    - No
7. Intra-Operative Fluid Management:
    - Crystalloids only
    - Colloids only
    - Combination of crystalloids and colloids

8. Intraoperative urine output adequate

    Yes

    No

9.Intraoperative Complications:

- Hypotension
- Hypertension
- Bradycardia
- Arrhythmias
- Other (Specify)

8. Intraoperative Use of vasopressors or Inotropes

.Yes

.No

9. If yes

.Infusion

.Bolus only

Section 4: Post-Operative Factors

1. Post-Operative Hemoglobin(mg/dl)
   - --
2. Post-Operative Creatinine:

   --(mg/dl)
3. Post-Operative Transfusion requirement
   - Yes
   - NO
4. Post-Operative Vasopressor requiremnt
   - Yes
   - NO
5. Post-Operative Use of Diuretics:
   - Yes
   - No
6. Post operative Urine output,Adequate(if documented)

   .Yes

   .NO
7. Postoperative complications (check all that apply):
   - Infections(sepsis)
   - Bleeding Or collection
   - Thrombosis or graft failure
   - Renal dysfunction or worsening of impairment
   - None
8. Nephrotoxic drug use

   Yes

   No
9. Length of hospital stay (in days):
   - Less than 5 days
   - 5-10 days
   - More than 10 days