

Barefoot Walking Habits and their Potential Protective Effect Against Rheumatoid Arthritis: A Qualitative Study among the Kajangand Highland Papua Communities

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Abstract

Background: Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disorder primarily affecting synovial joints, leading to inflammation, pain, and progressive joint damage. While genetic predisposition plays a role, environmental and lifestyle factors—such as physical activity—have emerged as significant contributors to the onset, progression, and prevention of RA. Among these, natural physical activity embedded in cultural practices may offer unexplored protective benefits. This study examines the traditional practice of barefoot walking in two indigenous Indonesian communities: the Kajang ethnic group in South Sulawesi and residents of the Highland Papua region, where walking barefoot is not only a cultural norm but also a necessity due to geographic and socio-economic conditions.

Objectives: This study aims to explore the prevalence of RA symptoms and assess muscle strength among individuals aged 50–60 years who habitually walk barefoot in natural terrains. It seeks to understand whether this daily activity has a potential role in preventing RA and promoting lower extremity musculoskeletal health.

Material and Methods: A qualitative phenomenological approach was adopted to capture the lived experiences and physical health perceptions of the participants. The study involved in-depth, semi-structured interviews with 100 individuals—50 from each community—who reported daily barefoot walking over distances ranging from 4 to 8 kilometers. The interviews were conducted in local dialects with the aid of trained translators. In addition to subjective narratives, field observations and basic physical assessments focusing on calf muscle firmness and posture were carried out to evaluate muscular development and functional mobility.

Results: None of the participants reported any clinical or self-reported symptoms suggestive of RA, such as persistent joint pain, morning stiffness, or joint deformities. Observational findings consistently revealed strong calf musculature and stable gait patterns across both communities. Participants also reported high levels of physical activity tolerance, with minimal complaints of musculoskeletal discomfort despite advanced age. The daily barefoot walking on uneven terrain appears to provide natural resistance training, possibly enhancing joint stability and muscular endurance.

Conclusions: The habitual practice of barefoot walking in natural environments may play a protective role against the development of RA by enhancing musculoskeletal strength and promoting joint mobility. These findings suggest that traditional lifestyle practices can offer valuable insights into preventive health strategies, particularly in musculoskeletal health among aging populations. Further multidisciplinary research—including clinical and biomechanical analysis—is needed to substantiate these preliminary observations and elucidate the mechanisms linking barefoot walking to rheumatoid arthritis prevention.

Keywords: Barefoot walking, Rheumatoid arthritis, Indigenous health practices, Musculoskeletal health, Qualitative research.

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic autoimmune disorder affecting approximately 0.5–1% of the global population, with a higher prevalence in women and older adults. It is characterized by chronic synovial inflammation, leading to cartilage degradation, bone erosion, and progressive joint destruction, often resulting in significant disability and reduced quality of life [1]. While genetic predisposition, such as HLA-DR4 and HLA-DR1 alleles, plays a substantial role in disease susceptibility, environmental and lifestyle factors have been increasingly recognized as crucial in the modulation and manifestation of RA [2].

Among these modifiable factors, physical activity has been identified as having a protective role against systemic inflammation. Several large-scale studies have demonstrated that regular moderate physical activity is associated with lower levels of pro-inflammatory cytokines such as IL-6 and TNF- α , both of which are central to RA pathogenesis [3,4]. A longitudinal cohort study in Sweden found that individuals engaging in consistent physical activity had a 33% lower risk of developing RA compared to inactive counterparts [5].

Moreover, physical activity performed in natural settings—such as barefoot walking on uneven terrain—may offer additional musculoskeletal benefits. Research by Wang et al. (2020) revealed that habitual barefoot walking improves proprioception, foot muscle strength, and joint stability, which may collectively contribute to lower mechanical stress and reduced inflammation in weight-bearing joints [6]. In indigenous populations where barefoot walking is culturally embedded, such as the Maasai in East Africa and tribal groups in India, the prevalence of musculoskeletal disorders, including RA, has been observed to be significantly lower than in urban sedentary populations, although comprehensive epidemiological studies are still limited [7,8].

The traditional practice of barefoot walking in certain Indonesian indigenous communities, such as the Kajang in South Sulawesi and the highland populations in Papua, offers a valuable and underexplored model of natural physical activity. These communities often walk 4–8 kilometers daily on diverse natural terrain without footwear, engaging multiple muscle groups and joints in the lower limbs. This habitual activity may promote joint lubrication, muscle endurance, and systemic circulation, thereby offering potential protection against inflammatory joint disorders such as RA [9].

OBJECTIVES

This study aims to explore the relationship between habitual barefoot walking and the absence of RA symptoms among individuals aged 50–60 years in the Kajang and Highland Papua communities.

MATERIAL AND METHODS

Study Design and Setting

This study employed a qualitative phenomenological design to explore the lived experiences, health perceptions, and physical conditions of individuals engaged in habitual barefoot walking. The research was conducted in two culturally distinct yet geographically challenging areas in Indonesia: the Kajang region in South Sulawesi and the highland areas of Papua. These settings were selected due to the persistence of traditional practices, including walking barefoot across varying natural terrains such as forest paths, rocky hills, and unpaved roads.

Phenomenological designs are widely used in health research to capture subjective experiences and understand how individuals perceive and interpret their physical health and environment [9]. This approach is particularly suitable for indigenous populations where cultural context heavily influences lifestyle behaviors and health outcomes.

Participants

A total of 100 participants—50 from each region—were recruited using purposive sampling. Inclusion criteria included age between 50 and 60 years, lifelong residency in the respective community, the absence of diagnosed rheumatologic conditions, and the habitual practice of walking barefoot since childhood. Exclusion criteria included a history of systemic illness, joint deformity, or use of footwear in daily activities. This targeted selection allowed for a focused exploration of the potential musculoskeletal benefits derived from long-term barefoot activity.

Previous studies have employed similar purposive approaches in indigenous settings to assess musculoskeletal function and physical activity behaviors in aging populations [10].

Data Collection

Data were collected between January and October 2024. In-depth, semi-structured interviews were conducted in the local languages with the assistance of trained community translators to ensure accuracy and cultural sensitivity. The interviews explored daily routines, perceived health status, family health history, and beliefs regarding barefoot

walking. Participants consistently reported walking barefoot 4 to 8 kilometers per day as part of their routine tasks, including farming, collecting firewood, or visiting markets.

In addition to qualitative data, basic physical assessments were performed to observe muscle tone and lower limb strength. Manual palpation and visual inspection were used to assess calf muscle firmness, a recognized proxy for muscle strength and physical conditioning in field settings [11].

Ethical Considerations

Ethical approval was obtained from the Makassar Health Polytechnic Ethics Committee (Approval No: 12/AB/2023). All participants were informed about the study's purpose, voluntary nature, and confidentiality, and written informed consent was secured prior to data collection. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

None of the 100 participants reported experiencing symptoms commonly associated with rheumatoid arthritis (RA), such as joint pain, morning stiffness, swelling, or limited joint mobility. This absence of symptoms was consistent across both the Kajang and Highland Papua groups. When probed for family history or prior diagnoses, participants also denied having relatives with inflammatory joint disease, which may suggest a lower prevalence of RA in these communities.

Field-based physical assessments revealed consistent findings of strong calf muscle tone, particularly in the gastrocnemius and soleus regions. Visual inspections and manual palpation demonstrated well-developed muscle mass and firmness, indicative of sustained muscular use and conditioning. This was observed even in participants at the upper limit of the age range (60 years), suggesting a lifelong pattern of effective musculoskeletal engagement.

Participants consistently credited their physical well-being to an active lifestyle centered around daily barefoot walking, agricultural labor, and other physically demanding routines. Walking distances ranged between 4 and 8 kilometers per day over uneven, natural terrain—conditions that provide a form of natural resistance training known to enhance muscular endurance and joint stability [12].

These findings are consistent with previous research on physical activity and RA prevention. A population-based study by Sparks et al. (2016) found that physically active adults had significantly lower systemic inflammation

and reduced incidence of RA compared to sedentary individuals [13]. Similarly, a cross-sectional study conducted among elderly rural workers in Brazil reported that those involved in manual labor had higher lower-limb muscle mass and fewer complaints of joint pain than their urban counterparts [14].

Barefoot locomotion itself may provide additional benefits beyond general activity. A biomechanical study by Hollander et al. (2017) demonstrated that habitual barefoot walkers showed greater foot muscle volume and improved balance compared to shod individuals, which could contribute to better joint alignment and reduced mechanical stress on the knees and hips [15]. Furthermore, long-term barefoot walking is associated with improved proprioception and neuromuscular coordination, factors that may reduce the risk of joint degeneration and injury [16].

In both study sites, the cultural normalization of barefoot walking appears to facilitate sustained engagement in outdoor physical activity well into older adulthood. This is notable, as physical inactivity is a known risk factor for sarcopenia and chronic inflammatory conditions, including RA [17]. The combination of barefoot ambulation, physically intensive subsistence activities, and minimal exposure to industrialized environmental triggers may together play a role in protecting these populations from RA and other musculoskeletal disorders.

DISCUSSION

The complete absence of rheumatoid arthritis (RA) symptoms among study participants aged 50–60 years, despite their advancing age, is notable and may be attributed to their physically active lifestyles, particularly habitual barefoot walking. Physical activity is widely recognized for its anti-inflammatory effects and role in modulating immune responses. It reduces the production of pro-inflammatory cytokines such as IL-6 and TNF- α , which are central to the pathophysiology of RA [18].

Barefoot walking represents a form of low-impact, sustained physical activity that is both functional and culturally embedded in the communities studied. This traditional practice may act as a natural therapeutic mechanism by promoting proprioception, correcting postural alignment, and encouraging full engagement of intrinsic foot and lower limb muscles [19]. Unlike structured exercise programs that may be inaccessible to remote or low-income populations, habitual barefoot walking provides continuous, lifelong musculoskeletal engagement with minimal external intervention.

Biomechanical analyses have shown that walking barefoot alters gait mechanics in a way that reduces the load on knee

joints and enhances ankle mobility [20]. Such adaptations may be protective against mechanical stress and inflammatory responses commonly seen in degenerative and autoimmune joint disorders. Furthermore, barefoot locomotion enhances sensory input, which stimulates neuromuscular coordination and helps maintain balance and agility in older adults—factors that have been inversely correlated with disability and frailty [21].

Moreover, the outdoor, subsistence-based lifestyle of both the Kajang and Highland Papua communities likely contributes to lower systemic inflammation through multiple channels. A study by Booth et al. (2012) emphasized that lifestyles involving natural movement throughout the day—not merely exercise—are protective against metabolic and inflammatory diseases [22]. These populations, by virtue of their limited exposure to urban pollution, processed food, sedentary routines, and psychosocial stressors, may possess a health profile inherently less conducive to autoimmune dysregulation.

It is also important to consider the potential role of environmental and dietary factors. Traditional diets rich in fibrous plants, tubers, and unprocessed proteins—as consumed by the Kajang and Highland Papuan communities—have been associated with reduced systemic inflammation and better metabolic profiles [23]. The anti-inflammatory properties of these diets could act synergistically with physical activity to further reduce the risk of RA onset.

The findings of this study are supported by global epidemiological patterns indicating lower RA prevalence in rural, non-industrialized societies. For example, studies among the Tsimane people of Bolivia and rural populations in sub-Saharan Africa report extremely low incidence of autoimmune disorders, including RA, despite similar or greater physical demands on the musculoskeletal system [24,25].

However, while this study reveals a compelling association between barefoot walking and the absence of RA symptoms, causality cannot be definitively established due to the study's qualitative nature. Longitudinal and comparative studies are needed to determine whether barefoot walking directly contributes to RA prevention, or whether it is one of several protective lifestyle factors.

Additionally, genetic predisposition may play a modifying role. While environmental and behavioral factors strongly influence RA manifestation, specific HLA-DRB1 genotypes remain central in RA pathogenesis [26]. Future research should incorporate genotyping to better understand the interaction between behavior and genetic risk.

Conclusions

The findings of this study suggest that habitual barefoot walking, as practiced by the Kajang and Highland Papua communities, may contribute meaningfully to the preservation of musculoskeletal integrity and potentially reduce the risk of developing rheumatoid arthritis (RA). Despite their age range (50–60 years), none of the participants exhibited clinical symptoms of RA or reported a history of joint disorders. Their consistent engagement in barefoot walking and manual labor appears to support muscle strength, joint stability, and overall mobility well into later life.

These results are in line with prior evidence suggesting that regular, natural physical activity—particularly when initiated early and sustained throughout life—has a protective effect against systemic inflammation and autoimmune disease development [27]. Barefoot ambulation, by engaging a broader range of foot and lower limb musculature, may enhance joint alignment and reduce mechanical stress, thus lowering the risk for degenerative and inflammatory joint conditions [28,29].

Additionally, the cultural embedding of barefoot walking in daily life highlights the role of traditional lifestyle practices in preventive health strategies. As modern societies continue to face rising burdens of non-communicable and autoimmune diseases, revisiting indigenous physical routines may offer valuable, low-cost interventions for musculoskeletal and immune system health [30].

While the current findings are exploratory and observational, they warrant further longitudinal and cross-cultural studies to validate the protective relationship between barefoot walking and RA. Future research should aim to integrate clinical, biomechanical, and immunological assessments—along with genetic profiling—to determine whether barefoot locomotion constitutes a modifiable behavioral factor in RA prevention.

Ultimately, this study underscores the potential of traditional, non-industrialized behaviors in informing contemporary public health strategies. Recognizing and preserving culturally embedded practices such as barefoot walking may have broader implications for aging, mobility, and chronic disease prevention in diverse global populations.

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Cite this article: Agussalim, Khadizah Bt Haji Abdul Mumin, Kornkanok Ingkaninan. Barefoot Walking Habits and their Potential Protective Effect Against Rheumatoid Arthritis: A Qualitative Study among the Kajang and Highland Papua Communities. *Open Journal of Nursing Research* 2025; 1(1): 08-13.

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