COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DETERMINANTS OF PODOCONIOSIS IN NORTHERN ZONE OF SIDAMA REGION, ETHIOPIA: AN UNMATCHED CASE-CONTROL STUDY

BY

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JUNE, 2024

HAWASSA, ETHIOPIA

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A THESIS SUBMITTED TO THE COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF GRADUATE STUDIES, HAWASSA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN GENERAL PUBLIC HEALTH

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DECLARATION

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ACKNOWLEDGEMENTS

I wish to express my deepest gratitude to Hawassa University's College of Medicine and Health Science, School of Public Health. The opportunity it has afforded me to conduct this thesis marks a significant milestone in my academic journey. I extend my sincere appreciation to the Sidama Regional State Health Bureau. Their collaboration and support during data collection have greatly contributed to the success of this thesis. I am grateful to my advisors, Mr. Nana Chea (MPH, Assistant Professor) and Mr. Sisay Dejene (MPH, Lecturer), for their guidance, insightful feedback, and unwavering support that have been instrumental in shaping this proposal. I would also like to express my boundless gratitude to the dedicated data collectors and supervisors for their unwavering contributions to the data collection process. Lastly, my heartfelt thanks go to the study participants for their willingness to share relevant information crucial to this study.

ACRONYMS AND ABBREVIATIONS

AOR	Adjusted Odds Ratio
CI	Confidence Interval
FTS	Filariasis Test Strip
HLA	Human Leukocyte Antigen
IRB	Institutional Review Board
NTDs	Neglected Tropical Diseases
OR	Odds Ratio
SD	Standard Deviation
SNNPR	Southern Nations, Nationalities and Peoples Region
SPSS	Statistical Package for Social Sciences
VIF	Variance Inflation Factor
WHO	World Health Organization

Table of contents

Contents

DECLARATION III

HAWASSA UNIVERSITY EXAMINERS' APPROVAL SHEET IV

ADVISORS' APPROVAL SHEET V

ACKNOWLEDGEMENTS VI

ACRONYMS AND ABBREVIATIONS VII

Table of contents VIII

List of tables XI

LIST OF FIGURES XII

ABSTRACT XIII

1. INTRODUCTION 1

1.1 Background 1

1.2 Statement of the problem 3

1.3 Significance of the Study 5

2. LITERATURE REVIEW 6

2.1 Socio-demographic and economic determinants 6

2.2 Behavioral determinants of podoconiosis 8

2.3 Knowledge and attitudes related determinants 9

2.4 Familial/genetic-related determinants 10

2.5 Conceptual framework 12

3. OBJECTIVE 13

4. METHOD AND MATERIALS 14

4.1 Study area 14

4.3 Source and study population 14
4.3.1 Source population 14
4.3.2 Study population 15
4.4 Inclusion and exclusion criteria 16
4.4.1 Inclusion criteria 16
4.4.2 Exclusion criteria 16
4.5 Sample size determination 16
4.6 Sampling technique and procedure 17
4.7 Study variable 19
4.7.1 Dependent variable 19
4.7.2 Independent variable 19
4.8 Operational definition/Definition of terms 19
4.9 Data collection tool and procedure 21
4.10 Data quality management 22
4.11 Data processing and analysis 24
4.12 Ethical consideration 25
5. RESULTS 26
5.1 Socio-demographic characteristics 26
5.2 Behavioral related factors 28
5.3 Knowledge and attitude related factors 29
5.4 Family related factors 30
5.5 Factors associated with podoconiosis 31
6. DISCUSSION 34
7. CONCLUSION AND RECOMMENDATIONS 37

7.1 Conclusion 37

7.2 Recommendations 37

7. REFERENCE 38

8. ANNEXES 43

Annex I: Information sheet and consent form (English version) 43

Annex II: Questionnaire (English version) 45

አባሪ III፡- የመረጃ እና የስምምነት ቅጽ (የአማርኛ ቅጂ) 54

አባሪ IV፡ መጠይቅ (የአማርኛ ቅጂ) 56

QA'MISO V: TAJE UYNANNI BORRI-XA'MO 65

QA'MISO VI: SIDAAMU AFII GANO (Sidamoo Afo questionnaire) 66

List of Tables

Table 1: Sample size determination for determinants of podoconiosis in Northern Zone, Sidama Region, 2024. 17
Table 2: Socio-demographic characteristics of study participants in Northern Zone of Sidama Region, Ethiopia, 2024. 26
Table 3: Behavior and related factors among study participants in Northern Zone of Sidama Region, Ethiopia, 2024. 28
Table 4: Knowledge and attitude about podoconiosis among study participants in Northern Zone of Sidama Region, Ethiopia, 2024. 29
Table 5: Family and other related factors among study participants in Northern Zone of Sidama Region, Ethiopia, 2024. 30
Table 6: Bivariable and multivariable logistic regression analysis of factors associated with podoconiosis in Northern Zone of Sidama Region, Ethiopia (n = 574), 2024 32

LIST OF FIGURES

Figure 1: Conceptual framework for determinants of podoconiosis adapted from literature (19, 34, 35). 12

Figure 2: Sampling procedure for participant selection for determinants of podoconiosis in Northern Zone, Sidama Region, 2024. 18

ABSTRACT

Background: Podoconiosis is a type of elephantiasis caused by long-term barefoot exposure to red clay soil. It is a debilitating disease that leads to disability and stigma. Despite the widespread prevalence of podoconiosis, the determinants of it remain largely unexplored, especially within the context of the Sidama region. The findings will contribute to a comprehensive understanding of the determinants, facilitate the development of targeted prevention strategies in the specified region, and bridge the existing knowledge gap pertaining to determinants in southern Ethiopia.

Objective: To identify the determinants of podoconiosis in the Northern Zone of Sidama Region, Southern Ethiopia, in 2024.

Methods: An unmatched case-control study design was employed in selected districts within the northern zone of the Sidama Region. The cases comprised 191 randomly selected individuals with clinically confirmed podoconiosis and a negative filarial test. The controls consisted of 383 randomly selected individuals who exhibited no signs or symptoms of podoconiosis. Data were collected through structured interviews conducted using the KoBo mobile application. Both bivariable and multivariable logistic regression analyses were performed to evaluate the associations between potential determinants of podoconiosis. Statistical significance was declared at a p-value of less than 0.05. The magnitude of the association was presented using the adjusted odds ratio (AOR) with a 95% confidence interval.

Results: A total of 574 (191 cases and 383 controls) participants were included in the study. Age ≥50 years (AOR=2.61; 95% CI: 1.22, 5.58), no formal education (AOR=3.04; 95% CI: 1.06, 7.73) , primary education (AOR=3.67; 95% CI: 1.32, 10.20), not wearing shoes (AOR=4.10; 95% CI: 1.72, 9.79), having unclean feet (AOR=4.80; 95% CI: 2.84, 8.11), purchasing no or a pair of shoes in a year (AOR=2.61, 95% CI: 1.48-4.61), poor knowledge (AOR = 3.52; 95% CI: 2.14, 5.78) and negative attitude (AOR = 1.80; 95% CI: 1.11-2.94) were significantly associated with podoconiosis.

Conclusions: The study identified older age, lower educational attainment, not wearing shoes, poor foot hygiene, buying no shoes or a pair of shoes in a year, poor knowledge, and poor

attitude as significant factors for podoconiosis. Multifaceted interventions on awareness- creation education, consistent shoe use and foot hygiene, and changing attitudes towards podoconiosis are crucial to mitigating this neglected tropical disease in endemic regions.

Key words: Podoconiosis, case-control study, determinants, Sidama region, Ethiopia

1. INTRODUCTION

1.1 Background

Neglected tropical diseases (NTDs) are a group of communicable diseases prevalent in tropical and subtropical regions, affecting over one billion people in 149 countries (1). These diseases persist in impoverished populations with unsafe water, poor sanitation, and limited healthcare access (2). Despite their significant health burden, NTDs have been largely overlooked for decades (3). In 2017, the World Health Organization (WHO) identified 20 prevalent NTDs, including podoconiosis (4). Efforts to control and eliminate NTDs are essential for achieving the United Nations Sustainable Development Goals and universal health coverage (5).

Podoconiosis, also known as non-filarial lymphedema or endemic non-filarial elephantiasis, is a geochemical disease caused by long-term barefoot exposure to volcanic red clay soil (6). This chronic condition arises through particle penetration and inflammation rather than infection (7). Key features include bilateral, asymmetric lower limb lymphedema that starts in the feet and progresses proximally (6). Mineral particles absorbed through the skin induce lymphatic obstruction, but the specific soil mineral triggers and mechanisms remain unclear (8).

Patients initially experience itching and burning in the feet, with lymphedema leading to severe mobility impairment if untreated (9). Acute inflammatory episodes, or acute attacks, are common and involve painful inflammation, swelling, fever, and malaise, further reducing quality of life (9, 10). Podoconiosis typically remains below the knee, with the WHO classifying it into early (stage 1) and late (stages 2-5) stages (11, 12). Early-stage disease features ankle swelling that subsides overnight, while late-stage disease involves above-ankle swelling, skin changes, and joint deformation (12). Most patients seek care in late stages after irreversible lymphedema and disability have occurred (13).

The global burden of podoconiosis is estimated at four million cases across over 30 endemic countries, though true prevalence is uncertain due to inconsistent surveillance and misdiagnosis as other filarial diseases like lymphatic filariasis (11, 14). The highest disease concentrations and at-risk populations reside in tropical African highlands with irritant soils at elevations of 1,000-2,500 meters above sea level (15). Cases clustered across geographically delimited foci likely reflect localized geology and specific environmental risk factors (16).

The World Health Organization's 2030 roadmap aims to eliminate podoconiosis in endemic countries, with a particular emphasis on enhanced active surveillance in Ethiopia and several other African nations (5). In line with this, Ethiopia's 2021-2025 National Master Plan for Neglected Tropical Diseases

sought to bolster the capacity for podoconiosis prevention, diagnosis, treatment, and morbidity control across endemic regions (17).

Despite its elimination potential, podoconiosis is poorly understood, leading to misconceptions about its cause, prevention, and treatment (18). Understanding these factors is crucial for developing effective preventive and control strategies tailored to local conditions, significantly contributing to global elimination efforts.

1.2 Statement of the problem

Podoconiosis is a significant public health issue, affecting an estimated 4 million people across 17 countries in Africa, Central and South America, and South and Southeast Asia (19). A staggering 85% of this burden is carried by African nations (15). Ethiopia has the highest global burden, with over 1.5 million cases and 35 million people at risk (20). The disease is endemic in 345 districts, particularly in the Oromia, Southern Nations, Nationalities and Peoples (SNNP), Amhara, and Benishangul Gumuz regions (21). The SNNP region, which previously encompasses the current Sidama region, is the most affected, accounting for 39% of total cases. Oromia and Amhara regions also carry significant burdens, with 32% and 29% of cases, respectively (10, 22). In areas with irritant soil, the prevalence of the disease is about 5%-10% in the country (9, 21) with recent evidences showing from 5.5% to 6.2% prevalence of the disease in different zones of southern Ethiopia (23, 24). Ethiopia is projected to bear 25% of the global burden of podoconiosis (23).

Beyond physical disabilities, podoconiosis exerts substantial psychological, social, and economic burdens (9). Recent studies report a 12.6% prevalence of depression among patients compared to 0.7% in healthy individuals (25). Enacted and felt stigma is also major issues, as discrimination affects marital prospects, school attendance, livelihoods, and community inclusion (26). Annually, podoconiosis costs Ethiopia over $200 million in productivity losses, treatment expenditures, and reduced quality of life (20). The disability-adjusted life years (DALYs) lost to podoconiosis were estimated at 172,073 in 2019, surpassing other endemic NTDs like trachoma, onchocerciasis, and leishmaniasis (11). Capturing this multidimensional disease burden, patients with podoconiosis have demonstrated up to seven times poorer quality of life relative to unaffected populations (27).

Environmental factors such as altitude, rainfall, temperature, and soil composition significantly affect podoconiosis, typically occurring at altitudes of 1,000-2,000 meters above sea level, a specific ecological niche found in tropical highlands (15, 22, 28). Prolonged exposure to irritant soil, either through occupational or residential circumstances, shoe wearing, number of shoe owned, type of shoe, distance to water source, foot hygiene, soap utilization during foot washing, income level, gender, housing condition, educational level and family history are individual factors associated with podoconiosis (15, 18, 23, 29, 30).

Despite considerable research in northern Ethiopia, significant knowledge gaps remain regarding susceptibility factors and determinants in southern endemic areas, likely bearing a substantial portion of the national burden (7, 31). The epidemiology, environmental risks, and sociocultural context vary

across different regions of Ethiopia. Studies on podoconiosis determinants in the Sidama region are limited to a single district (18). While providing important insights, these findings may not apply broadly due to regional variations. A comprehensive study across a larger zone in the Sidama region, considering additional factors related to knowledge, attitudes, and culture, is necessary. This study aims to investigate the determinants of podoconiosis in the Northern Zone of the Sidama region to better understand vulnerabilities and shape tailored prevention initiatives.

1.3 Significance of the Study

This study generated evidence on the determinants of podoconiosis disease burden in a high-prevalence region of Ethiopia. The focus on socioeconomic, behavioral, and other factors is an important contribution, as most prior research has examined the magnitude and environmental factors. Identification of key modifiable determinants is essential for developing effective interventions for podoconiosis prevention and control in affected communities. In particular, findings related to factors such as shoe wearing, foot hygiene practices, the use of protective clothes while farming and podoconiosis knowledge and attitudes can directly inform health promotion efforts. The results highlighted specific behaviors and beliefs that should be addressed through health education campaigns in communities like the study area. This may support substantial reductions in podoconiosis cases. The study will add to the very limited evidence base on podoconiosis in the Sidama region of Ethiopia, which appears to be most affected. The focus on the Northern Zone of Sidama Region will provide local data to inform control initiatives tailored to this specific high-burden area. Moreover, the findings of this study will be used as a reference in the scientific world.

2. LITERATURE REVIEW

Podoconiosis, a type of tropical lymphedema, is a complex disease influenced by a myriad of factors, including socioeconomic, behavioral, demographic, and genetic factors. Understanding these interplays is crucial for effective disease management and prevention strategies (9).

2.1 Socio-demographic and economic determinants

Multiple observational studies reveal podoconiosis distributions varying across basic demographic factors like age, sex, and marital status. As one gets older, the risk of contracting podoconiosis increases. A global systematic review of studies revealed that the prevalence of podoconiosis was higher among older adults than youths and children (11). A study in south Ethiopia found that individuals aged above 26 years were more likely to have podoconiosis compared to those aged 20–25 years (34). In the 2023 study in east Gojjam, Ethiopia, age was significantly associated with increased odds of podoconiosis, specifically for the age group 41–60. For the age group 61–80, the AOR was 15.74, suggesting that the risk of developing podoconiosis increases with age (35). However, a study in Dano, central Ethiopia, finds no significant association between age and podoconiosis (35).

The incidence of podoconiosis was four times higher in the male gender compared to females in the study from the east and west Gojjam zones (36) However, other studies have shown that females have increased odds of being affected than males in the study from western Ethiopia (37) which is in line with the studies in Sidama region, where being female has three times higher odds of developing podoconiosis, and east Gojjam of the Amhara region, where females have 4.25 times higher odds than males (19, 35), but the study from Wolaita and Gamo zone of southern Ethiopia reported no association between sex (24, 34).

Limited education markedly increases the odds of podoconiosis in most settings. A study in Sodo zuria district, Wolaita zone, south Ethiopia, reported a significant association between illiteracy and podoconiosis. This suggests that illiterate individuals were over 10 times more likely to be affected by podoconiosis compared to literate ones (34). One study documented six times higher odds among illiterate people relative to literate community members (14). Those with no formal education were two times more likely to be affected by podoconiosis in the case of south-west Ethiopia (38).

Multiple indicators of socio-economic status have been evaluated for links with podoconiosis susceptibility. Specifically, lower income levels demonstrate a fairly consistent positive association, with insufficient earnings linked to 2–6 times higher odds of podoconiosis across several case-control studies (7, 31). For instance, monthly income under $25 was associated with four times increased odds of disease compared to higher earnings in one Ethiopian study (7). However, a study in western Ethiopia, Gulliso district, found income did not retain significance (37) but, surprisingly, participants with the lowest wealth index were less likely to develop podoconiosis than those who had the highest wealth index in a study conducted in Gamo zone, southern Ethiopia, in 2021 (24).

Individuals who spent more than thirty minutes traveling to their water source were found to have an elevated risk of contracting podoconiosis compared to those whose travel time was less than thirty minutes (38). However, distance from the nearest water source turned out to not be significantly associated in the central Ethiopian study (39). Individuals living in good housing conditions had 83% lower odds of developing podoconiosis compared to those living in poor housing conditions, according to a study in the Amhara Region of Ethiopia (7). However, a study from central Ethiopia reported no significant association between housing conditions and podoconiosis, nor did the study from the Sidama region and Gamo zone in southern Ethiopia (19, 24, 39).

Individuals who owned fewer shoes and those who often did not wear shoes were more likely to have podoconiosis; having one pair of shoes had six times higher odds than those who had more than three pairs of shoes; participants who did not wear shoes at home had about 2.5 times a higher chance of being affected by podoconiosis as compared to those who never walked barefoot (24). A similar finding was found in the Kenyan study, in which individuals who did not frequently wear shoes were more likely to have podoconiosis (40).

2.2 Behavioral determinants of podoconiosis

Among the modifiable exposures evaluated, shoe-wearing practices demonstrate the most robust ties to podoconiosis susceptibility. The majority of contemporary observational studies document significantly reduced shoe usage frequency and access among cases relative to neighborhood controls. For example, a study in Bensa, Sidama region, revealed that not wearing shoes has more than twice the odds for podoconiosis (19); likewise, a study in northern Ethiopia found five times higher odds of podoconiosis among those habitually walking barefoot outdoors compared to those who did not (33). Furthermore, the odds of developing podoconiosis among those who didn‘t wear shoes daily were nine times higher compared to those who wore daily in the study conducted in central Ethiopia, Dano district, and the systematic review and meta-analysis showed a higher prevalence of the disease among those who often go barefoot (10, 39). On the contrary, there was no statistically significant difference in ‘ever’ owning shoes between cases and controls, and neither was there a significant difference between those who wore protective shoes or no protective shoes among cases and controls in a case control study conducted in east Gojjam (33). Another report from Ethiopia showed that shoe-wearing was not found to be associated with podoconiosis (41).

As the age of first shoe-wearing delays by 5 years, the risk of podoconiosis increases by 49%, according to a study in central Ethiopia. Another study in southern Ethiopia found that the risk of developing podoconiosis was 8.14 times higher for participants who started wearing shoes later in life (34, 39). As the age of first shoe-wearing increases by one year, the risk of developing podoconiosis increases by 8%, suggesting that starting to wear shoes at an earlier age may help reduce the risk of developing the disease in central Ethiopia (39).

A systematic review and meta-analysis conducted in 2020 found that the prevalence of podoconiosis is associated with poor foot hygiene (10). Poor foot hygiene also increased the odds of podoconiosis in the case-control study in northern Ethiopia (36). The odds of developing podoconiosis among those who did not use soap during foot washing were three times higher than those who utilized soap (24). Likewise, participants who washed their feet only with water were about four times higher as compared to those who washed with water and soap in the study in central Ethiopia (39).

2.3 Knowledge and attitudes related determinants

Awareness and understanding of podoconiosis among at-risk populations play a vital role in early diagnosis, care-seeking behaviors, self-management, and the prevention of disease progression (16, 25). However, studies conducted in northern, central, and southern Ethiopia indicate generally low levels of podoconiosis knowledge in endemic communities (14, 35).

In the West Gojam zone, only 38% of respondents correctly identified the cause of podoconiosis, while 34% considered it a familial disorder (33). Similarly, a study in northwest Ethiopia found only 28.7% of participants linked the condition to irritant soil, with the majority attributing it to familial inheritance, witchcraft, or supernatural causes (42). Comparable knowledge gaps were reported in southern region investigations. In the Wolaita zone, only 22.5% identified the role of irritant soils in podoconiosis etiology (34).

Across observational studies, podoconiosis knowledge was positively correlated with literacy, formal education, and access to awareness-raising campaigns. For example, in East Gojam, a correct understanding of podoconiosis was over twice as likely among literate versus illiterate respondents. The researchers conclude that improving population awareness and knowledge are crucial to reducing podoconiosis burden (7). Negative attitudes, discrimination, and stigmatization greatly increase the psychosocial burden of podoconiosis across endemic regions (27). A study in the East Gojam Zone using validated stigma scales found that 90% of patients experienced some discrimination due to their illness (43). Common manifestations involved isolation, loss of employment and livelihoods, inability to attend social functions like church or school, diminished marriage prospects, and exclusion from community leadership roles (31, 43).

Investigations on the drivers of podoconiosis stigma have underlined the role of awareness and causal misconceptions. In communities holding predominant genetic or supernatural beliefs around disease etiology, stigma was two-to-six times more likely compared to areas recognizing the role of soil irritants. Providing increased education on the non-infectious, non-hereditary nature of podoconiosis could help mitigate stigma (25).

Healthcare professionals also demonstrate stigmatizing attitudes that adversely impact patient emotional wellbeing and willingness to seek care. A 2010 study in southern Ethiopia found nearly half of surveyed nurses expressed reservations about physical proximity to or interacting socially with podoconiosis patients (31). Trainings to address misconceptions among formal and informal healthcare providers may reduce stigma and improve services.

Mass media campaigns constitute a frequently used approach to disseminating health promotion messages and behavior change communication surrounding NTDs (11). However, in the context of podoconiosis, limited evidence exists on optimal channels for enhancing community awareness. In East Gojam, interpersonal communication with healthcare workers, radio programs, and community meetings were identified as common information sources (43). Meanwhile, patients in southern zone investigations reported predominantly utilizing radio, television, health workers, and peer support groups (42, 44). Interestingly, community health education programs were rarely mentioned as information sources in either region (42).

In conclusion, the level of knowledge and attitude towards podoconiosis among communities in Ethiopia is not well studied. Most existing studies have focused on the level of knowledge and attitude among health professionals rather than the community at large. Furthermore, the association between the level of knowledge and attitude towards podoconiosis and the development of the disease itself has not been thoroughly investigated. This highlights a significant gap in our understanding and suggests that further research is needed to fully comprehend the impact of knowledge and attitudes on the prevalence and management of podoconiosis in these communities. Such insights could be instrumental in informing targeted interventions and public health strategies aimed at mitigating the burden of this disease.

2.4 Familial/genetic-related determinants

In a comprehensive genome-wide study conducted among three ethnic groups in Ethiopia—Wolaita, Amhara, and Oromia—where podoconiosis is prevalent, the results confirm the association of Human Leukocyte Antigen (HLA) class II with podoconiosis. This suggests that the pathogenesis of podoconiosis may be directly influenced by HLA-mediated abnormal initiation and regulation of immune responses. This study provides valuable insights into the genetic factors contributing to the susceptibility of podoconiosis in these populations (45). The

study in east and west Gojjam of northern Ethiopia suggested three times increased odds of podoconiosis with positive family history compared to their counterparts (36). Studies conducted in various regions of Ethiopia have consistently found a significant association between a family history of leg swelling and the prevalence of podoconiosis. In the Gamo zone of southern Ethiopia, individuals with a family history of leg swelling were found to be approximately 5 times more likely to develop podoconiosis. A similar study in the East Gojjam zone of northern Ethiopia reported an adjusted odds ratio of three. The association was even stronger in the Bensa district of the Sidama region, where the AOR was 10.2 (19, 24, 35). These findings suggest a possible genetic predisposition to podoconiosis among individuals with a family history of leg swelling.

2.5 Conceptual framework

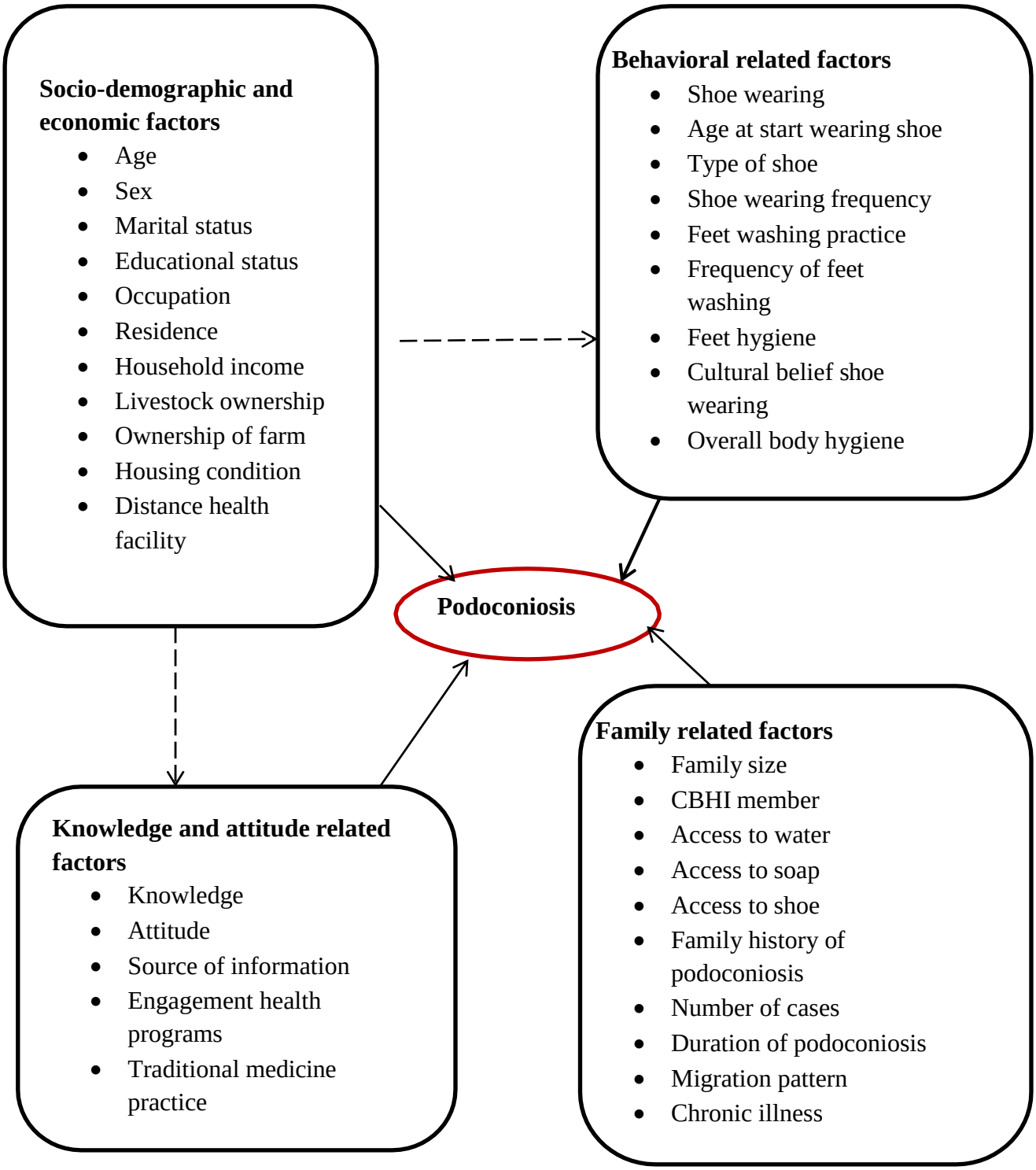

Figure 1: Conceptual framework for determinants of podoconiosis adapted from literature (19, 34, 35).

3. OBJECTIVE

- To identify the determinants of podoconiosis in the Northern Zone of Sidama Region, Southern Ethiopia, 2024.

4. METHOD AND MATERIALS

4.1 Study area

The study was conducted in the selected districts of Northern Zone of the Sidama Region, Southern Ethiopia. The Northern Zone consists of eight districts and two town districts. It has a population of about 1 million predominantly engaged in subsistence agriculture. The research was conducted in three specific districts: Hawella Lida, Shebedino, and Wondo Genet. These districts were chosen due to their reported high prevalence of podoconiosis, as indicated by routine surveillance data (44). Hawella Lida district is located 294 km from the country's capital and 17 km from the regional capital, Hawassa city. The district is divided into two urban and 11 rural kebeles (the smallest administrative unit in Ethiopia) and has a population of 109,599, with females accounting for 55,271. The district is served by four health centers and eleven health posts that offer preventive, promotional, curative, and rehabilitative services. Shebedino district is situated 300 km from the country's capital and 27 km from Hawassa city. It comprises 26 kebeles (3 urban and 23 rural) and has a total population of 261,128, with 132,392 being females. The district's healthcare infrastructure includes one general hospital, six health centers, and 26 health posts. Wondo Genet district, located 270 km from Addis Ababa and 24 km east of Hawassa City, consists of 14 kebeles. The district's total population is 156,017, with females making up 79,257. The district's healthcare services are provided by one primary hospital, five health centers, and 16 health posts.

4.2 Study design and period

A community-based, unmatched case-control study was conducted from April 10 to May 2, 2024. An unmatched case-control study design was selected because podoconiosis is a relatively rare outcome, making matched control recruitment resource-intensive. Additionally, there was no clear basis for matching specific factors in this context.

4.3 Source and study population

4.3.1 Source population

All individuals aged greater than or equal to 15 years and residing in the Northern Zone were the source population.

4.3.2 Study population

Individuals aged greater than or equal to 15 years and residing in selected three districts in the northern zone of Sidama Region.

Cases: Individuals aged greater than or equal to 15 years with clinically confirmed podoconiosis (bilateral asymmetric lymphedema of the lower leg, mossy and nodular changes to the feet, and the presence of fibrotic nodules along the lower leg lymphatic) and a negative filarial test and residing in the selected districts of the northern zone.

Controls: Individuals aged greater than or equal to 15 years without signs and symptoms of podoconiosis residing in the selected districts of the northern zone.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All individuals who were aged 15 years or older and had been residents of the selected districts for a period of 10 years or more were included in the study.

4.4.2 Exclusion criteria

Individuals with confirmed filarial-related lymphedema or who were critically ill or unable to communicate effectively were excluded from the study.

4.5 Sample size determination

The sample size for this study was calculated using the double population proportion formula using the Epi-Info software's statcalc program. The following parameters were considered: a confidence level of 95%, a power of 90%, a case-to-control ratio of 1:2, an exposure rate among controls of 29.3%, and an adjusted odds ratio (AOR) of 2.2 for participants who do not wear shoes daily, based on a previous study conducted in Bensa District, Sidama, Ethiopia (19).

The calculation yielded the required sample size of 348. To account for the multistage sampling design, a design effect (deff = 1.5) was incorporated, resulting in a required sample size of 522. Additionally, to accommodate the non-response rate, an additional 10% of the final sample size was added, resulting in a final sample size of 574 participants, consisting of 191 cases and 383 controls.

Table 1: Sample size determination for determinants of podoconiosis in Northern Zone, Sidama Region, 2024.

Variable	CI	Power	Percent in control	Ratio	AOR	Sample size	Reference
Age: 35-44 years >55 years	95%	90%	28.8	1:2	0.34	302	(19)
Family history: Yes No	95%	90%	42.3	1:2	3.0	180	(35)
Shoe wearing: Not daily Daily	95%	90%	29.3	1:2	2.2	348	(19)
Housing condition: Poor Good	95%	90%	33.7	1:2	0.11	132	(7)

4.6 Sampling technique and procedure

The study employed a multistage sampling technique. The first stage involved the purposeful selection of three districts: Hawela Lida, Shebedino, and Wondo Genet. These districts were chosen based on their reported high prevalence of podoconiosis in the Northern Zone (46). The total sample size was distributed across these selected districts using a probability-proportional-to-size approach. This approach takes into account the number of lymphedema cases reported in each district. According to the regional health bureau report, there are 232 cases in Hawela, 220 in Shebedino, and 191 in Wondo Genet. By applying the proportional allocation method, the study included 69 cases from Hawela Lida, 65 from Shebedino, and 57 from Wondo Genet. To prepare a comprehensive sampling frame, the lymphedema management registries within these districts were reviewed.

Cases were selected using a simple random sampling method from the registers in health facilities (health centers and hospitals). The total podoconosis patients from the registers of hospitals and health centers were listed in a logbook that contains vital information such as patient name, identification number, his or her kebele, and village to facilitate the random

selection procedures. Similarly, family folders from the health post were used to facilitate the selection of controls. The cases were excluded from family folders before a random selection procedure. Controls were selected using a random sampling procedure from family folders after a complete list of controls was prepared in the kebeles.

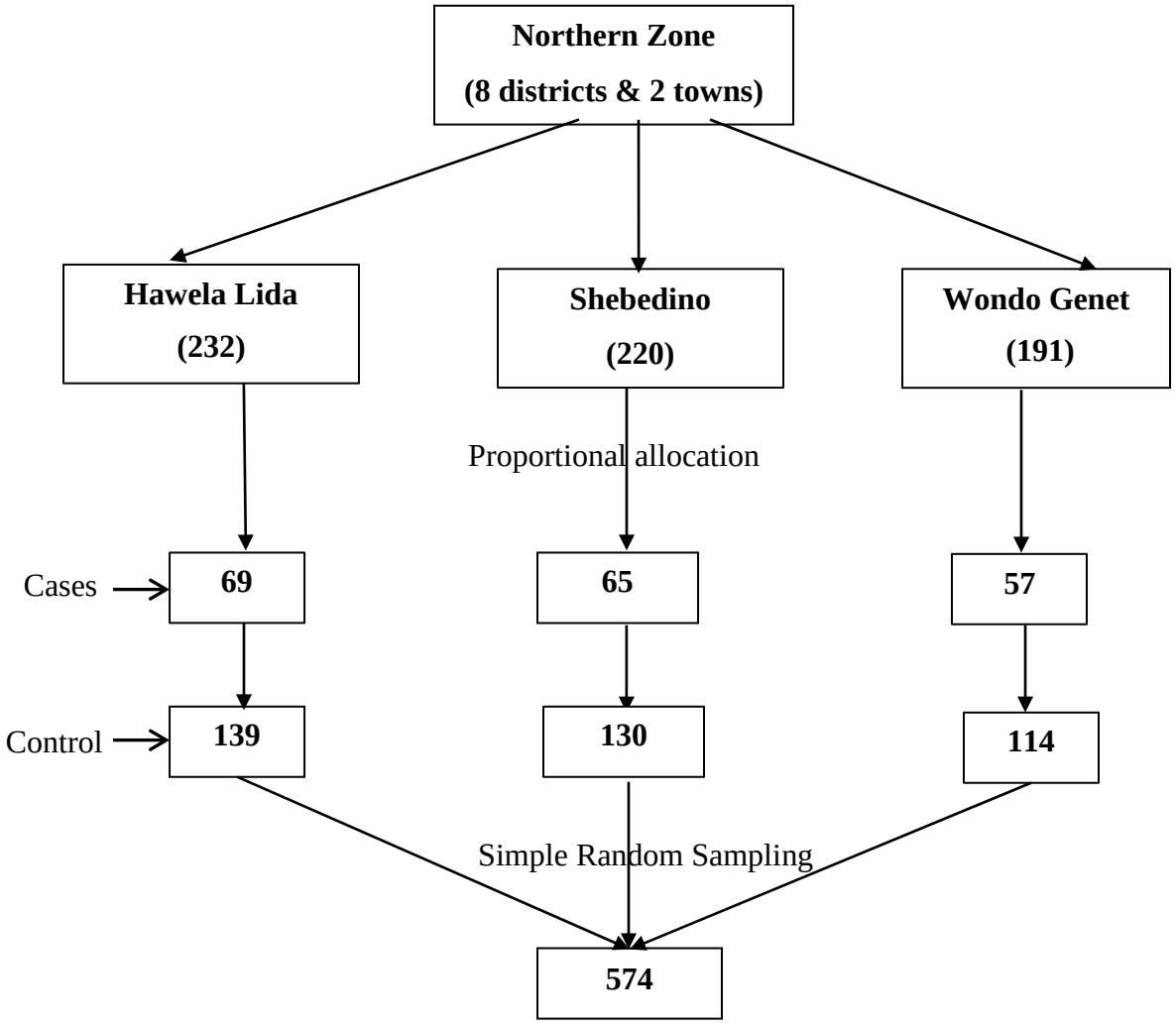

Figure 2: Sampling procedure for participant selection for determinants of podoconiosis in Northern Zone, Sidama Region, 2024.

4.7 Study variable

4.7.1 Dependent variable

- Podoconiosis

4.7.2 Independent variable

- **Socio-demographic Characteristics**: Age, sex, marital status, educational status, occupation, residence, household income, livestock ownership, farm land ownership, housing condition, and distance to the health facility.
- **Behavioral-related factors**: shoe wearing, age at first shoe wearing, type of shoe, shoe wearing frequency, foot washing practice, frequency of foot washing, foot cleanliness, overall body hygiene, and cultural beliefs related to shoe wearing.
- **Knowledge and attitude-related factors:** knowledge on podoconiosis, attitude towards podoconiosis, sources of information, engagement in community health programs, and traditional medicine practice.
- **Family-related factors**: family size, membership in community health insurance, access to water, access to soap, access to shoes, family history of podoconiosis (first-, second-, and third-degree relatives), number of cases, duration of podoconiosis, migration pattern, and chronic illness.

4.8 Operational definition/Definition of terms

Case: An individual with bilateral but asymmetric swelling which develops first in the foot often confined to the lower leg and showed negative results for Filariasis Test Strip (FTS).

Control: An individual living in the selected kebeles and clinically did not demonstrate clinical signs and symptoms of podoconiosis.

Feet cleanness: was defined as the absence of visible soil, debris, or foreign material on the surface of the feet. It was assessed by observation, a person's feet were considered clean if there are no observable traces of dirt, mud, or other extraneous substances on the skin, nails, or in the interdigital spaces.

Shoe wearing: was defined as the state in which an individual has enclosed each foot in footwear, such as shoes, sandals, or boots, covering the entirety of the foot and providing a physical barrier between the foot and the ground (18).

Knowledge: It was evaluated through a set of eight questions related to the symptoms, causes, and

prevention methods of podoconiosis. Those who achieved a score above the mean were classified as having ‘good knowledge’, while those with scores equal to or below the mean were categorized as having ‘poor knowledge’ (23, 41).

Attitude: It was assessed using a set of ten questions, with responses captured on a five-point Likert scale ranging from ‘strongly agree’ to ‘strongly disagree’. Participants who scored above the mean were classified as having a ‘positive attitude’, while those with scores equal to or below the mean were deemed to have a ‘negative attitude’ (45).

Family history of podoconiosis: History of podoconiosis in the family clustering, such as, first degree relatives (parents and child), second degree (grandparents and siblings), third degree (aunt, uncle, nephew, cousin, niece), and other (husband or wife).

Family size: The total number of individuals living in a household, including family members, relatives, and others.

Time to fetch water: The estimated duration, reported by participants, that it takes to collect water from their primary source.

Number of soaps used: The average number of bars of soap consumed by the household in one month.

Household income: The combined estimated total income generated by all household members, which may come from various sources.

Shoe wearing frequency: defined as the number of days the participant wore shoe in a week or month. Categorized as Always (every day), Frequently (3-6 days per week), Occasionally (once per week), and Rarely (once a month) (18).

Housing condition: Describes the materials used in the construction of the house, specifically the floor, walls, and roof by observing.

4.9 Data collection tool and procedure

The data collection for the study was conducted using a structured questionnaire, which has been designed based on similar studies on podoconiosis (7, 19, 35). The questionnaire encompasses various factors, including socio-demographic and economic aspects, behavioral elements, knowledge and attitude-related factors, and family history. Initially, the questionnaire was drafted in English and then translated into the local language, Sidaamu afoo. To ensure the consistency and cultural appropriateness of the translation, it was then translated back into English by a different interpreter. The questionnaire was digitized using the KoBo Collect mobile application for efficient data collection. The participants were interviewed in Sidaamu

Afoo language. The data collection team consisted of six nurses who were proficient in the local language and had prior experience with the KoBo Collect application. They used smartphones for data collection. To ensure the quality and accuracy of the data collected, a public health officer with previous experience in data collection and proficiency in the KoBo Collect application and the local language supervised the process. The interviews were conducted at the homes of the selected participants to ensure their comfort and convenience.

Blood specimen collection and laboratory test

A blood test was done to exclude the possibility of lymphatic filariasis among participants with sign and symptoms using the Filariasis Test Strip (FTS). The FTS, frequently used to detect the Wuchereria bancrofti antigen, is highly reliable for diagnosing Lymphatic Filariasis due to its sensitivity and specificity ranges of 94-100% and 99-100%, respectively (46). The collection process was carried out by trained medical laboratory professionals, adhering to the national and international test algorithm procedures. The participant's ring finger, specifically on the left hand for right-handed individuals or on the right hand for left-handed individuals, was thoroughly cleaned with 70% alcohol. Following this, a sterile lancet was used to puncture the cleaned finger. Then, a 75-µl blood specimen was collected using a capillary tube. Then, the collected blood was transferred to the pad on the FTS card. The FTS card was carefully observed, and the test result was red precisely at the 10-minute mark, not before or after this time. The interpretation of the test was based on the appearance of lines on the FTS card. The presence of two lines indicated a positive result, while a single line signified a negative result (47). The FTS kit was provided by the Ethiopian Public Health Institute for this study. The 3, 2, and 2 cases were excluded from Hawela Lida, Shebedino, and Wondo Genet districts after the FTS positive test result, respectively. Conversely, the remaining 229, 218, and 189 cases were considered for the random selection procedure for this study from Hawela Lida, Shebedino, and Wondo Genet districts, respectively.

4.10 Data quality management

The assurance of data quality was achieved through meticulous design and pre-testing of the questionnaire. Initially, the questionnaire was developed in English, then translated into Sidamu afoo, and subsequently retranslated back into English to verify consistency. A pretest was conducted in Hawela Tula sub-city on a sample size constituting 5% of the total (24 individuals), one week prior to the actual data collection. The pretest allowed for a thorough examination of the questionnaire's clarity,

understandability, uniformity, completeness and cultural appropriateness. Necessary amendments were implemented based on the pretest results, ensuring a logical flow of ideas.

The FTS kits, provided by the Ethiopian Public Health Institute, ensured standardized and reliable testing materials. Quality assurance measures included specific training for medical laboratory professionals on specimen collection and FTS testing procedures, adherence to standard operating procedures and regular calibration and maintenance of equipment were done.

Data were collected electronically using the KoBo Collect mobile application, which increased accuracy and completeness. To further ensure the quality of data, both data collectors and supervisors took a two-day training session. This session covered the study's objectives, data collection tool KoBo application utilization and techniques such as how to approach respondents, introduce themselves, and clarify the importance of responding to the study's questions. Moreover, the supervisor received additional training on how to check the consistency of the questionnaires.

4.11 Data processing and analysis

The data collected via the KoBo Collect application were exported to the Statistical Package for Social Sciences (SPSS) version 26 for data cleaning and analysis. Descriptive statistics, including mean, median, standard deviation, interquartile range, frequency, and percentage, were employed to characterize the cases and controls. The result was presented through textual descriptions and tables.

Bivariable logistic regression was performed, with the results presented as crude odds ratios (COR) along with their 95% confidence intervals (CI). During the bivariable logistic regression analysis, variables with a p-value of ≤0.25 were selected as candidate variables for the multivariable binary logistic regression model. During multivariable logistic regression, the fit of the regression model was evaluated using the Hosmer & Lemeshow test (*P-value = 0.644*). Variance inflation factor (VIF) was used to check for multicollinearity among independent variables, and VIF less than 5 was used to declare multicollinearity was not a concern for this study. Effect modification was assessed by entering each logically plausible interaction term in the multivariable model, and none of them were significant, which indicates that there was no effect modification in this analysis. Variables with a p-value of <0.05 were considered independent determinants of podoconiosis. The magnitude of the association was shown using the adjusted odds ratio (AOR) with a 95% CI.

4.12 Ethical consideration

The study involved the use of human participants; ethical considerations were taken into consideration. Ethical approval and clearance were obtained from the Institutional Review Board (IRB) at the College of Medicine and Health Sciences of Hawassa University. The official letter was secured from the Regional Health Bureau and provided to the Northern Zone and the selected district health offices for commencing the study. The data collection began after permission, and a cooperation letter was written to each selected kebele authority on which the study was carried out.

At the individual level, informed written consent was sought from the respondents. The study's purpose, procedure, duration, possible risks, and benefits were clearly explained to the participants using local language. Respondents were guaranteed confidentiality and informed that the information provided would only be used for research purposes. Confidentiality was assured by not including respondent names on the questionnaires but only unique code numbers. Participants were informed that they have the full right to withdraw from the study at any time or skip any question that they find uncomfortable. The identified lymphatic filariasis cases during confirmatory laboratory diagnosis were linked to nearby health facilities for further treatment.

5. RESULTS

5.1 Socio-demographic characteristics

A total of 574 (191 cases and 383 controls) participants were included in the study, with a response rate of 100%. The mean (SD) age of the cases was 45.5 (± 16.8) years, while controls had a mean age of 37.7 (± 12.0) years. The cases had a higher proportion of older individuals aged ≥ 50 years (41.9%) compared to controls (15.7%). Ninety-six (50.2%) of the cases and 182 (47.5%) of the controls were female. The majority of cases (73.8%) and controls (78.1%) were married. Regarding the educational status of the participants, more than half of cases (59.2%) and less than half of controls (43.9%) had no formal education. The most common occupations were housewife (40.3% cases, 29.5% controls) and farmer (39.8% cases, 38.1% controls). Almost all participants were from rural areas (99% cases, 97.4% controls). The median (IQR) monthly income for cases was 1000 (1400) ETB, and for controls, it was 2000 (3000) ETB. Most cases (88.5%) had a monthly income ≤ 2799 ETB, while a higher proportion of controls had incomes between 2800–5599 ETB (22.2%) and ≥ 5600 ETB (13.6%). About 65% of controls owned livestock, compared to 26.7% of cases. Regarding farm ownership, 152 (79.6%) of cases and 306 (79.9%) of controls owned a farm. More than half of cases (69.6%) and controls (62.4%) live less than 30 minutes away from the nearest health facility (Table 2).

Table 2: Socio-demographic characteristics of study participants in Northern Zone of Sidama Region, Ethiopia, 2024.

Variable	Category	Case n (%)	Control n (%)	Total n (%)
Age (Years)	≤ 29	29 (15.2)	102 (26.6)	131 (22.8)
	30-39	49 (25.7)	131 (34.2)	180 (31.4)
	40-49	33 (17.3)	90 (23.5)	123 (21.4)
	≥ 50	80 (41.9)	60 (15.7)	140 (24.4)
Sex	Male	95 (49.7)	201 (52.5)	295 (51.4)
	Female	96 (50.3)	182 (47.5)	279 (48.6)
Marital status	Unmarried	50 (26.2)	84 (21.9)	134 (23.3)
	Married	141 (73.8)	299 (78.1)	440 (76.7)
Education Level	No formal education	113 (59.2)	150 (39.2)	261 (45.5)
	Primary education	69 (36.1)	168 (43.9)	238 (41.5)

	Secondary or above	9 (4.7)	65 (17.0)	75 (13.1)
Occupation	Housewife	77 (40.3)	113 (29.5)	190 (33.1)
	Farmer	76 (39.8)	146 (38.1)	222 (38.7)
	Employee	2 (1.0)	29 (7.6)	31 (5.4)
	Daily laborer	13 (6.8)	31 (8.1)	44 (7.7)
	Business owner	10 (5.2)	44 (11.5)	54 (9.4)
	Others (specify)	13 (6.8)	20 (5.2)	33 (5.8)
Residence	Urban	2 (1.0)	10 (2.6)	12 (2.1)
	Rural	189 (99.0)	373 (97.4)	562 (97.9)
Income	≤ 2799	169 (88.5)	246 (64.2)	415 (72.3)
	2800-5599	14 (7.3)	85 (22.2)	99 (17.2)
	≥ 5600	8 (4.2)	52 (13.6)	60 (10.5)
Own livestock	Yes	51 (26.7)	249 (65.0)	300 (52.3)
	No	140 (73.3)	134 (35.0)	274 (47.7)
Type of livestock	Cattle	36 (58.1)	211 (41.9)	247 (43.1)
	Poultry	14 (22.6)	134 (26.6)	148 (25.8)
	Sheep	4 (6.5)	50 (9.9)	54 (9.4)
	Goats	6 (9.7)	64 (12.7)	70 (12.2)
	Donkey	1 (1.6)	44 (8.7)	45 (7.8)
	Other	1 (1.6)	1 (0.2)	2 (0.3)
Own farm	Yes	152 (79.6)	306 (79.9)	458 (79.8)
	No	39 (20.4)	77 (20.1)	116 (20.2)
Farm size (hectare)	< 0.5	115 (75.7)	176 (57.5)	291 (63.5)
	0.51-0.99	4 (2.6)	6 (1.9)	10 (2.2)
	≥ 1	33 (21.7)	124 (40.5)	157 (34.3)
Floor of the house	Earth/mud	157 (82.2)	143 (37.3)	300 (52.3)
	Cement	30 (15.7)	233 (60.8)	263 (45.8)
	Bamboo	3 (1.6)	4 (1.0)	7 (1.2)
	Other (specify)	1 (0.5)	3 (0.8)	4 (0.7)
Walls of the house	Mud and wattle	162 (84.8)	273 (71.3)	435 (75.8)
	Stone	3 (1.6)	82 (21.4)	85 (14.8)
	Bamboo	25 (13.1)	25 (6.5)	50 (8.7)
	Other (specify)	1 (0.5)	3 (0.8)	4 (0.7)
Distance to nearest HF	< 30 minutes	133 (69.6)	239 (62.4)	372 (64.8)
	30-59 minutes	13 (6.8)	50 (13.1)	63 (11.0)
	≥ 60 minutes	45 (23.6)	94 (24.5)	139 (24.2)

5.2 Behavioral related factors

Most controls (97.4%) wore shoes compared to cases (70.7%). Among those wearing shoes, more controls (78.6%) wore closed shoes compared to cases (56.3%). More than half (59.5%) of controls reported always wearing shoes, compared to 48.9% of cases. The majority of the participants reported washing their feet (82.7% cases, 97.9% controls), with a higher proportion of controls (73.6%) washing daily compared to cases (81%). About 120 (62.8%) of cases and 353 (92.2%) of controls used soap for washing feet. Upon observation, 138 (72.3%) of cases had unclean feet, while only 20.9% of controls had unclean feet. A majority of controls (68.4%) had good overall body hygiene practices, while most cases had fair (51.3%) or poor (36.6%) hygiene practices (Table 3).

Table 3: Behavior and related factors among study participants in Northern Zone of Sidama Region, Ethiopia, 2024.

Variable	Category	Case n (%)	Control n (%)	Total n (%)
Wear shoe	Yes	135 (70.7)	373 (97.4)	508 (88.5)
	No	56 (29.3)	10 (2.6)	66 (11.5)
Type of shoes	Closed shoes	76 (56.3)	293 (78.6)	369 (72.6)
	Sandals	59 (43.7)	80 (21.4)	139 (27.4)
Shoe wearing frequency	Always	66 (48.9)	222 (59.5)	288 (57.0)
	Frequently	41 (30.4)	117 (31.4)	158 (31.4)
	Occasionally	18 (13.3)	26 (7.0)	44 (8.7)
	Rarely	10 (7.4)	8 (2.1)	18 (3.6)
Feet washing practice	Yes	158 (82.7)	375 (97.9)	533 (92.8)
	No	33 (17.3)	8 (2.1)	41 (7.2)
Feet washing frequency	Daily	128 (81.0)	276 (73.6)	404 (75.6)
	3-6 times a week	14 (8.9)	91 (24.3)	105 (19.0)
	1-2 times a week	7 (4.4)	2 (0.5)	9 (1.7)
	Rarely	9 (5.7)	6 (1.6)	15 (2.8)
Soap use	Yes	120 (62.8)	353 (92.2)	473 (82.4)
	No	38 (19.9)	22 (5.7)	60 (10.5)
Soap use frequency	Always	35 (29.2)	90 (25.5)	125 (26.4)
	Often	37 (30.8)	151 (42.8)	188 (39.7)
	Occasionally	37 (30.8)	90 (25.5)	127 (26.8)
	Rarely	11 (9.2)	22 (6.2)	33 (7.0)
Observed feet cleanness	Clean	53 (27.7)	303 (79.1)	356 (61.9)
	Unclean	138 (72.3)	80 (20.9)	218 (38.1)

Overall body hygiene	Good	23 (12.0)	262 (68.4)	285 (49.7)
	Fair	98 (51.3)	99 (25.8)	197 (34.3)
	Poor	70 (36.6)	22 (5.7)	92 (16.0)
Cultural belief on wearing	Yes	5 (2.6)	13 (3.4)	18 (3.1)
Shoes	No	186 (97.4)	370 (96.6)	556 (96.9)

5.3 Knowledge and attitude related factors

Ninety-three (48.7%) cases and 116 (30.3%) of the controls had poor knowledge about podoconiosis. Additionally, about 135 (70.7%) of cases had negative attitudes towards podoconiosis, compared to less than half (47%) of controls. The main source of health information for cases was healthcare workers (90.2%), while for controls, it was social media (52.8%), family (43.3%), and healthcare workers (78%). More controls (41.3%) engaged in community health programs compared to cases (30.4%). More than half of cases (51.3%) used traditional medicines compared to controls (14.9%) (Table 4).

Table 4: Knowledge and attitude about podoconiosis among study participants in Northern Zone of Sidama Region, Ethiopia, 2024.

Variable	**Category**	**Case n (%)**	**Control n (%)**	**Total n (%)**
Knowledge	Poor knowledge	93 (48.7)	116 (30.3)	209 (36.4)
	Good knowledge	98 (51.3)	267 (69.7)	365 (63.6)
Attitude	Negative attitude	135 (70.7)	180 (47.0)	315 (54.9)
	Positive attitude	56 (29.3)	203 (53.0)	259 (45.1)
Source of health information	Mass media	5 (6.1)	29 (22.8)	34 (17.8)
	Social media	8 (9.8)	67 (52.8)	75 (37.3)
	Family	18 (22.0)	55 (43.3)	73 (35.8)
	Healthcare workers	74 (90.2)	99 (78.0)	173 (85.3)
	Friends	4 (4.9)	44 (34.6)	48 (23.3)
Engage in community health	Yes	58 (30.4)	158 (41.3)	216 (37.6)
Programs	No	133 (69.6)	225 (58.7)	358 (62.4)
Traditional medicines use	Yes	98 (51.3)	57 (14.9)	155 (27.0)
	No	93 (48.7)	326 (85.1)	419 (73.0)

5.4 Family related factors

The mean (SD) family size among cases was 5.4 (± 1.9), while controls had a mean family size of 5.6 (± 1.9) years. The family size distribution was similar between cases (53.9% ≤ 5 members) and controls (54.6% ≤ 5 members). More than two-thirds (69.7%) of controls were members of community-based health insurance (CBHI) compared to cases (38.2%). The main water sources were public taps (53.9% cases, 60.6% controls) and rivers and streams (38.2% cases, 21.9% controls). Most participants (72.8% cases, 84.3% controls) spent < 30 minutes fetching water. The majority of participants found the price of soap not very affordable (88.5% cases, 76.2% controls), and more controls (66.3%) purchased ≥ 4 soaps per month compared to cases (32.5%). More cases (79.1%) purchased < 2 pairs of shoes per year compared to controls (39.7%), and most participants found the price of shoes not very affordable (91.6% cases, 78.3% controls). A higher proportion of cases (17.8%) had first-degree relatives affected by podoconiosis compared to controls (2.3%). Few participants had second-degree relatives (13.1% cases, 3.1% controls) or other relatives (4.2% cases, 3.1% controls) affected. Only a small proportion of participants had a spouse affected (2.1% cases, 1% controls) or a family migration pattern (6.8% cases, 2.3% controls). The prevalence of chronic illness was similar between cases (6.8%) and controls (7%), with hypertension being the most common (50% cases, 85.7% controls) (Table 5).

Table 5: Family and other related factors among study participants in Northern Zone of Sidama Region, Ethiopia, 2024.

Variable	Category	Case n (%)	Control n (%)	Total n (%)
Family size	≤ 5	103 (53.9)	209 (54.6)	312 (54.4)
	≥ 6	88 (46.1)	174 (45.4)	262 (45.6)
CBHI membership	Yes	73 (38.2)	267 (69.7)	340 (59.2)
	No	118 (61.8)	116 (30.3)	234 (40.8)
Water source	Household tap	13 (6.8)	67 (17.5)	80 (13.9)
	Public tap	103 (53.9)	232 (60.6)	335 (58.4)
	River/stream	73 (38.2)	84 (21.9)	157 (27.4)
Water time??	< 30	139 (72.8)	323 (84.3)	462 (80.5)
	≥ 30	52 (27.2)	60 (15.7)	112 (19.5)
Time spent to buy soap	< 30	114 (59.7)	171 (44.6)	285 (49.7)
	≥ 30	77 (40.3)	212 (55.4)	289 (50.3)
Price of soap	Affordable	2 (1.0)	19 (5.0)	21 (3.7)
	Fair	20 (10.5)	72 (18.8)	92 (16.0)

	Not very affordable	169 (88.5)	292 (76.2)	461 (80.3)
Number of soaps in	< 4	129 (67.5)	129 (33.7)	258 (44.9)
Month	≥ 4	62 (32.5)	254 (66.3)	316 (55.1)
Number of shoes	< 2	151 (79.1)	152 (39.7)	303 (52.8)
Purchased	≥ 2	40 (20.9)	231 (60.3)	271 (47.2)
Price of shoes	Affordable	1 (0.5)	12 (3.1)	13 (2.3)
	Fair	15 (7.9)	71 (18.5)	86 (15.0)
	Not very affordable	175 (91.6)	300 (78.3)	475 (82.7)
First-degree relatives	Yes	34 (17.8)	9 (2.3)	43 (7.5)
	No	157 (82.2)	374 (97.7)	531 (92.5)
Second-degree relatives	Yes	25 (13.1)	12 (3.1)	37 (6.4)
	No	164 (85.9)	366 (95.6)	530 (92.3)
	I don't know	2 (1.0)	5 (1.3)	7 (1.2)
Other relatives affected	Yes	8 (4.2)	12 (3.1)	20 (3.5)
	No	181 (94.8)	360 (94.0)	541 (94.2)
	I don't know	2 (1.0)	11 (2.9)	13 (2.3)
Spouse affected	Yes	4 (2.1)	4 (1.0)	8 (1.4)
	No	181 (94.8)	371 (96.9)	552 (96.2)
Family migration pattern	Yes	13 (6.8)	9 (2.3)	22 (3.8)
	No	178 (93.2)	374 (97.7)	552 (96.2)
Chronic illness	Yes	13 (6.8)	27 (7.0)	40 (7.0)
	No	178 (93.2)	356 (93.0)	534 (93.0)

5.5 Factors associated with podoconiosis

During the bivariable logistic regression analysis, age, educational status, income, shoe wearing, regular foot washing, foot cleanliness in observation, knowledge, attitude, time spent fetching water, number of soaps purchased, and number of shoes purchased were significantly associated with podoconiosis. However, after adjusting for potential confounding variables in multivariable logistic regression, six variables, such as age, educational status, shoe wearing, foot cleanliness in observation, knowledge, attitude, and number of shoes purchased, were found to be independent determinants of podoconiosis.

Individuals aged 50 years and older had 2.61 times higher odds of developing podoconiosis compared to those aged ≤ 29 years (AOR = 2.61; 95% CI: 1.22, 5.58). The odds of podoconiosis were 3.04 times higher among individuals with no formal education as compared to those with secondary or above educational status (AOR = 3.04, 95% CI: (1.06, 8.73). Correspondingly, the

odds of podoconiosis were 3.67 times higher among individuals with primary education as compared to those with secondary or above educational status (AOR = 3.67, 95% CI: (1.32, 10.20). The odds of podoconiosis were 4.1 times higher among individuals who did not wear shoes as compared to those who do (AOR = 4.10, 95% CI: 1.72, 9.79). Individuals observed to have unclean feet were 4.8 times more at risk for podoconiosis than those who observed to have clean feet (AOR = 4.80, 95% CI: (2.84, 8.11). The odds of podoconiosis were 3.52 times higher among individuals who had poor knowledge of podoconiosis as compared to those who had good knowledge (AOR = 3.52, 95% CI: 2.14, 5.78%). Additionally, individuals with a negative attitude towards podoconiosis had 1.8 times higher odds of podoconiosis as compared to their counterparts (AOR = 1.80, 95% CI: (1.11-2.94). Individuals who purchased one or fewer pairs of shoes had 2.61 times increased odds of podoconiosis compared to those who purchased two or more pairs (AOR = 2.61, 95% CI: 1.48–4.61).

Table 6: Bivariable and multivariable logistic regression analysis of factors associated with podoconiosis in Northern Zone of Sidama Region, Ethiopia (n = 574), 2024.

Variables	Case n (%)	Control n (%)	COR (95% CI)	AOR (95% CI)
Age (years)				
≤ 29	29 (15.2)	102 (26.6)	1	1
30-39	49 (25.7)	131 (34.2)	1.32 (0.78-2.23)	1.19 (0.58-2.41)
40-49	33 (17.3)	90 (23.5)	1.29 (0.73-2.29)	0.83 (0.37-1.89)
≥ 50	80 (41.9)	60 (15.7)	4.69 (2.76-7.98)	2.61 (1.22-5.58)*
Sex				
Male	95 (49.7)	201 (52.5)	1	1
Female	96 (50.3)	182 (47.5)	1.12 (0.79-1.58)	1.53 (0.95-2.46)
Marital status				
Unmarried	50 (26.2)	84 (21.9)	1.26 (0.84-1.89)	1.72 (0.95-3.11)
Married	141 (73.8)	299 (78.1)	1	1
Educational status				
No Formal Education	113 (59.2)	150 (39.2)	5.44 (2.60-11.39)	3.04 (1.06-8.73)*
Primary Education	69 (36.1)	168 (43.9)	2.97 (1.40-6.29)	3.67 (1.32-10.20)*
Secondary & Above	9 (4.7)	65 (17.0)	1	1
Income				
≤ 2799	169 (88.5)	246 (64.2)	4.47 (2.07-9.64)	1.84 (0.75-4.54)
2800-5599	14 (7.3)	85 (22.2)	1.07 (0.42-2.73)	0.88 (0.30-2.62)
≥ 5600	8 (4.2)	52 (13.6)	1	1

Shoe wearing practice				
Yes	135 (70.7)	373 (97.4)	1	1
No	56 (29.3)	10 (2.6)	15.74 (7.67-31.19)	4.10 (1.72-9.79)**
Regular feet washing practice				
Yes	158 (82.7)	375 (97.9)	1	1
No	33 (17.3)	8 (2.1)	9.79 (4.42-21.67)	2.01 (0.70-5.76)
Observed feet cleanliness				
Clean	53 (27.7)	303 (79.1)	1	1
Unclean	138 (72.3)	80 (20.9)	9.86 (6.60-14.73)	4.80 (2.84-8.11)**
Knowledge				
Poor knowledge	93 (48.7)	116 (30.3)	2.18 (1.53-3.12)	3.52 (2.14-5.78)**
Good knowledge	98 (51.3)	267 (69.7)	1	1
Attitude				
Poor attitude	135 (70.7)	180 (47.0)	2.72 (1.88-3.94)	1.80 (1.11-2.94)*
Good attitude	56 (29.3)	203 (53.0)	1	1
Engage in community health programs				
Yes	58 (30.4)	158 (41.3)	0.62 (0.43-0.90)	1.56 (0.91-2.66)
No	133 (69.6)	225 (58.7)	1	1
Time to water source				
< 30 minutes	139 (72.8)	323 (84.3)	0.50 (0.33-0.76)	0.95 (0.53-1.70)
≥ 30 minutes	52 (27.2)	60 (15.7)	1	1
Number of soaps used (in a month)				
< 4 bars	129 (67.5)	129 (33.7)	4.10 (2.83-5.93)	0.91 (0.52-1.59)
≥ 4 bars	62 (32.5)	254 (66.3)	1	1
Purchasing power of shoes per year				
0	151 (79.1)	152 (39.7)	5.74 (3.83-8.60)	2.61 (1.48-4.61)**
≥ 1	40 (20.9)	231 (60.3)	1	1

*p<0.05, **p<0.01

6. DISCUSSION

This study aimed to identify the determinants of podoconiosis in the Northern Zone of Sidama Region, Southern Ethiopia. The study identified that age, educational status, shoe wearing, number of shoes purchased; observed foot cleanliness, knowledge, and attitude were found to be independent determinants of podoconiosis.

The current study revealed that individuals aged 50 years and older had three times higher odds of podoconiosis compared to those aged ≤ 29 years. The finding is supported by studies conducted at Bensa district in Sidama Region (19), Wolaita Zone in South Ethiopia (34), and East Gojjam Zone in Northwest Ethiopia (35) and a global systematic review (11) that found the prevalence of podoconiosis was higher among older adults than youths and children. This association between advanced age and increased podoconiosis risk could be attributed to cumulative exposure to irritant soil over time as well as age-related changes in the lymphatic system that may impair its ability to clear particle loads efficiently.

This study found that the odds of podoconiosis were three and four times higher among individuals with no formal education and primary education, respectively, compared to those with secondary or above educational status. This finding is supported by studies conducted in Sodo zuria district, Wolaita zone (34), and a study conducted in highly podoconiosis-endemic areas of Ethiopia that documented six times higher odds among illiterate relative to literate community members (14). Limited education is often associated with lower awareness and understanding of podoconiosis prevention methods, which can lead to delayed diagnosis, inadequate self-management, and increased disease progression. Additionally, individuals with higher education are more likely to have better knowledge of prevention methods, improved shoe-wearing practices, and a higher income to purchase shoes, which can reduce the risk of podoconiosis (14).

Podoconiosis was found to be determined by shoe wearing; the odds of podoconiosis were four times higher among individuals who did not wear shoes compared to those who do. This finding is in line with studies at Bensa district in Sidama Region (19), East and West Gojam Zones, northern Ethiopia (7), and a systematic review and meta-analysis that showed a higher prevalence of podoconiosis among those who often go barefoot (10). This can be explained by

the fact that not wearing shoes increases exposure to irritant soil particles, which can penetrate the skin and trigger the inflammatory response that leads to lymphatic dysfunction and the subsequent development of podoconiosis.

In addition to wearing shoes, the number of shoes you own has a significant association with podoconiosis. Our study found that individuals who purchased one or fewer pairs of shoes had three times increased odds of podoconiosis compared to those who purchased two or more pairs. This finding is consistent with a study in Gamo Zone, southern Ethiopia, which found that individuals who owned fewer shoes and those who often did not wear shoes were more likely to have podoconiosis (24). Access to and utilization of shoes play a crucial role in reducing exposure to irritant soil particles, which is a key risk factor for podoconiosis.

The current study revealed that individuals observed to have unclean feet were five times more at risk for podoconiosis than those observed to have clean feet. This finding is supported by a systematic review and meta-analysis that found the prevalence of podoconiosis is associated with poor foot hygiene (10). Poor foot hygiene may facilitate the entry and persistence of soil particles in the skin, contributing to the development and progression of podoconiosis.

This study found that the odds of podoconiosis were four times higher among individuals who had poor knowledge of podoconiosis compared to those who had good knowledge. This finding is consistent with studies conducted in various regions of Ethiopia that indicate generally low levels of podoconiosis knowledge in endemic communities (14, 42, 47). Adequate knowledge and understanding of podoconiosis can lead to prevention practice, appropriate care-seeking behaviors, and better self-management, ultimately reducing the burden of the disease (47). Furthermore, in this particular study, individuals with good knowledge had higher foot hygiene and shoe-wearing practices, which are known preventive methods for podoconiosis.

The current study revealed that individuals with negative attitudes towards podoconiosis had two times higher odds of the disease compared to their counterparts. This finding is supported by previous research that showed negative attitudes, misconceptions, and stigmatization greatly increase the psychosocial burden of podoconiosis across endemic regions (27). Negative attitudes can discourage individuals from seeking medical attention or adopting preventive

measures, ultimately exacerbating the disease burden. Moreover, positive attitudes towards podoconiosis may arise from improved knowledge about the disease, which can lead to better preventive practices and health-seeking behaviors.

Limitations of the study

The interpretation of this study's findings should consider several limitations. Firstly, there could be recall bias (age and knowledge) that might overestimate or underestimate the effect size (AOR). Secondly, there is a risk of social desirability bias regarding age, attitude, shoe wearing practice, and purchasing power variables that might overestimate or underestimate the AOR. This could lead to respondents either understating or overstating certain influencing factors. Similarly, there is a potential misclassification bias of controls due to the chronic nature of the disease; the controls might have podoconosis disease without signs and symptoms, which was wrongly classified as controls. This bias might shift the AOR toward or away from null.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

In conclusion, the study identified advanced age (≥ 50 years), educational status (no or primary education), not wearing shoes, number of shoes purchased, observed unclean feet, knowledge, and attitude towards the disease as independent determinants of podoconiosis.

7.2 Recommendations

Based on the findings of the study, the following recommendations were made to stakeholders for addressing the determinants of podoconiosis:

At the federal ministry of health and regional health bureau level

- Collaborate with local authorities, community-based organizations, and shoe manufacturers to increase access to affordable and durable shoes for at-risk populations.
- Create a small economic reform focused on podoconisi patients to improve their economic status and enable them to purchase shoes and maintain good hygiene practices.

At the district and community levels

- Conduct campaigns highlighting the importance of consistent shoe-wearing, particularly among older individuals and individuals with lower formal education.
- Implement community-based programs to promote foot hygiene practices, such as regular washing with soap and water and proper drying of feet.
- Implement targeted education and awareness campaigns in communities, particularly for individuals with limited formal education, to improve knowledge and understanding of podoconiosis, its causes, prevention methods, and the importance of seeking early treatment.

For researchers

- To conduct further study using a community-based longitudinal study to establish causality and additional qualitative study to explore and in-depth understand the contextual factors.

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8. ANNEXES

Annex I: Information sheet and consent form (English version)

Title of the Research Project: Determinants of Podoconiosis in three selected district of Northern zone, Sidama Region, Ethiopia.

Name of Investigator: Melkamu Ugamo

Introduction: This information sheet and consent form is prepared to explain the study you are being asked to join. Please listen carefully and ask any questions about the study before you agree to join. You may ask questions at any time after joining the study.

Purpose of Research Project: The purpose of this research is to assess determinants of Podoconiosis in Podoconiosis in three selected district of Northern zone, Sidama Region, Ethiopia. The study will be helpful in determining the determinants of podoconiosis to design appropriate prevention and intervention strategies. It also will serve as baseline information for subsequent studies in the country.

Procedure: To assess the determinants of podoconiosis we invite you to take part in this project randomly. If you are willing to participate in this project, you need to understand and sign the agreement form. You do not need to tell your name to the investigator or write on the questionnaire and all your responses and the results obtained will be kept confidentially by using coding system whereby no one will have access to your response.

Risk/ Discomfort: By participating in this research project, you may feel that it has some discomfort especially on wasting your time about 30 minutes. We hope you will participate in the study for the sake of the benefit of the research result. There has no any risk to you for participating in this research project.

Benefits: If you participate in this research project, there may not be direct benefit to you but your participation is likely to help us in assessing determinants of podoconiosis. Ultimately, this will help us to work on prevention and intervention strategies.

Incentives/Payments for Participating: You will not be provided any incentives or payment to take part in this project.

Confidentiality: The information collected from this research project will be kept confidential and information about you that will be collected by this study will be stored in a file, without

your name, but, a code number assigned to it and it will not be disclosed to anyone except the principal investigator.

Right to refuse or withdraw: You have full right to refuse from participating in this research. You can choose not to respond to some or all questions if you do not want to give your response. You have also the full right to withdraw from this study at any time you wish, without losing any of your right.

Person to contact: This research project will be reviewed and approved by the ethical clearance committee Hawassa university college of medicine and health sciences. If you want to know more information, you can contact the principal investigator through the address below. If you have any question you can contact any of the following individuals (Investigator and Advisors) and you may ask at any time you want.

Participants agree: 1. Yes 2. No

Signature:_____ Date_____

Principal Investigator:

Full name: Melkamu Ugamo

Cell phone: +251919761520

E-mail: @gmail.com

Main advisor

Full name: Nana Cea

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Annex II: Questionnaire (English version)

Part I. Socio-demographic characteristics			
Code	***Questions***	***Possible responses***	***Skip***
Q101	What is your current age?	_____Years	
Q102	What is your sex?	1. Male 2. Female	
Q103	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Windowed	
Q104	What is the highest level of education you have completed?	1. No formal education 2. Primary education 3. Secondary education 4. College or above	
Q105	What is your current occupation?	1. Housewife 2. Farmer 3. Employee 4. Daily laborer 5. Business/Entrepreneur 6. Others(specify)_____	
Q106	Do you currently reside in an urban or rural area?	1. Urban 2. Rural	
Q107	What is the average monthly income for your household?	_____Birr	
Q108	Do you currently own any livestock?	1. Yes 2. No	It 'No' go to Q109
Q109	If 'Yes' to the Q107 question, please	1. Cattle	

	specify the type(s) of livestock you currently own? (multiple response is possible)	2. Poultry 3. Sheep 4. Goats 5. Donkey 6. Horses 7. Other (specify)_____	
Q110	Do you currently own any farm land?	1. Yes 2. No	It 'No' go to Q111
Q111	If 'yes' to Q109 question, what is the size of the farm land?	_____(timad)	
Q112	What is your flooring material of the house?	1. Earth/mud 2. Cement 3. Bamboo 4. Other (specify)_____	
Q113	What is the material of the walls in your home?	1. Mud and wattle 2. Stone 3. Bamboo 4. Other (specify)_____	
Q114	How long does it take to reach the nearest healthcare facility?	_____in minutes	

Part II. Behavioral related questions			
Code	***Questions***	***Possible responses***	***Skip***
Q201	Do you wear shoes?	1. Yes 2. No	
Q202	What type of shoes do you usually wear?	1. Closed shoes 2. Sandals/flip-flops 3. Other (specify)_____	

Q203	How often do you wear shoe?	1. Always 2. Frequently 3. Occasionally 4. Rarely	
Q204	Do you have a regular practice of washing your feet?	1. Yes 2. No	
Q205	How often do you wash your feet in a week?	1. Daily 2. 3-6 times a week 3. 1-2 times a week 4. Rarely	
Q206	When you wash your feet, do you use soap?	1. Yes 2. No	
Q207	If 'Yes' to Q206, how frequent?	1. Always 2. Often 3. Occasionally 4. Rarely	
Q208	Assess the cleanness of the feet.	1. Clean 2. Unclean	Observe
Q209	How would you rate your overall body hygiene practices?	1. Good 2. Fair 3. Poor	
Q210	Are there any cultural beliefs in your community related to the practice of wearing shoes?	4. Yes 5. No	

PART III: Knowledge and attitude related questions			
Questions for assessing knowledge of the participants on podoconiosis			
Q301	Have you ever heard of podoconiosis?	1. Yes	

		2. No 318	**Skip**
Q302	What is the cause of podoconiosis?	1. An evil sprit 2. Soil particles 3. Hereditary 4. Malnutrition 5. I don't know 6. Other (specify)_____	
Q303	What are early symptoms of podoconiosis?	1. Leg swelling 2. Burning and itching of feet 3. Appearance of moss-like lesions 4. Joint fixation 5. I don't know 6. Other (specify)_____	
Q304	Which groups are most vulnerable to podoconiosis?	1. Elderly 2. Pregnant women 3. Farmers and barefoot individuals 4. Urban populations 5. I don't know 6. Other (specify)_____	
Q305	How is podoconiosis transmitted?	1. Through mosquito bites 2. Person-to-person contact 3. Prolonged contact with minerals in the soil 4. I don't know 5. Other (specify)_____	
Q306	Is podoconiosis preventable?	1. Yes 2. No	
Q307	Method of prevention?	1. Wearing shoes	

		2. Regular feet washing 3. Using insect repellent 4. Getting vaccinated 5. Other (specify)_____	
Q308	Is podoconiosis curable?	1. Yes 2. No	
Attitude of the participants towards podoconiosis			
Q309	I would feel comfortable if my child marries a person affected by podoconiosis.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q310	People with podoconiosis should be allowed to work any job.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q311	I would be certain to eat a meal prepared by someone with podoconiosis.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q312	Podoconiosis not results from a genetic disorder.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q313	Individuals with podoconiosis are not cursed or possessed.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree	

		5. Strongly disagree	
Q314	There is effective treatment for podoconiosis.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q315	Podoconiosis primarily impacts poor communities.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q316	I would welcome a podoconiosis treatment center being opened in my community.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q317	Podoconiosis patients should not avoid public social functions.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Q318	Addressing podoconiosis is not a waste of health resources.	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
Source of health information			
Q319	Did you take health education about NTD/podoconiosis in the past two years	1. Yes 2. No	
Q320	Source of health information?	1. Mass media	

		2. Social media 3. Family 4. Healthcare workers 5. Friend 6. Other (specify) _____	
Q321	Do you engage in health programs or initiatives within your community?	1. Yes 2. No	
Q322	Do you utilize traditional medicine practices for healthcare?	1. Yes 2. No	

Part IV. Family history and household related questions			
Code	***Questions***	***Possible responses***	***Skip***
Q401	What is the total number of individuals residing in your household?	_____(in number)	
Q402	Is your family a member of the Community-Based Health Insurance (CBHI) program?	1. Yes 2. No	
Q403	What is your main source of water?	1. Household tap 2. Public tap 3. Well 4. River/stream 5. Other (Specify): _____	
Q404	How long does it take to reach the water source?	_____in minutes	
Q405	How much time does it typically take you to purchase soap?	_____in minutes	
Q406	How do you find the price of soap?	1. Affordable	

		2. Fair 3. Not very affordable	
Q407	On average, how many pairs of shoes do you purchase in a year?	_____in number	
Q408	How do you find the price of shoe?	1. Affordable 2. Fair 3. Not very affordable	
Q409	Have any of your first-degree relatives (parents, siblings, children) been affected by leg or foot swelling?	1. Yes 2. No 3. I don't know	
Q410	Have any of your second-degree relatives (grandparents, aunts/uncles, nieces/nephews) had leg or foot swelling?	1. Yes 2. No 3. I don't know	
Q411	Have any of your other blood relatives had symptoms of leg/foot swelling or podoconiosis?	1. Yes 2. No 3. I don't know	
Q412	Has your spouse or partner ever been affected by leg or foot swelling?	1. Yes 2. No 3. I don't know 4. Not applicable	
Q413	Number of family members affected?	_____in number	
Q414	At what age did the early family podoconiosis case first show swelling symptoms?	1. Childhood 2. Adolescence 3. Adulthood 4. Elderly 5. Don't know	
Q415	Have you or any member of your household experienced any migration?	1. Yes 2. No	
Q416	Do you have any chronic illness?	1. Yes	

		2. No	
Q417	If Yes to Q412, Which chronic illness do you have?	1. Diabetes Mellitus 2. Hypertension 3. Heart failure 4. HIV/AIDS 5. Other (specify)_____	

አባሪ III፡- የመረጃ እና የስምምነት ቅጽ (የአማርኛ ቅጂ)

የምርምር ፕሮጀክቱ ርዕስ ፡ የፖድኮኒዮሲስ በሽታን የሚወስኑ ምክንያቶች በሲዲማ ክሌሌ ሰሜናዊ ዞን ውስጥ።

የተመራማሪው ስም፡- መሌካሙ ኡጋሞ

መግቢያ ፡ ይህ የመረጃ እና የስምምነት ቅጽ የተዘጋጀው እንዱቀሊቀለት የሚጠየቁትን ጥናት ሇማብራራት ነው። እባክዎን በጥሞና ያዲምጡ እና ሇመቀሊቀሌ ከመስማማትዎ በፉት ስሇ ጥናቱ ማንኛውንም ጥያቄ ይጠይቁ። ጥናቱን ከተቀሊቀለ በኋሊ በማንኛውም ጊዜ ጥያቄዎችን መጠየቅ ይችሊለ።

የምርምር ፕሮጀክት ዓሊማ፡- የዚህ ጥናት ዓሊማ በኢትዮጵያ በሲዲማ ክሌሌ ሰሜናዊ ዞን የሚገኘውን የፖድኮኒዮሲስን በሽታ የሚወስኑትን ምክንያቶች ሇመገምገም ነው። ጥናቱ ተገቢውን የመከሊከያ እና የጣሌቃ ገብነት ስሌቶችን ሇመንዯፍና የፖድኮኒዮሲስን ቁጥጥር ሇመወሰን ይረዲሌ። በሀገሪቱ ሇሚዯረጉ ተከታታይ ጥናቶችም እንዯ መነሻ መረጃ ሆኖ ያገሇግሊሌ።

ሂዯት፡- የፖድኮኒዮሲስን መመዘኛዎች ሇመገምገም በዚህ ፕሮጀክት ውስጥ በዘፇቀዯ እንዱትሳተፈ እንጋብዝዎታሇን። በዚህ ፕሮጀክት ሊይ ሇመሳተፍ ፍቃዯኛ ከሆኑ የስምምነት ቅጹን መረዲት እና መፇረም ያስፇሌግዎታሌ። ስምዎን ሇመርማሪው መንገር ወይም በመጠይቁ ሊይ መጻፍ አያስፇሌግዎትም እና ሁለም ምሊሾችዎ እና የተገኘው ውጤት ማንም ሰው የእርስዎን ምሊሽ ማግኘት በማይችሌበት ኮዴ ስርዓት በመጠቀም በሚስጥር ይጠበቃሌ።

ስጋት/ አሇመመቸት፡- በዚህ የምርምር ፕሮጀክት ውስጥ በመሳተፍ በተሇይ ጊዜዎን ሇ30 ዯቂቃ ያህሌ በማባከን አንዲንዴ ምቾት እንዯሚሰማዎት ሉሰማዎት ይችሊሌ። ሇምርምር ውጤቱ ጥቅም ሲባሌ በጥናቱ ሊይ እንዯሚሳተፈ ተስፊ እናዯርጋሇን። በዚህ የምርምር ፕሮጀክት ውስጥ ሇመሳተፍ ምንም አይነት ስጋት የሇዎትም።

ጥቅማጥቅሞች፡- በዚህ የምርምር ፕሮጀክት ውስጥ ከተሳተፈ፣ ሇእርስዎ ቀጥተኛ ጥቅም ሊይኖር ይችሊሌ፣ነገር ግን የእርስዎ ተሳትፎ የፖድኮኒዮሲስን መመዘኛዎች ሇመገምገም ሉረዲን ይችሊሌ። በመጨረሻም ይህ በመከሊከሌ እና በቁጥጥር ስሌቶች ሊይ ሇመስራት ይረዲናሌ.

የተሳትፎ ማበረታቻ/ክፍያ፡- በዚህ ፕሮጀክት ሊይ ሇመሳተፍ ምንም አይነት ማበረታቻ ወይም ክፍያ አይሰጥዎትም።

ምስጢራዊነት፡- ከዚህ የምርምር ፕሮጀክት የሚሰበሰበው መረጃ በሚስጥር ይያዛሌ እናም በዚህ ጥናት የሚሰበሰቡት መረጃዎች በፊይሌ ውስጥ ይቀመጣለ ፣ ያሇ ስምዎ ፣ ግን ኮዴ ቁጥር ተሰጥቶታሌ እና አይገሇጽም ከዋናው መርማሪ በስተቀር ማንም።

እምቢ የማሆት ወይም የመውጣት መብት፡- በዚህ ጥናት ውስጥ ሊሆመሳተፍ ሙለ መብት አሆዎት። ምሊሸዎን መስጠት ካሌፇሆጉ ሆአንዲንዴ ወይም ሆሁለም ጥያቄዎች ምሊሽ ሊሆመስጠት መምረጥ ይችሊለ። እንዱሁም ማንኛውንም መብትዎን ሳያጡ በፇሆጉት ጊዜ ከዚህ ጥናት የመውጣት ሙለ መብት አሆዎት።

የሚመሇከተው፡- ይህ የምርምር ፕሮጀክት በሀዋሳ ዩኒቨርሲቲ ሕክምናና ጤና ሳይንስ ኮላጅ ታይቶ ይጸዴቃሌ። ሇበሇጠ መረጃ ሆማወቅ ከፇሆጉ ዋናውን መርማሪ ከታች ባሆው አዴራሻ ማግኘት ይችሊለ። ማንኛውም አይነት ጥያቄ ካልት ከሚከተለት ግሆሰቦች (መርማሪ እና አማካሪዎች) ማነጋገር ይችሊለ እና በፇሆጉት ጊዜ መጠየቅ ይችሊለ።

ተሳታፉዎች ይስማማለ ፡ 1. አዎ 2. አይሆንም

ፉርማ፡_____ቀን_____

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አባሪ IV፡ መጠይቅ (የአማርኛ ቅጂ)

ክፍሌ I. ማህበረ-ሕዝብ ባህሪያት			
ኮዴ	**ጥያቄዎች**	**ሉሆኑ የሚችለ ምሊሾች**	**ዝሇሌ**
Q101	የአሁኑ ዕዴሜዎ ስንት ነው?	_____ዓመታት	
Q102	ፆታዎ ምንዴነው?	1. ወንዴ 2. ሴት	
Q103	አሁን ያለበት የትዲር ሁኔታ ምንዴ ነው?	1. ያሊገባ/ች 2. ያገባ 3. የተፊታ/ች 4. የሞተበት/ባት	
Q104	ያጠናቀቁት ከፍተኛ የትምህርት ዯረጃ ምንዴነው?	1. መዯበኛ ትምህርት ያሌተማረ/ች 2. የመጀመሪያ ዯረጃ ትምህርት 3. የሁሇተኛ ዯረጃ ትምህርት 4. ኮላጅ ወይም ከዚያ በሊይ	
Q105	አሁን ያለበት ሙያ ምንዴን ነው?	1. የቤት እመቤት 2. ገበሬ 3. ሰራተኛ 4. የቀን ሰራተኛ 5. ንግዴ / ሥራ ፇጣሪ 6. ላልች (ይግሇጹ)_____	
Q106	በአሁኑ ጊዜ በምን አይነት አካባቢ ይኖራለ?	1. ከተማ 2. ገጠር	
Q107	የቤተሰብዎ አማካይ ወርሃዊ ገቢ ስንት ነው?	_____ ብር	
Q108	በአሁኑ ጊዜ የከብት እርባታ አሇዎት?	1. አዎ	'አይ' ወዯ

		2. አይ	Q110 ይሂደ
Q109	ሆ Q108 ጥያቄ 'አዎ' ከሆነ፣ እባክህ አሁን ያሆዎትን የእንስሳት ዓይነት(ቶች) ይግሆጽ ? (ከአንዴ በሊይ ምሊሽ መስጠት ይቻሊሌ)	1. ከብት 2. የድሮ እርባታ 3. በግ 4. ፍየልች 5. አህያ 6. ፇረሶች 7. ላሊ (ይግሆጹ) _____	
Q110	በአሁኑ ጊዜ የእርሻ መሬት አሆዎት?	1. አዎ 2. አይ	'አይ' ወዯ Q112 ይሂደ
Q111	ሆ Q110 ጥያቄ 'አዎ' ከሆነ፣ የእርሻው መሬት ምን ያህሌ ነው?	_____(ጥማዴ)	
Q112	የቤትዎ ወሇሌ ምንዴ ነው?	1. መሬት/ጭቃ 2. ሲሚንቶ 3. የቀርከሃ 4. ላሊ (ይግሆጹ)_____	
Q113	የቤትዎ ግዴግዲ ምንዴነው? ግዴግዲ ይግሆጹ	1. ጭቃ 2. ዴንጋይ 3. የቀርከሃ 4. ላሊ (ይግሆጹ)_____	
Q114	በአቅራቢያው ወዯሚገኝ የጤና ተቋም ሆመዴረስ ምን ያህሌ ጊዜ ይወስዲሌ?	_____ በዯቂቃ	

ክፍሌ II. ከባህሪ ጋር የተያያዙ ጥያቄዎች			
ኮዴ	**ጥያቄዎች**	**ሉሆኑ የሚችለ ምሊሾች**	**ዝሆሌ**
Q201	አሁን ጫማ ያዯርጋለ?	1. አዎ 2. አይ	
ጥ202	ብዙውን ጊዜ የሚያረጉት ጫማ ምን	1. ሸፍን ጫማ	

	ዓይነት ነው?	2. ክፍት ጫማ / ነጠሊ ጫማ 3. ላሊ (ይግሇጹ) _____	
Q203	መች መች ጊዜ ጫማ ያዯርጋለ?	1. ሁላም 2. አብዛኛውን ጊዜ 3. አንዴ አንዴ ጊዜ 4. አሌፎ አሌፎ	
Q204	እግርዎን የመታጠብ መዯበኛ ሌምዴ አሇዎት?	1. አዎ 2. አይ	
Q205	በሳምንት ውስጥ ስንት ጊዜ እግርዎን ይታጠባለ?	1. በየቀኑ 2. በሳምንት 3-6 ጊዜ 3. በሳምንት 1-2 ጊዜ 4. አሌፎ አሌፎ	
Q206	እግርዎን ሲታጠቡ ሳሙና ይጠቀማለ?	1. አዎ 2. አይ	
Q207	ሇ Q206 'አዎ' ከሆነ ምን ያህሌ ተዯጋጋሚነት ነው? መች መች ይጠቀማለ?	1. ሁላም 2. ብዙ ጊዜ 3. አንዴ አንዴ ጊዜ 4. አሌፎ አሌፎ	
ጥ208	የእግሮቹን/ቿን ንፅህና ይገምግሙ	1. ንጹህ 2. ንፁህ ያሌሆነ	አስተውሌ
Q209	አጠቃሊይ የሰውነት ንፅህና አጠባበቅ ሌምድችዎን እንዳት ይገመግማለ?	1. ጥሩ 2. ፍትሃዊ 3. ዯካማ	
Q210	በማህበረሰብዎ ውስጥ ጫማዎችን ከማዴረግ ጋር የተያያዙ ባህሊዊ እምነቶች አለ?	1. አዎ 2. አይ	

ክፍሌ ሶስት ፡- ከእውቀትና ከአመሇካከት ጋር የተያያዙ ጥያቄዎች			
በፖድኮኒዮሲስ ሊይ የተሳታፉዎችን እውቀት ሇመገምገም ጥያቄዎች			
Q301	ስሇ ፖድኮኒዮሲስ ሰምተው ያውቃለ?	1. አዎ 2. አይ	
Q302	የፖድኮኒዮሲስ መንስኤ ምንዴን ነው?	1. ክፈ መንፇስ 2. የአፇር ቅንጣቶች 3. በዘር የሚተሊሇፍ 4. የተመጣጠነ ምግብ እጥረት 5. አሊውቅም 6. ላሊ (ይግሇጹ) _____	
Q303	የፖድኮኒዮሲስ የመጀመሪያ ምሌክቶች ምንዴ ናቸው?	1. የእግር እብጠት 2. የእግር ማቃጠሌ እና ማሳከክ 3. እንዯ moss የሚመስለ ቁስልች መታየት 4. የመገጣጠሚያዎች መጠንከር 5. አሊውቅም 6. ላሊ (ይግሇጹ) _____	
Q304	ሇፖድኮኒዮሲስ በጣም የተጋሇጡ የትኞቹ ቡዴኖች ናቸው?	1. አረጋውያን 2. እርጉዝ ሴቶች 3. ባድ እግራቸው የሚጓዙ ግሇሰቦች 4. የከተማ ህዝብ 5. አሊውቅም 6. ላሊ (ይግሇጹ) _____	
Q305	ፖድኮኒዮሲስ እንዳት ይተሊሇፊሌ? ላሊ መተሊሇፉያ ይግሇጹ	1. በወባ ትንኝ ንክሻ 2. ከሰው ሇሰው ግንኙነት 3. በአፇር ውስጥ ከሚገኙ ማዕዴናት ጋር ረዘም ያሇ ግንኙነት 4. አሊውቅም	

		5. ላሊ (ይግሇጹ) _____	
Q306	ፖድኮኒዮሲስን መከሊከሌ ይቻሊሌ?	1. አዎ 2. አይ 3. አሊውቅም	
Q307	ዋና የመከሊከያ ዘዳ?	1. ጫማ ማዴረግ 2. አዘውትሮ እግሮችን መታጠብ 3. ፀረ-ነፍሳትን መጠቀም 4. መከተብ 5. አሊውቅም 6. ላሊ (ይግሇጹ) _____	
Q308	ፖድኮኒዮሲስ ሉታከም ይችሊሌ?	1. አዎ 2. አይ 3. አሊውቅም	
ሇፖድኮኒዮሲስ የተሳታፉዎች አመሇካከት			
Q309	ላጇ በፖድኮኒዮሲስ የተጠቃ ሰው ቢያገባ ምቾት ይሰማኛሌ።	1. በጣም እስማማሇው 2. እስማማሇው 3. ገሇሌተኛ 4. አሌስማማም 5. በጣም አሌስማማም	
Q310	ፖድኮኒዮሲስ ያሇባቸው ሰዎች ማንኛውንም ሥራ እንዱሠሩ ሉፇቀዴሊቸው ይገባሌ.	1. በጣም እስማማሇው 2. እስማማሇው 3. ገሇሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q311	ፖድኮኒዮሲስ ያሇበት ሰው የተዘጋጀውን ምግብ ሇመብሊት አመነታሇሁ።	1. በጣም እስማማሇው 2. እስማማሇው 3. ገሇሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q312	ፖድኮኒዮሲስ በዘር መታወክ ምክንያት ይከሰታሌ.	1. በጣም እስማማሇው 2. እስማማሇው	

		3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q313	ፖድኮኒዮሲስ ያሞባቸው ግሞሰቦች የተረገሙ ወይም በእርኩስ መንፆስ የተያዙ ናቸው.	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q314	ሞፖድኮኒዮሲስ ምንም ውጤታማ ሕክምና የሞም.	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q315	ፖድኮኒዮሲስ በዋነኛነት ዴሃ ማህበረሰቦችን ይጎዲሌ።	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q316	በማኅበረሰቤ ውስጥ የፖድኮኒዮሲስ ሕክምና ማዕከሌ ቢከፆት ዯስ ይሞኛሌ።	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q317	የፖድኮኒዮሲስ ሕመምተኞች የህዝብ ማህበራዊ ተግባራትን መሳተፍ የሞባቸውም.	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ 4. አሌስማማም። 5. በጣም አሌስማማም።	
Q318	የፖድኮኒዮሲስን ችግርን መፍታት የጤና ሀብትን ማባከን ነው።	1. በጣም እስማማሞው 2. እስማማሞው 3. ገሞሌተኛ	

		4. አሌስማማም። 5. በጣም አሌስማማም።	
የጤና መረጃ ምንጭ			
Q319	በዚህ ዓመት ውስጥ ስሆ NTD/ፖድኮኒዮሲስ የጤና ትምህርት ወስዯዋሌ	1. አዎ 2. አይ	
Q320	የጤና መረጃ ምንጭዎ ምንዴነው? ላሊ ምንጭ ይግሇጹ	1. መገናኛ ብዙሀን 2. ማህበራዊ ሚዱያ 3. ቤተሰብ 4. የጤና ባሇሙያዎች 5. ጓዯኛ 6. ላሊ (ይግሇጹ) _____	
Q321	በማህበረሰብዎ ውስጥ በጤና ፕሮግራሞች ውስጥ ይሳተፊለ?	1. አዎ 2. አይ	
Q322	ሇጤናዎ ባህሊዊ መዴሃኒቶችን ይጠቀማለ?	1. አዎ 2. አይ	

ክፍሌ IV. የቤተሰብ ታሪክና ላልች ከቤተሰብ ጋር የተያያዙ ጥያቄዎች			
ኮዴ	**ጥያቄዎች**	**ሉሆኑ የሚችለ ምሊሾች**	**ዝሇሌ**
Q401	በእርስዎ ቤተሰብ ውስጥ የሚኖሩ ሰዎች ጠቅሊሊ ቁጥር ስንት ነው?	_____(በቁጥር)	
Q402	ቤተሰብዎ የማህበረሰብ አቀፍ የጤና መዴህን (CBHI) ፕሮግራም አባሌ ነው?	1. አዎ 2. አይ	
ጥ 403	ዋናው የውሃ ምንጭዎ ምንዴነው?	1. የግሌ ቧንቧ 2. የህዝብ ቦኖ 3. ጉርጓዴ ውሃ 4. ወንዝ/ጅረት/ምንጭ 5. ላሊ (ይግሇጹ): _____	
Q404	የውኃ ምንጭ ሇመዴረስ ምን ያህሌ ጊዜ ይወስዲሌ?	_____ በዯቂቃዎች ውስጥ	

Q405	በተሟምድ ሳሙና ሟመግዛት ምን ያህሌ ጊዜ ይወስዲሌ?	_____ በዯቂቃዎች ውስጥ	
ጥ 406	የሳሙና ዋጋን እንዳት ያዩታሌ?	1. ተመጣጣኝ 2. ፍትሃዊ 3. በጣም ተመጣጣኝ አይዯሟም	
ጥ 407	በአማካይ በዓመት ውስጥ ስንት ጥንዴ ጫማዎችን ይገዛለ?	_____ በቁጥር	
ጥ 408	የጫማ ዋጋን እንዳት ያዩታሌ??	1. ተመጣጣኝ 2. ፍትሃዊ 3. በጣም ተመጣጣኝ አይዯሟም	
Q409	ከአንዯኛ ዯረጃ ዘመድችዎ (ወሊጆች፣ ወንዴሞች፣ እህቶች፣ ሌጆች) በእግር ወይም በእግር እብጠት/ፖድኮኒዮሲስ የተያዘ ሰው አሇ?	1. አዎ 2. አይ 3. አሊውቅም	
ጥ 410	ከሁሇተኛ ዱግሪ ዘመድችዎ (አያቶች፣ አክስቶች/አጎቶች፣ የአጎት ሌጆች /የወንዴም ሌጆች) የእግር እብጠት/ፖድኮኒዮሲስ የተያዘ ሰው አሇ?	1. አዎ 2. አይ 3. አሊውቅም	
ጥ 411	ከላልች የዯም ዘመድችዎ ውስጥ የእግር/የእግር እብጠት ወይም ፖድኮኒዮሲስ የተያዘ ሰው አሇ?	1. አዎ 2. አይ 3. አሊውቅም	
ጥ 412	የትዲር ጓዯኛዎ ወይም የትዲር ጓዯኛዎ በእግር ወይም በእግር እብጠት ወይም ፖድኮኒዮሲስ ተይዘዋሌ?	1. አዎ 2. አይ 3. አሊውቅም 4. ተፇፃሚ የማይሆን	
ጥ 413	የተጎደት የቤተሰብ አባሊት ብዛት?	————————በቁጥር	
ጥ 414	የመጀመሪያው ቤተሰብ የፖድኮኒዮሲስ እብጠት ምሌክቶችን ያሳየው በየትኛው ዕዴሜ ሊይ ነው?	1. በሌጅነት 2. በጉርምስና ዕዴሜ 3. በአዋቂነት 4. በአረጋውያን	

		5. አሊውቅም	
ጥ 415	እርስዎ ወይም የቤተሰብዎ አባሌ ስኖት አጋጥሟችኋሌ?	1. አዎ 2. አይ	
ጥ 416	ከዚህ በፉት ሥር የሰኖኖ በሽታ አሇብዎት?	1. አዎ 2. አይ	
ጥ 417	ሇ Q412 አዎ ከሆነ፣ የትኛው ሥር የሰኖኖ በሽታ አሇብዎ?	1. የስኪር በሽታ 2. የኖም ግፉት 3. የሌብ ችግር 4. ኤችአይቪ / ኤዴስ 5. ላሊ (ይግሇጹ) _____	

QA'MISO V: TAJE UYNANNI BORRI-XA'MO

Xiinxallote Umi: GULUCHU WORI LEKKATE FUUGO XISSO ABBITANNORI HIIKKURIUUTI YAANNO UMINNI TUULATE SINU QUCHUMI GIDDO,SIDAAMU QOQQOWIRA, TOPHIYA

Xiinxallote Anni Su'mi: Melkaamu Uggamo

Xiinxallote Bitima: Tenne taje xawinsannihe wotenna atewiinni fajjo xa'mi'nannihe yannara huluullo heedhannokki gede seekkite ha'runsie ballo!

Xiinxalote guulcho hedo: Guluchu wori lekkate fuugo xisso abbitannori hiikkuriuuti yaanno uminni Tuulate sinu quchumi giddo, Sidaamu qoqqowira, Tophiya.

Tini xiinxallo gobbate deerrinni assinanni fayyimmate mixo qorqorshira kaima ikkitanno hedo cu'mate lowo geeshsha kaa'litanno.

Xiinxallo assinanni gari ortenna fojo: Guluchu wori lekkate fuugo xisso abbitannori hiikkuriuuti yaanno uminni Tuulate sinu quchumi giddo, Sidaamu qoqqowira, Tophiya, yaanno uminni ate doorronnihehu sai doorshinniiti; tenne xiinxallora beeqqaancho ikkatenni ate fojo wolu mannira sayinse dikullanni taje aannohuno ayeno afannokki garinniiti; tenne sekkite hawaqiri.

Xiinxallote beeqqaancho ikkootohura horontanni mitte gawajjono di''iillitannohe. Kayinnilla ,30 daqiiqi xa'mo xa'matenna dawarate keeshshineemmo.Tenne xiinxallora beeqqootto daafira mitte gawajjono horontanni di''iillitannohe ; su'makkinno horontanni diborreessinanni hattono su'makki ayetiro dixa'minanni.

Xiinxallote horo: Tenne xiinxallora beeqqaancho ikkakkinni xaaddote uynanniheri/baantanniheri horoontanni dino, tenne xiinxallora beeqqaancho ikkittoro lowo atewiinni taje lowo horo uytanno yaano tenne guluchu wori lekkate fuugo xisso gargadhatenna xagisi'rate widoonni.

Xiinxallote xa'mo gundikkinni agura dandaatto; qoosskki agarantinote: xiinxallo gumulate geeshshano ikko mereeroho agurate ate fajjo calla hasiissanno.

Tenne xiinxallora amanyootu borro Hawaasi yuniversitenni hikkiminnunna xagishshu koollejenninna Sidaamu fayyimmate instuyeetenni afi'noonnite.

Beeqqaancho mahooyye/gimbi: 1. Ee 2. Dee'ni

Malaate:_____ barra_____

Xiinxallaanchu su'ma: Melkaamu Uggamo

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QA'MISO VI: SIDAAMU AFII GANO (Sidamoo Afo questionnaire)

Gamo I. Dagi-mannoommitte Mashalaqqe Daafira			
Koodde	***Xa'mo***	Dawaro	***Sai***
Q101	Tenne yannara Dirikki me''eho ?	_____dirooti	
Q102	Adhammekki gari hiittooho?	5. adhaminokkiha 6. adhaminoha 7. Tirinoha 8. Gunnitte/a	
Q103	Jawiidihu rosu dirimikki hiikkonneeti? (mitto doori)	5. Xaaddote roso dirosoomma/o 6. 1mi dirimi roso 7. 2ki dirimi roso 8. 2ki dirimi ale	
Q104	Loosikki qeechi maati?	7. Mini ama 8. Baattote looso 9. Mootimmate loosaasincho 10. Barru loosaasincho 11. Uminsa looso kalaqqe loossannore. 12. Wole xawisi_____	
Q105	Xa yannara quchumahonso woy badiyyete he'raatta/o ?	3. Quchumaho 4. Baadiyyete	Q
Q106	Maate'ne xaphooma me''e ikkite heedhanno?	_____kiirotenni	

Q107	Aganunni mereerima eo mini'ne maatera mageeshshi birra ikkanno?	_____Birraati	
Q108	Mini'ne ullaaydi mayinni loonsoonniho?	5. Bushshunni/sabbunni 6. Simmintotenni 7. shomboqqotenni 8. Wole xawisi_____	
Q109	Waa roore yannara hiikkiinni afidhinanni?	1. Mini waati 2. Dagate waati 3. Balete waati 4. Lagu waati 5. Wole xawisi_____	
Q110	Mageeshshi yanna adhanno way noowa iillate?	_____daqiiqunni	

Gaamo II. Amanyootu ledo xaadinohunni xa'minanni borri-xa'mo.			
Koodde	***Xa'mo***	***Dawaro***	***Sai***
Q201	Lekkate koatte(caamma) lukatta/o lekkakira?	3. Ee 4. Dee'ni	
Q202	Hiitto koatte lukkatto/a lekkakkira duucha wote?	4. Lekka dibbino koatte 5. Silippere 6. Wole xawisi_____	
Q203	Me''e higge lukkatto koatte lekkakira?	5. Wo'ma wote 6. Duucha wote 7. Sae sae 8. Keeshshe	
Q204	Lekkakki wo'ma wote hayishshi'ratta/o rosichi gade	3. Ee 4. Dee'ni	

	nooheni?		
Q205	Mitte lamala giddo lekkakki me''e higge hayishshi'ratto/a?	5. Barru tuqa 6. 3-6 hige lamalate giddo 7. 1-2 hige lamalate giddo 8. keeshshe	
Q206	Lekkakki hayishshi'ratto/a wote saamununni hayishshi'ratto/a?	3. Ee 4. Dee;ni	
Q207	Xa'mo ''206,'Ee' ikkiro me''e higge?	5. Wo'ma wote 6. Duucha wote 7. Sae sae 8. keeshshe	
Q208	Lekkate co'imma buuxi hiittooti?.	3. Co'itte lekka 4. Co'itte lekka ikkitinokki lekka	Lekka lai
Q209	Dagakki widoonni budunni/amma'note xaadinohunni ammannani rosichi nooheni koatte lukate	6. Ee 7. Dee'ni	

Gaamo III: Egennonna laooshshe la'nohunni shiqqino bori-xa'mo.			
Xa'muwa illachishshaannohu taaliweelo guluchu woro lekka fuugissanno xisso daafira (podoconiosis) noo mannira egennonsa deerra buuxateeti.			
Q301	Guluchu woro lekka fuugissanno xisso macciishshite egennootta/o	3. Ee 4. Dee'ni	
Q302	Guluuchu woro lekka fuugissanno xisso mayinni dagganno?	7. Bushu ayyaanninni(sheexaanunni) 8. Bushshunni 9. Sirchunni	

		10. Sagalete gattonni 11. Diafoomma/o 12. Wole xawisi_____	
Q303	Guluchu woro lekka fuugissanno xisso umo leellishanno malaati maati?	7. Lekka fuugisanno. 8. Lekka giiranna hangaarsiisa 9. Lekka madi'ra 10. Guluchu eramannokkkinna diriirannokki gede ikka. 11. Diafoommo/a 12. Wole xawisi_____	
Q304	Guluchu woro lekka fuugissanno xissora roorenkanni reqecci assannori maati?	7. Geedhima 8. Ama godobburooti. 9. Batato loosi're galanna hatttono koatte (caamma) luka hoogatenni. 10. Quchumu teesaano ikka. 11. Diafoommo/a 12. Wole xawisi_____	
Q305	Guluchu woro lekka fuugissanno xisso mayinni taraabbanno	6. Biinnicho qassuro. 7. Gulucho woro lekka fuugisanno xissamino manninni kikkisamatenni. 8. Keeshshitino bushshunna shiilote kikkisaminni. 9. Diafoommo/a 10. Wole xawisi_____	
Q306	Guluchu woro lekka fuugissanno xiso gargadha dandinanni?	3. Ee 4. Dee'ni 5. Diafoommo/a	
Q307	Guluuchu woro lekka fuggissanno xisso hitte hayyonni gargadha	6. Koatte lukatenni 7. Ganyine lekka	

	dandinaanni?	hayishshi'ratenni 8. Shiimmadda duuxa gargartanno keemikaale buudhatenni. 9. Kittiwaate kattawamatenni 10. Diafoomo/ma 11. Wole xawisi_____	
Q308	Guluchu woro lekka fuugissanno xisso hurtano?	3. Ee 4. Dee'ni 5. Diafoommo/a	
Guluchu woro lekka fuguissanno xisso noo xissamaanora noonsa laooshshe bunxanni borri-xa'mo.			
Q309	Qaaqqi'ya/qqo'ya gulucho woro lekka fuugissanno xisso noo manninni adhanturo Injaannohe?	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma/o	
Q310	Guluchu woro lekka fuugissanno xisso noo manni aye loosono loosa hassiissannosi.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemo/ma 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma /o	
Q311	Guluchu woro lekkate fuugo xisso noo manni qixxeessino sagale saga'la waajjishshannoe.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma/o	
Q312	Guluchu woro lekkate fuugo xisso dagganohu sirchunni/fiixunniiti.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemo/ma	

		4.Sumuu yeemma/o 5.Addinta sumuu diyeemma /o	
Q313	Guluchu woro lekkate fuugo xisso daggannohu rumotenni /xisso hasi'ratenni.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma	
Q314	Guluchu woro lekkate fuugo xissora xagissi'nanni xagga dino	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma/o	
Q315	Guluchu woro lekkate fuugo xisso buxane manna gawajjitanno	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma /o	
Q316	Guluchu woro lekkate fuugo xissora xaginsanni mereershi heeroommero daga'yara ,hawalle dagginni yee adheemmo/a	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma/o	
Q317	Guluchu woro lekkate fuugo xisso xiwamaasine dagate ledo looso loosa hoolate.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o 5.Addinta sumuu diyeemma/o	
Q318	Guluchu woro lekkate fuugo xisso xagisa fayyimmate jiro hunate.	1.Addinta sumuu yeemma/o 2.Sumuu diyeemma/o 3.Mittore diyeemmo/a 4.Sumuu yeemma/o	

		5.Addinta sumuu diyeemma/o	
Fayyimmate daafira afi'nanni taje la'nohunni			
Q319	Fayyimmate rosicho afidhe egennootta/o, guluchu woro lekkate fuugo abbitanno xissora sai lamu diri giddo?	3. Ee 4. Dee'ni	
Q320	Fayyimmate rosichi taje maminni afi'ritto/a?	7. Televizhiine/raadoonetenni 8. Xuqu xaadinni 9. Maate'yanni 10. Fayyimmate ogeeyyewiinni 11. Jaalla'yawiinni 12. Wole xawisi_____	

Gaamo IV. Maatete woy sirchu ledo xaadinnohunni xa'minanni borri-xa'mo.			
Koodde	***Xa'mo***	***Dawaro***	***Sai***
Q401	Mini'ne maate xaphooma me''e maate heedhanno?	_____(kiirotenni wori)	
Q402	Ate annira/amara hattono roduuwikkira/oosokkira guluchu woro lekkate fuugonni xissaminnohu gamba yino fiixi noohe?	4. Ee 5. Dee'ni 6. Diafoommo/a	
Q403	Ate ahaahe/ira hattono la'laamate /abboho /rodoote/roodu qaaqqora/qaqqira guluchu woro lekkate fuugo xisso noohu nooni?	4. Ee 5. Dee'ni 6. Diafoommo/a	
Q404	Atera wole mundeete xaadanno fiixira, guluchu woro lekkate fuugo xisso noo malaati noohu no?	4. Ee 5. Dee'ni 6. Diafoommo/a	
Q405	Ate gashshaanni/gashshaama guluchu woro lekkate fuugo noohu no?	5. Ee 6. Dee'ni	

		7. Diafoommo/a 8. Diguutino(xisso dinosi/e)	
Q406	Maate'nera meu xissamino tenne guluchu woro lekkate fuugonni?	_____(kiiroteenni wori)	
Q407	Hiittene dirraraati,guluchu woro lekkate xisso umo fuugate malaate hanaffannohu?	6. Qaaqqimmate dirira 7. Qedhiimmate dirira 8. Gamaareeyyete dirira ikkanno wote 9. Geedhiimmate dirira 10. Diafoommo/a	
Q408	Ati woy maatekki miili darame wolewa ha're egenninohu no?	3. Ee 4. Dee'ni	