

The Economic impact of Lower Extremity Amputations in Diabetics. A retrospective study from A Tertiary Care Hospital of Faisalabad, Pakistan.

Original Article

Muhammad Labeeq,¹ Muhammad Ahsan Tariq,¹ Samar Atta Tung,¹ Muhammad Asfand Yar,¹ Waleed Rehman,¹ Sumera Badar Ehsan.²

1. **Students**, Final Year MBBS, Punjab Medical College, Faisalabad Medical University, Faisalabad, Pakistan.

2. **Assistant Professor (Medical Education)**, Punjab Medical College, Faisalabad Medical University, Faisalabad, Pakistan.

ABSTRACT

Background: Among the various complications of diabetes, lower-extremity amputation due to diabetic foot is a common problem. In Pakistan, 6-7% of patients with diabetes suffer from diabetic foot ulceration.

Objectives: Our primary objective was to explore the frequency of diabetic foot amputations, and the secondary objective was to calculate the economic burden of these preventable surgeries on the health budget of the provincial government.

Materials & Methods: It was a retrospective cross-sectional observational study conducted after obtaining approval from the Ethical Review Committee of Allied hospital, Faisalabad Medical University. The data of diabetic foot patients who underwent amputations between July 2017 and December 2017 were retrieved from three Surgical Units (I, II & III), using a purposive sampling technique. All amputations carried out for reasons other than diabetic foot were excluded. The direct medical cost of one diabetic foot amputation was calculated via a local survey of the various private hospitals of Faisalabad. The indirect costs in terms of loss of productivity and disability costs, transport costs, rehabilitation costs were not included in this study. The data were evaluated by using SPSS Version 23.

Results: A total of 85 patients were included in our study. The male to female ratio was 2.7 to 1. The mean direct treatment cost for minor amputation was PKR 46926.00 ± 11730.90 (\$382.35 ± 95.58), and the mean direct treatment cost for major amputation was PKR 53720.00 ± 12401.24 (\$437.71 ± 101.40). Out of 85 amputations, 63 (74%) were major amputations, and the remaining 22 (26%) were minor amputations. The total cost for 63 major amputations was PKR 3,384,360 (\$27568.91) and for 22 minor amputation was PKR 1,032,372 (\$8409.67). The net cost came out to be PKR 4,416,732 (\$35978.59) for all the 85 cases being reported in a tertiary care hospital of Faisalabad for six months.

Conclusion: Diabetic foot, a preventable complication of long-term diabetes mellitus, has an economic burden on the hospital budget, which, if adequately addressed via primary prevention programme, can yield not just economical but medical benefits as well.

Keywords: *Diabetic foot, Limb amputation, Infection, Neuropathy, Diabetes mellitus, Medical Treatment cost.*

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder that leads to both health and economic concerns for patients and the healthcare machinery in Pakistan and across the world. Prevention is one of the best health policies that the patients may adopt. This is further fortified by the fact that revamping economic resources can increase the quality of life, especially in the developing world, where health economics plays a vital role in disease control. Diabetes mellitus is affecting

millions of lives across the globe, causing preventable losses which can be tackled by global efforts through effective policy-making based on proper research. It has a global prevalence rate of 8.3% and in Pakistan is 11.77%, affecting 7.1 million adult population.^[1,2] Among the various complications of diabetes, diabetic foot is a common problem throughout the world, and despite being preventable, it leads to amputation in poorly compliant cases. Diabetic attentiveness and foot care are



CORRESPONDING AUTHOR

Muhammad Labeeq
Final Year MBBS, PMC,
Faisalabad, Pakistan.

Author Email
m.labeeq@gmail.com



doi:
10.5281/zenodo.3595027

Submission: Oct 2, 2019
Acceptance: Jan 20, 2020
Publication: Feb 1, 2020



less likely to be observed in illiterates and the poorly aware. This indicates that shortcomings in public awareness and primary prevention do exist.^[3] Diabetes mellitus is a serious medical condition affecting 451 million people worldwide as of 2017, and the number is expected to rise in the future, especially in third world countries.^[4] The prevalence of diabetic foot in Pakistan is 13.9%.^[2] Diabetic foot ulcer has a high recurrences rate, and the American Diabetes Association (ADA) reported a 50% recurrence rate in treated patients after 24.3 months of healing.^[6]

Our primary objective was to explore the frequency of diabetic foot amputations, and the secondary objective was to calculate the economic burden of these preventable surgeries on the health budget of the provincial government. Diabetic foot is not only having a deteriorating effect on the quality of life of the patient by causing permanent disabilities but is also a significant burden on our public health budget. If budget is redistributed from treatment to prevention, the economic burden on public health budget alongside the burden of disability on the patient level can be decreased.

MATERIALS AND METHODS

This was a retrospective cross-sectional observational study, carried out in the surgical units of a tertiary care hospital in Faisalabad, Pakistan, to estimate the frequency and burden of diabetic foot amputations on the economy.

Inclusion and Exclusion Criteria

A total of 85 subjects, selected by non-probability purposive sampling, who underwent transfemoral or above-knee (AK), below knee (BK) and below ankle (BA) amputations, were diagnosed Type II diabetics were included in this study. Patients who underwent amputation for other indications were excluded from this study.

Type of Amputations

The lower extremity amputations were categorized into major and minor amputations.^[7] Major amputation was defined as an amputation leading to loss of limb, whereas minor amputation was defined as amputation of toes or partial foot.

Cost Estimation

The cost of one diabetic foot amputation was calculated via a local survey of the various private hospitals of Faisalabad. All expenses incurred from the first consultation until the operation itself were summed up to obtain the total cost of treatment, which was expressed as the estimated direct medical cost of diabetic foot amputation procedure after deducting 21% profitability margin.^[8] The indirect costs in terms of loss

of productivity and disability costs, transport costs, rehabilitation costs were not included in this study. The dollar conversion rate was defined as per current exchange rate USD 1 = PKR 122.26.

Ethical Consideration

This study was approved by the institutional review board of Faisalabad Medical University via letter number 855/2018 dated 31-03-2018.

RESULTS

A total of 85 patients were reported for diabetic foot amputations during six months of duration from July 2017 to December 2017. Out of these, 62 (73%) were male, and 23 (27%) were female [Figure 1]. The ages of reported patients ranged from 18 years to 85 years, with a mean age of 55.12 ± 11.66 years. The patients were divided into four age intervals, and the frequency of cases in each interval was recorded. 5 cases (6%) fall in 18-35 years, 12 (14%) in 36-45 years, 47 (55%) in 46-60 years and 21 (25%) in 61-85 years [Figure 2].

Out of these 85 amputations, 63 (74%) were major amputations, while 22 (26%) were minor amputations [Figure 3]. After deducting 21% profitability margin, the mean direct treatment cost for minor amputation was PKR 46926.00 ± 11730.90 ($\$382.35 \pm 95.58$), and the mean direct treatment cost for major amputation was PKR 53720.00 ± 12401.24 ($\$437.71 \pm 101.40$).

This study looks further at the total costs, including the detailed breakdown of funding being spent on a diabetic foot amputation surgery in a tertiary care hospital [Table 1].

DISCUSSION

Diabetic foot ulcer is one of the many complications of diabetes, requiring urgent intervention. It indicates that a significant portion of the health budget is being spent on the treatment of preventable complications but not on patient education and public awareness.^[5] If strategies to reduce the risk of such complications are adopted, a substantial economic benefit can be obtained. Since it was not possible to calculate the cost in a government tertiary care hospital, therefore, a local survey was conducted in the private hospitals of Faisalabad to calculate the cost of the procedure. After deducting the profitability margin of private hospitals, which was taken at 21% (as jointly reported by State Bank of Pakistan and International Finance Corporation), a comparative cost was calculated that was considered to be considered equal to the cost being spent in government hospitals.^[8]

Our study showed that the net cost came out to be PKR 4,416,732 ($\$35978.59$) for all the 85 cases being reported during six months in the public sector tertiary care hospital where this study was conducted. The estimated

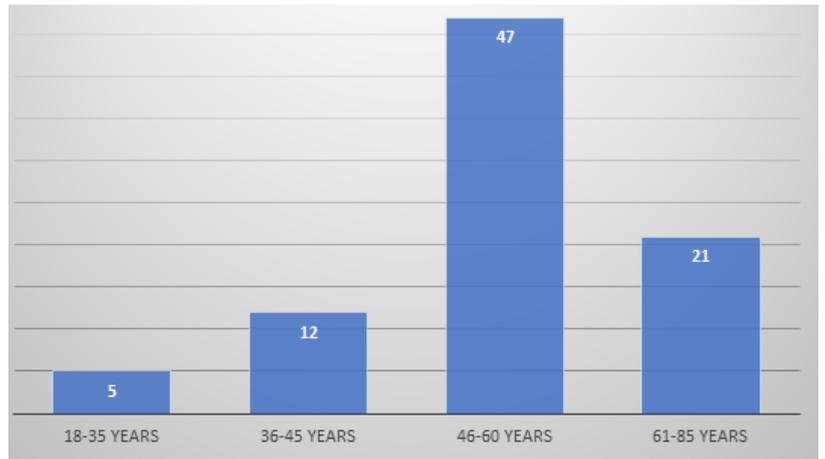
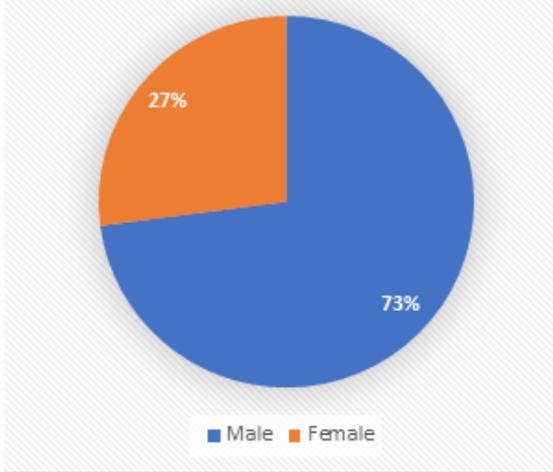


Figure 1: Gender wise distribution of subjects **Figure 2:** Age Wise Distribution of subjects

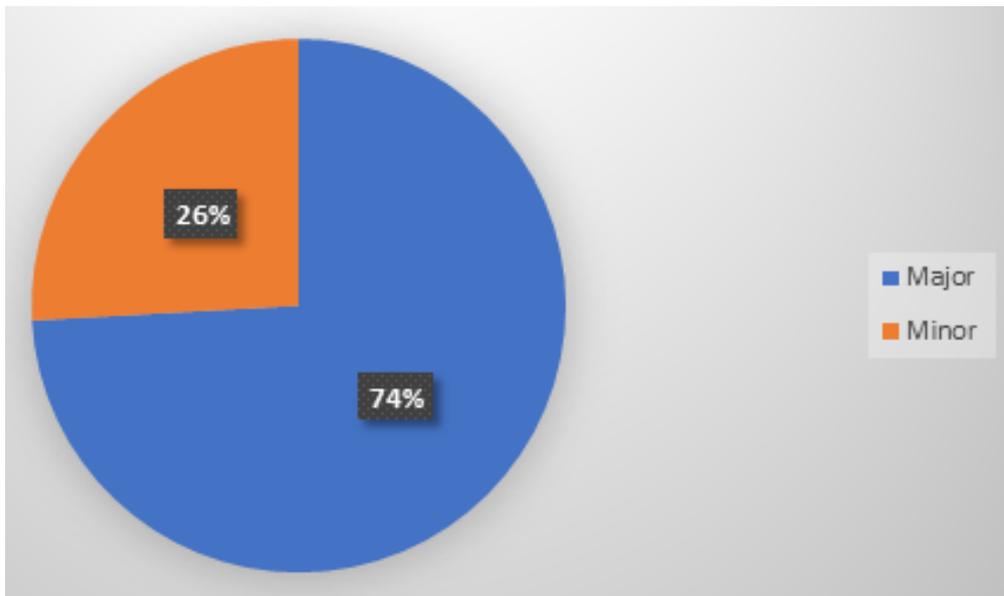


Figure 3: Major Amputation to Minor Amputation Ratio

No.		Minor Amputation Mean ± SD (PKR)	Major Amputation Mean ± SD (PKR)
1	Consultation Charges	1350.00 ± 212.13	1350.00 ± 212.13
2	Operation Theatre Charges	4100.00 ± 141.42	4100.00 ± 141.42
3	Room Charges	4300.00 ± 424.26	12900.00 ± 1272.79
4	Doctor's Visit	1350.00 ± 212.13	1350.00 ± 212.13
5	Medicine Cost	7000.00 ± 1414.21	7000.00 ± 1414.21
6	Surgeon Charges	20000.00 ± 7071.07	20000.00 ± 7071.07
7	Anesthetist Charges	3500.00 ± 707.11	3500.00 ± 707.11
8	Miscellaneous Charges	3500.00 ± 707.11	3500.00 ± 707.11
9	Investigations Cost	3000.00 ± 0.00	3000.00 ± 0.00
10	Dressing Charges	6300.00 ± 2969.85	6300.00 ± 2969.85
11	Plaster Casts	2000.00 ± 0.00	2000.00 ± 0.00
12	Follow-up charges in uncomplicated surgery	3000.00 ± 1414.21	3000.00 ± 1414.21
	Total Mean Direct Treatment Cost in PKR	59400.00 ± 14849.24	68000.00 ± 15697.77
	Total Mean Direct Treatment Cost in PKR after deduction of 21% profitability margin	46926.00 ± 11730.90	53720.00 ± 12401.24
	Total Mean Direct Treatment Cost in USD after deduction	382.35 ± 95.58	437.71 ± 101.40

Table 1: Breakup of Direct Treatment Cost

annual budget of Allied hospital Faisalabad is PKR 5.694 billion, and the approximate 6-month budget of Allied Hospital is approximately PKR 2.6 billion.^[9] Diabetic Foot amputations took up 0.17% of the budget of Allied hospital Faisalabad for the duration of the study. This is the economic impact of a single preventable complication of diabetes on the gross budget of a public sector tertiary care hospital of a developing country like Pakistan. About PKR 70 billion are allocated to the health budget of Punjab, out of which hospital services accounting for the treatment of diseases are allocated PKR 64 billion and the Preventive Health Care Programme budget is PKR 1.9 billion only.^[9] This distribution depicts that the budget spent on preventive healthcare is only 2.7%, and the major proportion of that (91%) is spent on the treatment of diseases indicating a prioritization of treatment rather than prevention.^[9] If we extrapolate this burden to account for all health establishments of the province, both private and public, it would add up to become an alarming figure. The breakdown of cost analysis in this study includes the direct costs of this complication and its treatment but due to limitations in record keeping it excludes the expenditure of post-surgical foot care, cost of antibiotics, hyperglycemia management, and the indirect costs including the disability cost, loss of employment, rehabilitation cost and ultimately the loss in productivity. This indicates that there are economic implications seen by patients of this disease beyond what the costs of the surgical procedure alone determine.

CONCLUSION

More resources should be allocated to primary prevention programs. It will not only decrease the incidence of diabetic foot ulcers but also substantially reduce the financial cost of treatment. Therefore, strategies on a national scale should be devised to run public awareness programs, including the establishment of dedicated diabetic clinics in all public sector secondary and tertiary hospitals to deal with diabetic patients, promoting patient compliance to hyperglycemia control and preventing damage from long-term complications. Record keeping of the direct and indirect costs of treatment needs to be improved and digitized in public sector hospitals to conduct further research on health economics. Disability and rehabilitation programs, including regular follow-ups of patients after diabetic foot amputations, are required to be initiated by the government to reduce the burden of treatment on patient's end after disability. The government should strengthen the primary prevention

programs to educate the masses about diabetes and its preventable complications. However, more studies are required in this area to determine the economic burden due to these indirect costs.

LIMITATIONS

Some limitations exist due to the narrow area of the study's application. Due to limitations of the analog record-keeping of funds and lack of digital hospital records in a public sector tertiary care hospital, the direct determination of the procedure cost was not possible. Despite having limitations, this retrospective study is essential for a developing country with limited data on health economics. Further higher scale studies are needed to address this issue in more detail.

REFERENCES

1. Meo SA, Zia I, Bukhari IA, Arain SA. Type 2 diabetes mellitus in Pakistan: Current prevalence and future forecast. *J Pak Med Assoc.* 2016;66(12):1637-1642.
2. Syed F, Arif MA, Ramzan A, Niazi R, Musarrat S, Kayani MM. The ATONE study - assessment of diabetes knowledge in individuals with type 2 diabetes in the Pakistani population. *J Pak Med Assoc.* 2019;69(3):383-388.
3. Valk GD, Kriegsman DM, Assendelft WJ. Patient education for preventing diabetic foot ulceration. *Cochrane Database Syst Rev.* 2005;(1):CD001488. Available from: doi: 10.1002/14651858.CD001488.pub2.
4. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, Malanda B. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Res Clin Pract.* 2018;138:271-281. Available from: doi: 10.1016/j.diabres.2018.02.023.
5. Khan A, Junaid N. Prevalence of diabetic foot syndrome amongst population with type 2 diabetes in Pakistan in primary care settings. *J Pak Med Assoc.* 2017;67(12):1818-1824.
6. Boulton AJM, Armstrong DG, Kirsner RS, et al. *Diagnosis and Management of Diabetic Foot Complications.* Arlington (VA): American Diabetes Association; 2018. Available from: doi: 10.2337/db20182-1.
7. Molina CS, Faulk JB. Lower Extremity Amputation. [Updated 2019 Aug 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546594/>.
8. SBP. A market analysis and industry overview report on the Private hospitals of Pakistan 2011. [Internet]. 2011 [cited 2019 March 10]. Available from: <http://www.sbp.org.pk/departments/ihfd/Sub-Segment%20Booklets/Health%20and%20Social%20Work-Private%20Sector%20Hospitals.pdf>.
9. Department of Finance, GOP. Annual Budget Statement for 2017-18 [Internet]. 2017 [cited 2019 March 10]. Available From: <https://finance.punjab.gov.pk/system/files/DevelopmentRevised2017-18Vol-I.pdf>.

CONFLICT OF INTEREST

The Authors declare no conflict of interest.

HOW TO CITE

Labeeq M, Tariq MA, Tung SA, Yar MA, Rehman W, Ehsan SB. The Economic impact of lower extremity amputations in diabetics. A retrospective study from a tertiary care hospital of Faisalabad, Pakistan. *Pak J Surg Med.* 2020;1(1):18-22. doi: 10.5281/zenodo.3595027.

E-OP

We Value your Opinions. Register your Opinion to this Original Article by Labeeq M et al. by [clicking here](#).

COPYRIGHT STATEMENT

Copyright © 2020 Pakistan Journal of Surgery & Medicine. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 License, which permits unrestricted use, distribution & reproduction in any medium provided that original work is cited properly.