Jurnal Keperawatan
Volume 18 Nomor 1, Maret 2026
e-ISSN 2549-8118; p-ISSN 2085-1049
https://journal3.stikeskendal.ac.id/index.php/keperawatan

HOW LOWER LIMB AMPUTATION SHAPES PATIENT QUALITY OF LIFE? SYSTEMATIC REVIEW

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ABSTRACT
Amputation substantially affects both physical and psychological well-being, bringing considerable changes to patients' lives. The present systematic review sought to examine QoL and Health-Related Quality of Life (HRQoL) among individuals who underwent lower limb amputation. A comprehensive literature search was performed across PubMed, Scopus, and ScienceDirect databases using keywords including "Lower Extremity Amput*" OR "Lower Limb Amput*" AND "Quality of Life" OR "Psychologist*". Studies published between 2018 and 2023 addressing QoL/HRQoL in lower limb amputee populations were considered for inclusion. Article selection and analysis followed the PRISMA protocol. The search identified 577 articles in total, of which 14 met the eligibility criteria and were incorporated into the review. The findings consistently showed that lower limb amputees experienced reduced QoL/HRQoL, with notable recovery observed from at least six months post-amputation onward. Key drivers of this recovery included emotional resilience, motivational factors, availability of social support, and individual patient attributes.

Keywords: amputation lower limb; anxiety; HRQoL; psychological adjustment; quality of life

INTRODUCTION
Amputation refers to the surgical excision or traumatic loss of a limb (Calabrese et al., 2023), commonly resulting from peripheral vascular conditions, physical trauma, or malignancies such as osteosarcoma, with lower extremity involvement being considerably more frequent than upper limb cases. Diabetes-related vascular complications and chronic kidney disease represent leading etiologies of lower limb amputation (Ng et al., 2020). Such a procedure introduces profound alterations to a patient's everyday functioning, substantially diminishing their capacity to carry out routine tasks (Roșca et al., 2021). Consequently, it can result in permanent disability, impacting the patient's quality of life (QoL), functional capacity, and psychological well-being (Migaou et al., 2019). The physical disability associated with amputation can trigger emotions like hopelessness, depression, anxiety, and loss of self-esteem, exacerbating feelings of stigma, isolation, and vulnerability (Khan, 2018).

Globally, the incidence of amputation is estimated between 1.2 and 4.4 cases per 10,000 individuals, with lower limb cases accounting for approximately 90% of all amputations. These numbers are projected to increase twofold by 2050 (Sarroca et al., 2021). Beyond physical consequences,

amputation carries significant emotional repercussions that deeply affect the lives of those involved (Crocker et al., 2021). Multiple determinants including amputation level, capacity for daily self-care, patient age, prosthesis use, and social network support have been recognized as factors shaping QoL outcomes in amputee populations (Maciver et al., 2023).

Notably, there are circumstances in which amputation may actually benefit patients' QoL and functional status, particularly when chronic limb ischemia or severe infection-related pain has been impairing mobility and independence (Van der Schans et al., 2003). While the procedure may alleviate disability in such contexts, it simultaneously disrupts physical integrity, potentially resulting in diminished QoL, restricted mobility, ongoing pain, and lasting physical consequences (Sarroca et al., 2021). To comprehend the Quality of Life (QoL) and Health-Related Quality of Life (HRQoL) among amputees, it is imperative to investigate the factors influencing QoL in patients with lower limb amputation and how various QoL components, as measured, collectively shape overall QoL in this population. This objective will be achieved through systematic studies examining the impact of lower limb amputation on patient QoL, followed by rigorous assessment and synthesis of study findings.

METHOD

This systematic review adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) protocol (Page et al., 2021). The review was registered on the PROSPERO website under the registration number CRD42024541784. Eligible articles were required to be written in English and published in internationally reputable journals, primarily quantitative studies, especially cross-sectional and longitudinal studies. Articles were included if they addressed amputation concerning psychological aspects such as QoL/HRQoL, anxiety, depression, and coping mechanisms. Exclusions comprised studies involving patients under 18 years of age, research involving caregivers, and patients with upper limb amputation. Additionally, articles focusing on drug trials or medical and technical issues were excluded.

The data sources comprise internationally reputable journal articles aligned with predetermined themes, obtained from the Scopus, PubMed, and ScienceDirect databases. Specific keywords were employed in the search process, including terms like "Lower Extremity Amput*" OR "Lower Limb Amput*" AND "Quality of Life" OR "Psychologist*". Articles included were those published between 2018 and 2023. Boolean operators and wildcard characters were used to refine the search and identify both singular and plural forms of the same terms across all databases, with keyword searches employing MeSH terms to encompass synonyms or spelling variations. The data collection process commenced with the article search, followed by separate screening of titles for relevance, abstract review to filter eligible articles, and full-text examination to ensure alignment with predetermined inclusion and exclusion criteria. Regarding data extraction, relevant information was collectively determined based on the review's focus, clinical experience, and previously published reviews. Subsequently, a table was devised to highlight pertinent data, into which information from each article was inputted, and potential inconsistencies were discussed. Finally, the full texts were revisited to confirm the accuracy of the extracted data. Three reviewers (GT, YP, and ASS) independently assessed the risk of bias of each included study by using the JBI (Joanna Briggs Institute) risk of bias tool, and discrepancies were resolved through a team discussion. The scoring outcomes are based on percentage scores categorized as follows: ≥75% (Good), 50-75% (Fair), and <50% (Poor) (Monnaatsie et al., 2021).

RESULT

Search Results and Study Selection

Following the literature search, a total of 577 articles were identified matching the specified keywords, sourced from the Scopus database (n = 200), PubMed (n = 176), and ScienceDirect (n = 201). Subsequently, a duplication check was conducted, revealing 129 duplicate articles, which were consequently excluded from the search results, leaving 448 unique articles for further analysis. Reviewers then conducted screening based on title (n=448), abstract (n=66), and full text (n=50),

aligning with the predetermined theme. Following meticulous eligibility screening against the predefined inclusion and exclusion criteria, 14 articles meeting the criteria for inclusion were selected for inclusion in this review (Figure 1). This study reviewed 14 articles concerning Quality of Life (QoL) and Health-Related Quality of Life (HRQoL) in patients with lower limb amputation, originating from 11 countries and spanning the period from 2018 to 2023.

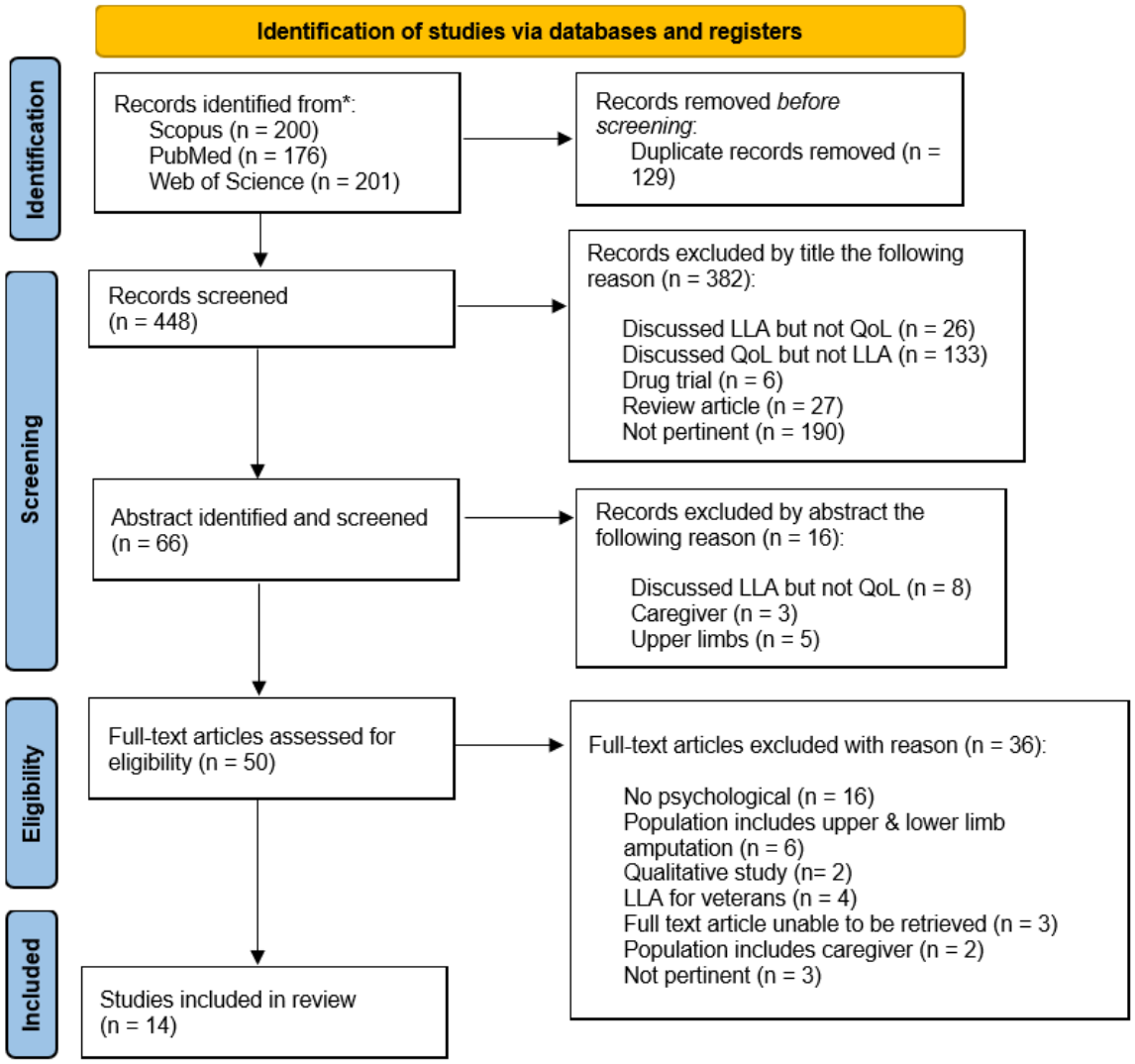

Figure 1. The PRISMA flowchart illustrates the systematic review selection process, depicting the number of excluded articles along with the reasons for their exclusion

Study Characteristics

The main characteristics of the selected studies encompass study objectives, study populations, QoL assessment methodologies, and summaries of study results. Appendix A (Table A) presents the quantitative articles incorporated in the present systematic review. Among the selected studies, four were published between 2018 and 2019, while the remaining ten were published in 2020 and thereafter. Several studies delineated the cause of lower limb amputation, attributing it to diabetic foot ulcer patients (Kizilkurt et al., 2020; Kolivand et al., 2023; Ng et al., 2020; Pedras et al., 2020; Yusof et al., 2019), whereas more than half of the articles did not explicitly specify the primary cause of amputation, instead including samples with varied causes of amputation. The study populations were typically recruited from hospitals, rehabilitation centers, and prosthesis fitting centers.

Sample Population

The study encompassed a total of 1013 amputees, with sample sizes ranging from 13 to 206 patients and ages spanning from 18 to 100 years, with a predominant representation of individuals aged over

60 years. Respondent demographics varied across studies, though in some, males constituted the majority. Notably, not all studies reported whether participants utilized prostheses or other walking aids.

Table 1.
Country-Related Results

Country	HD (Rank)	n (%) 14
Brazil	0,754	3 (21,4%)
Portugal	0,866	2 (14,2%)
Tanzania	0,549	1 (7,1%)
Turkey	0,838	1 (7,1%)
Iran	0,774	1 (7,1%)
Tunisia	0,731	1 (7,1%)
Trinidad & Tobago	0,810	1 (7,1%)
United Kingdom	0,929	1 (7,1%)
Spain	0,905	1 (7,1%)
Brunei Darussalam	0,829	1 (7,1%)
Malaysia	0,803	1 (7,1%)

Research Design

The review revealed that over half of the reviewed articles employed cross-sectional (n=9), longitudinal (n=4), or case-control (n=1) quantitative research designs. These studies were conducted across various countries globally. Table 1 provides a summary of the study results by country of origin. Primarily, the studies included in this review were predominantly from Continental Europe, specifically Turkey (n=1), the UK (n=1), Portugal (n=2), and Spain (n=1).

Outcome Measures

Several articles in this review delved into patient perceptions of general Quality of Life (QoL), while others focused on Health-Related Quality of Life (HRQoL). Throughout the review, various topics were discussed, including QoL/HRQoL, anxiety, social support, psychology, body image, self-esteem, and prosthesis use. Notably, there was considerable variability in the instruments utilized across the studies. A range of generic QoL outcome measures were employed across the studies, including the 36-Item Short Form Survey (SF-36, n=7) (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Kizilkurt et al., 2020; Matos et al., 2020; Migaou et al., 2019; Ng et al., 2020; Sarroca et al., 2021; Yusof et al., 2019), World Health Organization Quality of Life-Bref (WHOQOL-BREF, n=2) (Costa et al., 2021; Melo et al., 2021), Hospital Anxiety and Depression Scale (HADS, n=2) (Abdel Rahim et al., 2022; Pedras et al., 2020), B-COPE (n=1) (Pereira et al., 2018), five-level version of the EuroQol five-dimensional questionnaire (EQ-5D-5L, n=1) (Pereira et al., 2018), and DQoL (n=1) (Kolivand et al., 2023). In assessing the level of functionality, commonly utilized tools included the Barthel Index and the International Physical Activity Questionnaire (IPAQ). However, it is challenging to directly link these measures to QoL/HRQoL, as this aspect of functionality assessment tends to encompass broader measures of patient functionality.

Research Findings

Thematic analysis of the 14 articles revealed a consistent trend: overall Quality of Life (QoL) and Health-Related Quality of Life (HRQoL) decreased immediately post-surgery (Abdel Rahim et al., 2022; Kizilkurt et al., 2020; Melo et al., 2021; Migaou et al., 2019; Pedras et al., 2020; Pereira et al., 2018; Pran et al., 2021; Sarroca et al., 2021; Yusof et al., 2019). However, QoL/HRQoL typically improved over time, particularly after 6 months (Yusof et al., 2019) or 10 months (Pedras et al., 2020). Additionally, these studies highlighted a negative correlation between QoL/HRQoL and emotional reactions such as anxiety and depression (Kizilkurt et al., 2020; Migaou et al., 2019; Pedras et al., 2020). Table 2 summarizes the findings of the studies included in the present systematic review.

Table 2.
Findings from the study

Characteristics	Journal	HRQoL results
Age <60 years >60 years	(Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Migaou et al., 2019; Pran et al., 2021)	Amputee patients aged <60 years have superior quality of life compared to patients aged >60 years.
Gender Woman Man	(Matos et al., 2020)	Better quality of life assessment in male compared to female patients
Level of Amputation Transtibial Transfemural	(Kizilkurt et al., 2020; Pereira et al., 2018; Pran et al., 2021)	In the study, it was found that patients who underwent transtibial amputation had better quality of life compared to patients with higher-level amputations
Amputation Time < 1 year > 1 year	(Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Matos et al., 2020)	Patients with more than 1 year elapsed since the amputation have better quality of life and are associated with better health outcomes.
Use Prostheses & Assistive Devices Prosthesis No	(Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Matos et al., 2020; Migaou et al., 2019; Ng et al., 2020; Pereira et al., 2018; Pran et al., 2021)	It was found that amputee patients with prostheses had significantly better quality of life scores compared to patients without prostheses.
Economy Good Not enough	(Kolivand et al., 2023)	There is a significant relationship between satisfaction with economic status and QoL. Good economic status is associated with good QoL.
Disease concomitant / comorbidity	(Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023)	The absence of comorbid conditions has a negative impact on the QoL aspects of amputee patients.
Educational status High Low	(Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023)	Good quality of life is found in patients with higher levels of education.

In this study, a significant direct relationship was observed between Quality of Life (QoL) and Health-Related Quality of Life (HRQoL) and social support. Various studies have highlighted the pivotal role of social support in enhancing patients' quality of life (Kolivand et al., 2023). Moreover, the utilization of prostheses has been demonstrated to improve QoL and (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Kizilkurt et al., 2020; Matos et al., 2020; Migaou et al., 2019; Ng et al., 2020; Pran et al., 2021; Sarroca et al., 2021). Reviewers also noted that pain (Abdel Rahim et al., 2022; Costa et al., 2021a; Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Kizilkurt et al., 2020; Migaou et al., 2019; Yusof et al., 2019) and post-amputation complications (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023) were associated with QoL and HRQoL. Another relevant aspect concerning the quality of life of amputees is the level of amputation undergone. The study revealed that patients who underwent transtibial amputation generally exhibited better QoL and HRQoL compared to those who underwent transfemoral amputation (Kizilkurt et al., 2020; Pereira et al., 2018; Pran et al., 2021). Additionally, factors such as age ((Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Migaou et al., 2019; Pran et al., 2021), gender (Matos et al., 2020), economic status (Kolivand et al., 2023), comorbidities, and educational level (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023) were associated with QoL and HRQoL.

DISCUSSION

This review systematically examined QoL, HRQoL, and psychosocial adjustment in patients following lower limb amputation. The findings shed light on several factors associated with this health condition, with a predominant focus on psychological adjustment and QoL/HRQoL assessment in the literature describing lower limb amputation. Most of the studies reviewed underscored that patients who underwent lower limb amputation generally exhibited significantly diminished QoL/HRQoL. This aligns with prior research findings, such as those by (Yusof et al., 2019), elucidating that low QoL/HRQoL is correlated with the impact of amputation, which can impede

patients' ability to perform daily physical activities and work. However, the results also revealed that QoL/HRQoL tends to improve over time, notably after six months (Yusof et al., 2019) and ten months (Pedras et al., 2020). This improvement is influenced by several factors, including physical performance related to functionality and mobility, emotional and motivational aspects, social support from close relationships, and the characteristics of the amputees. Moreover, patients with over a year elapsed since amputation were found to have better QoL and HRQoL, leading to improved health outcomes ((Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Matos et al., 2020), echoing findings by (Matos et al., 2020) indicating that patients with longer amputation durations (exceeding 10 years) demonstrated better adjustment to limitations.

Furthermore, the level of amputation emerged as another crucial factor impacting QoL/HRQoL. Prior literature has highlighted that the level of amputation can be pivotal in affecting QoL/HRQoL in patients. Specifically, patients undergoing transtibial amputation exhibited superior QoL/HRQoL compared to those undergoing transfemoral amputation (Kizilkurt et al., 2020; Pereira et al., 2018; Pran et al., 2021). This disparity is attributed to the greater mobility among patients with transtibial amputation compared to those with transfemoral amputation (Kizilkurt et al., 2020). Mobility constitutes a paramount aspect of post-amputation QoL, as it is most directly affected and can influence all other facets (Pran et al., 2021). Additionally, differences in the rehabilitation process contribute, with patients undergoing transfemoral amputations requiring lengthier rehabilitation periods to regain function and independence compared to trans-tibial amputees.

Moreover, robust social support has been shown to positively impact QoL/HRQoL. The review highlighted the significance of social support (Kolivand et al., 2023), echoing findings by Cruz Silva et al. (2021) indicating that social support can positively affect mental health. Social support has also been noted to alleviate negative thoughts by providing positive influences, fostering resilience, or the patient's ability to cope with traumatic events (Mcdonald et al., 2014). Family support emerged as a cornerstone of psychological fortitude in amputees, with patients expressing the need for a balanced reaction to feel empowered and express emotions simultaneously (Abouammoh et al., 2021). Nevertheless, social support extends beyond family to encompass peer support, serving as a source of strength. Peer support allows individuals to compare experiences, fostering clearer and more realistic expectations about amputation and facilitating acceptance of the altered circumstances (Torbjörnsson et al., 2017).

Additionally, the use of prostheses emerged as a significant factor influencing QoL/HRQoL. Prostheses and assistive devices play a pivotal role in post-amputation rehabilitation, with their utilization reported to positively impact QoL/HRQoL in various studies (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Matos et al., 2020; Migaou et al., 2019; Ng et al., 2020; Pereira et al., 2018; Pran et al., 2021). This finding resonates with prior research, indicating that amputees with prostheses exhibit significantly better QoL compared to those without prostheses (Pereira et al., 2018). Individuals with high mobility (ability to walk) reported greater acceptance, distraction, humor, and sought emotional support. Coping strategies such as active coping and planning, involving choice and preparation/engagement in social activities and goals, alongside prosthesis use and walking ability, were deemed positive predictors for adjusting to amputation (Pereira et al., 2018). Effective prosthesis utilization enables individuals to regain mobility more swiftly, aiding in their adaptation to amputation (Kizilkurt et al., 2020)

Conversely, several factors were found to negatively impact QoL/HRQoL. Notably, pain emerged as a significant factor ((Abdel Rahim et al., 2022; Costa et al., 2021a; Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023; Kizilkurt et al., 2020; Migaou et al., 2019; Yusof et al., 2019), aligning with prior research indicating that prosthesis-related pain significantly influences quality of life (Van der Schans et al., 2003). Prosthesis-related pain restricts activity due to its adverse effects on mobility and rehabilitation. This activity restriction, pivotal for quality of life, underscores the significance of prosthesis-related pain (Kizilkurt et al., 2020).

Other factors associated with QoL/HRQoL include gender ((Matos et al., 2020), economic status (Kolivand et al., 2023), comorbidities, and educational level (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023). In this review, a more favorable quality of life assessment was noted in male patients compared to female patients. Despite the female population's better adaptation to limitations, it does not translate to a superior perception of quality of life, as their scores were lower than those of men, corroborating previous studies (Van der Schans et al., 2003). Similarly, consistent with data from the Brazilian population, male patients were attributed a better quality of life assessment due to their greater sociability, primarily owing to their larger social support networks. Furthermore, a significant relationship was observed between satisfaction with economic status and QoL/HRQoL. A favorable financial situation can alleviate the financial burden of treatment and health needs among amputees, thus correlating with a higher quality of life (Kolivand et al., 2023). Lastly, higher education levels were associated with better quality of life, aligning with previous research. Education level, as part of a broad socio-economic domain, significantly impacts post-amputation rehabilitation and long-term care for amputees. Higher education levels are linked with better HRQoL, particularly in the mental health dimension (Gil-Lacruz et al., 2020). A higher education level, typically reaching university levels, indicates greater employment opportunities for patients. This contrasts with patients with lower education levels, who may have engaged in physically demanding jobs before amputation, potentially explaining the higher job loss rates observed among study participants post-amputation, as maintaining physically demanding employment post-amputation poses challenges (Hando, Byomuganyizi, Ngendahayo, Ramadhani, et al., 2023).

CONCLUSION

In summary, this systematic review represents one of the few efforts to consolidate evidence regarding various psychological aspects among patients with lower limb amputation. To the best of our knowledge, it stands as the sole review to explore the relationship between QoL/HRQoL and psychological adjustment from diverse perspectives, drawing insights from quantitative studies. The findings offer valuable insights for guiding future research endeavors and interventions tailored to this clinical cohort. They underscore the necessity for further investigations into the development of interventions addressing not only the physical dimensions but also social and psychological aspects to enhance QoL/HRQoL.

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