ORIGINAL ARTICLE DOI: https://doi.org/10.52206/jsmc.2024.14.4.991 OPEN ACCESS

Factors Influencing Timely Diagnosis and Management of Acute Limb Ischemia (ALI) in Emergency Departments

Imranullah, Saqib Qayyum, Muhammad Khalid Siddique, Athar Badshah, Azaz Ayubi, Arham Hai

Combined Military Hospital, Rawalpindi, Pakistan.

ABSTRACT

Background: Acute limb ischemia (ALI)" is a potentially disabling condition Especially in younger patients, early recognition and prompt administration of appropriate therapy play a vital role in reducing mental distress, as well as loss of limbs and fatalities.
Objectives: To determine frequency of various reasons for delayed presentation of acute limb ischemia (ALI) at Combined Military Hospital, Rawalpindi, Pakistan.
Materials and Methods: It was a cross sectional study Conducted at Department of Vasculer Surgery Combine military Hospital Rawalpindi from june 2023 to November 2023. After inform consent all patients suspected having Acute limb ischemia were included in the study.
Results: In our study, mean age was 45.52 ± 6.47 years. 45 (60.00%) patients were male while 30 (40.00%) were female. Mean duration of onset of symptoms was 10.67 ± 2.55 hours. Most common reason of delay in presentation was lack of patient access to the specialist vascular surgeon 25 (33.30%) followed by lack of awareness of the condition 19 (25.30%), financial constraints 13 (17.30%), lack of timely referral to the specialist vascular surgeon by the general practitioner 11 (14.70%) and delay in referral from the primary health care facility 7 (9.30%). In our study, frequency of loss of the limb in study participants was 13 (17.30%).
Conclusion: Lack of patient access to the specialist vascular surgeon and disease awareness are the most common reasons for delayed patient presentation who suffers from "acute limb ischemia (ALI)".
Keywords: Acute Limb Ischemia, Awareness, Delayed Presentation, Reasons, Vascular Surgery.

This article may be cited as: Imranullah, Qayyum S, Siddique MK, Badshah A, Ayubi A, Hai A. Factors Influencing Timely Diagnosis and Management of Acute Limb Ischemia (ALI) in Emergency Departments. J Saidu Med Coll Swat. 2024;14(4):379-383. DOI: https://doi.org/10.52206/jsmc.2024.14.4.991

INTRODUCTION

"Acute limb ischemia (ALI)" is a potentially disabling condition which occurs when there is sudden onset disruption in the circulation of blood and subsequently the perfusion of the limb which can threaten the viability of the affected appendage and can lead to even devastating outcome of loss of the limb.[1] Especially in younger patients, early recognition and prompt administration of appropriate therapy play a vital role in reducing mental distress, as well as loss of limbs and fatalities.[2] There are several morbidities that can precipitate an acute episode of limb ischemia, however, background pathophysiology is driven either by atherosclerosis of the supplying blood vessel or thromboembolic event, both of which lead to circulatory disruption.[3] Amongst these, one of the most common condition that causes this is atrial fibrillation.[4]

It is still difficult for vascular specialists to treat cases of sudden arterial blockage. For a long time, "surgical thromboembolectomy bypass grafting" was the gold standard of treatment. As this field underwent advancement, "thrombolytic therapy" and "percutaneous transluminal angioplasty" have emerged as two of the most common endovascular procedures for some individuals.[5] Notwithstanding the progress that has been made in treatment, the associated morbidity, fatalities and extremity amputation ratios associated with acute ischemia continue to be significant.[6] Early recognition of the condition, appropriate medical education of the patient, timely and appropriate referral to the relevant specialists (vascular surgeon in these cases) and swift commencement of therapeutic interventions are the most important factors that can play pivotal role to salvage the affected limb. These factors are important regardless of the choice modality that is used for intervention in "acute limb ischemia (ALI)" and lack of aforementioned practices can lead to higher incidence of poor patient outcomes in the form of loss of the limb.[7]

Amongst all these factors, one of the major reason, in the developing countries where resources to treat vascular pathologies are already sparse, is the delay in the presentation of patient to the relevant physician and subsequently a delay in the administration of appropriate intervention.[8] There are several factors that have been reported to contribute towards the delay in presentation of the patient to the revascularization facilities and include time delay due to lack of awareness of the patient regarding the condition, delays at the healthcare setting while performing the radiological investigations where patient initially presents and the administrative delays to transfer patient from the presenting facility to the specialized facility where appropriate intervention and interventionist is available.[9] Vascular surgery is still in its development phase in Pakistan, where there are just a handful of specialized healthcare settings in large cities with vascular surgeons. Together with this limitation, delay in the presentation of the patients having "acute limb ischemia (ALI)" adds to already high prevalence of loss of limb due to this rapidly

Correspondence: Dr. Imran Ullah
Combined Military Hospital (CMH), Rawalpindi, Pakistan.
Email: immisaani@yahoo.com

Received: June 05th, 2024 - 1st Revision: July 05th 2024
2nd Revision: September 26th 2024 - Accepted: October 06th, 2024

progressive condition which according to previous studies has been reported to range from 10% 15%.[10]

Owing to this high degree of morbidity associated with this reversible condition it is highly imperative to seek various causes that can lead to delay in presentation of the patients suffering from "acute limb ischemia (ALI)" at the tertiary care facility so that essential planning can be done and a comprehensive plan of prevention can be made to avoid the presentation delays as much as possible to improve patient outcomes.

MATERIALS AND METHODS

We conducted this cross sectional study at Department of Vascular Surgery, Comnined Military Hospital, Rawalpindi, Pakistan, after taking approval from the ethical review board (ERB#:453) of aforementioned institution on 25/09/2023. This study began from September 01st 2023 and continued till February 01st 2024. We calculated the appropriate sample size of our study by using WHO sample size calculator software in which we used calculator for estimation of single proportion. Formula [11] that was used for this is given below:

$$n = \frac{z^2_{1-\alpha/s} P(1-P)}{d^2}$$

For calculations we assumed confidence level to be at 95%, absolute precision at 10% and anticipated frequency of delayed presentation of "acute limb ischemia (ALI)" at 73.5%.[12] Based on these sample size for our study was 75.

Patient of age above 18, both male and female presenting with non-traumatic acute occlusion of arterial blood supply to the lower limbs leading to "acute limb ischemia (ALI)" were included in the study and those patients who had history of trauma preceding development of ALI, those already using anti-coagulant therapy and previous history of arterial occlusion of the limbs were excluded from the Study. Connivance sampling technique was used for sampling.

To make the diagnosis of "acute limb ischemia (ALI)" we used both clinical evaluation through examination and radiological investigation. Cold extremity, decreased sensation and absence of distal pulse upon palpation during physical examination and absence of flow on the Doppler ultrasound of the affected limb was used to make diagnosis of "acute limb ischemia (ALI)" as it has high sensitivity and specificity [13]. Case of delayed presentation was defined as "patients who presented to the specialist facility with vascular surgeon availability after six hours of the onset of symptoms of acute limb ischemia (ALI)" [14]. Once eligible patients were identified, we recorded baseline demographics of the patients in a predesigned proforma including age (in years), gender, duration of symptoms onset, presence of diabetes or hypertension, smoking status, place of residence and site of ischemia. After that a detailed interview of patient was conducted to identify the reason for delayed presentation of the patient.

IBM SPSS 22.00 were used for statistical analysis. Mean and standard duration were computed for qualitative data like ag, duration of symptoms. Percentage and frequency were find out for gender, smoking status, site of ischemia, reason for delay and comorbidities like diabetics and hypertensions. Moreover, sample t test and chi-square test were also applied in data analysis and p value less than 0.05 were considered statistically significant.

RESULTS

Our study includes 75 patients with mean age of 45.52± 6.47 years. Among them, 45 (60.0%) were male, while 30 (40.0%) were female. The average duration of symptom onset was 10.67 hours (± 2.55). Diabetes was reported in 7 (9.3%) patients, and hypertension in 6 (8.0%) patients. Moreover, 17(22.7%) patients were smokers. Around 67 (89.3%) patients who were presented with delay acute limb ischemia were belong from rural areas and only 8 (10.7%) resided in the city. Acute ischemia of the right lower limb was find out in 48 (64.0%) patients, whereas 27 (36.0%) patients had ischemia in the left lower limb. Table 01.

Moreover, most common reason of delay in presentation was lack of patient access to the specialist vascular surgeon 25 (33.3%). followed by lack of awareness of the condition 19 (25.3%), financial constraints (i.e., non-affordability of the required investigations and treatment) 13 (17.3%), lack of timely referral to the specialist vascular surgeon by the general practitioner 11 (14.7%) and delay in referral from the primary health care facility 7 (9.3%) {table 02}. Additionally, 13 (17.3%) patients lost limb due to delayed presentation to vascular surgery unit and 62 (82.70%) patients our team was able to salvage the limb {Fig 01}

Table 01. Baseline characteristics

Sr. No.	Characteristics		Value
1		Mean age	45.52 ± 6.47 years
2	Gender	-Male -Female	45 (60.0%) 30 (40.0%)
3		Mean duration of symptoms onset	10.67 ± 2.55 hours
4		Diabetes present	7 (9.3%)
5		Hypertension present	6 (8.0%)
6		Smoker	17 (22.7%)
7	Place of Residence	-Within city -Outside city	8 (10.7%) 67 (89.3%)
8	Site of Ischemia	-Right lower limb -Left lower limb	48 (64.0%) 27 (36.0%)

Table 02. Reasons for Delay in Presentation of the Patients of Acute Limb Ischemia

Reason	Frequency n (%)
Lack of patient access to the specialist vascular surgeon	25 (33.3)
Lack of awareness of the condition	19 (25.3)
Financial constraints	13 (17.3)
Lack of timely referral by the general practitioner	11 (14.7)
Delay in referral from the primary health care facility	7 (9.3)

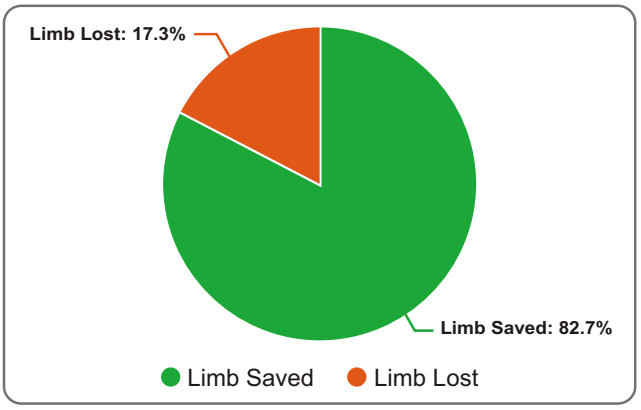


Figure 01. Frequency of Limb Loss

DISCUSSION

Acute limb ischemia (ALI) is a Significant issue because there's only a short timeusually just six to eight hoursto act and prevent lasting harm to the limb[13]. In our study most patients were age around 45 years (mean age). Recent literature study on 582.3 million patients by Marissa C. Jarosinski et.all.[14] calculate that the mean age of acute limb ischemia occurrence is around 68.80 years. This difference could be due to the demographic and life style difference among the two population as the risk factors of acute limb ischemia including diabetics, hypertension, smoking etc are more prevalent in our population. In our study, there was a slight predominance of frequency of "acute limb ischemia (ALI)" among male patients. This may be due to higher chances of men to have risk factors as well as "acute limb ischemia (ALI). Several studies in literaure documanted that man are more prone to ischemic diseases then females[15'16].

In our study, there was quite a large time lapse from the moment patient developed the symptoms of acute ischemia of the limb to the time they presented at the hospital. This was alarming and prompted us to devise plan to shorten this time period. In our study, most common cause of delay in presentation was lack of patient access to the specialist vascular surgeon, followed by lack of awareness of the condition and lack of timely referral to the specialist vascular surgeon by the general practitioner. According to previous literature Logistical issues, such as a shortage of vascular units and trained personnel, combined with low awareness among the general population and general practitioners (GPs), often lead to the unfortunate outcomes of limb loss and even mortality.[17] More over Some of these reasons were also observed in a study conducted by Khan et al.[18]. In our study, quite a large number of patients suffered from the loss of limb as a consequence of delay in presentation of the patients with "acute limb ischemia (ALI)". This was much higher that a study conducted by Dubouis et al.[19] However, it was almost similar to what was reported in a

study conducted by Dilawari et al. [12]. Contrary to our finding, Khan et al. [18] reported much higher frequency of loss of limb as compared to our study.

Based on findings of our study, it is evident that delay in presentation can lead to quite devastating outcomes of a significantly high magnitude. Furthermore, it also shows that there is still a major deficiency of healthcare establishments that lack facilities of vascular surgery making it hard for suffering patients to have easy access. Additionally, a lot of patients in our study lacked the basic medical education regarding their condition. For this purpose we recommend to develop a comprehensive plan to improve the availability of vascular surgery facilities and ensure the conductance of public awareness programs to educate general public regarding this potentially disabling condition.

CONCLUSION

Lack of patient access to the specialist vascular surgeon and disease awareness are the most common reasons for delayed patient presentation who suffers from "acute limb ischemia (ALI)".

Acknowledgements

We are thankful to Head of vascular surgery department Brig muhammad khalid siddique for their support and guidance throughout our research which was very helpful to us in completion of our research project. We are also thankful to the whole surgical team as well as the study participants who have helped us thoroughly in addressing this public health problem and conduct this research.

Ethical consideration

This study was approved by Institutional Review Board of Combined Military Hospital, Rawalpindi, Pakistan.

Funding

There is no role of any funding agency in this study.

Conflict of Interest

Authors declared no conflict of interest.

REFERENCE

1. Obara H, Matsubara K, Kitagawa Y. Acute limb ischemia. Ann Vasc Dis. 2018;11(4):443-448. DOI: https://doi.org/10.3400/avd.ra.18-00074.
2. Pomares G, Coudane H, Dap F, Dautel G. Psychological effects of traumatic upper-limb amputations. Orthop Traumatol Surg Res. 2020;106(2):297-300. DOI: https://doi.org/10.1016/j.otsr.2019.12.013.
3. Natarajan B, Patel P, Mukherjee A. Acute lower limb ischemia-etiology, pathology, and management. Int J Angiol. 2020;29(3):168-174. DOI: https://doi.org/10.1055/s-0040-1713769.
4. Lee HF, Chan YH, Li PR, Liu JR, Chao TF, Wu LS, et al. Oral anticoagulants and antiplatelet agents in patients with atrial fibrillation and concomitant critical limb ischemia: A nationwide cohort study. Can J Cardiol. 2021;37(1):113-121. DOI: https://doi.org/10.1016/j.cjca.2020.02.071.
5. Olinic DM, Stanek A, Tătaru DA, Homorodean C, Olinic M. Acute limb ischemia: an update on diagnosis and management. J Clin Med. 2019;8(8):1215. DOI: https://doi.org/10.3390/jcm8081215.
6. Kulezic A, Acosta S. Epidemiology and prognostic factors in acute lower limb ischaemia: a population based study. Eur J Vasc Endovasc Surg. 2022;63(2):296-303. DOI: https://doi.org/10.1016/j.ejvs.2021.10.044.
7. McNally MM, Univers J. Acute limb ischemia. Surg Clin North Am. 2018;98(5):1081-1096. DOI: https://doi.org/10.1016/j.suc.2018.05.002.
8. Londero LS, Nørgaard B, Houlind K. Patient delay is the main cause of treatment delay in acute limb ischemia: an investigation of pre- and in-hospital time delay. World J Emerg Surg. 2014;9(1):56. DOI: https://doi.org/10.1186/1749-7922-9-56.
9. Normahani P, Standfield NJ, Jaffer U. Sources of delay in the acute limb ischemia patient pathway. Ann Vasc Surg. 2017;38:279-285. DOI: https://doi.org/10.1016/j.avsg.2016.05.118.
10. Gunawansa N. Atraumatic acute limb ischemia: clinical presentation, classification, assessment and management- a review. Int J Vasc Surg Med. 2017;3(3):46-52. DOI: https://doi.org/10.17352/2455-5452.000029.
11. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian J Psychol Med. 2013;35(2):121-126. DOI: https://doi.org/10.4103/0253-7176.116232.
12. Dilawari TH, Farooqui F, Aimon S, Jehan M, Latif S. Late presentation of acute limb ischemia: causes and outcomes. J Coll Physicians Surg Pak. 2023;33(1):103-106. DOI: https://doi.org/10.29271/jcpsp.2023.01.103.
13. Björck M, Earnshaw JJ, Acosta S, Gonçalves FB, Cochennec F, Debus ES, et al. Editor's choiceEuropean Society for Vascular Surgery (ESVS) 2020 clinical practice guidelines on the management of acute limb ischaemia. European Journal of Vascular and Endovascular Surgery. 2020 Feb 1;59(2):173-218. DOI: https://doi.org/10.1016/j.ejvs.2019.09.006
14. Jarosinski MC, Kennedy JN, Iyer S, Tzeng E, Eslami M, Sridharan ND, et al. Contemporary national incidence and outcomes of acute limb ischemia. Annals of Vascular Surgery. 2024 Jul 26. DOI: https://doi.org/10.1016/j.avsg.2024.06.032
15. Gitto M, Gentile F, Nowbar AN, Chieffo A, Al-Lamee R. Gender-related differences in clinical presentation and angiographic findings in patients with ischemia and no obstructive coronary artery disease (INOCA): a single-center observational registry. International Journal of Angiology. 2020 Dec;29(04):250-5 DOI: https://doi.org/10.1055/s-0040-1709500.
16. Sanchez JB, Alcalde JD, Isidro RR, Luna CZ, Cubas WS, Charres AC, et al. Acute limb ischemia in a Peruvian cohort infected by COVID-19. Annals of vascular surgery. 2021 Apr 1; 72:196-204. DOI: https://doi.org/10.1016/j.avsg.2020.12.005
17. Dilawari TH, Farooqui F, Aimon S, Jehan M, Latif S. Late presentation of acute limb ischemia: causes and outcomes. Trauma (iatrogenic and self-inflicted). 2023 Jan 1;9:6-1. DOI: https://doi.org/10.29271/jcpsp.2023.01.107

18. Khan AR, Shaikh FA, Riaz A, Zia-ur-Rehman, Sophie Z, Siddiqui NA. Why do patients with limb ischaemia present late to a vascular surgeon? A prospective cohort study from the developing world. J Pak Med Assoc. 2019;69(Suppl 1)(1).
19. Dubouis A, Vernier-Mosca M, Rinckenbach S, Salomon Du Mont L. Results of the surgical management of acute limb ischemia in the nonagenarians. Ann Vasc Surg. 2021; 70:378-385. DOI: https://doi.org/10.1016/j.avsg.2020.05.073.

DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHORS' CONTRIBUTION

The following authors fullfill authorship criteria as per ICMJE guidelines;

Imranullah, Qayyum S:	Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Siddique MK, Badshah A:	Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Ayubi A:	Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Hai A:	Analysis and interpretation of data, critical revision,final approval, agreed to be accountable for all the work.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License, which permits unrestricted use, distribution & reproduction in any medium provided that original work is cited properly.