Profile of Childhood Amputations in a Tertiary Institution in North Central Nigeria. A 10 Year Retrospective Study

Chukwuemeka Ndubuisi Chibuzom [1], **Chukwuemeka Stanley Egele** [2]

[1] *Department of Orthopaedics and Trauma Surgery, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.*
[2] *Department of Surgery Dalhatu-Arafat Specialist Hospital, Nasarawa State, Nigeria.*

ABSTRACT

Background: Amputation is the removal of a limb or part of the limb through bone. Amputation affects a child's emotional, psychological, and social development and might lead to poor performance at school. **Objective**s: To analyze the profile of childhood amputations done in Dalhatu-Arafat Specialist hospital Nasarawa, North-Central, Nigeria. **Materials and Methods**: Medical records of all consecutive patients who had amputations done between January 2012 and December 2021 who were 18 years and below were retrieved from the records department. Patient's demographics, indications, types and complications of surgery were extracted and analyzed with SPSS version 23. **Results**: There were 56 unilateral amputations done in 47 males and 9 females. The upper limb was involved in 30 (53.6%) while 26 (46.4%) were on the lower limb. Above elbow amputation was done in (25%) while below elbow was done in (14.3%). (14.3%) was below knee amputation while (8.9%) were above knee joint. (7.1%) were trans-knee amputation while one was a trans-elbow amputation. Trauma was the leading cause 50 (89.3%), followed by tumor 3 (5.6%). 60% of the trauma cases arose from wrongful manipulation of simple fractures and dislocations by traditional bone setters. Flap necrosis and wound infection were the common complications noted. **Conclusion**: Trauma was the commonest indication for childhood amputation and majority were due to gangrene from traditional bone setter's mismanagement. Above elbow and below knee amputation were the commonest types of amputation done. These avoidable causes of amputation can be reduced by combined efforts from government, public and private individuals.

Keywords: Amputation; Causes; Childhood; Complications

OPEN ACCESS
***Correspondence:**
Chukwuemeka Ndubuisi Chibuzom. Department of Orthopaedics and Trauma Surgery, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.
***Tel:** Phone: 08062946030.*
Email:
buzom4christ@yahoo.com.

Specialty Section:
This article was submitted to Clinical, a section of TJMR.

***Received:** 13 October2022*
***Accepted:** 5 November 2022*
***Published:** 9 November 2022*

Citation:
Chukwuemeka Ndubuisi Chibuzom and Chukwuemeka Stanley Egele. Profile of Childhood Amputations in a Tertiary Institution in North Central Nigeria. A 10 Year Retrospective Study. Trop J Med Res. 2022:21(2);139-146. DOI: 10.5281/zenodo.7792170 .

Access Code

http://tjmr.org.ng

INTRODUCTION

Amputation is the surgical removal of a limb or part of a limb through bone. [1]. It may be performed for therapeutic reasons such as Trauma, peripheral vascular disease, gangrene, infections, congenital limb deformities, and tumors. [2] Although it is aimed at treating and rehabilitating the patient, it is however often regarded by the patient as a

mutilating form of treatment, and may lead to psychological trauma. It may also lead to social adjustment challenges, poor self-image, poor academic performance and ultimately career pursuit. [3] Amputation may be major when involving part of the limb proximal to the wrist or ankle, or minor when it is distal to the wrist or ankle. [4] Amputation in children is a less commonly reported procedure. The impact on the parents as well as on the growing child who may not even be aware at the time of surgery but will overtime demand explanations as to the reason for his limb loss constitutes extra source of worry.

Causes of limb amputation are well documented all over the world in adults. [5-8] However there are only very few studies documenting the causes of amputation in children especially in our environment. The causes of amputation are varied between children and adults, and between different countries of the world. Even within the same country it may also vary from region to region. [9-11] Traditional Bone Setters (TBS) misadvised intervention in trauma/fracture care leading to gangrene is a top cause for amputation in our setting. [12-13] Some studies reported trauma as the leading cause, while others reported congenital anomalies as the leading cause. [14-15]

Regardless of the reason for the amputation, obtaining consent for the surgery is a very difficult task often confronting the orthopedic surgeon as inputs are often sought from the extended family before decision can be reached. This results to situations where emergencies are converted to semi-emergencies and even out rightly to cold cases in some instances with attendant danger to the patients.

Child amputees generally present fewer complications, easier to rehabilitate and are more easily adapted to their prosthesis. [16] However this may be more difficult in our environment as a result of changing size and needs as the child grows, as well as the conspiracy between poverty and ignorance in our land. Rehabilitation centers are yet scarce in our environment and data to push for their establishment lacking. This gives further impetus for this study.

This study therefore was done to review the causes, types and complications of amputation in children presenting to Dalhatu-Arafat Specialist Hospital, Nasarawa State, Nigeria, over a ten year period.

MATERIALS AND METHODS

This is a ten year retrospective study done to identify the profile of childhood amputation in a tertiary institution in North Central Nigeria. Ethical approval of the institution was obtained before the commencement of the study with approval reference number DASHREC/233 issued 22/08/2022.

The medical records of all consecutive patients who attended the casualty department of the hospital and those who were seen at the clinics who had amputation done between January 2012 and December 2021 were included in the study. The case folders, clinics and theatre records were all retrieved and studied to extract the demographics, diagnosis and indications for amputations, levels of amputation (site), type, complications from the amputation surgery and prosthetic rehabilitation. Cases with incomplete records as to cause, type and complications of surgery were excluded from the study. Also cases that fell outside the study period were excluded. Cases whose ages were above 18 years were excluded from the study.

A proforma was used to collect data which was then entered into Statistical Package for Social Sciences (SPSS) version 23 for sorting and analysis. Continuous variables were analyzed using descriptive statistics. Mean values were compared using Students t-test. Categorical variables were compared using chi square test. Confidence interval was set at 95% and all p-values less than 0.05 were assumed significant. Data is presented in frequencies, figure and tables below.

RESULTS

There were a total of 56 children who had 56 amputations during the period studied. 47 (83.9%) were males while 9 (16.1%) were females: a male: female ratio of 5.2:1. The mean age was 9.71 ± 5.01 with a range of 1 month to 18 years, see table 1.

Fifty-two cases were done as emergency while four were done as elective procedure. Four was done as open procedure while fifty-two were done as closed procedure.

Table 1: age distribution of study population.

Age (years)	frequency	frequency %
<1	1	1.8
1-3	6	10.7
4-6	9	16.1
7-9	12	21.4
10-12	11	19.6
13-15	6	10.7
16-18	11	19.6
Total	56	100

Table 2: Types and Levels of Amputations

Type (site)	frequency	frequency %
Upper Limb	30	53.6
Lower Limb	26	46.4
Total	56	100
BEA	8	14.3
AEA	14	25
AKA	5	8.9
BKA	8	14.3
TKA	4	7.1
TEA	1	1.8
Ray (hand)	7	12.5
Ray (foot)	9	16.1
Total	56	100

Key:
BEA=below elbow amputation
AEA= above elbow amputation
AKA= above knee amputation
BKA= below knee amputation
TKA= Trans knee amputation
TEA= Trans elbow amputation

Table 3: Traumatic causes of amputation

Causes of trauma	frequency	frequency
TBS gangrene	30	60
RTA	8	16
Assault	3	6
GSW	1	2
Burns	1	2
Motor bike accident	1	2
Bicycle accident	2	4
Industrial accident	1	2
Domestic accident	1	2
Snake bite	1	2
Other	1	2
Total	50	100

Key. TBS=Traditional bone setter, RTA= Road traffic accident, GSW= Gunshot wound

The upper limb was involved in 30 (53.6%) cases while the lower limb was involved in 26 (46.4%) of the cases. There were 8 (14.3%) and 14 (25%) of below and above elbow amputations respectively. 5 (8.9%) had above knee amputation (AKA), while 8 (14.3%) had a below knee amputation (BKA). 4 (7.1%) had a trans-knee amputation while 7 (12.5%) had amputation of upper limb digits, and 9 (16.1%) had amputation of the lower limb digits. 1 (1.8%) was a trans-elbow amputation, see table 2.

Majority of the cases 50 (89.3%) were due to trauma while tumor accounted for 3 (5.4%) cases. One was due to infection and 2 were iatrogenic following corrective osteotomy in one and forgotten tourniquet in another see figure 2. Among those caused by trauma 30 (60% of trauma, 53.6% of total) resulted from ill-advised manipulations of simple fractures and dislocations by traditional bone setters resulting in gangrene of the affected limb, while one each was from electrical burn and snakebite, and another from gunshot injury. Road traffic accident accounted for 8 cases, while two resulted from bicycle accident. One was from a motor bike accident, three was from assault, and one was from industrial machine accident, see table 3.

All three cases caused by tumor were sarcomas; two were due to soft tissue sarcoma, while osteosarcoma accounted for one. One case resulted from infection of the digit with resultant digital vascular thrombosis and gangrene due to poor management before presentation. Two iatrogenic causes occurred; one case was due to complications of corrective osteotomy and the other was forgotten tourniquet in a month old child resulting in gangrene. Three (5.4%) and four (7.1%) had flap necrosis and infection respectively, see figure 3. None of the patients in our study had prosthetic rehabilitation.

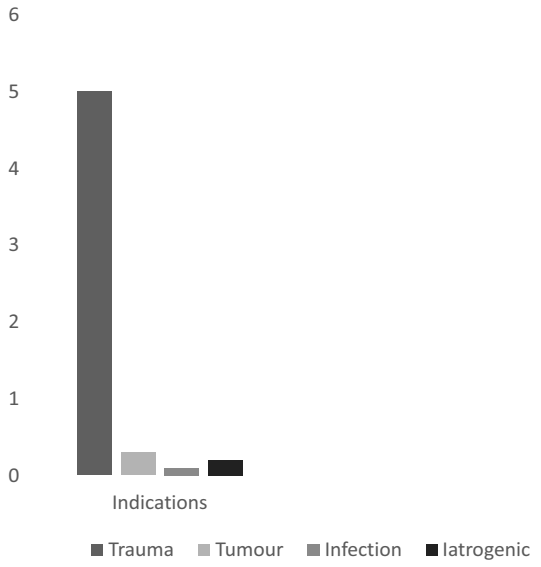

Figure 2: Indications for Amputations

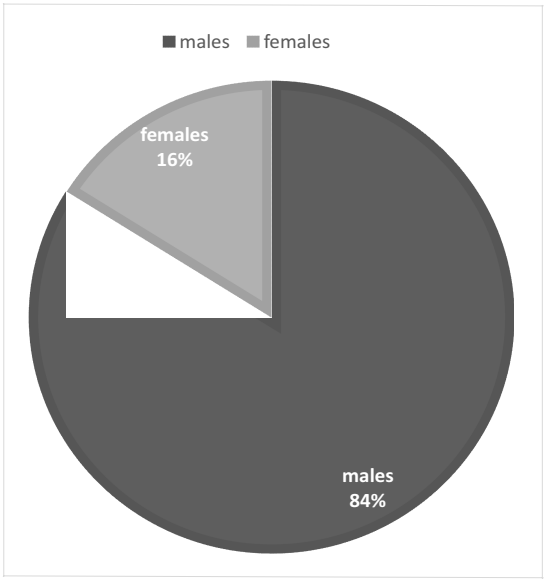

Figure 1: Gender distribution of study population

DISCUSSION

Amputation in children have a huge impact on the child's growth and development as well as his academic wellbeing and indeed the overall quality of life of the child. This makes rehabilitation of the child amputee a very important part of the care in other to re-integrate the child into his society satisfactorily. [17].This involves multiple disciplines such as the orthopedic surgeon, the prosthetist, the physiotherapist, occupational therapists, and social workers. Unfortunately this aspect of the child amputee rehabilitation is not yet given adequate attention in Nigeria, probably due to scarce resources as well as paucity of data to support the need for the establishment of rehabilitation centers. Efforts involving the government, private initiatives, nongovernmental organizations and community based initiatives towards setting up child amputee rehabilitation centers will go a long way in helping the child amputee fit in back into the society with minimal losses.

Causes

Trauma was the leading cause for amputation in this study accounting for 50 cases (89.3%) out of which 30 (60% of trauma cases, and 53.6% of total cases) resulted from simple fractures and dislocations which were mismanaged by traditional bone setters. This is similar studies to previous studies from Nigeria where trauma was found to be the leading cause and TBS gangrene as a notorious contributor to traumatic cases. [10, 12-13, 18-20]. The high incidence of traumatic cases resulting from TBS mismanagement of fractures and dislocations is completely unacceptable in present times. It reflects a synergy between poverty and ignorance as well as lack of advocacy targeted at this group of "care givers" as well as the general population with a view to reducing such catastrophes. It also reflects how poorly our system responds to research findings; there is no reduction in the high incidence of this between the previous studies in Nigeria and this present study. [18-20] In fact our study shows an increased contribution of TBS gangrene to traumatic causes when compared with the previous studies.

More so the fact that trauma generally continues to be a leading cause for amputation in our environment suggests poor safety attitude of road users as well as poor enforcement of existing traffic laws. Advocacy in this regard targeted at the young active age group in particular as well as the general public will reduce this cause. Strict enforcement of traffic rules as well as responsibility on the part of the government in providing safe pliable roads will help further reduce this. This however differs from reports from Kenya where burns was the leading traumatic cause. [15] Burns seem to be prevalent in Kenya accounting for up to 11.4% of total cases and 27% of trauma cases. We found only one case due to electrical burn in this study. This may be because there is a low prevalence of childhood burns in our environment compared to Kenya. [21-22] Safety measures at home and at public and industrial areas should prevent burns in the first place.

Tumor was the second most prevalent cause for amputation at 5.4% in this study. This is lower than the figures reported by other studies: 11.4%- 24.3%. [4, 15, 23-25] This lower figure may have been due to differences in demographics as well as geographical locations where the studies were done. All the tumors were sarcomas, osteosarcoma accounting for one of the tumors' while the other two were soft tissue sarcoma. Although this is difficult to compare with results from other studies given the low number of cases due to tumor (only three) and differences in the demographics of the study populations, our findings however differ from other studies which also reported majority of the tumors were sarcomas with osteosarcoma as the commonest cause. Soft tissue sarcoma was more common in our study. [15, 23-25] Our findings of low number of cases due to tumor is however similar to findings reported by other studies in literature. [26-27] Amputation due to sarcomas ought to be largely preventable given that the tumor is largely amenable to limb salvage procedures rather than ablative procedure. Sarcomas when detected at earlier stages are usually still confined to the compartment of origin and so are amenable to limb salvage. Even when it is locally advanced, it can be down-staged by neo-adjuvant chemo or radiotherapy so as to conserve the limb ultimately rather than do amputation. [28-31] This seems to suggest late presentation in our environment. Thus early referral of such cases to the Orthopedic Centre as well as advocacy to enlighten the general public on benefits of early presentation will further reduce this avoidable cause for amputation. Also ready provision of radio-therapeutic and radio-diagnostic equipment and centers as well as affordable chemotherapeutic agents will further enhance limb sparing surgery in our environment. Training and retraining of competent Orthopedic, Plastic and vascular surgeons, especially exchange programs abroad in high volume centers where limb salvage is routinely done will go a long way in reducing further those with tumors who end up with amputation. A National Health Insurance Scheme (NHIS) with all inclusive coverage, functional patient friendly services will also bridge this gap, and make limb salvage common practice as it should be in the treatment of sarcomas of the extremities in our environment.

Infection accounted for only one case of amputation in this study. This is lower than 12.4% reported by the study in Kenya. [15] This difference may be due to the fact that the Kenyan study involved a rural population where attention to details of principles targeted at curtailing infection may not have been as adequate as is expected from a Tertiary hospital setting as in this study. More so use of concoctions and herbs to un-hygienically bandage open injuries of the limb is a common practice in rural setting in Africa than a tertiary setting. Generally hygiene is also poorer in rural than urban areas. Also infection is rarely an indication for amputation unless when it is difficult to eradicate by more conservative means or when it is life threatening when amputation is then done as a lifesaving procedure. [32-33] Infections are usually the cause of amputation following chronic osteomyelitis which is difficult to treat otherwise, or when vascular thrombosis complicates an infective process or when a bone or

soft tissue focus may need to be urgently removed to enhance likelihood of the septic patients survival as we may find in patients with gas gangrene. [34].This should be avoided by prompt attention, early recognition and appropriate referral of high risk patients to the orthopedic surgeon for proper care.

Sadly one case each resulted from complication of corrective osteotomy and application of tourniquet both of which are completely avoidable by attention to surgical principles and details as well as proper vigilance in any procedure involving patients. The case from corrective osteotomy was due to an unrecognized vascular injury leading to ischemia and gangrene while the forgotten tourniquet was done following profound ischemia and the need to avoid reperfusion injury capable of causing the death of the child if the tourniquet was removed at the time it was discovered.

None of the patients in our study had prosthetic rehabilitation which may be as a result of non-availability of rehabilitation centers, poverty, and ignorance. Government should partner with private organizations and non-governmental Organizations in bridging this gap by providing affordable prosthesis for the child amputee as is the case in Kenya. [15]

This study may have been constrained by its sample size. Had the sample size been larger we may have had more contribution from other causes of amputation than we had. This may however reflect the poor health seeking behavior of our people. There is a need to focus on prosthetic rehabilitation in this patient group.

CONCLUSION

Trauma was the commonest indication for childhood amputation and majority were due to gangrene from traditional bone setter's mismanagement. Above elbow and below knee amputation were the commonest types of amputation done. These avoidable causes of amputation can be reduced by combined efforts from government, public and private individuals.

Acknowledgment: we sincerely appreciate the assistance of the records department of our institution in helping to sort out the folders of the patients included in the study.

Author contributions

CS Egele and CN Chibuzom conceptualized and designed the study, contributed to the implementation and revision of the manuscript, and also contributed to writing and revising the manuscript. We have read and approved the final copy and accept responsibility for all parts of the manuscript.

Data availability

The data used in supporting the findings of this study are available from the corresponding author upon reasonable request.

Funding

No funding sources

Conflict of interest

None declared

Ethical approval

Study was approved by the research and ethics committee of the institution.

REFERRENCES

1. Enweluzo GO, Giwa SO, Adekoya-Cole TO, Mofikoya BO. Profile of amputations in Lagos University Teaching Hospital, Lagos, Nigeria. Nig Q J Hosp Med. 2010; 20 (4): 205-208
2. Phillipo LC, Joseph BM, Ramesh MD, Isdori HN, Alphonce BC, Nkinda Mbelenge, et al. Major Limb amputations: a tertiary hospital experience in NorthWestern Tanzania. J Orthop Surg Res. 2012; 7: 18. Doi: 10.1186/1749-799X-7-18
3. Olasinde AA, Oginni LM, Bankole JO, Adegbehingbe OO, Oluwadiya KS. Indications for amputations in Ile-Ife, Nigeria. Niger J Med. 2002; 11 (3): 118-121
4. Ajbade A, Akinniyi OT, Okoye CS. Indications and Complications of major Limb amputations

in Kano, Nigeria. Ghana Med J. 2013; 47 (4): 185-188
5. Nwosu C, Babalola MO, Ibrahim MH, Suleiman SI. Major Limb amputations in a tertiary hospital in North West Nigeria. Afr Health Sci. 2017; 17(2): 508-512. Doi: 10.4314/ahs.v17i2.26
6. Ndukwu C, Muoneme CA. Prevalence and Pattern of major extremity amputation in a tertiary hospital in Nnewi, South East Nigeria. Tropical J Med Res. 2015; 18: 104-108
7. Odatuwa-Omagbemi DO, Adiki OT. Extremity amputations in Warri, South-South Nigeria. J West Afr Coll Surg. 2012; 2 (1): 14-24
8. Awori KO, Atinga JEO. Lower Limb amputations at the Kenyatta National hospital, Nairobi. East Afr Med J. 2007; 84 (3): 121-126
9. Akinyoola AL, Oginni LM, Adegbehingbe OO, Orimolade EA, Ogundele OJ. Causes of Limb amputations in Nigerian Children. West Afr J Med. 2006; 25 (4): 273-275.
10. Thanni LOA, Tade AO. Extremity amputation in Nigeria: a review of indications and mortality. Surgeon 2007; 5 (4): 213-217
11. Solagberu BA. The scope of amputations in a Nigerian Teaching hospital. Afr J Med Sci. 2001; 30 (3): 225-227
12. Obalum DC, Okeke GCE. Lower Limb amputations at a Nigerian Private Tertiary Hospital. West Afr J Med. 2009; 28 (1): 24-27. Doi: 10.4314/wajm.v28i1.48420
13. Ekere AU. The scope of extremety amputation in a private hospital in the South-South region of Nigeria. Niger J Med. 2003; 12 (4): 225-228
14. Garba ES, Deshi PJ. Traditional Bone Setting: a risk factor in Limb amputation. East Afr Med. J. 1998; 75 (9): 553-5
15. Ogeng'o JA, Obimbo MM, King'ori J, Njogu SW. Pattern of Limb Amputation among Rural Kenyan Children and Adolescents. Journal of Prosthetics and Orthotics 2010; 22 (3): 157-161
16. Boonstra AM, Rijnders LJ, Groothoff JW, Eisma WH. Children with congenital deficiencies or acquired amputations of the lower limbs: Functional aspects. Prosth Ortho Int 2000; 24: 19-27
17. Kuyper MA, Breedijk M, Mulders AH, Post MW, Prevo AJ. Prosthetic management of Children in the Netherlands with upper limb deficiencies. Prosthet Orthot Int 2001; 23: 228-234
18. Thaddeus CA, Mathew EO. The Indications for major limb amputations: 8 years retrospective study in a private Orthopaedic and trauma centre in the South East Nigeria. J Clin Orthop Trauma 2016; 7 (4): 242-247. Doi: 10.1016/j.jcot.2016.03.006
19. Theophilus MD, Friday TN, Stanley TB. Current indications for extremity amputations in Maiduguri, North-East Nigeria: a 6-year retrospective review. Ann Afr Med. 2018; 17 (1): 22-25. Doi: 10.4103/aam.aam_40_17.
20. Yinusa W, Ugbeye ME. Problems of amputation Surgery in a developing Country. Int. Ortho. 2003; 27 (2):121-124. Doi: 10.1007/s00264-002-0421-x. Epub 2003 Jan 23.
21. Oladele AO, Olabanji JK. Burns in Nigeria: a review. Annals of Burns and Fire Disasters. 2010; 23(3): 120-127
22. Solagberu BA. Trauma of deaths in Children: a preliminary report. Nig J Surg Research. 2002; 4: 98-102
23. Joana Grudziak, Cornelius Mukunzuga, Caroline Melhado, sven Young, Leonard Banza, Bruce Cairns, et al. Etiology of major limb amputations at a tertiary care Centre in Malawi. Malawi Med J. 2019; 31 (4): 244-248. Doi: 10.4314/mmj.v31i4.5
24. Jongkolnee Settakorn, Samreung Rangdaeng, Olarn Arpornchayanon, Suree Lekawanvijit, Lertlakana Bhoopat, John Attia. Why were limbs amputated? An evaluation of 216 Surgical Specimens from Chiang Mai University Hospital, Thailand. Arch Orthop Trauma Surg. 2005; 125 (10): 701-705. Doi: 10.1007/s00402-005-0060-y. Epub 2005 Oct 8.
25. Kauzlaric N, Kauzlaric KS, Kolundzic R. Prosthetic rehabilitation of persons with lower

limb amputations due to tumour. Eur J cancer Care (Engl). 2007; 16 (3): 238-243. Doi: 10.1111/j.1365-2354.2006.00727.x.

26. Joseph KW, Mohammed KA, Ernest M, Patrick O, Atem DG. Pattern of limb amputations in Liberia. Ann Afr Med 2019; 18 (4): 196-199. Doi: 10.4103/aam.aam_19_19
27. Ubayawansa DHB, Abeysekera WYM, Kumara MMAJ. Major Lower Limb Amputations: Experience of a Tertiary Care Hospital in Sri Lanka. J Coll Physicians Surg Pak. 2016; 26 (7): 620-622
28. McDonald DJ. Limb-salvage surgery for treatment of sarcomas of the extremeties. AYR Am J Roentgenol. 1994; 163 (3): 509-513; discussion 514-16. Doi: 10.2214/ajr.163.3.8079835
29. Mohamed AFH, Sherif ZK, Hanem S, Ebrahim ELD, Talal A, Refaat AFH, et al. Preoperative isolated limb infusion of Doxorubicin and external irradiation for limb-threatening soft tissue sarcomas. Ann Surg Oncol. 2007; 14 (2): 568-576. Doi: 10.1245/s10434-006-9138-1. Epub 2006 Nov 9.
30. Nichter LS, Menendez LR. Reconstructive considerations for limb-salvage surgery. Orthop Clin North Am. 1993; 24 (3): 511-521.
31. Haussler MD, Vestring T, Hillmann A, Wuisman P, Peters PE. Reconstruction possibilities following resection of malignant musculoskeletal tumors. Radiologe. 1994; 34 (2): 67-72
32. Paola C, Maurizio G, Miriam L, Lorenzo S, Ferdinando C, Esposito K. When amputation is not the end of the challenge: A successful therapy for osteomyelitis and soft tissue infection in a patient with type 1 diabetes. Journal of Diabetes Investigation, 2022; 13 (1): 209-212
33. Giurato L, Meloni M, Izzo V, Uccioli L. Osteomyelities in diabetic foot: a comprehensive overview. World J Diabetes, 2017; 8 (4): 135-142. Doi: 10.4239/wjd.v8.i4.135. Epub 2017 April 15
34. Aggehdakis J, Lasithiotakis K, Topalidou A, Koutroumpas J, Kouvidis G, Katonis P. Limb salvage after gas gangrene: a case report and review of the literature. World J Emerg Surg. 2011; 6: 28. Doi: 10.1186/1749-7922-6-28. Epub 2011 Aug 17.