



Enabling Mobility of War Victims: Amputees in Yemen

Abdullah A. Al-Rabeeh¹ · Shahul Ebrahim² · Abdullah S. AlMoallem¹ · Ziad A. Memish^{3,4,5}

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Conflict exerts substantial trauma on people's lives and destabilizes the future wellbeing of survivors in multiple ways. The loss of a limb is one of the most severe outcomes of war. Loss of a limb impacts a person's mobility, psychosocial well-being, economic self-sufficiency, and therefore integration into society creating a downward spiral for conflict survivors. With manual labor as a dominant source of income in most conflict-affected countries, amputees face poverty and other secondary health issues due to reduced mobility including high blood pressure, deterioration or onset of diabetes, post-traumatic stress disorder and depression making them vulnerable to addiction to substances and domestic violence [1–3]. Mortality risk is significantly higher for persons aged 40 years or older with blast, spine or vascular injury, and those with infections. Amputee rehabilitation is a component of the comprehensive set of rehabilitation efforts targeting people exposed to conflicts that are supported by KSRelief including demining, child soldier

rehabilitation, enabling food and agriculture security, and infectious disease control efforts.

Yemen's protracted civil war deters reconstruction efforts and large-scale rehabilitation. Though the actual number of amputees in Yemen are unknown, with the beginning of conflict in Yemen in 2015, Yemen was added to the countries with the largest number of amputees along with Cambodia, Vietnam, Angola, Mozambique, and Uganda. In the first year of the Yemeni war alone, reports indicate that an estimated 6,000 people have been left disabled [3]. Despite the lack of a defined cessation of hostilities in Yemen, on July 15 2016 the KSrelief established the Prosthetics and Rehabilitation Program for Yemeni amputees, in view of the population level humanitarian impact, after executing many land mine removal projects to eliminate the root cause of the problem [4–6]. In collaboration with KSrelief, the therapeutic Medicine Sector of Ministry of Health of Yemen (MOPHP) identified the following objectives for this joint intervention.

✉ Ziad A. Memish
zmemish@yahoo.com

Abdullah A. Al-Rabeeh
Alrabeeh@ksrelief.org

Shahul Ebrahim
brahimsh2@gmail.com

Abdullah S. AlMoallem
a.almoallem@ksrelief.org

¹ King Salman Humanitarian Aid and Relief Center, Riyadh, Saudi Arabia

² University of Science, Technique and Technologies of Bamako, Bamako, Mali

³ King Salman Humanitarian Aid and Relief Center & College of Medicine, Alfaisal University, Riyadh, Saudi Arabia

⁴ Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

⁵ Abu Dhabi University, Abu Dhabi, UAE

- Provide high-quality free specialized health services for amputees in the field of prosthetics, orthotics, and rehabilitation, along with physiotherapy services for individuals with mobility impairments.
- Rehabilitation to enable amputees regain their ability to work and actively participate in economic activities.
- Strengthen Yemeni national capacity in the manufacture, fitting, and service of prosthetic devices meeting international standards.
- Reduce the financial burden on Yemeni government entities by minimizing the need for treatment outside Yemen.

During 2016–2024, the total number of beneficiaries from all phases of the program in four governorates of Yemen reached 109,463 (67% male) including the manufacturing and fitting of 10,851 modern prosthetic and orthopedic devices (Fig. 1). Overall, 76% of the

amputations resulted from war related injuries (landmines, remnants of war, munitions). The service encounters constitute physical rehabilitation services for amputees including maintenance, psychological rehabilitation, physiotherapy, and medical consultations. Training of over 200 Yemeni technical, medical, and administrative personnel has been integral to enhancing the sustainability and availability of these vital services for amputees.

Intra-conflict amputee rehabilitation in Yemen is complex and research reports are rare. A review of 3,930 patients [2] who were treated at three major trauma centers in Sana'a city from January 2016 to December 2020 indicated that most of the amputees were young males (85%, mean age 28 years) and civilians who suffered from complex and severe injuries involving multiple body regions, especially the lower extremities, with a mean hospital stay of 15 days, and requiring a mean 12 months of follow up. Those patients had undergone multiple surgical procedures and implants and had high rates of complications and mortality. Infection, nonunion, malunion, and amputation are the most common complications, and sepsis as the main cause of death (overall mortality rate, 7%; sepsis, 34%).

Though the knowledge on the impact of physical rehabilitation of war-related amputation among civilians is limited, KSrelief efforts indicate that patients suffering non-war

injuries rehabilitate well. Despite the difficult circumstances and limited resources available in an area of conflict, rehabilitation of war victims is possible in the intra-conflict period. Medical rehabilitation is only one aspect of the spectrum of challenges faced by amputees; their economic rehabilitation will remain a major challenge to amputees' full integration to the society. Unlike most other health effects of conflict, loss of limb occurs both in conflict and post conflict period. During conflict, the greatest number of amputations result from the fighting, gunshot wounds, landmine exposure, and lack of timely medical care. Landmine explosions remain the most common cause of post-conflict loss of limb.

The above findings and other studies reiterate the need for timely and adequate trauma care for the war-wounded patients, including prompt evacuation, resuscitation, wound-debridement, fracture stabilization, antibiotic prophylaxis, and tetanus immunization. Poorly managed infections can facilitate the emergence of multidrug-resistant organisms. War limits civilian access to appropriate surgical techniques and implant materials for the reconstruction of large segmental defects and soft-tissue defects impacting rehabilitation outcomes. The need for early access to comprehensive rehabilitation services and psychosocial support during war is challenging but remains a required element.

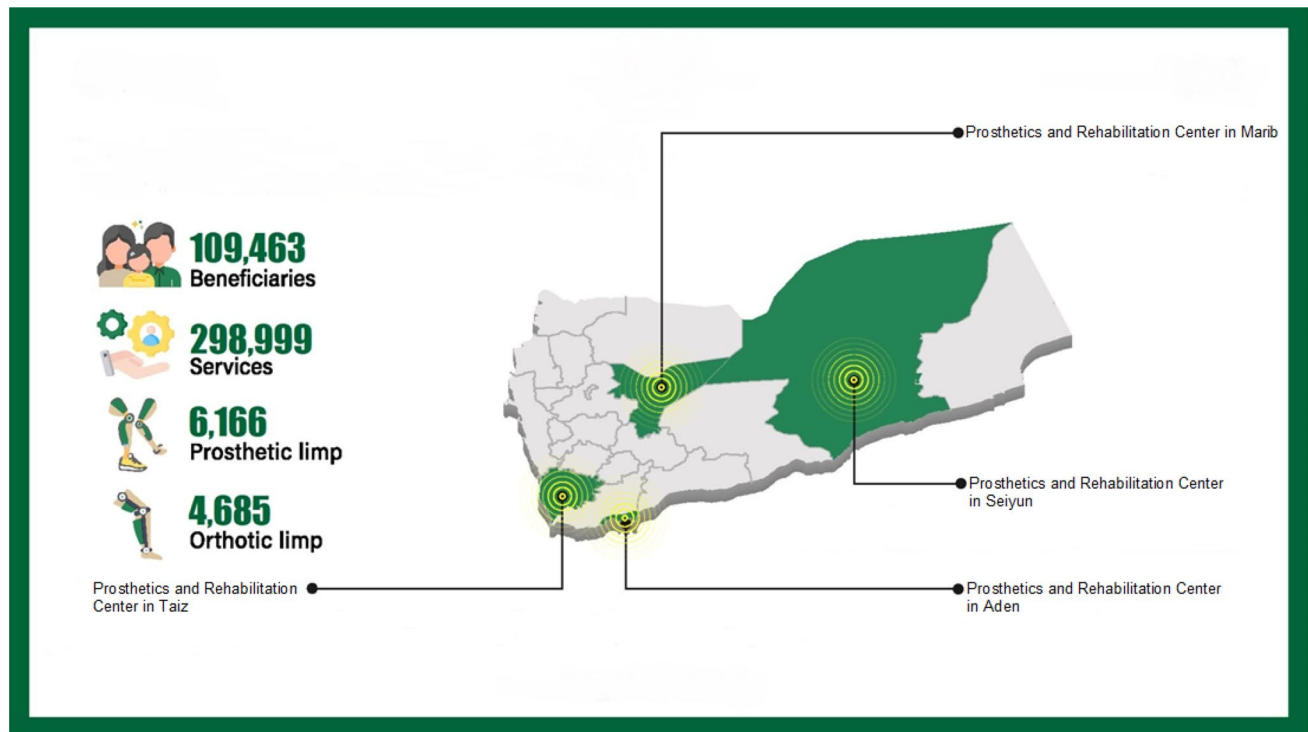


Fig. 1 Amputee support activities, services, and beneficiaries in Yemen, 2016–2024* *Beneficiaries include immediate family members of for whom the amputee is responsible. Services include out-

patient clinics for recurrent consultations, physical therapy, prosthetic maintenance, and prosthetic fitting

To advance the knowledge base on war-related amputations, research including exploration of the risk factors for infection and nonunion/malunion, evaluation of the effectiveness and cost-effectiveness of different surgical procedures and implants, assessment of the long-term outcomes and quality of life of the patients, and development of novel strategies to enhance bone and soft tissue healing are needed. Advancements in neurology, robotics, and 3D printings can revolutionize the utility of prosthetic devices. Residual motor and sensory neurons in arms and legs of amputees can be used with implants and surgery techniques to confer different sensations and precise motor control of prostheses [7]. Such bidirectional communication between tissues and artificial limbs and the possibly combinations of these approaches can help improve the quality of life for amputees.

Photos: Artificial limb recipients Source: KSrelief



Civilian amputee victims of war deserve special consideration in global development and philanthropic agenda. As standard public health systems are marginalized during conflicts, civilians are less likely to receive the same level of attention as does combatant soldiers of war. Further, delayed actions can lead to permanent disability increasing the cost of post-conflict reconstruction and nation building efforts. Early rehabilitation within disaster and conflict settings is important in the

prevention of severe mobility and self-care limitations, postural disorders, reduction in body's endurance, and inability to tolerate physical activities. Global sports industry can help enhance the participation of amputees in special events such as the World Amputee Football Federation activities. The successful rehabilitation of amputees during war requires a coordinated, multidisciplinary effort that begins immediately post-event and continues long after the war has ended. Due to the multitude challenges to wound healing, and the need for early interventions, amputee rehabilitation cannot be delayed as a post-conflict reconstruction agenda, rather an integral element for the highest consideration of the parties engaged in conflict. Continuation of rehabilitation efforts post conflict is equally important that also enables the amputees to continue contributing to post conflict development.

Declarations

Conflict of interest ZAM EIC and SE Deputy editor. Otherwise no other COI.

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